

ID-880H

VHF/UHF Digital Mobile Transceiver

QST Product Review

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ICOM®

ICOM ID-880H Dual Band Transceiver with D-STAR

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“Several articles in this issue of our magazine point the way toward the most significant development that has ever occurred in amateur radiotelephony: ... so immense are these advantages that we are convinced that a speedy revolution in our equipment and our operating practices is imminent and certain.”¹

Sigh. Digital voice advocates may dream about an endorsement like this, but they’re not likely to see one soon. There are advantages to digital voice, but not everyone sees them as head and shoulders above analog — at least not yet. The words quoted above came from the January 1948 *QST* editorial, and of course refer to single sideband. Experimental SSB appeared on the ham bands in 1947. In 1948, *QST* began running articles explaining what the “immense advantages” were over AM, how to build a transmitter and how to tune a receiver.

Two years later, a *QST* column estimated that about 50 hams were actually on the air with SSB.² At the three-year point, that column chides the hams who “just ain’t interested,” but by September 1952 they can no longer keep up with all the hams using this new mode. In that issue, two ads appeared for the first two commercial SSB transmitters, including the Central Electronics 10A. Over the next few years, some of the better known brands of the day introduced their own sideband products, but AM transmitters were still the rule. Heathkit launched the legendary DX-100 — CW and AM phone only — in 1955. The “speedy revolution” was still underway when I fired up my own (used) DX-100 for the first time in 1965, and I had plenty of AM company.

Against this backdrop, I want to give credit to ICOM, as it inches... no, as it *strides* out on the D-STAR branch alone among the major manufacturers, nearly a decade after the Japan Amateur Radio League (JARL) and ICOM launched the mode. ICOM has continued to introduce new and improved



D-STAR radios, the latest being the ID-880H mobile, which I’ll review here, and the IC-80AD handheld, reviewed last month.³

“New and improved” is particularly apt for the ’880H, an update of ICOM’s first dual band D-STAR mobile, the ID-800H. That radio suffered from a confusing programming structure and memory limitations. I’ve never memorized the arcane sequence of button-pushes and knob twists needed to program new D-STAR channels into my ’800H. So when the ID-880H arrived, the test to see how much I could do before I cracked the manual took on special significance.

I’m happy to report that I was able to use and program the radio in both analog and digital modes, making local and linked D-STAR repeater contacts, all with ease. My experience with ICOM’s newer radios such as the IC-2820H mobile and IC-92AD handheld helped. With that base of knowledge, the ID-880H’s menu system was more consistent and intuitive. I didn’t have trouble until I opened the manual and tried to follow the step-by-steps, which I often found confusing.

The Basics

The ID-880H is a one band at a time dual band mobile, with up to 50 W output on both 2 meters and 70 cm in analog FM and D-STAR digital modes. The receiver covers a big slug of VHF and UHF (118 to 174 MHz and 230 to 550 MHz), but manages to miss the 222 MHz ham band. UHF coverage adds 800 to 999 MHz with the cell phone frequencies deleted.

Physically the ID-880H is fairly small. It’s a little wider than the ’800H, accommodating a wider display and a sixth button below the display (see Figure 1). A new D-STAR data jack was added to the rear.

The front panel snaps off to become a small control head. An 11 foot separation

cable is included for the head, but the microphone plugs into the radio body, not the head, and the mic extension is optional. A CAT-5 Ethernet cable and a double female RJ-45 adapter work fine to extend the mic.

The only step backward in layout is that the labels indicating the primary function of the six buttons below the display are no longer on the backlit buttons. They are now printed on the panel just above the buttons, but the unlit print is small and hard to read in my shack. At night in a mobile they disappear completely, so memorize them. The secondary (push and hold) functions of the buttons are clearly displayed as on-screen menu items. The secondary functions, and their labels, change as you navigate through options and menus.

The display was one of the ID-800H’s biggest selling points — and one of its serious limitations. Users liked the big, bright characters that are easy to see in any light and at any angle (it does fade from below). But it could show only six characters. The ID-880H’s display is wider, though a touch shorter, and it shows eight characters. The last two on the right are shrunk a bit to make room for some top row icons. It’s a bit more cluttered with that new menu row along the bottom. The main characters are a little smaller than the ’800H’s, but they’re still plenty big.

High-End Analog Features

The ’880H is typical of the high end analog radios. It has more features than you’ll ever use, 1000 memories and flexible bank and scan systems for all those memories. Typical of today’s radios, there are not enough buttons and knobs to control all those features, so it goes deep into multiple functions and menus. The set and forget functions (such as backlight color) are usually buried deeper into menus, while the more frequently adjusted items (power

¹K. B. Warner, W1EH, “Single Sideband,” It Seems to Us..., *QST*, Jan 1948, pp 11-12.

²B. Goodman, W1DX, “On the Air with Single Sideband,” *QST*, Jan 1950, pp 38, 114.

³S. Ford, WB8IMY, “ICOM IC-80AD Dual Band Handheld Transceiver,” Product Review, *QST*, Dec 2009, pp 40-42.

level, repeater offset, tone) get dedicated primary or secondary function buttons.

One programming change I like is the way some items are selected. For example, tone squelch options used to be selected by multiple button pushes through a choice of OFF, ENCODE ONLY, ENCODE-DECODE, POCKET BEEP and back to OFF. Tone squelch options multiplied a few years ago with the addition of digital coded squelch (DTCS), and a DTCS pocket-beep option. That made for a lot of button pushing. With the ID-880H, you

push and hold the TONE button under the display just once and then turn the dial to select the clearly labeled tone mode (Figure 2). And there's a new tone mode selection — TSQL-R. ICOM calls it "reverse tone squelch." It lets you reject a signal with one specific tone (your radio stays silent when it hears a signal with that tone) while being able to listen to all other signals on the channel sending any other tone, or no tone.

I do have a few minor complaints. I didn't notice any problems, but a technically inclined friend finds his '880H receiver prone to intermodulation interference on a good base station antenna eight miles from a cluster of broadcast and two way laden 2000 foot towers. Dynamic range and adjacent channel rejection measurements from the ARRL Lab came in a few dB lower than the somewhat more expensive IC-2820H reviewed in November 2007.⁴ If you hear intermod, the 10 dB attenuator that kicks in when you advance the squelch control might help.

My next issue is the thin transmit audio. We are not police dispatchers. We rag-chew. Can we work our way back to a little more pleasant fidelity? I guess I've gotten used to it. I hear plenty of ID-880H radios on the air and I don't give it a second thought anymore, but better audio would be nice. ICOM notes, that the default level is designed to reduce background noise pickup, but an adjustment is provided to increase level, if not frequency response.

Finally, yet another generation of ICOM radios turn the automatic repeater offset function *off* for the five channels between 145.11 and 145.19. The ARRL national band plan developed long ago calls for linear translators (such as the OSCAR satellites, but on the ground) in this little part of the band. There are none. This spectrum is full of locally coordinated conventional FM repeaters everywhere in North America, but you'll lose your automatic offset when you dial them in. Memory channels hold the offset, of course.

D-STAR on the ID-880H

⁴S. Ford, WB8IMY, "ICOM IC-2820H Dual Band FM Transceiver," Product Review, QST, Nov 2007, pp 74-77.

Good analog operation is expected, but you're here for D-STAR. And as I mentioned earlier, this radio is good news.

I keep saying that D-STAR has a short but steep learning curve. A friend recently disagreed, reminding me that you only have to learn the four call sign mantra — MY (my call), UR (your call), RPT1 (local repeater station ID) and RPT2 (local gateway station ID) — and you're mostly there. You enter ham radioish call signs in these fields of the radio by punching buttons and twisting the dial, and these call signs tell repeaters and other radios what to do. See Figure 3.

Here's an example. I'm on the KR4RDU D-STAR repeater in Chapel Hill, North Carolina. I want see what's up on the KI4WXS machine down in Charlotte. I put these four call signs into my radio:

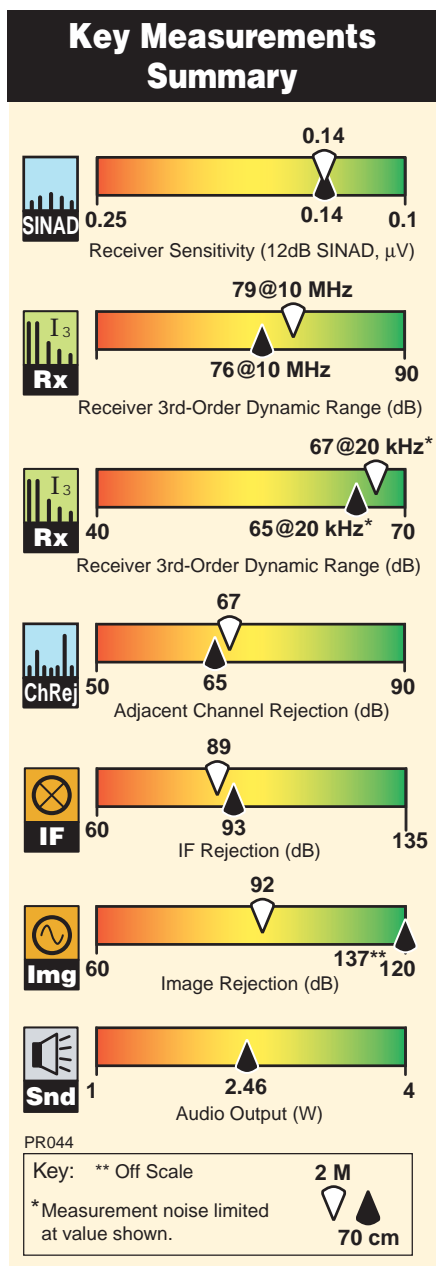
MY	KN4AQ
UR	KI4WXSCL
RPT1	KR4RDU B
RPT 2	KR4RDU G

I punch my PTT button, and the repeater sets up the link. You'd do something like this on most analog linked repeater systems by pushing DTMF buttons. I have a YouTube video that demonstrates D-STAR programming on my Web site (see www.ARVideoNews.com/dstar-programming). While the demo focuses on the IC-2820, it will help make this fuzzy concept clear for all D-STAR radios.

If you do "speak" D-STAR, you'll move into the ID-880H easily. Menus for setting the four call signs and other options are more intuitive, and have much better prompts and cues than did the '800H. One of the buttons on the front panel is now assigned to take you directly to the call sign lists (yay!). Still, there are the usual — and D-STAR means *more* than the usual — bewildering array of settings and menu options. Some of the menu labels are more cryptic (EDIT R AUT) than others (SOUNDS). A push of the MENU key almost always bails you out to the main display.

DR Mode: Read the Manual If You Can

Steep or not, D-STAR does have a learning



Bottom Line

Price and features will make the ICOM ID-880H a popular VHF/UHF dual band mobile radio with D-STAR digital and analog FM capability built in.



Figure 1 — Compare the ID-880H display with the older ID-800H below. The '880H is wider, a bit more cluttered, but still easy to read. The '880H display can show eight characters compared to the ID-800H's six. The ID-880H has one extra button, but the button labels are printed on the panel and disappear in the dark. The bottom row of icons shows the button's secondary (push and hold) functions.

Table 2
ICOM ID-880H, serial number 0501331

Manufacturer's Specifications

Frequency coverage: Receive, 118-173.995, 230-549.995, 810-823.990, 849-868.990, 894-999.990 MHz; transmit, 144-148, 430-450 MHz.

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

Power requirements: 13.8 V dc \pm 15%. Receive, standby, 0.9 A; maximum audio, 1.2 A; transmit, VHF, 11.5 A; UHF, 12.5 A (max, high power).

Receiver

FM sensitivity: 12 dB SINAD, 118-174 MHz, 0.16 μ V; 230-260 MHz, 0.56 μ V; 260-300 MHz, 0.32 μ V; 300-400 MHz, 0.22 μ V; 400-550 MHz, 0.16 μ V; 810-1000 MHz, 0.45 μ V.

AM sensitivity: 10 dB S/N, 118-174 MHz, 0.5 μ V; 230-260, 1.8 μ V; 300-350 MHz, 0.79 μ V; 350-400 MHz, 0.63 μ V; 400-550 MHz, 0.56 μ V; >810 MHz, n/a.

DV sensitivity: VHF (144-148 MHz only), 0.35 μ V; UHF (430-450 MHz only), 0.35 μ V.

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

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

Adjacent-channel rejection: Not specified.

Spurious response: >60 dB.**

Squelch sensitivity: <0.13 μ V.

Audio output: >2 W at 10% THD into 8 Ω .

Transmitter

Power output: VHF and UHF, 50 W high; 15 W medium; 5 W low.

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): 1.6 x 5.9 x 7.8 inches; weight, 3 pounds, 14 ounces (including microphone and mobile mounting bracket).

Price: ID-880H transceiver, \$500; OPC-1529R serial data cable, \$25; OPC-478UC USB cloning cable, \$55; OPC-440 mic extension cable, \$80.

†Current consumption was typically 40 mA higher in DV receive mode.

‡No P/N9/GMSK signal generator was available for testing.

*20 kHz measurements were noise limited.

**Guaranteed 144-148 MHz and 430-450 MHz ranges only.

Measured in ARRL Lab

Receive and transmit, as specified.

As specified.

Receive: standby, 0.33 A; no signal, maximum audio, 0.53 A.†
Transmit (high/medium/low):
146 MHz, 10.6/5.5/3.6 A;
440 MHz, 11.4/5.9/3.5 A.

Receiver Dynamic Testing

For 12 dB SINAD, 146 MHz, 0.14 μ V;
440 MHz, 0.14 μ V; 902 MHz, 0.18 μ V.

10 dB S+N/N, 1-kHz, 30% modulation,
120 MHz, 0.41 μ V; 146 MHz, 0.38 μ V
440 MHz, 0.46 μ V; 902 MHz, 0.68 μ V.

Not tested.‡

20 kHz offset: 146 MHz, 67 dB;
440 MHz, 65 dB; 902 MHz, 60 dB.*
10 MHz offset: 146 MHz, 79 dB;
440 MHz, 76 dB.

146 MHz, 74 dB.

20 kHz offset: 146 MHz, 67 dB;
440 MHz, 65 dB; 902 MHz, 60 dB.

IF rejection, 146 MHz, 89 dB;
440 MHz, 93 dB; 902 MHz, >135 dB.
Image rejection, 146 MHz, 92 dB;
440 MHz, >137 dB; 902 MHz, 8 dB.

At threshold, VHF, 0.08 μ V; UHF, 0.1 μ V.

2.46 W at 10% THD into 8 Ω ;
1.5 % THD at 1 V_{RMS}.

Transmitter Dynamic Testing

With 13.8 V dc (high, medium, low):
VHF, 53/16/6 W, UHF, 53/16/5 W.

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

Squelch on, S9 signal, VHF, 102 ms;
UHF, 96 ms.

VHF, 46 ms; UHF, 46 ms.

It took me several hours of quality time with the manual and poking buttons on the radio to get DR Mode figured out. The manual could use some narrative description telling you a little about what you're going to do, and what you should see when you're done. More instruction would make a long manual even longer, and once you've figured it out, the instructions seem more obvious, but it would ease the pain initially.

DR Mode is worth the trouble. It gives you 300 more memory slots for D-STAR repeaters, and a different way to fetch up call signs from the UR and RPT lists. Get used to it, and it might make your D-STAR experience smoother.

DR Mode "Breaks" DPlus and the DV Dongle?

DPlus, besides being my high school grade point average, is non ICOM add-on software that runs on a D-STAR repeater's gateway computer. It adds several cute extra functions to the repeater, such as voice IDs and the ability to "echo" your transmission so you can hear how you sound into the repeater by putting a specially configured call sign in the radio's UR field. But by far the most useful and popular function is *DPlus Linking* that lets users link two repeaters together, or link to multiple-repeater reflectors, with another simple call sign entry in their UR field.

True repeater linking was missing in ICOM's initial D-STAR system, which required *everyone* in a two repeater conversation to manipulate call signs to route their transmissions to the distant repeater. *DPlus* allows all users to talk to each other without having to program their individual radios. It is now *the* way to link D-STAR repeaters. Many new D-STAR users never bother to learn the original procedure, although that procedure still has its uses.

The DV Dongle is a little blue box that plugs into your computer's USB port to let you operate through D-STAR repeaters via their Internet gateway connections without a radio of your own. I reviewed it in the February 2009 issue of *QST*.⁵

So what's DR Mode got to do with it? Both *DPlus* and the DV Dongle depend on having *every user* program their local repeater's gateway call sign into their radio's RPT2 field, whether they intend to use the gateway or not. Since these aren't ICOM products, ICOM hasn't planned for them and has always recommended putting "Not Use" in the RPT2 field for local communication. DR Mode actually *forces* this convention. If you follow the manual for DR Mode, you *can't* put your local gateway into RPT2.

⁵G. Pearce, KN4AQ, "DV Dongle D-STAR Adapter," Product Review, *QST*, Feb 2009, pp 47-49.

curve. Master that, and you still have some menu manipulation every time you want to do something beyond talking on the local repeater. Each D-STAR radio has special memory lists of call signs that you can fill up, then scroll through to pluck entries for those four magic call sign fields. To handle situations that I encounter frequently, such as "link to Charlotte," I put everything into a regular channel memory. To make that link, then, I simply turn to that memory and push

the PTT button.

With the ID-880H mobile and its handheld companion, the IC-80AD, ICOM has introduced a new way to handle D-STAR manipulation called DR Mode. Once you learn it, it does make things easier, but it has confused a lot of hams who *thought* they knew the ins and outs of D-STAR pretty well. One said she was told that DR Mode was for Japanese hams, and US hams should ignore it. Several '880H owners I talked to do just that.



Figure 2 — Selecting a tone mode in the ID-880H. The tone options shows up as big characters, not just tiny icons. This is the new reverse tone squelch mode described in the text.



Figure 3 — Here I'm programming the ID-880H. Note the little arrows at the bottom of the display that aid navigation. Also note that the display shows eight characters (with the last two shrunk a bit). This call sign: KI4WXSBL is *DPlus* shorthand that says "link to the KI4WXS UHF repeater."

DPlus and DV Dongle users won't hear you! This convention, according to ICOM, is per the D-STAR standard.

There are two workarounds. First, just don't use DR Mode, and everything works as it always did. But if you find DR Mode useful, the second workaround is to never use the "local" GRP CQ function. You'll recognize that when you get to it in the manual. Use the GRP UR function instead, and program "CQ" as a UR call sign for local operation. The radio will assume that you are attempting to do ICOM call sign routing, and will allow you to enable the Gateway in RPT2. Thanks to Larry LeCrone, WW6USA, who pointed me to this workaround.

Free Software

Cloning software for the ID-880H and IC-80AD is a free download, and the same program works for both radios. The cables are extra cost options. My old ID-800H cable

worked on the '880H, so I tried the software and it worked fine. Aftermarket software is also available. You really do want to use software to program a 1000 memory radio (with hundreds more programmable fields and features). Heads up ordering the cable. There are three options. Only the OPC-1529R lets you do both cloning and low-speed data with your computer. It's only available with a nine pin RS-232 connector. The OPC-478UC will let you clone with a USB cable, but it won't let you do data.

Other Features

The ID-880H will do D-STAR's 1200 bps low speed data. The free *D-RATS* program by Dan Smith, KK7DS, makes great use of this capability. It's available from www.d-rats.com.

I tested the BK (break-in) and EMR (emergency) functions, and both worked. BK lets you interrupt anyone who is using any of the

selective squelch modes. EMR does that, and also reaches into everyone's radio and *turns the volume control up* so they can hear you!

You can connect an external GPS to the data connector and send your location via D-STAR. The optional OPC-1529R will make the connection, but only to a nine pin RS-232 GPS. There are no provisions for newer USB GPS units.

Wrap-up

To wrap up, while I generally prefer two bands at once radios over one at once as in the ID-880H, the price gulf between the '880H and a D-STAR equipped IC-2820H is several hundred dollars. Price made the ID-800H a popular D-STAR entry radio. Price, plus the improved features and functions, should make the ID-880H even more popular.

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