

PRODUCT REVIEW

Kenwood TM-D710A Dual Band Mobile Transceiver



Reviewed by Howard Robins, W1HSR
ARRL Contributing Editor

How do you improve on perfection? That was the question I asked myself when Kenwood introduced the TM-D710A. I have been using its predecessor, the TM-D700A, for nearly five years, and considered it the finest, most feature-rich dual band mobile I had ever used.¹ So, when tasked with checking out the TM-D710A, I saw it as a great opportunity to answer my question.

Overview

The TM-D710A has the same core features and functions as Kenwood's TM-V71A.² The list is extensive, including a dual band receiver, 1000 memory channels, flexible scanning, tone squelch encode and decode and so on. As shown in Table 1, the 'D710A's performance is nearly identical to the 'V71A. The wide coverage receiver is best on the 2 meter and 70 cm bands, but sensitivity is good over much of its range. As with the 'V71A, you can listen to both receivers at the same time (both tuned to VHF, both UHF or one of each). Transmitter power is 50 W on both bands. Much of this review will focus on the data communication features not found in the 'V71A and significant changes from the 'D700A.

The 'D710A includes EchoLink sysop

¹S. Horzepa, WA1LOU, "Kenwood TM-D700A Dual-Band FM Mobile Transceiver," Product Review, *QST*, May 2000, pp 60-64. *QST* Product Reviews are available on the Web at www.arrl.org/members-only/prodrev/.

²H. Robins, W1HSR, "Kenwood TM-V71A Dual-Band Mobile Radio," Product Review, *QST*, Nov 2007, pp 71-74.

capability described in detail in the TM-V71A review, as well as an internal TNC with Automatic Packet Position Reporting System (APRS) and AX.25 packet functionality.^{3,4} It's the APRS capability that the TM-D700A is best known for. With my 'D700A, I started with a Magellan GPS receiver and later upgraded to an AvMap G4T. Both GPS receivers worked well, but the G4T provides a large, brilliant color map that shows the *full* call sign and subsystem ID along with the location of received position beacons. We ordered the new AvMap G5 GPS receiver to use with the 'D710A. It's shown in the title photo and described in an accompanying review.

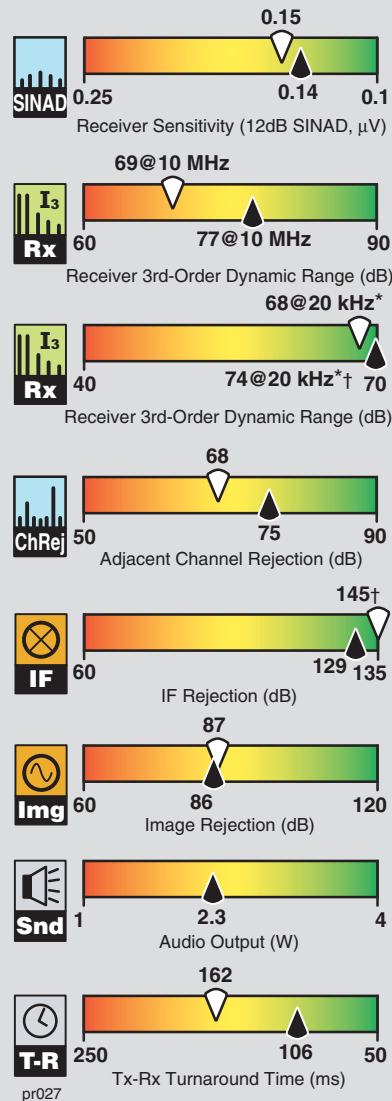
My TM-V71A review discussed Kenwood's *MCP-2A* memory programming software. *MCP-2A* works with the 'D710A too, requiring the same optional PC interface cable set. As with the TM-V71A, you can import repeater lists created with ARRL's *TravelPlus for Repeaters* and download them to the TM-D710A's memories.⁵

³EchoLink software allows licensed amateurs to communicate with one another over the Internet, using voice-over-IP (VoIP) technology. Connections may be made from station to station or from computer to station. For detailed information, software and registration, visit www.echolink.org.

⁴APRS was developed by Bob Bruninga, WB4APR, to support rapid reliable exchange of information among amateurs connected to a network via packet radio. For more information on the technology and many useful links, see www.aprs.org.

⁵*TravelPlus for Repeaters* CD-ROM, 2007-2008 edition. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 9930. Price, \$39.95 plus shipping. Telephone 860-594-0355, or toll-free in the US 888-277-5289; www.arrl.org/shop/; pubsales@arrl.org.

Key Measurements Summary



pr027

Key:
* Noise limited at value shown.
† Off Scale

Bottom Line

Kenwood's TM-D710A refines and enhances the capabilities found in the venerable TM-D700A. The 'D710A has all the features you expect for FM voice operation, plus a built-in TNC for APRS and packet as well as support for Kenwood's Sky-Command II remote control system.

In addition to a very basic printed book, a lengthy TM-D710A *Owner's Manual* is provided on a CD-ROM in multiple PDF files. Kenwood did a great job on much of this document. There is a lot to know about this radio, and the organization and detailed content mitigate much of the complexity. The radio's menus are also very well organized and leave little to the imagination. I strongly recommend participation in the Yahoo Groups that have been established for APRS, the TM-D710A and the AvMap G5. As good as they are, the manuals only scratch the surface, and interaction with other users will help you get the most out of your investment.

Little Black Box

The TM-D710A main unit can be mounted in any convenient location. A recessed RJ-45 modular jack on the front panel is for the umbilical cable from the control head. Another RJ-45 jack, on a side panel, is for the microphone.

Your antenna connects to a single SO-239 jack on the rear panel. A 6-pin mini-DIN data port is typically used to connect to an external TNC or PC sound card, while an 8-pin mini-DIN PC port connects to your computer's RS-232 serial port via an optional cable. The internal speaker provides superb audio quality, but you can connect external speakers for each of the receivers.

Control Head

As with the 'D700A, the 'D710A control head doesn't attach to the main unit. The radio comes with a desk mount and a mount for vehicle installation. The head is easily detachable so you don't have to leave it in your vehicle. (TM-D700A instructions warned about losing the control head: There are no direct replacements. Kenwood recently introduced the RC-D710A control head to convert a TM-V71A to a TM-D710A. The RC-D710A can be purchased to replace a lost 'D710A control head, but better to just treat the one you have with care.)

The control head's mounting arrangement is the same as for the 'D700A, but the connectors are RJ-45, not RJ-11. This is because the GPS receiver now connects to the control head, not the main unit. If you are replacing an installed 'D700A with a 'D710A, you will have to change out the umbilical between the main unit and the head and you won't need the GPS wire.

The control head has a COM port on the back not found on the 'D700A. It's for using the internal TNC for packet communication. Note that memory programming with the *MCP-2A* software requires connection between your computer's serial port and the

Table 1
Kenwood TM-D710A, serial number 90600349

Manufacturer's Specifications	Measured in the ARRL Lab
Frequency coverage: Receive, 118-524, 800-1300 MHz (cell blocked); transmit, 144-148, 438-450 MHz.	Receive, as specified; transmit, 144-148, 430-450 MHz.
Power requirement: Receive, 1.2 A (2 W audio); transmit, 13 A (max).	Receive, 1.4 A; transmit, 9.6 A. Tested at 13.8 V.
Modes of operation: FM.	FM, AM (receive only).
Receiver	Receiver Dynamic Testing
AM sensitivity: 10 dB S/N: 118-174 MHz, 0.4 μ V; 174-230 MHz, 0.5 μ V; 230-300 MHz, 5.6 μ V; 300-350 MHz, 1.0 μ V; 350-400 MHz, 0.56 μ V; 400-500 MHz, 0.36 μ V; 500-524 MHz, 0.71 μ V.	For 10 dB S+N/N: 120 MHz, 0.55 μ V.
FM sensitivity, 12 dB SINAD: 118-174 MHz, 0.32 μ V; 174-230 MHz, 0.4 μ V; 230-300 MHz, 5.6 μ V; 300-350 MHz, 1.0 μ V; 350-400 MHz, 0.56 μ V; 400-500 MHz, 0.28 μ V; 500-524 MHz, 0.56 μ V; 800-1240 MHz, 7.1 μ V; 1240-1300 MHz, 2.2 μ V.	For 12 dB SINAD: 144 MHz, 0.14 μ V; 222 MHz, 0.25 μ V; 430 MHz, 0.15 μ V; 906 MHz, 1.9 μ V; 1240 MHz, 1.5 μ V.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset: 146 MHz, 74 dB; 440 MHz, 68 dB.* 10 MHz offset: 146 MHz, 77 dB; 440 MHz, 69 dB.
FM two-tone, second-order IMD dynamic range: Not specified.	87 dB.
FM adjacent channel rejection: Not specified.	20 kHz offset: 146 MHz, 75 dB; 440 MHz, 68 dB.
Spurious and image rejection: Not specified.	First IF rejection, 146 MHz, 129 dB; 440 MHz, 145 dB. Image rejection, 146 MHz, 86 dB; 440 MHz, 87 dB.
S-meter sensitivity: Not specified.	Max indication: 146 MHz, 3.8 μ V; 440 MHz, 3.7 μ V.
Squelch sensitivity: 0.1 μ V.	At threshold: 146, 440 MHz, 0.1 μ V.
Receiver audio output: 2 W at 5% THD into 8 Ω .	2.3 W at 5% THD into 8 Ω .
Transmitter	Transmitter Dynamic Testing
Power output (H/M/L): 50/10/5 W.	146 MHz, 51 / 10 / 3.9 W; 440 MHz, 45 / 12 / 4.8 W.
Spurious-signal and harmonic suppression: 60 dB.	VHF, 72 dB; UHF, 66 dB. Meets FCC requirements.
Transmit-receive turnaround time (PTT release to 50% audio output): Not specified.	S9 signal, 146, MHz, 106 ms; 440 MHz, 162 ms.
Receive-transmit turnaround time (tx delay): Not specified.	146 MHz, 75 ms; 440 MHz, 76 ms.
Bit-error rate (BER), 9600-baud: Not specified.	146 MHz: Receiver BER at 12-dB SINAD, 3.2×10^{-4} ; at 16 dB SINAD, $<1.0 \times 10^{-5}$; at -50 dBm, $<1.0 \times 10^{-5}$. 146 MHz: Transmitter BER at 12 dB SINAD, 1.6×10^{-3} ; at 12 dB SINAD +30 dB, $<1.0 \times 10^{-5}$. 440 MHz: Receiver BER at 12-dB SINAD, 3.8×10^{-4} ; at 16 dB SINAD, $<1.0 \times 10^{-5}$; at -50 dBm, $<1.0 \times 10^{-5}$. 440 MHz: Transmitter BER at 12-dB SINAD, 1.8×10^{-3} at 12-dB SINAD +30 dB, $<1.0 \times 10^{-5}$.

Size (height, width, depth): Main unit, 1.7 x 5.6 x 5.7 inches; control head, 2.8 x 6.2 x 1.5 inches; weight: main unit, 2.6 pounds; control head, 0.66 pound.

Price: TM-D710A, \$600; VGS-1 voice unit, \$70; PG-5H PC interface cable, \$60.

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.

PC port on the main unit. So, if your main unit is in the trunk as mine is, and you frequently change programming, consider running a data cable to the passenger compartment. You will also need a shielded Ethernet type cable and coupler for the mic. (Sure would be convenient if the mic connected to the control head.)

There are seven buttons below the LCD screen, one more than the 'D700A. The new button is called KEY. The KEY button switches the functions of the other six buttons from radio functions (F, TONE, REV, LOW, PF1, PF2) to a new set of APRS specific functions (F, MSG, LIST, BCON, POS, P.MON). The change makes accessing APRS functions a lot more convenient. The layout of the other buttons and controls are similar to the 'D700A — CALL, VFO, MR on the left, and PWR, PM, TNC on the right. Press F, followed by the tuning control, to get into menu mode.

While the control head is only slightly larger than the 'D700A's, the display area and fonts are larger and easier on the eyes. A vertical bar in the center helps segregate information for the two bands. Above the frequency display, a new information line displays the current time, along with call signs of received duplicated APRS packets and an indicator of what sort of packet it was. When your beacon or sent message is received (from a digipeater) MY POSITION or MY MESSAGE is displayed in this screen position. Only new packets interrupt the frequency display and are displayed across the full width of the screen (a settable option).

APRS Features

Beaconing, messaging and routing functions have been enhanced, full digipeater capabilities added and menus streamlined. The control head display and dedicated APRS buttons make accessing these functions more straightforward.

- The received station list can be sorted by call sign, date/time or distance. The list can be filtered to create lists of digipeaters, mobile stations, weather reports and so on.

- Packet filtering allows you to select a position distance limit and to choose the types of packets you want to receive (weather, digipeater, mobile and so on). This is useful to keep the amount of information manageable in areas with lots of APRS activity.

- The 'D710A supports 29 station icons; the 'D700A supports 19.

- Many 'D700A users send a 100 Hz tone with beacons and set the receiver subaudible tone to 100 Hz on the APRS channel. This opens the squelch so we hear beacon packet



Figure 1 — Here, the TM-D710A's control head is set up for APRS operation on the left side and voice operation on the right.

clatter when within range of one another, indicating that we are close enough for simplex voice communication. There's now a settable menu option called Voice Alert on the 'D710A for this function.

- You can set one of the 'D710A's bands for APRS data operation and the other band for voice operation. Using the settable QSY function, the 'D710A can embed your voice (QSY) frequency into a status text. When this voice frequency information is received by another 'D710A, it is displayed on the station list. Pressing the TUNE button sets the voice band of your radio to the QSY frequency of the selected station.

- You can select the packet path type from N (new) PARADIGM, RELAY PARADIGM, STATE/SECTION/REGION or OTHERS. Each of these selections brings up an appropriate set of parameters.

- Several selectable beaconing strategies are available to help you control how much traffic you add to the APRS frequency data.

Manual — Pressing KEY then BCON sends a beacon.

PTT — Pressing and releasing the mic push-to-talk (PTT) button sends a beacon. One interesting application: During a public service operation you make a report from the field by voice, and your position is sent to the command center when you release your PTT button.

Auto — Beacons are sent based on a settable time interval.

Proportional Pathing — This function allows you to give local stations frequent updates while reducing the number of updates sent to distant parts of the network to help reduce network congestion. Proportional pathing automatically cycles your packets through different transmit paths so that direct (local) paths are used more often and multihop paths less often. For example, your data transmits direct path every minute, via a one-hop path every three minutes, via a two-hop path every nine minutes, and so on.

Decay Algorithm — If position data does not change, the time between transmissions lengthens according to a decay algorithm

(1-2-4-8-16-32-32-32 minutes, and so on). You can also set the radio to use a decay algorithm for transmitting, if the speed is 1 knot or slower, and switch to proportional pathing when the speed picks up.

- Weather station support includes wind direction and speed, temperature and rainfall in last hour. Connect your compatible weather station to the GPS port on the 'D710A, set some options, and you are an APRS weather station.

- A Kenwood proprietary data sentence is available for output to the AvMap G5 with target speed, course and altitude in addition to target ID and position. The 'D700A only outputs ID and position data.

AX.25 Packet

The COM port on the back of the control head connects the internal TNC to a computer. Using *Windows HyperTerminal* software, I was able to connect to packet nodes and even leave a message in a friend's personal mailbox.

When I tried to use *Airmail* software to connect to a local Telpac gateway (the interface between local VHF packet radio activity and the Winlink 2000 network), I discovered that *Airmail* didn't have any Kenwood models in its list of compatible TNCs. I tried a few of the other TNC setups but none worked correctly. Even though Kenwood indicates its TNC is Winlink compliant, there are no indications that *Airmail* will support Kenwood built-in TNCs in the future, so I looked for other options.

Someone suggested that I try *Paclink* to see if it would work with the TM-D710A to interact with Telpac gateways. I did and it does. *Paclink* allows you to use common email applications to send and receive mail via your radio link. This is a fairly complex implementation involving several programs. In addition to your e-mail software, you need *Microsoft.NET Framework*, *Paclink AGW Packet Client*, *Paclink Post Office* and *AGWPE Pro*. For details, see www.winlink.org/Client.htm. *AGWPE Pro* has a long list of compatible TNCs. The TM-D700A selection worked fine with the 'D710A.

Kenwood cautions that the built-in TNC does not offer all functions that might be supported by external TNCs. The parameter and command sets seem to be as complete as my Kantronics KPC-3+ standalone TNC.

Other Features

Different operators will make frequent use of different functions, so Kenwood provides some pushbuttons (PF keys) that can

be programmed with features that you use most often. There are two PF keys on the control head and four on the mic. In addition to receiving the NOAA weather channels, the 'D710A includes weather alert. You can program a PF key for quick access to the weather band.

The review radio included the optional VGS-1 voice guide and storage unit. The *voice guide* function announces changes in mode, frequency and other settings. It tells you just what you want to know, and at the right time. The announcement vocabulary seems to cover every detail. *Storage unit* refers to three voice recorder channels for storing voice memos, and a single channel for recording conversations.

SkyCommand II uses two compatible Kenwood dual band radios to remotely control specific Kenwood HF radios, or one V/UHF radio with the TS-2000. One of the dual band radios is connected to the mic and external speaker jack on the HF radio. Control signals are sent on the 70 cm band using the built-in TNC, with audio signals sent on 2 meters.

Wireless remote control enables you to use a dual band handheld radio to control the 'D710A. In this case, control tones are transmitted on a frequency in the 70 cm band. I was able to activate and deactivate crossband repeat with this feature.

Limitations and Restrictions

Although the TM-D710A does a lot, it can't do everything at the same time. For example, when the TNC is on for APRS or packet communications, weather alert cannot be turned on. You can manually tune to weather frequencies on the non-data band, but the PF key for this will not work with the TNC on. Likewise, Echolink sysop mode doesn't work with the TNC on, precluding the possibility of using the TM-D710A simultaneously as an APRS digipeater and EchoLink node. Use of the repeater mode (crossband, locked band), wireless remote control or SkyCommand II features prohibit the use of the TNC. A new firmware release, V1.11, available at no cost on the Kenwood Web site, reportedly resolves some of these problems. It was not available during our testing.

AvMap G5 Personal Navigator

*Reviewed by Howard Robins, WIHSR
ARRL Contributing Editor*

At first glance, the AvMap Geosat5 (G5) looks like the other GPS navigators that you see advertised everywhere. What makes the AvMap G5 special is that it's designed to work with Kenwood's APRS-ready radios, including the TM-D710A also reviewed this month. It provides GPS location information for your transmitted APRS beacons, and it shows received APRS information on its map display.

The G5 replaces and improves upon AvMap's G4T. It uses a colorful 5 inch LCD touch screen. The built-in SiRF III GPS receiver has 20 channels. Tele Atlas street maps for North America are included on a 2 GB SD memory card.

Connection to the TM-D710A is through a serial port normally used for an external TMC receiver (Traffic Message Channel, for traffic and weather data from consumer FM radios). Other connections include an audio/video input, an audio output (there is an internal speaker), an infrared sensor and a USB port. There's also a port for their external hockey puck type GPS antenna, but I found that the internal antenna worked just fine under the windshield.

The G5 is about the same size as the earlier G4T and the connections on the rear panel are the same, so I was able to unhook the G4T and

attach the G5 in its place. The package comes with a healthy, adjustable on-glass mount and a cigarette lighter plug for power and charging the internal battery. The supplied interface cable plugs into the TM-D710A control head. Perform a little menu-driven setup on both units and you're ready to go.

Using the G5

I've used a G4T for a while and find the G5's controls to be a distinct improvement. The G4T comes with an infrared remote control for navigating the menus. That's been replaced by touch screen controls in the G5, which I find easier to use. The G5's display is bright, crisp and easy to read, and brightness adjusts automatically depending on lighting conditions. You can switch between 2D and 3D display modes.

In addition to the map, an information line shows your location in words — down to the number on the street. As you drive by houses, you can see the numbers change. Zoom controls are on screen touch buttons. Boxes showing time, date, speed, altitude,

Final Analysis

If you are new to the world of mobile APRS, the TM-D710A and AvMap G5 or other GPS receiver will launch you into the mainstream without too much effort. If you are not interested in APRS or SkyCommand, then the TM-V71A might be a better choice.

The APRS community is growing rapidly as more equipment like this comes to market. Consequently, the volume of traffic on the APRS frequency is also growing. Strategies that allow you to control how much traffic you contribute to the mix is a valuable addition to Kenwood line.

The TM-D710A offers some new and updated capabilities. Programming enhancements simplify the use of the many features and functions. It plays well with AvMap G5, and both products offer great value for their respective prices.

Manufacturer: Kenwood USA Corp, 3975 Johns Creek Ct, Suite 300, Suwanee, GA 30024; tel 310-639-4200, fax 310-537-8235; www.kenwoodusa.com.

estimated time of arrival and other parameters float along the map's left side and can be hidden in an instant by touching an on-screen button near them. The G4T has five such boxes, but the G5 has only three (you pick the parameters you want to see).

APRS with the G5

The G5 sends your position data to the radio over the interface cable, and the radio uses that information in your position beacons. On receive, the 'D710A sends APRS data to the G5. The unit can store up to 1000 "APRS Contacts" and display them on the map.

Static positions are represented by blue bulls-eye icons along with the associated call sign. Moving positions are represented by red triangles and associated call sign. While this is fine for a standalone mobile APRS display, it is not as robust as some of the APRS applications designed for personal computers and larger screens. Position icons remain on the display until the contact list overflows or you manually remove them. So, while moving positions are identified and refreshed, there is no way to automatically drop aged positions.

A "tactical" mode uses the 'D710A's proprietary data feed and the latest G5 software. Tactical mode allows you to select an APRS contact to see its speed, course and altitude in addition to its call sign and

Bottom Line

The AvMap G5 is an attractive, feature-rich personal navigator that's customized with Amateur Radio features. Integration with Kenwood's APRS transceivers is quick and easy.

position. You can also acquire a route from your position to the target APRS contact.

My G5 came with an older version of software, so I performed an update using drivers and the latest software from AvMap's Web site. The drivers allow *Windows* to recognize the G5 when it is plugged into a USB port. The entire process took just a few minutes and went smoothly. User settings are lost during the update and need to be re-entered — no big deal, but I didn't see it mentioned.

"It's a great standalone Navigator first..."

While hams naturally focus on the APRS features, the G5 was designed for the personal navigation marketplace. It offers turn-by-turn driving directions and options such as fastest or shortest route. A line at the bottom of the display spells out your current location, and another tells you the street to take at the next maneuver. Next to that, a graphic depicts the maneuver



Figure 2 — The G5's map shows APRS station data received from the Kenwood TM-D710A near the center of the display. The blue area near the bottom of the screen is for location and driving directions when the vehicle is in motion.

with arrows and shows the distance to that maneuver. Voice prompts are available in 14 languages. While the information lines take real estate from the map display, they provide precise information that is less discernable from the map in many instances. This is a valuable improvement over the G4T.

The G5 includes points of interest (POIs)

that show up as icons on the map. For APRS, the only icons I want to see on the map are received APRS station positions, so I turn off all of the POIs. A problem I experienced with the G4T hasn't been cured with the G5. Some travel layer POIs remain after they are turned off. According to AvMap, this problem is being addressed by the designers and will be resolved in a future downloadable firmware release to be available at no cost.

I found the G5 to be a worthy successor to the G4T, with noticeable refinements in operation. If you're looking for a plug-and-play mobile APRS solution, give the G5 and a compatible Kenwood radio a close look.

Manufacturer: AvMap s.r.l. Carrara, Italy, www.avmap.it. US distributor, AvMap/USA, 133 Falmouth Rd, Mashpee, MA 02649. Amateur Radio contact: Don Arnold, W6GPS, 410 Cyndica Dr, Chattanooga, TN 37441; e-mail info@geosat.us; www.geosat.us. Price: \$650, external antenna, \$149.

Yaesu VX-3R Miniature Dual-Band Handheld Transceiver

*Reviewed by Dan Henderson, N1ND
ARRL Regulatory Information Specialist*

I first saw the VX-3R at a hamfest before knowing I would do this review. When someone handed it to me, my immediate impression was "I don't need your cell phone." Only then did I realize I was holding a dual-band amateur transceiver. This radio fits in the palm of your hand and is a follow-on to the popular VX-2R reviewed in October 2003 *QST*.⁶

Out of the Box Experience

After spending a few minutes reviewing an extensive instruction manual, I pressed the orange button on the side of the radio and it switched on. At power up the VX-3R reports battery voltage — a good initial check of your radio's readiness to operate.

The VX-3R's small size dictates that the function buttons are small — and not easily

managed by someone like me with larger fingers. At first you may want to keep the manual close at hand, as well as a pencil with a small eraser to assist with pushing buttons.

I made my first QSO after reviewing the manual and a couple of trial-and-error attempts. The receive audio quality was surprisingly good considering the miniature size and lower than usual audio output power. The reports back to me were of good transmitted audio.

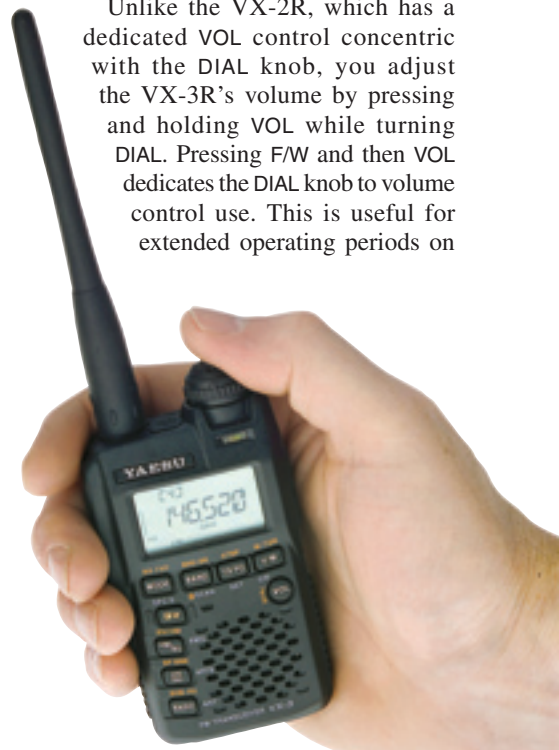
Controls and Functions

You will quickly become familiar with the large DIAL knob on top that's used for frequency changes and for menu selections. A new — and very useful — feature is that the VX-3R tuning knob locks when pressed down, making accidental changes in the various settings less likely.

Eight of the nine buttons on the front of the radio have three functions. A single press of a button performs one function. Pressing and holding the same button takes you to a second function. By pressing the F/W switch simultaneously, you enter the third set of

functions for that button.

Unlike the VX-2R, which has a dedicated VOL control concentric with the DIAL knob, you adjust the VX-3R's volume by pressing and holding VOL while turning DIAL. Pressing F/W and then VOL dedicates the DIAL knob to volume control use. This is useful for extended operating periods on



From February 2008 *QST* © AHK

⁶B. Price, "Yaesu VX-2R Miniature Dual-Band Handheld Transceiver," Product Review, *QST*, Oct 2003, pp 69-71. *QST* Product Reviews are available on the Web at www.arrl.org/members-only/prodrev/.