

IC-92AD

VHF/UHF Dual Band Handheld Transceiver

QST Product Review

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Shown with Optional
GPS Speaker Mic
(HM-175GPS)

PRODUCT REVIEW

ICOM IC-92AD Dual Band Handheld Transceiver

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The IC-92AD came along pretty quickly as an addition to the IC-91AD, ICOM's flagship dual-display, D-STAR capable VHF-UHF handheld. The two models are so similar in form and function that you may wonder why there is an IC-92AD, and what justifies its higher price. I'll try to explain that. And since Dan Henderson, N1ND, reviewed the '91A model (without D-STAR) in December 2006 *QST*, I'll look at the digital capabilities of both the IC-91AD and IC-92AD.¹ For more general information on D-STAR, see my article "Operating D-STAR" in September 2007 *QST*.²

Both the IC-91AD and IC-92AD are very full featured dual band (144 and 440 MHz) FM handhelds. They have lots of memories, wide receiver coverage (500 kHz to 1 GHz, except for the forbidden cell phone band), with receive modes for AM, FM and wide FM. The '91 series is D-STAR

¹D. Henderson, N1ND, "ICOM IC-91A Dual Band Handheld Transceiver," Product Review, *QST*, Dec 2006, pp 59-61. *QST* Product Reviews are available on the Web at www.arri.org/members-only/prodrev/.

²G. Pearce, KN4AQ, "Operating D-STAR," *QST*, Sep 2007, pp 30-33.



optional. The '92AD is available only with D-STAR built in.

The IC-92AD exists to make emergency responders happy. It does that by having an optional GPS equipped speaker-mic. With that mic, in D-STAR digital mode, the radio can transmit the operator's position with every voice transmission as part of the data stream. And it can be set to beacon a position report at adjustable intervals, similar to APRS. If you have a second GPS equipped '92AD, or a GPS equipped ICOM IC-2820H mobile, you can use that information to show a compass bearing and distance between the radios, right on the radio's display — "He's 2.8 miles that-a-way" (Figure 1). Other D-STAR radio models can display the received coordinates numerically. The IC-91AD can be connected to an external GPS, so the '92AD with the GPS mic just makes a neater, self-contained package. More on the GPS capabilities later in the article.

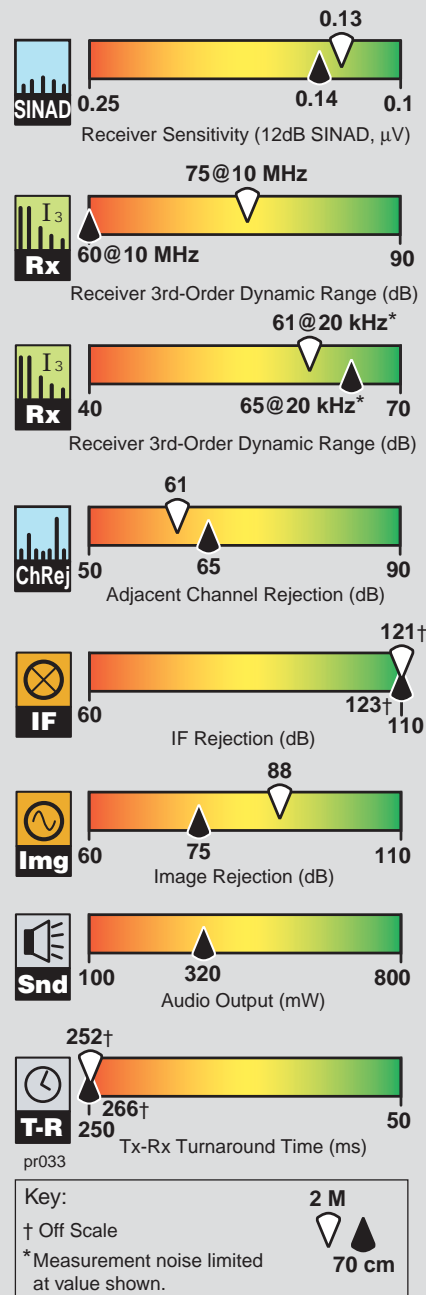
The '92AD is also submersible (1 meter, 30 minutes). The Emcomm guys like that, too, but I've heard a few hams scoff. One said that you perform emergency service *after* the hurricane, not during it, and you can buy a lot of umbrellas for the price difference. But an experience I had with another "water resistant" handheld came to mind. I had the radio on my belt at Disney World as my wife Cyndi, KD4ACW, and I got on one of those water rides. A sign warned: "You will get wet. You may get soaked." We got soaked. That radio has never worked right since.

So the '92AD has a couple of exclusives. Given the chance for a do-over, ICOM also took the opportunity to address a few issues hams had with the '91 series and made the IC-92AD a better package, with or without the GPS mic. As this is written, the '91 series is still available. You can decide if the IC-92AD's updates are worth the extra money.

One of These Things is Not Like the Other

Most reviewers like to see how much they can make a radio do before they crack the manual.

Key Measurements Summary



See www.arri.org/members-only/prodrev/, "A New Look For Product Review."

Bottom Line

The IC-92AD is a very capable radio for analog and D-STAR digital VHF/UHF operation. It's expensive compared to analog-only dual-banders, and you'll need to spend some time learning the digital features. In return, D-STAR offers many capabilities not available in the analog world. If you're into emcomm or search and rescue, check out the HM-175GPS speaker/mic with a built-in GPS receiver.

Can they turn it on, set a frequency, offset and tone, then key up a repeater and make a contact all without help? With the complexity of radios these days, that's not a given. Since I already had an IC-91AD, and the '92AD is very similar, my challenge was more like the "Game of Seven Differences" or the *Sesame Street* tune quoted in the heading for this paragraph. I went hunting for the changes. Most of the time, when I found one my reaction was, "Yes, that's better."

The very first thing I noticed was the VOLUME control, the outer ring on the dual-control shaft on the top of the radio. It rotates too easily on the '91AD, so it's easy to bump too loud or soft. The IC-92AD's control is stiffer and has detents, so it stays in place.

Ah, the humble VOLUME control. Today's diminutive dual display radios have a problem: not enough real estate on top for two VOLUME controls. One knob does double-duty, controlling both bands. That forces a choice. Do you control both bands at once? Do you only control the "Main" band? Each choice is a compromise. The '91AD and '92AD let you select either method, with options in the SET menu. The '92AD has another SET menu option labeled DIAL REPLACE. I saw that while playing the seven differences game, but didn't know what it meant until I read the manual. It lets you swap the functions of the center and ring knobs on that top shaft. This radio is nothing if not choices. Another example: Scan delays are adjustable from 2 to 20 seconds.

The DIAL REPLACE mystery prompts me to mention that the display has a fine-grain dot matrix that permits lots of real English words in the various menus (see Figure 2). DIAL REPLACE may have stumped me, but SET MODE, SCAN, DUP/TONE, DISPLAY and SOUNDS are all pretty intuitive, at least if you speak basic ICOM. I can never remember some of the more obscure abbreviations of earlier radio menus — what does 100 DT mean on my IC-W32A? And if you forget your reading glasses, the font size can be adjusted between large and small.

My next observation was that the mic connector wasn't the usual two-pin affair. It's a round, multi-pin connector, covered with a heavy rubber cap. That connector is needed for the GPS/mic, and also handles all other data and programming connections to the radio. If you have an ICOM mic from an older radio, you can get an adapter cable. The rubber cap is a little hard to put in place once popped off. It's obviously there to maintain submersibility. The rubber plug covering the dc power connector is heavy duty, too.

Physically, the '92AD is a little taller than the '91AD, and maybe a hair wider

Table 1
ICOM IC-92AD, serial number 0201019

Manufacturer's Specifications

Frequency coverage: Receive, 0.495-999.990 MHz (cell blocked); transmit, 144-148, 420-450 MHz.

Modes: FM, AM (receive only), WFM (receive only), DV.

Power requirements: 10-16 V dc or specified battery pack.† Receive, 150 mA at rated output (single watch, FM), 38 mA (single watch FM power save), 220 mA (dual watch, FM/DV) with 7.4 volt battery pack. Transmit, 2.1 A (high power, 440 MHz), 0.4 A (lowest power, 144 MHz).

Receiver

AM Sensitivity: 10 dB S/N, 0.5-5 MHz, 1.3 μV, 5-30 MHz, 0.56 μV, 118-137 MHz, 0.5 μV, 222-247 MHz, 0.79 μV, 247-330 MHz, 1.0 μV.

FM sensitivity: 12 dB SINAD, 1.6-30 MHz, 0.4 μV, 30-118 MHz, 0.25 μV, 118-174 MHz, 0.14 μV, 174-350, 470-600 MHz, 0.32 μV, 350-470 MHz, 0.16 μV, 600-999 MHz, 0.56 μV; WFM, 76-108 MHz, 1 μV, 175-222 MHz, 1.8 μV; 470-770 MHz, 2.5 μV.

FM two-tone, third-order IMD dynamic range: Not specified.

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

FM adjacent-channel rejection: Not specified.

Spurious response: VHF, 60 dB; UHF, 50 dB.

Squelch sensitivity: Not specified.

Audio output: 200 mW at 10% THD into 8 Ω.

Transmitter

Power output: VHF and UHF, 5.0/2.5/0.5/0.1 W.

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.

Size (height, width, depth): 4.4 × 2.3 × 1.3 inches; weight, 11.5 ounces.

Price: IC-92AD, \$580; HM-175GPS speaker/mic, \$350; RS-92 software and cable, \$70.

†BP-256 battery pack (7.4 V, 1620 mAh Li-ion) and BC-167 wall charger (approx 6 hour recharge time) supplied. Available options: Replacement BP-256, \$75. BC-177 desktop drop-in rapid charger (2.5 hours), \$60; BP-257 battery case (2 AA cells, TX power limited to 100 mW), \$30; CP-12L (\$36) and CP-19R (\$44) cigarette lighter cables; OPC-254L external power cable, \$14.

*Measurement was noise limited at the value shown.

Measured in ARRL Lab

Receive and transmit, as specified.

As specified

Receive (max vol, no signal), 180 mA; transmit (hi/med/low/s-low, with 8.2 V measured battery voltage), 144 MHz: 1.75/1.24/0.6/0.35 A; 440 MHz: 1.98/1.37/0.67/0.36 A.

Receiver Dynamic Testing

10 dB S+N/N, 1-kHz tone, 30% mod: 1, 3.9 MHz, 0.5 μV; 14, 53 MHz, 0.34 μV; 120, 146, 440 MHz, 0.42 μV.

For 12 dB SINAD, 29 MHz, 0.13 μV; 52 MHz, 0.17 μV; 146 MHz, 0.13 μV; 222 MHz, 0.24 μV; 440 MHz, 0.14 μV; 902 MHz, 0.26 μV; WFM, 100 MHz, 0.97 μV.

20 kHz offset: 29 MHz, 60 dB*; 52 MHz, 59 dB; 146 MHz, 61 dB*; 222 MHz, 63 dB*; 440 MHz, 65 dB*; 902 MHz, 65 dB.

10 MHz offset: 146 MHz, 75 dB; 440 MHz, 60 dB.

146 MHz, 62 dB.

20 kHz offset: 29 MHz, 60 dB; 52 MHz, 57 dB; 146 MHz, 61 dB; 222 MHz, 60 dB; 440 MHz, 65 dB; 902 MHz, 54 dB.

IF rejection, 52 MHz, 22 dB; 146 MHz, 121 dB; 440 MHz, 123 dB; 902 MHz, 110 dB; Image rejection, 52 MHz, 79 dB; 146 MHz, 88 dB; 440 MHz, 75 dB; 902 MHz, 2 dB.

At threshold, VHF, 0.1 μV; UHF, 0.13 μV.

320 mW at 10% THD into 8 Ω.

Transmitter Dynamic Testing

With battery pack or external 13.8 V dc, VHF, 5.3/2.8/0.5/0.1 W; UHF, 5.0/2.8/0.5/0.06 W;

VHF, 66 dB; UHF, >70 dB. Meets FCC requirements.

Squelch on, S9 signal, VHF, 252 ms, UHF, 266 ms.

VHF, 74 ms; UHF, 77 ms.

and thicker. Even so, several hams who held it said they liked the feel of the newer model. Another change is the belt clip. The IC-91AD has a very stiff, single-piece steel clip. The '92AD has a lever with a hook at the bottom that I find easier to clip to my

belt single-handed.

All these discoveries came while the radio was addressing its "A" side. I tried to switch to the "B" side. Couldn't do it. ICOM swapped the functions of three main front panel buttons, but my fingers had muscle

memory from the '91AD. Reading the labels on the '92AD solved my problem, still without resorting to the manual.

After reaching the B side, I tried DV (Digital Voice) mode to key up the local D-STAR repeater. The '91AD and '92AD do digital only on the B side of the radio (they do analog on both sides). I programmed the key call sign fields needed for local repeater use (see Figure 3; this procedure is described in more detail later). But I got nothing. Stock-from-ICOM D-STAR repeaters don't have hang-time or a courtesy beep, so it can be hard to tell if you've keyed it up. I was listening on my ID-800H base station, so I'd hear myself — and I didn't.

There are a lot of DV settings, but I was pretty sure things were right. I looked harder at the main display and noticed the tiny legend SLO in the corner. Hmmm. SLO. Slow? Something prompted me to push (and hold) the output power button. The legend changed to LOW. Okay, it's the power indicator. Another push brought MID, and another brought... a blank spot (for HIGH).

The 2.5 W Sweet Spot

The IC-92AD has four power levels — 100 mW (SLO), 500 mW, 2.5 W and 5 W. The '91AD has just the 500 mW and 5 W levels. The new radio's extra power levels address two complaints about the IC-91AD: battery life and heat. On longer transmissions at 5 W, both radios get pretty hot and uncomfortable to hold. They should. They're dissipating about 4 W, the same as one of those old, big Christmas tree light bulbs. Try wrapping your hand around one of *them* for a minute! The manual warns you about it (the radio's heat, not the Christmas light). Both radios use lithium-ion batteries that seem to give other handhelds nearly indefinite life, but the '91AD appears to chew up its battery quickly.

The IC-92AD has a somewhat higher capacity battery and marginally lower current drain. The big advantage for battery life is that 2.5 W MID power setting. It's just 3 dB down from 5 W and not very noticeable in FM (a slightly noisy signal will get a little noisier). It's not noticeable at all in DV, where signals stay "full quieting" until they're almost gone, unless you're right at that minimum signal threshold. At 2.5 W, current drain drops significantly (see Table 1). The radio gets warm, but not hot, with long transmissions. The batteries for the '91AD and '92AD are slightly different sizes so, alas, they can't share batteries or drop-in chargers.

I was successful in keying up the repeater once I raised power. My call sign and the short message I'd programmed with my name and the radio model number scrolled

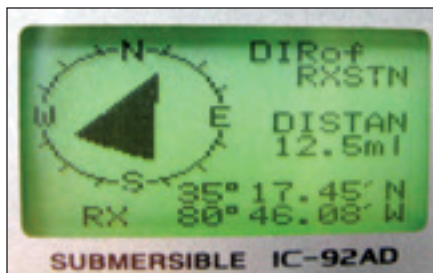


Figure 1 — The GPS compass display shows that the last reported position of the received station is 12.5 miles North-Northeast, and gives the exact latitude and longitude. As this radio moves, the direction and distance to the last received report is continuously updated.

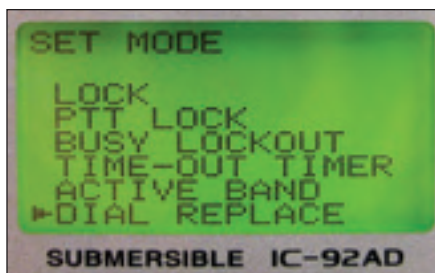


Figure 2 — The large display and fine dot-matrix pattern allow longer words, many in something like real English.

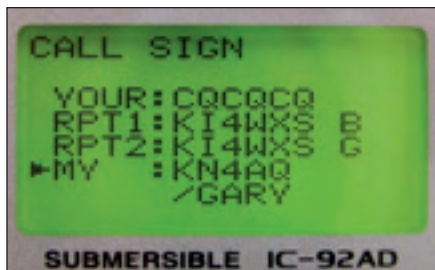


Figure 3 — These four key call sign fields (YOUR, RPT1, RPT2 and MY) are the heart of D-STAR repeater operation and routing through the Internet.

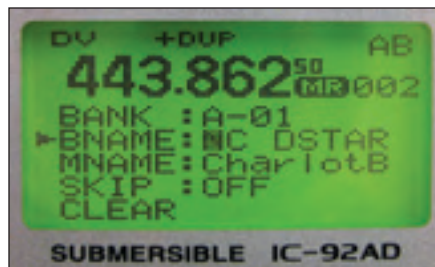


Figure 4 — The display shows many of the memory channel parameters on one screen.

across my base station display. D-STAR digital sends that information with each transmission, right along with your voice.

I kept the IC-92AD turned on from 7 AM to near midnight several times, with a few short ragchews at 2.5 W, a little more listening, but mostly squelched receive. It

had enough juice left for a finger-frying test of the adjustable time-out timer (set for three minutes) at 5 W before the battery indicator dropped the first of its two bars. Switching down to 2.5 W brought that bar back for many more minutes of transmitting. I never managed to kill the battery. I plugged in the charger and ticked off another little upgrade: a big CHARGING indicator on the display. The '91AD just flashes the tiny battery icon when charging.

Audio Reports and Memories

On the air, I asked for audio reports in both analog and digital. The first analog report was "very natural — sounds like you." But other reports weren't so flattering, especially when I offered a comparison with the '91AD and my IC-2820H mobile. The '91AD had better fidelity, with more lows and highs. The '2820H rolled off the low end and was very sharp, giving it marks for "most readable." The '92AD seemed somewhat restricted, right in the middle of the vocal spectrum. I've heard a couple of other IC-92ADs on the air, and they sounded okay to me.

I've made recordings of all three radios, in both analog and digital mode, recorded directly from the speaker jack of my ID-800H into my computer line input. You can judge for yourself by listening to the audio file, available for download from the ARRLWeb binaries page.³

The receive audio was reasonable for a handheld. I've seen complaints that the volume isn't loud enough, but I could hear it just fine in a car with open windows at highway speeds. I don't know what more you could ask.

Next it was time to fill up some memories with local repeaters. ICOM offers optional software and an interface cable for this, but it didn't come with the review radio so I did it manually. The big display makes this easy. It presents your options for naming and storing the memory all on the same screen (Figure 4). Tone settings are buried in another menu. And remember when turning tone on and off was simple? Now pressing the TONE button brings an endless series of options. Here's a secret: hold the TONE button and turn the top knob to move quickly forward and backward through the options.

An UP/DOWN, LEFT/RIGHT "rocker switch" is embedded in the keypad for navigation through the menus. That fine-grain display lets you name your memory channels with eight characters, including upper and lower case text, numbers and lots of special characters. With the radio set for single-band display, it shows both the

³www.arrl.org/files/qst-binaries.

frequency and your memory name. In dual-display, you choose one or the other.

Programming is easy, but with 800 memory channels on the A side, 400 more on the B side (the A and B sides are separate — they don't share memory channels), and 24 more scan-limit pairs on each side, it's going to take some time. Memory channels are especially useful for D-STAR, which I'll explain in a minute. So the software is a good investment.

There is no "national simplex channel" for D-STAR, as 146.52 MHz is for FM voice. The D-STAR community is discussing the options, and the leading contender is 145.67, but that is used for conventional packet in some areas. The UHF discussion hasn't even gotten that far.

Back to memory programming — the BANK NAME doesn't refer to the financial institution from which you obtained a loan to buy the radio (if you loaded it up with the GPS mic, software, cables, a rapid charger and extra battery, you crossed the \$1000 mark a while ago). With that many memories, you need a second level of management. Both the '91AD and '92AD have 26 memory "banks," labeled A through Z. Each bank holds 100 channels. You can cherry-pick individual memory channels and place them in banks. When you select a bank, you're limiting the radio to the 100 or fewer memories in that bank for scanning or manual tuning.

Let's Do Digital

Now I'm going to tax your ability to absorb new stuff. The details of D-STAR programming aren't easy to grasp at first. I interviewed several of the hams at the leading edge of D-STAR for my video documentary *Digital Voice for Amateur Radio*.⁴ I asked each of them to demonstrate how to program a radio for the various D-STAR functions. Doing this off the cuff, each of my experts made a mistake in one detail or another. What chance do we mere mortals have?

Let's all take a deep breath and give it a try. I'm only going to touch the basics. This is a review, not an instruction manual. But I am planning on producing a short, new video that concentrates on D-STAR radio programming. The one will be free, hosted on YouTube, and it should be ready by the time this review is printed. Check my Web

⁴S.Ford,WB8IMY, "ShortTakes — Amateur Radio Video News," QST, August 2008, p 64.

site www.ARVideos.com.

To describe programming, I'm going to shift perspective and write mostly in the first-person — I do something with my call sign. That's because the nomenclature of ICOM's programming is from that perspective. My call is KN4AQ. Your call is... well, you know what your call is.

Here's the key — D-STAR operation is based on call signs. There are four call sign "fields" in every D-STAR radio. What I put in those fields controls where my signal is heard.

The '91AD and '92AD present these four fields together on one screen labeled CALL SIGN (see Figure 3). The bottom field, MY, gets my call sign, KN4AQ, as long as I'm using the radio. If I hand the radio to my wife, she switches it to KD4ACW.

The top field, YOUR, is where I put your



Figure 5 — The HM-175GPS speaker/mic includes a GPS receiver, making a self-contained package. It's big, as shown here with a more conventional speaker/mic.

call sign if I want to talk to you. For routine, local operation on repeaters or simplex, that field holds CQCQCQ, but there are circumstances in which I'd put your individual call sign. One example is *call sign squelch*. You can tell your D-STAR radio that you only want to hear transmissions directed specifically to you — a very personal squelch control. So to open your speaker, I put your call sign in the YOUR field. Neat trick.

If you'll bear with me, I'll push that YOUR example a little further. D-STAR is a network of repeaters, linked by the Internet through Gateways — Linux based computers running at the repeater sites. The Gateway keeps a list of all the users who have keyed up the repeater recently, and the

list is shared with other Gateways. That's part of what MYCALL is for. So if I plug your call in to my radio's YOUR field, my local repeater plays another game — a D-STAR version of *Where's Waldo?* It looks at its list to see what repeater, anywhere on the network, anywhere in the world, you keyed up last. Then it instantly routes my transmission to that repeater. I can also put a specific *repeater's* call sign in the YOUR field to "manually" route my transmission to that repeater. In that case, I'd need to precede the call sign with a "/" that says "this is a repeater call." And I'd need to include the *port letter*, which I'll explain next.

The middle two fields shown in Figure 3 are RPT1 and RPT2. RPT1 is almost always the call sign of the local repeater. In this example, it's KI4WXS in Charlotte. But notice the "B" hanging out there on the end. That's the port letter. ICOM has D-STAR repeaters

for 144, 440 and 1200 MHz, and many installations have all three bands.

They all share a single call sign. Since transmissions are routed by call sign, I need to enter the extra letter to specify which repeater I want my signal to reach. The convention is A for 1200 MHz, B for 440 MHz and C for 144 MHz.

The RPT2 field in Figure 3 shows KI4WXS G. The G stands for "Gateway." The current recommendation is that I leave the Gateway call sign in RPT2 pretty much all the time. When D-STAR first arrived, ICOM said to set that to "Not Use" if you weren't going to actually

use the Gateway. You'll see that in the manual. That's changed, primarily to support use of a device called the DV Dongle, which lets hams access D-STAR repeaters from their home computers over the Internet. Dongle users (get over it, that's the name) can only hear stations that have the Gateway addressed in RPT2.

Now, if you think about it, you've got the potential for a lot of call sign programming, as you route your signal to specific hams around the world. Fortunately, the memory channels store the YOUR, RPT1 and RPT2 fields along with the usual frequency, offset, tone and mode. So for every combination of local repeater, distant repeater, and friend's call sign, you use a memory channel. You'll need to get creative in naming those channels.

By the way, to use a Gateway, you have to be registered. That's done locally, through

your repeater's *Gateway Administrator*. You'll be able to track him or her down through dstarusers.org.

There is news on the Gateway front. Until recently, we've all said that you can't "link" repeaters in D-STAR in the same way as IRLP and Echolink — all network communication was between individuals. Now you can, two different ways. ICOM's G2 Gateway software now permits connections between as many as 10 individual repeaters. The Administrator sets up the conference and users must put a conference name in the YOUR field. And the third-party *Dplus* program lets the Administrator connect the repeater to a conference server. Users don't have to do anything special. Everyone on all the conferenced repeaters hears everyone else.

That wasn't so hard, was it? We've still got to cover two more features, and that GPS microphone.

Turn Up the Volume!

The last two features I'll describe are the Break-In and Emergency modes, common to the '91AD and '92AD handhelds, and the ID-800H and IC-2820H mobiles.

These transmit modes allow you to be heard by D-STAR stations who are using any of the various forms of selective squelch (call sign squelch, which I described earlier, and Digital Code Squelch (DCS), which is similar to analog's CTCSS). Just turn on BREAK-IN with a keypad button on the IC-91AD, or in a menu on the '92AD, and everyone on the channel hears you, regardless of their squelch settings.

Emergency mode is even cooler.

What do you do when a conversation on the radio interrupts something you're doing — a phone call, writing an article on your computer, sleeping...? You turn the volume down. And there it sits until you remember to turn it up again. If I activate EMERGENCY MODE (again, keypad on the '91AD, menu on the '92AD), I can reach into your radio and turn your volume back up!

I felt a little strange as I experimented with this, almost like I was dialing 911 just to see if it worked. Only problem was, it didn't work! I tried all four of my D-STAR radios. I turned their volume down, then transmitted to them with a radio in EMR. They stayed quiet. The manual was just as silent, referring to "the specified volume level" without telling me how to specify that level (or even who specifies it, because apparently it isn't me). I experimented, and



Figure 6 — My position, course and speed, as reported on FindU.com, courtesy of the *Dplus* program running on the Charlotte D-STAR Gateway.

only after receiving an EMR transmission with my volume up once was I able to then hear them with my volume down. After that, EMR worked every time. Try this before you rely on it!

GPS on D-STAR

The IC-92AD's GPS speaker-mic (HM-175GPS) shown in Figure 5 comes with built-in sticker shock. We're not used to paying \$350 or more for a speaker/mic, but of course this one has a GPS receiver and it plugs conveniently into the radio with no adapter or power cables.

The mic is large and heavy for a handheld. It'll tug hard at the collar of your shirt if you clip it there. And GPS is its only trick. There are no up/down buttons or volume control. You might expect some extras for the price, but this mic is designed for emergency responders in the field, so KISS applies. It has one illuminated yellow button to turn the GPS on and off. That button lights up while the GPS is acquiring satellite signals and blinks when it has a lock. Under open sky, it took about a minute to lock. It took longer but did get a lock indoors in some single-story, wood-frame buildings.

I turned to the manual (for the first time!) before trying to use the GPS function. I understood the instructions up to the point of telling me to plug in the mic. Then it lost me under the heading "Sentence formatter setting." While ICOM's manuals are usually above average, they all fall short in explaining general D-STAR operation. Without some prior knowledge, they leave you hanging.

I gleaned enough from the manual to let me poke around the menus and get the GPS functions turned on in both the '92AD handheld and my IC-2820 mobile. It turns out that you need very little from the manual to get GPS data to flow between these radios

and show up on the compass display that shows the direction and distance between radios (see Figure 1). And that was very cool. I was following Ken, KC4YOZ, up to the Charlotte D-STAR repeater site, and we got far enough apart that I could read his bearing and distance.

If GPS has you thinking APRS, I'll warn you that D-STAR data is not "on-air" compatible with AX.25 packet data. They're both digital, but the similarity ends there. The '91AD and '92AD *do* have D-STAR's "low speed" data capability. A 1200 bps data "signal" rides along with every voice transmission. You need a

computer and another optional cable to use it — there's no access to this data via the radio's controls or display. There are several third-party programs already available for using this data stream for text messages and small file transfers, and more on the way. Again, this data is not AX.25 packet compatible.

There is a bridge between D-STAR and the APRS networks. A third-party application called *Dplus* runs on the Gateway. It can pick off your GPS data and forward it to the APRS network via the Internet. Your location shows up on APRS displays, and on Internet sites like Find-U (see Figure 6). The manual falls short here. I was successful using instructions supplied by Ken, KC4YOZ. I suggest contacting your local D-STAR experts.

In Conclusion

The IC-92AD is a very capable, complete radio for analog and digital VHF/UHF operation. The only significant downsides I found are the mediocre transmit audio, the price and the complexity (you'll need some local help to get the most out of this radio). If you're into emcomm or search and rescue, the GPS mic is a great addition.

Manufacturer: ICOM America, 2380 116th Ave NE, Bellevue, WA 98004; tel 800-872-4266; www.icomamerica.com. 