

PRODUCT REVIEW

ICOM IC-V82 2 Meter Handheld Transceiver



Reviewed by Dan Henderson, N1ND
Contest Branch Manager

Those looking for a basic 2 meter FM handheld transceiver will certainly want to consider the latest entry into this highly competitive market from ICOM—the IC-V82. It is specified to pack a full 7 W on high power, enough signal whether you are providing support communications in an emergency or checking into the net on the local repeater. If you are looking for a similar transceiver for 70 cm, ICOM offers the IC-U82 for that band. What's really new is that this radio is easily upgradeable to D-STAR digital voice and data operation, as described later in the column.

So What's it Like?

The first impression of the 'V82 may be about its physical size. The last several handhelds I have reviewed were smaller in size. The 'V82 is not bulky, about comparable to a standard cordless home telephone. My first impression was that it was a substantial radio, one that you would definitely feel clamped onto your belt

ready for action. It feels good in my hand and I was comfortable using it while walking around the neighborhood. Its sleek modern look is appealing to me.

ICOM is known for quality and the 'V82 is next in the line of this proud tradition. Its documentation is thorough, though at times finding information in the 84 page manual took some digging.

How's it Play?

My standard first test is “how easy is it to get on the air and make a contact with this radio.” The 'V82 passes this one with relative ease. Attach a charged battery pack and the provided BNC-connected flexible antenna and you are ready to go.

With the exception of the VOLUME control (also a MULTIFUNCTION control; see below), the large knob on top of the radio, all of the buttons necessary for operating the 'V82 are on the front panel as shown in Figure 1. To turn the radio on, push and hold the orange button on the panel until you hear the radio beep, and you are powered up. For fast tuning, you can either manually enter the operating frequency on the keypad or you can use the UP and DOWN arrows on the top row of the keypad. The 'V82 automatically sets in standard repeater offsets, depending on the band segment you select. Punch up the desired frequency, and unless you need to set repeater access tones, you can press the push-to-talk button on the side and you are on the air—straightforward and simple.

Would you prefer to use the knob on the top of the radio as a turning dial instead of a volume control? You can use the initial set mode to change this option. When you do so, the UP and DOWN arrow buttons will function as the VOLUME control for the radio.

Another operation basic to the casual user is setting the squelch level. It's as

simple as pressing the MONI button on the keypad and using the UP and DOWN arrows to loosen or tighten the squelch as desired. Just be careful. If you have big fingers as I do, you may have to learn to use a light touch on the keypad to avoid hitting multiple keys.

The digital display is black on gray, which I found a bit difficult for me to read under some lighting conditions, even while using the backlight function. The layout of some of the keypad buttons is different from some other radios I've tested. The *, 0 and # buttons are located on the right side and the A, B, C and D buttons are across the second row of the keypad. As you learn to use the radio, this layout should become second nature.

I found the method of setting the various functions from the keypad took some getting used to as well. For example, the process for changing power level was: first push keypad button FUNC to activate the function tier, then push keypad H/M/L to change the power level. However, if you wanted to change the power by two levels, from HIGH to MEDIUM for example, you would have to do the sequence twice—the first to go from HIGH to LOW, the second from LOW to MEDIUM.

Thanks for the Memories

The 'V82 comes with the bells and whistles that one expects in this new generation of compact handhelds. You will find 207 memory channels, complete with the capability of programmable features for each, such as subaudible tone encoding, tone squelch, odd repeater offsets and the ability to give channels names for easy identification on the display.

A very handy function, especially when traveling in an unfamiliar area, is *tone scan*. This function allows the operator to monitor a repeater frequency to determine the access tone or digital coded squelch (DCS) sequence in use. The radio will remember it for immediate use or it can be stored in memory for use later.

The display method for the frequency can be set in one of three ways. If you prefer to see the specific frequency, you can set the radio to FREQUENCY indication mode. If you prefer seeing the display of the programmed memory channel, then use the CHANNEL NUMBER indication setting,

Bottom Line

ICOM brings digital voice and data capability to a handheld transceiver that is compatible with the open D-STAR standard yet still can function as an analog transceiver.

Table 1
ICOM IC-V82, serial number 2501315

Manufacturer's Specifications

Frequency coverage: Receive, 136-174 MHz; transmit, 144-148 MHz.

Power requirements: 6.0-10.3 V dc**; receive; 0.25 A (max); transmit, 2.6 A.

Size (height, width, depth): 5.2" x 2.1" x 1.4"; weight, 7.1 ounces.

Receiver

Sensitivity: 12 dB SINAD, 0.16 mV.

Adjacent-channel rejection: Not specified.

Two-tone, third-order IMD dynamic range: 65 dB, (spacing not specified).

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

Spurious and image rejection: 80 dB.

Squelch sensitivity: 0.11 mV.

Audio output: 300 mW at 10% THD into 8 ω .

Transmitter

Power output: 7 W high, 4 W mid, 0.5 W low. Under battery power; Powered by 10 V dc supply;

Spurious signal and harmonic suppression: 60 dB.

Transmit-receive turnaround time (PTT release to 50% of full audio output): Not specified.

Receive-transmit turnaround time ("tx delay"): Not specified.

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.

**Using ICOM-supplied battery pack.

Measured in the ARRL Lab

Receive and transmit, as specified.

Receive, 0.16 A (max volume, no signal); transmit, 2.4 A, tested at 10 V.

Receiver Dynamic Testing

For 12 dB SINAD: 0.11 mV.

20 kHz offset from 146 MHz, 69 dB.

20 kHz offset from 146 MHz, 69 dB,*
 10 MHz offset from 146 MHz, 88 dB.

82 dB.

IF rejection, 104 dB;
 image rejection, 108 dB.

0.09 mV at threshold.

350 mW at 5% THD into 8 ω .

Transmitter Dynamic Testing

7.2 W high, 3.9 W mid, 0.5 W low,
 7.4 W high, 4.0 W mid, 0.5 W low.

70 dB. Meets FCC requirements for spectral purity.

Squelch on, S9 signal, 116 ms.

65 ms.

although this will limit the availability of some of the available user functions. If you have set up alphanumeric names, then the CHANNEL NAME indication mode can be utilized.

There is a large demand for VHF repeater frequencies. This sometimes means the need for reverse and non-standard shifts in the duplex mode, and the 'V82 can readily be programmed to support these in addition to the standard offsets. The user can program these special cases into stored memory channels. If you don't want to store the offset in a memory, you can use the FUNCTION/4**DUP* button to change the offset for immediate use. Again, if you wish to change from a standard offset to simplex, for example, you will have to go through the process twice, as you did to change power levels.

It is becoming rare to find repeaters that do not require an access tone, so you will want to make sure you are familiar with how to program these. You will need to remember that you first need to set the subaudible tone frequency, using the A/FUNC and 8/SET button. To change the

tone, you will use the VOLUME/MULTI-FUNCTION knob on the top. Once you have selected the correct tone, press the 8/SET button again to confirm the tone. To activate the tone on the selected stored memory channel of current display frequency, you will need to then press A/FUNC and keypad 1/TONE in sequence until you see a small "musical note" above the channel frequency display. That will tell you the tone is set and ready for transmit.

Extra Bells and Whistles

The 'V82 has numerous features that will be valuable to those interested in more advanced operation. I formerly lived in an area where I monitored a repeater to listen for friends. I often found myself turning off the radio because of other chatter on the frequency. The 'V82 offers the capability to use the DTMF touchtone codes as a *message pager* to allow calls to be heard by particular radios. This would have been a perfect solution to my problem. Some special programming of the radio is required to use this function, but the step-by-step instructions in the manual allow



Figure 1—Close-up of the IC-V82 control panel and display.

this feature to become yet another useful tool in an amateur's bag of tricks.

Perhaps the most exciting new feature to the 'V82 is that it has been designed to operate in digital voice as well as D-STAR low-speed data modes, to 9600 kbps. The 'V82 has a special socket to accept the optional UT-118 digital encoding unit (see the remainder of this review for more about the UT-118 and digital voice and data) that provides for simultaneous digital voice and data in addition to regular FM voice operation. The 'V82 thus can be equipped to provide a new level of capability and versatility.

The 'V82 provides very simple access to local NOAA weather channels, of particular interest to those active in local SKYWARN or weather watch activities. It also incorporates the ability to notify the user when NOAA broadcasts the special weather alert tone. When the weather alert function is activated, the 'V82 monitors the selected weather channel every 5 seconds. If NOAA has issued no alert, the radio continues to operate in whichever mode you have it set for. When an alert is issued, the 'V82 displays the alert on the LED screen and sounds a beep tone until acknowledged.

Handheld 2 meter FM transceivers have come a long way in my 35 years as a licensed amateur. From large, bulky crystal controlled radios the size of a small boom box to the first of the synthesized radios to the next generation that included tone access pads for autopatch use to today's microchip marvels in miniature form, the handheld has evolved not only in style. It has become one of the stan-

ard pieces of equipment in almost every amateur's shack or pocket. With its design features and options expanded to incorporate today's digital technology and the quality of the ICOM name behind it, the

'V82 is a durable, high quality handheld transceiver—one that any amateur would enjoy having in their shack or in the field.

Manufacturer: ICOM America, 2380 116th Ave NE, Bellevue, WA 98004; tel

425-454-8155; www.icomamerica.com. Price: IC-V82, \$229.95; IC-V82 Sport, identical to the 'V82 except it comes with a holder for AA batteries instead of rechargeable and trickle charger, \$199.95.

D-STAR Digital Voice and Data—An Overview

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Introducing D-STAR

Hams are asking a lot of questions about ICOM's new digital VHF and UHF feature called "D-STAR." What is D-STAR? Is it restricted to ICOM rigs? What does the D-STAR standard describe? How can I use D-STAR? In this section, I'll try to answer those questions, and more.

Interest in digital technology runs deep in Amateur Radio, back to the early days of radioteletype, or RTTY. Packet radio was created from the Bell 202 and X.25 standards, and more recently there has been an explosion of new modes such as PSK, PACTOR, MFSK and others. Voice transmissions have been slow to be adapted to digital transmission standards, but the G4GUO¹ protocol has been implemented on HF by AOR,² and ICOM has now released equipment that supports the D-STAR standard for transmitting both voice and data.

D-STAR, The Standard

D-STAR was the result of three years of research funded by the Japanese Minis-

¹B. Charles, G4GUO, "Practical HF Digital Voice," *QEX*, May 2000, p 3.

²J. Hallas, "AOR ARD9800 Digital HF Voice Modem," Product Review, *QST*, Feb 2004, pp 80-81.

try of Posts and Telecommunications to investigate digital technologies for Amateur Radio. The research was conducted by a committee administered by the Japan Amateur Radio League (JARL). Included in the group were representatives of the Japanese Amateur Radio manufacturers, including ICOM, which provided the equipment used for development and testing. The committee produced a standard called D-STAR in 2001.

Although D-STAR is a standard published by JARL, it is available to be implemented by anyone. D-STAR is an *open protocol*, meaning that any equipment complying with the published standard can interoperate with D-STAR equipped radio equipment. ICOM is the only manufacturer to date that makes equipment that supports the D-STAR standard.

What does the D-STAR standard actually control? As shown in Figure 2, D-STAR applies to what data communications engineers call the *air link*, meaning the actual radio transmissions between radios. (PSK31 is also an air link standard.) D-STAR radios can talk directly to each other without any intermediate equipment or through a D-STAR repeater with D-STAR voice or data transceivers. The D-STAR standard controls the conversion between analog voice and digital radio signals through its *codec* or coder-decoder function. The standard supports conversion between

digital data and digital radio signals. On the data terminal side, D-STAR radios are required to present either an RS-232, Ethernet or USB interface.

The methods a D-STAR repeater uses to handle those voice or data signals internally is up to the repeater designer. The manufacturer defines the details of the communications between the D-STAR voice and data transceivers and the repeater controller shown in Figure 2.

D-STAR also specifies how a repeater communicates to other D-STAR systems through *gateways* that are connected to the repeater controller. Whether the gateways communicate via the Internet or a radio link is up to builders of the repeater system. D-STAR repeaters from any manufacturer can be linked to form networks by using the D-STAR gateways.

How does D-STAR compare to other digital radio standards? The D-STAR system defines a little more than the packet radio AX.25 standard and a little less than the popular wireless networking standard, IEEE 802.11. Packet radio, as a data-only means of communications, is only required to define how characters from the host are converted to tones and transmitted as packets of data over the air. IEEE 802.11, on the other hand, specifies much more, including how 802.11 devices connect to both the host and to each other, just as D-STAR radios must "link up" with each

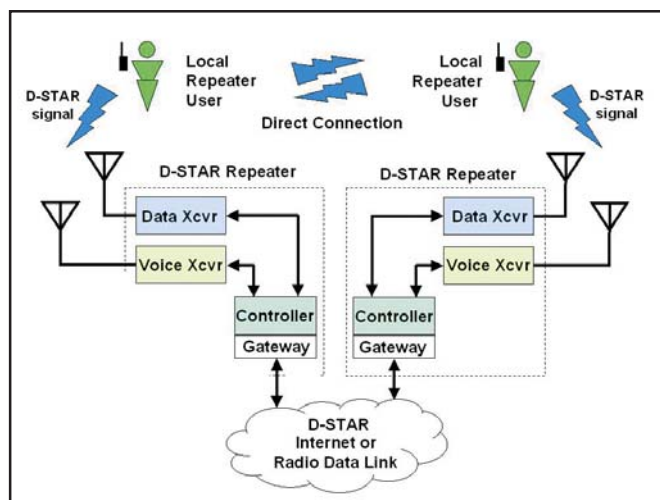


Figure 2—The D-STAR standard describes both user-to-user and user-to-repeater links as well as the repeater-to-repeater data link.

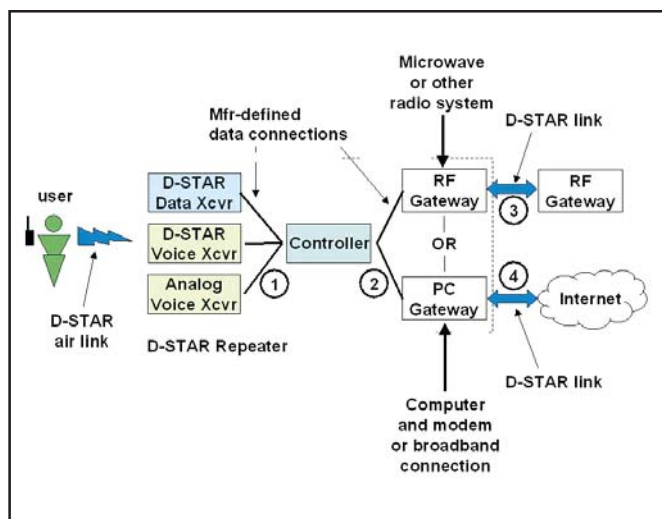


Figure 3—A D-STAR repeater consists of a radio "front-end," a controller and repeater-to-repeater links.

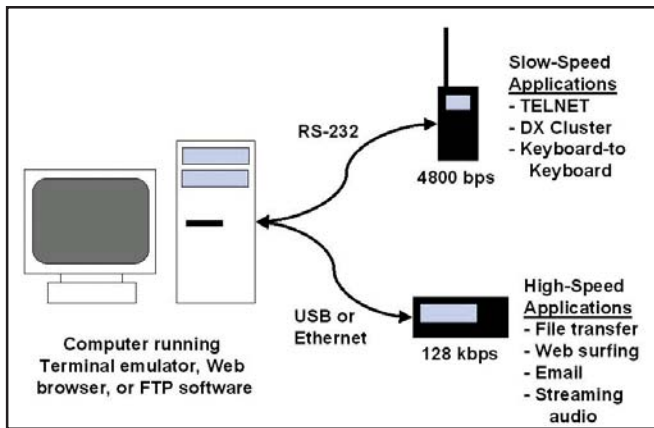


Figure 4—D-STAR supports both low- and high-speed data rates, connecting to your computer as a dial-up or direct Internet connection over standard interfaces.

other to exchange signals. D-STAR also defines the voice codec so that each radio knows how to turn the signals back into voices. The function is similar to the G4GUO digital voice standard being used on HF by AOR voice modems.

The D-STAR Repeater System

A D-STAR repeater based on ICOM's design is shown in more detail in Figure 3. While ICOM is currently the only manufacturer, it is likely that other D-STAR repeater designers will select a similar arrangement. Figure 3 only shows how the functions are connected, not necessarily how the hardware that performs them is constructed, since that is up to the designer.

The "front-end" of the repeater is what the user interacts with. If digital voice or data is to be used, the user's radio "connects" to either a voice or data D-STAR transceiver in the repeater. (Some manufacturers may choose to have a single transceiver handle both voice and data. D-STAR repeaters can also be equipped to include regular analog voice, packet, video or other functions if they desire.) Just as in a conventional analog repeater, the radios (receiver and transmitter) interact with a repeater controller. The controller in a D-STAR repeater is what handles the connection both between voice and data radios and to the gateway that links to other repeaters.

In Figure 3, the internal connections labeled 1 and 2 are not controlled by the D-STAR standard. If you were designing a D-STAR repeater, you would be free to create any kind of connection from the radios to the controller. In an ICOM D-STAR repeater, connection 1 is similar to that between a detachable front panel and the body of a mobile radio. Connection 2 is an Ethernet connection carrying a non-published communications stream or *protocol*. At this point in the D-STAR system, everything has been converted to a stream of digital data.

D-STAR repeaters from any manufacturer can be linked together by either a digi-

tal radio link or by a data connection through the Internet (Links 3 and 4 in Figure 3). In the first case, the gateway is a microwave radio. Data is exchanged using the Asynchronous Transfer Mode (ATM) protocol, commonly used for similar links in the commercial telecommunications world. In the second case, a regular PC with a broadband connection to the Internet is used. A standalone D-STAR repeater does not need a gateway function.

D-STAR Air Link—Technical Details

What would find if you looked "under the hood" of a D-STAR signal? Voice signals are converted to and from a digital stream of data by a codec implementing the AMBE (Advanced Multi-Band Excitation) method, one of several popular voice codec methods in use today. If you were transmitting digital data instead, the radio would connect to your computer with either an RS-232 or USB serial connection, for low-speed data, or a high-speed connection via Ethernet.

The speed of the data in D-STAR equipment is 4.8 kbps for voice and 128 kbps for digital data. This is sufficient to support communications quality voice and about twice as fast as good quality dial-up connections. The data is transmitted over the air in the 0.5GMSK format—Gaussian Minimum Shift Keying, a type of FSK that minimizes distortion of the transmitted waveform.

The D-STAR signals are also *packetized*, just as in packet radio. In fact, if you were communicating keyboard-to-keyboard at normal typing rates, you would find little difference between packet and D-STAR operation. The data from your computer has a small amount of data added to it, called the *radio header*. This information includes some *framing data* that lets the transceivers on each end get in sync, plus the call sign of the repeaters at each end, if a repeater is used, and the call signs of each station. Think of it as a little radio

envelope containing data addressed to the other station. This is the process of *encapsulation* used by most communications protocols.

System Features

One notable new function of the D-STAR system is the ability to connect users anywhere on the D-STAR network by using their call signs. Whenever you transmit to a D-STAR repeater transceiver, your call sign is included to identify the source of the data. The gateway stores that information so that it knows which users are present, even if they are not transmitting at the moment. That information is also shared with all other D-STAR repeaters having gateway connections. In just a few seconds after making even a short transmission to a D-STAR repeater, your call sign is *registered* on the system. Another user calling you will then be connected to your current D-STAR repeater wherever both of you may be—across town or on different continents, and even on different bands!

The second advance is high-speed data. Hams have had 9.6 kbps packet radio for some time, but the higher speeds needed for access to the Web and for useful file transfer have been mostly out of reach. D-STAR radios have the ability to carry data at up to 128 kbps, although the net data rate is usually less than 90 kbps due to packet overhead and error correction. This can happen either directly between D-STAR transceivers or through a D-STAR repeater and over the linking gateways, assuming that the gateway connection has a sufficient data rate. Note that these are maximum rates. Individual radios, such as the integrated voice-data transceivers tested in the ARRL Lab, may support lower rates.

D-STAR doesn't care what type of software the user is running, nor does it require special application software. The host computer will "see" a conventional modem interface for the low-speed connection and an Ethernet port for high speeds. This means you can use the standard software that is widely available for terminal emulation such as ProComm or Hyperterm, Web browsing applications such as Internet Explorer, Firefox or Netscape as well as File Transfer Protocol packages. D-STAR tries its best to look "just like a cable," except that it's connected by radio. Anything your computer does now via the Internet it will be able to do via a D-STAR system, assuming the data rate is high enough to support it. You are also still required to comply with any rules about commercial messages and usage over the air waves.

Summary

I'm sure you've already thought of several things you could do using D-STAR

systems: remote operation, emergency communications, even wireless Field Day logging networks. With the natural inventiveness of hams, there's no doubt we'll see some significant innovation as D-STAR becomes more widespread. If you'd like to

know more about the technical details of D-STAR, ICOM is translating the standard from Japanese and it should soon be available, along with a D-STAR Forum for interested parties, at www.icomamerica.com/amateur/dstar.

H. Ward Silver, N0AX, is an engineer, author and teacher who enjoys contesting and DXing. Ward is the author of Ham Radio for Dummies, as well as the current QST series "Hands-On Radio." He can be reached at 22916 107th Ave SW, Vashon, WA 98070 or at n0ax@arrl.org.

Installation and Test of UT-118 Digital Voice Modules

Michael Tracy, KC1SX
ARRL Test Engineer

UT-118 Installation and Setup

Installation

The UT-118 modules are constructed on a single small printed circuit board as shown in Figures 5 and 6. The board has no adjustments or controls, other than the menu settings to be described in the next section, a good thing since they disappear into the radios they are used with.

The installation in the IC-V82 is the simplest. The battery is removed as if for replacement, revealing a small panel on the surface of the battery compartment as shown in Figure 7. The panel is removed with two small Phillips head screws and the unit plugs into the connectors as shown in Figure 8. Put the cover back, replace the battery and you're done.

The IC-2200H installation is only slightly more complicated. The VFO knob is pulled off, then two Allen head screws are removed to detach the front panel. The UT-118 circuit board onboard connector just snaps into the mating connector on the rear of the exposed front panel as shown in Figure 9. A small stick-on foam pad is used to raise it off the front panel board of the IC-2200H. Reassembly is straightforward and the buttoned up unit looks just like it did before.

Setup

I found that setting up the D-STAR modes with the UT-118 is not particularly difficult. It would be easier, however, if the documentation were further refined. Since the unit has just been released, the documentation provided with the radios appears to be preliminary and I hope that clearer documentation will be available soon. I found that the wording from the more recent IC-V82 manual is somewhat more refined than that of the earlier IC-2200H manual, providing hope that the trend will continue. For example, rather than starting with an overview of how the modes are intended to work, the text immediately starts out discussing various menu settings that must be taken care of, without providing much information on

the significance of the parameters.

Particularly confusing to me were all the call sign settings—there is an entry of mYC (my call), yUC (your call), multiple listings for RnC (repeater call) with R1C indicating the closest (home) repeater. There wasn't much about the significance of these, or which were needed for what application. From what I could tell, it was only necessary to program the mYC entry.

A CQ call must also be selected prior to transmitting, but the default coding of CQCQCQ was just the ticket.

Direct station to station data transfer worked virtually flawlessly over a strong signal path, and simultaneous voice/data communication worked well too, although I wouldn't suggest typing keyboard to keyboard with the same person you are talking to—I find it quite disorienting.

Measured Performance

Measurement Setup

To test the UT-118, the ARRL Lab connected two UT-118 equipped IC-2200Hs back to back with variable attenuators on the RF link between them. First, the analog signal-to-noise ratio (S/N) versus attenuation was recorded. The equivalent digital signal voice quality was then noted at the same attenuation settings to provide a comparison of analog to digital voice performance.

The digital voice audio frequency response was measured by sweeping the microphone input with an audio generator and measuring the peak spectral display at the speaker of the second unit. The results were plotted as shown in Figure 10.

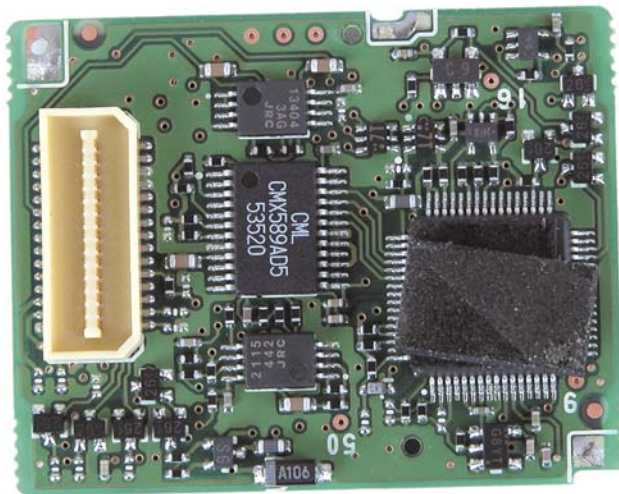
To determine data transfer performance, we transferred a 53 kB data file between the two radios at multiple attenuation settings corresponding to a range of S/N. The received file was compared to

the transmitted one and character errors were tabulated. We did not have the capability to measure bit error rate (BER, the usual measure of data transfer integrity) directly. For relatively few character error events, we felt safe in assuming that most characters with errors were the result of a single bit error and that the BER was $1/8$ of the character error rate. The results are described below.



Figure 5—Top view of the UT-118 digital encoding unit.

Figure 6—Bottom view of the UT-118 digital encoding unit.



Digital Voice Performance

We evaluated the ability to communicate via digital voice over channels with varying noise level. In analog communication, as the signal drops closer to the noise, the background noise gets louder and louder until it buries the desired signal. In a digital voice system, as long as the pulses are detected there is only the noise corresponding to codec rounding error (quantizing noise) and any noise bursts resulting from detection errors.

The UT-118 uses an advanced encoding scheme optimized for voice waveforms, and thus the usual single tone signal plus noise and distortion to noise and distortion (SINAD) measurements used to evaluate analog systems do not tell the real story. To get a handle on digital voice performance, we set the analog SINAD by reducing the received signal level using a calibrated attenuator and observing the output SINAD. We then switched to digital mode and made subjec-



Figure 7—Access door for the UT-118 in the IC-V82 battery compartment.

tive voice tests between two units.

We found solid, virtually noise free communication, equivalent to analog “full quieting” at any analog SINAD above about 6 dB. Note that while analog copy was useable at that level it was quite noisy, and a signal at least 10 dB stronger would be required for comfortable copy in analog mode with about 22 dB SINAD required for full analog quieting.

At a level corresponding to about 3 dB SINAD in analog mode, the digital signal hit its threshold and we could no longer copy. By comparison, at that level in analog mode a voice signal was just barely understandable, but the noise was overwhelming.

Some other observations taken during our subjective testing are worth noting:

- The voice, while solidly copyable at the levels above, exhibited a trace of “digital sound” artifacts. The speaker’s voice was recognizable as that of the individual speaking, but you could tell it was something a bit different than a copper pair interconnection.
- We noted that this system, unlike others we



Figure 8—UT-118 digital encoding unit installed in an IC-V82.

have looked at, could acquire synchronization in mid transmission. This means that if you turned the radio on or switched channels, you could listen to the ongoing conversation. This is a particularly important feature for mobile operation, in which occasional dropouts are likely due to terrain, and the conversation can continue as soon as the radio is back in the coverage area.

Data Transfer Performance

At the equivalent of 24 dB SINAD, a 53 kB text file was transferred without any errors at all. At 18 dB SINAD, there were 26 incorrect characters (assuming

1 erroneous bit per character, that would be a BER of 1 bit for each 610,000 bits transferred or a BER of $6.1E-5$. At 12 dB SINAD, there were only 19 kB transferred and many of those were in error, so the BER was worse than $6.4E-1$. Since coin tossing should result in a BER of 0.5 or $5E-1$ this level of signal is not useful for data communications.

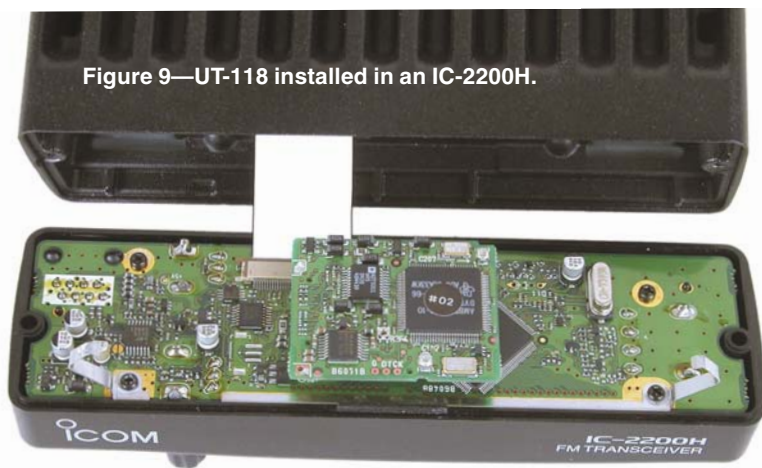


Figure 9—UT-118 installed in an IC-2200H.

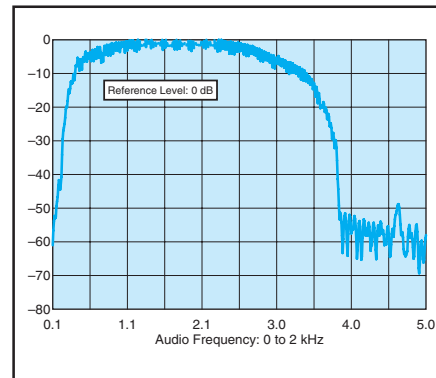


Figure 10—Frequency response of digital voice circuit between two UT-118 equipped IC-2200H transceivers.

Operating with the ICOM UT-118 Digital Voice and Data Unit

Reviewed by Joe Carcia, NJ1Q
W1AW Station Manager

Some time ago, I had the pleasure of reviewing the ICOM IC-2200H. At the time, we noted that it had a space for the not then available UT-118 digital voice and data unit. Upon the release of the UT-118, we obtained two and installed one into the

same IC-2200H and one in an ICOM IC-V82 2 meter handheld transceiver, the subject of another part of this review.

Making it Play

To operate in digital mode, you first need to activate it. This can be done from the microphone through the BANK/OPTION command. The word DIGITAL will

appear in the display above the frequency readout. Additional functions can then be set using either the BANK/OPTION or the SET or MONI buttons and the DIAL knob.

Setting One of the Functions

One of the first digital functions the manual describes is setting mYC (my call). At first glance, it appears to be just a mat-

ter of depressing a few buttons. I found however, that it's not as simple as all that. For example, to set mYC, you depress the BANK/OPTION for one second, and then again (or the V/MHz button) to select the mYC mode.

Next, you rotate the DIAL to get to the desired channel, and depress either the SET or MONI buttons. Push either button again to get into call sign programming. You can now use the DIAL to select the first character. To move the cursor to the next character, you depress either the SET or MONI button, depending on whether you need to go left or right, respectively.

In addition, there's a digital *Emergency Communications* mode and it is not necessary to set any call signs in this mode. This function can be activated whenever helpful.

So What Can You Do with This Unit?

The ICOM UT-118 digital unit allows for D-STAR format digital operation. With it, you can communicate using digital voice; text messaging; digital call, digital break-in, which allows breaking into digital communications between two other stations; digital code/call sign squelch; slow data communications, between PCs and GPS operation. GPS operation allows the radio to accept GPS input data in standard format. With this feature, the radio can send and receive current position information in latitude and longitude.

The *GPS operation* works both ways. It can be set up not only to transmit a position, but to receive one as well, from another digital operation compatible unit.

A few words about the text messaging and GPS operation: You can send a GPS message (via the *Text Messaging* scheme). At first glance, one might believe that this could support Amateur Position Reporting System (APRS) operation. Well, not really. For one thing, the transmission is digital. (If you've ever monitored an APRS transmission, you can hear the packet bursts, or analog signals. In addition, APRS has its own format—one that is recognized by other APRS stations independent of the APRS software.

In GPS operation mode, you're transmitting (in digital) your location and (if activated) a text message. That's about it. You're not transmitting a station icon, your location (aside from GPS data), beacon text, or anything else APRS-related.

If you want to run APRS, you need to stick with the analog side of the radio and use a TNC and appropriate APRS software.

All Those Settings?

When you read through the digital op-



Figure 11—Joe Carcia, NJ1Q, operating digital mode with an IC-2200H equipped with a UT-118 digital voice and data unit.

eration section of the manual, you'll notice that there are quite a few settings. We found that for generic testing, the defaults worked fine. For example, when we performed a digital voice test, the 'V82 didn't have its mYC set. (But we were still able to talk to each other.) And yet, I did set it in the '2200H. When we communicated, the 'V82 indicated mYC sign on its display. Obviously if you're going to make full use of the digital mode operations, you'll want to set the call signs, etc, appropriately.

What Was First Tested?

I first just had to see how well the slow data communications worked. I sacrificed a small serial cable (DB-9) and whipped up a data plug. Using a regular terminal program, I was able to send data to the '2200H. Now, if you opt to monitor your signal on a regular 2 meter receiver, all you'd hear is a rushing noise.

Assuming the PC parameters are correct (and the manual details what they should be) when you set the radio to digital mode operation, you should see on your terminal program screen, Ver 03.30C, and then the word READY!

With the IC-V82 attached to another PC, Dan Henderson, N1ND, the 'V82 reviewer, and I were able to send messages back and forth. It was kind of cool to see the backspaces when either of us made a typing error. One radio had to finish its transmission before it could receive the other station's text.

We began testing the digital audio. As expected, the audio sounded ever so slightly robotic. (It's digital, after all.) It was easy to understand what either station was saying. But you can clearly tell the difference between the digital and analog audio.

Next up was to see if one can *type and talk* at the same time. Aside from the "multitasking" associated with this feat, it's easy to have the radio send text and transmit audio at the same time. There did

not appear to be any degradation of either the text or the spoken audio.

And How About Using It through an Analog Repeater?


The D-STAR equipment is not designed to work through the usual analog repeaters. Of course, for normal repeater communication, you can switch the radios back to analog operation and they will work like any other radio with CTCSS or DCS access arrangements. A new generation of D-STAR compliant repeaters is under development and when released, will extend this digital operation beyond simplex operation.

Being hams, we couldn't resist trying to see what would happen. As anticipated the signal passing through a repeater ended up received as one that could not be decoded, likely because of the pre and post-emphasis processing in the analog system.

Since provision for the UT-118 will likely be made in most new VHF and UHF radios from ICOM, it seems likely that when dual band capability appears, ad hoc crossband repeater setups will be a solution for emergency digital communications until a repeater infrastructure is in place to support D-STAR.

Where is D-STAR Headed?

D-STAR offers a lot of potential for those looking to expand their digital communications capability. With "low speed" data to 9600 kbps (that was "high speed" in the days when we transmitted via analog systems) available in a 2 meter handheld transceiver and high speed to 128 kbps at 1296 MHz and higher, it will be possible to support digital communications for ARES and other functions at far higher rates than just for keyboard to keyboard communications we've been used to offering. We will watch with interest as this technology rolls out in new products from ICOM and perhaps other manufacturers.

Manufacturer: ICOM America, 2380 116th Ave NE, Bellevue, WA 98004; tel 425-454-8155; www.icomamerica.com. Price: UT-118; \$199.95. 

Strays

QST congratulates...

• Don Bateman, KK7UT, of Bellevue, Washington, who was recently inducted into the National Inventors Hall of Fame for creating a device that warns pilots to steer clear of approaching terrain. Conceived by Bateman in the 1970s, the device dramatically reduced the number of airline crashes and soon became mandatory for all US aircraft.