

PRODUCT REVIEW

ICOM IC-7700 HF and 6 Meter Transceiver



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National Contest Journal Managing Editor

Is the ICOM IC-7700 the very competent IC-756PROIII writ large or the top-shelf IC-7800 writ small?^{1,2} That's the nub of the debate raging in Amateur Radio cyberspace. Perhaps it's a bit of both, but the larger question may be: Is this a contester's radio, a DXer's radio or just a big, general-purpose box for someone with a lot of room in the shack and around \$7000 of discretionary income?

I've owned a PROIII for about three years and had a PROII before that, so I feel familiar with that segment of ICOM's product line. A collective gasp went up when ICOM came out with the original '7800 back in 2004 and set the retail price above \$10,000 — the top of the scale at the time. The advent of the similarly sized but less pricey IC-7700 puts many of the more expensive radio's capabilities within reach of a larger segment of the Amateur Radio population. The overall focus of this review will be to evaluate this radio on its own terms and as a possible next step up the ladder for PROIII owners like me. Let's see how it stacks up.

By the Pound

Like the IC-7800, the '7700 radiates *gravitas*. Yesteryear's heavy metal gear has

¹R. Lindquist, N1RL, "ICOM IC-756PROIII HF/6 Meter Transceiver," Product Review, *QST*, Mar 2005, pp 56-59. *QST* Product reviews are available on the Web at www.arrrl.org/members-only/prodrev/.

²D. Patton, NN1N, "ICOM IC-7800 HF and 6 Meter Transceiver Revisited," Product Review, *QST*, Mar 2007, pp 60-65

nothing on this baby! The IC-7700 has a slightly different — some say better — look to its case and is a little lighter than the IC-7800. Both units come with rack-mounting hardware, which lends it a professional air but mostly just gets in the way. The handles *are* handy to lift the radio into place in the shack, though.

This massive transceiver's myriad capabilities and features more than make up for any inconvenience in handling it — or, for that matter, fitting it onto your operating desk. The IC-7700's front panel layout is similar enough to the PROIII's that I got it up and running in no time.

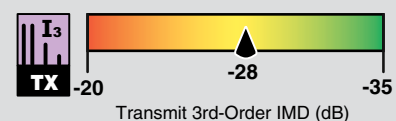
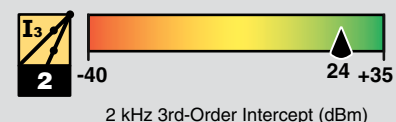
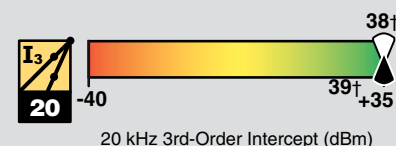
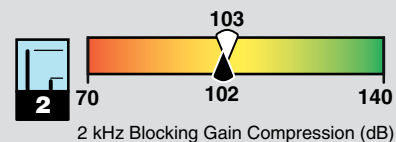
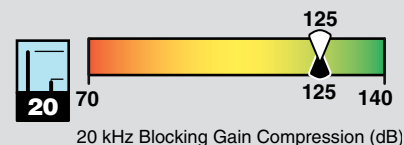
Comparison/Contrast

A manifestation of upward mobility for those owning "lesser" radios, the IC-7700 retains many of the niceties ICOM included in the IC-7800, such as a built-in ac power supply, 200 W output on all bands, 6 meter coverage, an attractive and capacious display screen, adjustable DSP filtering, notching, noise blanking, noise reduction, selectable crystal roofing filters and plug-and-play RTTY and PSK31 operation. What it does *not* offer compared to the IC-7800 may be less obvious.

Inside the IC-7700 are two independent and identical DSP units — one for transmit and receive functions and one for spectrum scope functions. Unlike the IC-7800, the '7700 is a *single-receiver* design, although it does have two VFOs. It does not have *Dual Watch* capability, something even the PROIII boasts. More on this topic later.

Similar to the IC-7800 design, the MOSFET power amplifier transistors in the

Key Measurements Summary



pr034

Key:
 † Off Scale
 Intercept values were determined using -97 dBm reference
 Receiver measurements with pre-amp OFF

Bottom Line

The IC-7700's attributes seem shaped more toward the serious contester and DXer, but it's a superior performer with features enough to attract any active HF or 6 meter enthusiast.

IC-7700 run at 48 V dc, providing 200 W at 100% duty cycle on every mode but full-carrier AM, which provides 200 W PEP, or 50 W carrier. The IC-7700 uses MRF-150s, while the IC-7800 has SD-2931s.

Other Similarities

Both radios include the DigiSel automatic tracking preselector, to minimize the effects of strong, out-of-band signals, plus a choice of 15, 6 or 3 kHz roofing filters to pair with each mode's three user-settable bandwidth filter settings. There's a separate front end for 6 meters.

The IC-7700 also includes the handy audio peak filter (APF), which ICOM wisely has resurrected (it was a popular feature on the original-flavor IC-756 but was omitted from the PRO series). Not only is it back, but it's improved, with narrow, mid and wide settings and a number of menu options.

The IC-7700's front end is similar to that of the '7800's, with narrow band-pass filters followed by the DigiSel preselector. The IC-7700 incorporates later-generation DSP chips that boast a slightly higher processing speed than the ICs inside the '7800.

A simulated analog multifunction meter that almost looks like the real thing graces the gorgeous 7 inch TFT LCD display; both radios include provisions for an external VGA video display (the LCD and external displays function simultaneously). I found the '7700's LCD display to be an order of magnitude better than the PROIII's already-terrific display. In fact the difference is *so* great that the PROIII's display — notwithstanding the praise I heaped upon it when reviewing that radio a few years ago — began looking positively primitive to me. Even so, using an external monitor is the best option if you plan to use the IC-7700 for more than just the occasional RTTY or PSK31 contact. Otherwise, you'll strain your eyes trying to read the text that appears in the tiny decoder window.

One complaint we voiced in the IC-7800 Product Review was that the vertical viewing angle of its display was too narrow. The same appears to be true of the IC-7700's display; it's best with the radio approximately at eye level with respect to the operator. ICOM does provide "lifts" for the front support legs, but these offered insufficient additional elevation with the radio sitting at typical desk height. While the display does fade somewhat when viewed from above or below a line perpendicular to its center, it remains readable at viewing angles of $\pm 45^\circ$.

Screen setup offers two display types, A and B, plus a choice of five character fonts. The A screen is a basic black background, while the B screen has a blue background. The screen saver is an eye-catcher. It's a

Table 1
ICOM IC-7700, serial number 0201528

Manufacturer's Specifications

Frequency coverage: Receive, 0.03-60 MHz; transmit, 1.8-2, 3.5-4, 5.33-5.40, 7-7.3, 10.1-10.15, 14-14.35, 18.068-18.168, 21-21.45, 24.89-24.99, 28-29.7, 50-54 MHz.

Power requirement: 85-265 V ac; receive, 210 VA (max audio); transmit, 800 VA (200 W out).

Modes of operation: SSB, CW, AM, FM, FSK, AFSK.

Receiver

SSB/CW sensitivity, 2.4 kHz bandwidth, 10 dB S/N: 0.1-1.8 MHz, 0.5 μ V; 1.8-30 MHz, 0.16 μ V; 50-54 MHz, 0.13 μ V.

Noise figure: Not specified.

AM sensitivity, 6 kHz bandwidth, 10 dB S/N: 0.1-1.8 MHz, 6.3 μ V; 1.8-30 MHz, 2 μ V; 50-54 MHz, 1 μ V.

FM sensitivity, 12 dB SINAD: 28-30 MHz, 0.5 μ V; 50-54 MHz, 0.32 μ V.

Blocking gain compression: Not specified.

Reciprocal mixing (500 Hz BW): Not specified.

ARRL Lab Two-Tone IMD Testing*

| Band/Preamp | Spacing | Input level | Measured IMD level | Measured IMD DR | Calculated IP3 |
|-------------|---------|--------------------------------|-----------------------------|-----------------|-------------------------------|
| 3.5 MHz/Off | 20 kHz | -130 dBm -97 dBm | -27 dBm -7 dBm | 103 dB | +24 dBm +38 dBm |
| 14 MHz/Off | 20 kHz | -129 dBm -97 dBm -72 dBm | -23 dBm -6 dBm 0 dBm | 106 dB | +30 dBm +39 dBm +36 dBm |
| 14 MHz/One | 20 kHz | -141 dBm -97 dBm | -26 dBm -17 dBm | 115 dB | +31 dBm +23 dBm |
| 14 MHz/Two | 20 kHz | -144 dBm -97 dBm | -32 dBm -23 dBm | 112 dB | +24 dBm +37 dBm |
| 14 MHz/Off | 5 kHz | -129 dBm -97 dBm -48 dBm | -33 dBm -15 dBm 0 dBm | 96 dB | +15 dBm +26 dBm +24 dBm |
| 14 MHz/Off | 2 kHz | -129 dBm -97 dBm -50 dBm | -34 dBm -16 dBm 0 dBm | 95 dB | +13 dBm +24 dBm +25 dBm |
| 50 MHz/Off | 20 kHz | -130 dBm -97 dBm | -32 dBm -11 dBm | 98 dB | +17 dBm +32 dBm |

Measured in the ARRL Lab

Receive, as specified;
transmit, as specified.

As specified.

As specified.

Receiver Dynamic Testing

Noise Floor (MDS), 500 Hz filter:

| | Preamp off | 1 | 2 |
|---------|------------|------|----------|
| 1.0 MHz | -130 | -140 | -143 dBm |
| 3.5 MHz | -130 | -141 | -144 dBm |
| 14 MHz | -129 | -141 | -143 dBm |
| 50 MHz | -130 | -140 | -143 dBm |

14 MHz, preamp off/1/2: 18/7/4 dB.

10 dB (S+N)/N, 1-kHz, 30% modulation:

| | Preamp off | 1 | 2 |
|---------|------------|------|--------------|
| 1.0 MHz | 2.7 | 0.75 | 0.53 μ V |
| 3.8 MHz | 2.2 | 0.62 | 0.44 μ V |
| 50 MHz | 2.4 | 0.68 | 0.55 μ V |

For 12 dB SINAD:

| | Preamp off | 1 | 2 |
|--------|------------|------|-------------|
| 29 MHz | 1.2 | 0.27 | 0.2 μ V |
| 52 MHz | 0.9 | 0.25 | 0.2 μ V |

Gain compression, 500 Hz bandwidth:

| | 20 kHz offset Preamp off/1/2 | 5/2 kHz offset Preamp off |
|---------|---------------------------------|------------------------------|
| 3.5 MHz | 125/112/106 dB | 103/103 dB |
| 14 MHz | 125/116/105 dB | 103/102 dB |
| 50 MHz | 124/115/103 dB | 96/96 dB |

20/5/2 kHz offset: -109/-91/-78 dBc.

mini-sized floating version of the active display screen as it was wherever you left the radio when you walked away and the display timed out. There are three menu modes for this: BOUND, ROTATION and TWIST.

The IC-7700 offers a choice of three meter styles — standard (analog), edgewise and bar, but you're limited as to which style(s) can appear on either the normal or

the wide (expanded) screen at any given time. Using the menu, you can pick any of the three as the default for the normal screen. With the standard meter selected for the normal screen, however, your only wide screen choice is the bar style meter. Otherwise, you're restricted to either a bar meter or an edgewise meter for the normal and wide screens. This means if you go to

Receiver

Second-order intercept: Not specified.
 FM adjacent channel rejection: Not specified.
 FM two-tone, third-order IMD dynamic range: Not specified.
 S-meter sensitivity: Not specified.
 Squelch sensitivity: SSB, CW, RTTY, 5.6 μ V; FM, 1 μ V.
 Audio output: 2.6 W into 8 Ω at 10% THD.
 IF/audio response: Not specified.

Spurious and image rejection: HF & 50 MHz, (except IF rejection on 50 MHz): 70 dB.

Transmitter

Power output: HF & 50 MHz: SSB, CW, FM, 200 W (high), 5 W (low); AM, 50 W (high), 5 W (low).

Spurious-signal and harmonic suppression: ≥ 60 dB on HF, ≥ 70 dB on 50 MHz.

SSB carrier suppression: ≥ 63 dB on HF, ≥ 63 dB on 50 MHz.

Undesired sideband suppression: ≥ 80 dB.

Third-order intermodulation distortion (IMD) products: Not specified.

CW keyer speed range: Not specified.

CW keying characteristics: Not specified.

Transmit-receive turn-around time (PTT release to 50% audio output): Not specified.

Receive-transmit turn-around time (tx delay): Not specified.

Composite transmitted noise: Not specified.

Size (height, width, depth): 5.9 \times 16.7 \times 17.2 inches; weight, 50 pounds.

Price: \$7000.

*ARRL Product Review testing now includes Two-Tone IMD results at several signal levels.

Two-Tone, 3rd-Order Dynamic Range figures comparable to previous reviews are shown on the first line in each group. The "IP3" column is the calculated Third-Order Intercept Point.

Second-order intercept points were determined using -97 dBm reference.

**Measurement was noise-limited at the value indicated.

†Default values; bandwidth and cutoff frequencies are adjustable via DSP.

‡Varies with PBT and Pitch control settings.

the wide screen, either two bar meters *or* a bar and an edgewise meter will appear on the screen for the S meter and power output functions.

The radio includes two USB ports on the front panel for a flash drive and/or keyboard. The IC-7800 has a single USB port on the rear apron and a CF card port on the front panel.

Receiver Dynamic Testing

Preamp off/1/2, +96/+96/+96 dBm.
 20 kHz offset, both preamps on: 29 MHz, 84 dB; 52 MHz, 83 dB.
 20 kHz offset, both preamps on: 29 MHz, 84 dB; ** 52 MHz, 84 dB. **
 10 MHz channel spacing: 52 MHz, 98 dB.
 S9 signal at 14.2 MHz: preamp off, 59 μ V; preamp 1, 15.5 μ V; preamp 2, 7.1 μ V.
 At threshold, both preamps: SSB, 1.1 μ V; FM, 29 MHz, 0.1 μ V; 52 MHz, 0.09 μ V.
 2.6 W at 10% THD into 8 Ω .
 Range at -6 dB points, (bandwidth)[†]: CW (500 Hz filter): 348-795 (447 Hz)[‡]; Equivalent Rectangular BW: 502 Hz; USB: 230-2730 Hz (2500 Hz); LSB: 230-2723 Hz (2493 Hz); AM: 135-3171 Hz (3036 Hz).

First IF rejection, 14 MHz, 96 dB; 50 MHz, 87 dB; image rejection, 14 MHz, 104 dB; 50 MHz, 120 dB.

Transmitter Dynamic Testing

HF: CW, SSB, FM, typically 205 W high, < 1 W low; AM, typ 52 W high, < 1 W low; 50 MHz: CW, SSB, FM, typ 190 W high, < 1 W low; AM, typ 47 W high, < 1 W low.

HF, 61 dB; 50 MHz, 68 dB.

Meets FCC requirements.

As specified on HF, > 70 dB on 50 MHz.

> 70 dB.

3rd/5th/7th/9th order (worst case band): HF, $-28/-41/-47/-53$ dB PEP; 50 MHz, $-28/-52/-58/-65$ dB PEP.

6 to 48 WPM.

See Figures 1 and 2.

S9 signal, 15 ms.

SSB, 11 ms; FM, 9 ms. Unit is suitable for use on AMTOR

See Figure 3.

Smooth Sailing

This radio feels *really* solid, and it definitely will impress visitors to your shack. Everyone who's touched the almost larger-than-life main tuning knob has remarked on its silky-smooth feel. I consider it exceptional; it's a sheer joy to use. I also appreciated that the stem controls along the lower apron of the front panel can hide away

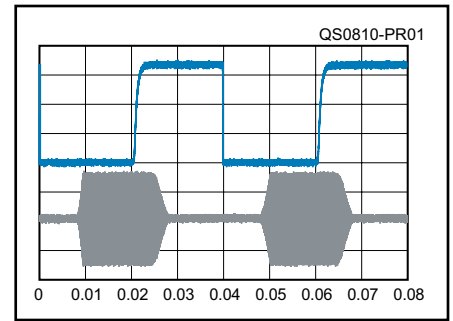


Figure 1 — CW keying waveform for the IC-7700 showing the first two dits in full-break-in (QSK) mode using external keying. Equivalent keying speed is 60 WPM. The upper trace is the actual key closure; the lower trace is the RF envelope. (Note that the first key closure starts at the left edge of the figure.) Horizontal divisions are 10 ms. The transceiver was being operated at 200 W output on the 14 MHz band.

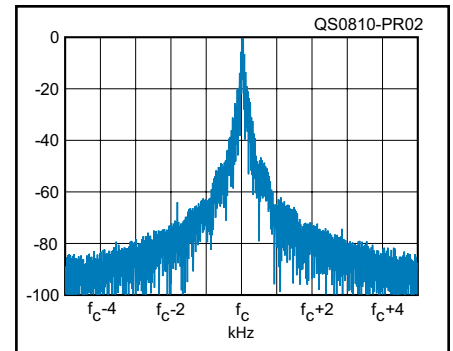


Figure 2 — Spectral display of the IC-7700 transmitter during keying sideband testing. Equivalent keying speed is 60 WPM using external keying. Spectrum analyzer resolution bandwidth is 10 Hz, and the sweep time is 30 seconds. The transmitter was being operated at 200 W PEP output on the 14 MHz band, and this plot shows the transmitter output ± 5 kHz from the carrier. The reference level is 0 dBc, and the vertical scale is in dB.

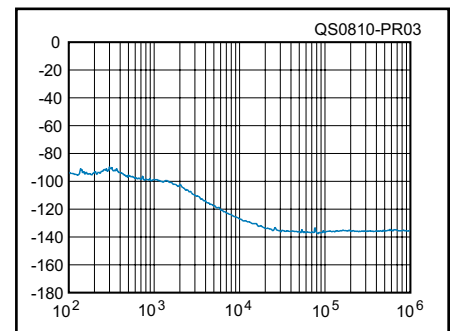


Figure 3 — Spectral display of the IC-7700 transmitter output during composite-noise testing. Power output is 200 W on the 14 MHz band. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 100 Hz to 1 MHz from the carrier. The reference level is 0 dBc, and the vertical scale is in dB.

when you're done adjusting things. These include settings for DRIVE, COMP, MONI GAIN, VOX GAIN, ANTI VOX, CONTRAST and BRIGHT (for the maximum LCD brightness level).

By and large the whole front panel is user friendly with controls and buttons sensibly grouped, albeit with some exceptions. For example, the SPLIT button on the IC-7700 mysteriously turns up next to the CW PITCH control, not grouped with the other VFO functions as it is on the PRO series transceivers.

I found it was *very* easy to confuse the vertically aligned and similar-looking MW and MP-W buttons when I wanted to enter a frequency into the "memory pad" (or "scratch pad") memory bank. For that, the MP-W button is the one you want. The IC-756PROIII has a superior implementation. Its memory pad buttons not only are side by side but larger and light gray, which further helps further to distinguish them from the other buttons. The '7700's scratch pad memories will retain a user-selectable 5 or 10 frequencies on a last-in, first-out basis.

A feature I yearned for on the IC-7700 was backlighting for all button and dial labels, particularly those that comprise the keypad. The two-color keypad buttons on the PROIII are smaller, but they're also easier to read than the '7700's when selecting bands or directly entering a frequency. Nonetheless, the front panel controls generally are easy to locate, even if they're not all ideally illuminated or highlighted.

On some concentric controls, I found myself wishing the control I used more often was the inner knob. NOTCH is one of my favorite features for doing a little CW filter shaping, but it's on the ring, making it more difficult to grasp, especially with the rack-mounting hardware in place. Offhand, it strikes me that the NOTCH should switch places with DIGI-SEL, which, quite honestly, I didn't find helpful at all. Unless you are operating in the presence of strong out-of-band signals that might degrade receiver performance, the DigiSel feature is not one that most North American operators will need to take advantage of. It *might* come in handy in a multi-transmitter environment, however.

The IC-7700 lets you stack three frequency/mode registers in each VFO, A and B, for a total of six on each band. When you "equalize" the VFOs for any reason, you'll overwrite the last-selected settings in the other VFO's register. You can program each band register to recall one of the four antenna port selections.

Using transmit and receive incremental tuning (XIT and RIT), you can shift either or both by up to 9.999 kHz up or down

the band. Some operators, me included, occasionally find it more convenient to use the XIT instead of the SPLIT button for split-frequency operation. That way, pressing RIT lets you listen to your transmit frequency *and* more conveniently tune for a clear spot (it beats holding in the XFC button while trying to tune the main VFO knob, sometimes with the same hand!).

Sssshhhhhh!

Many IC-7700 users have remarked on how quiet the receiver is. Some also feel the IC-7700 has bragging rights over the IC-7800 when it comes to CW reception. My impression was that the receiver is exceptionally quiet, a real plus in digging out the puny signals prevalent at this point in the sunspot cycle.

The IC-7700's filter menu goes a step beyond what's available on the PROIII. On the '7700 you can set up three discrete filter settings and shape (sharp or soft) as well as one of three preset roofing filter settings, 15 kHz, 6 kHz and 3 kHz. A separate filter shape set mode lets you establish default filter shapes for SSB, SSB data and CW on both HF and 50 MHz. For example, if you set the HF SSB (600 Hz –) filter shape to "sharp," that shape automatically applies when the IF filter is set at 600 Hz or wider. Likewise, if you set the HF CW (– 500 Hz) filter shape for "soft," that shape automatically applies when the IF filter is set at 500 Hz or narrower.

The DSP filters work hand in hand with the passband tuning (PBT) control to permit quickly setting just the right degree of filtering to hear the desired signal. Others who have used the IC-7700 came away with the impression that excellent, flexible selectivity is its strongest suit. The very effective noise reduction system also helps. DSP noise reduction on the '7700 is far superior to the implementation on the PROIII. For starters, there's a lot less high-frequency rolloff and overall distortion with the IC-7700's NR system; the audio remains fairly clean throughout. Advancing the NR control much beyond about 10 o'clock will begin to affect the AF output level, however, but that's probably a trade-off most of us can live with. In any event, I never found it necessary to engage extremely aggressive noise reduction.

By the same token, even while wearing headphones I sometimes felt a little starved for AF gain when using the IC-7700, especially at narrower IF bandwidth settings. As a result, I found myself punching P.AMP 1 to get a little more punch. Even at its highest setting the audio never knocked me out of the chair, although a handy menu feature allows independent adjustment of the headphone level.

Whither Dual Watch?

It actually took me a few hours of using the IC-7700 before it dawned on me that it did not have a sub-receiver or Dual Watch capability. *Could this be?* My PROIII has Dual Watch; why wouldn't ICOM include it on this much more expensive model?

That seems to be the question of the day on various Internet discussion sites, and for some potential owners, the lack of Dual Watch is a deal breaker. Dual Watch is handy for capturing the "big picture" — by letting the operator listen to the rare DX and the pileup at the same time, for example. The two receivers of the IC-7800 let you listen to one in each ear, a big plus compared to the Dual Watch's single audio channel. Still, many find the Dual Watch helpful. On the other hand, not everyone needs Dual Watch, and most contesters and DXers can work around it by using handy XFC button or by using RIT and XIT.

Related to this discussion is the fact that the display does not show the frequency of the other VFO, unless the transceiver is in split-frequency mode. Otherwise, you can only see the frequency of the selected VFO plus that of a memory channel.

Doing the Numbers Game

We measured the two-tone third-order IMD dynamic range of the PROIII on 14 MHz at 5 kHz spacing, preamp off, at 77 dB. More recent offerings, including the later IC-7800, Elecraft's new K3 and the FLEX-5000A, have raised the bar for this important receiver parameter considerably. Let's look at the hard numbers from the ARRL Lab.

The two-tone third-order IMD dynamic range of the latest IC-7800 model on 14 MHz at 5 kHz spacing, preamp off, came in at 96 dB, noise limited (see "Product Review," Mar 2007 *QST*). The IC-7700's measurement at the same settings was identical. *But wait! There's more!* The IC-7700's two-tone third-order IMD dynamic range measurement of 95 dB on 14 MHz at 2 kHz spacing, preamp off, was 9 dB *better* than that of the IC-7800 at the same settings. In both cases, the '7700 measurement was *not* noise limited. Figure 3 shows that the ARRL Lab measured lower levels of close-in composite noise for the IC-7700 compared to the IC-7800. The '7800 does hold a 117 dB to 102 dB advantage in blocking dynamic range on 14 MHz at 2 kHz spacing, preamp off.

On a busy band, it's possible to hear the discrete layers of stations on top of one another. Most times you also can pick out just the signal you want by using the passband tuning and/or APF features. During one operating event, I was able to work two stations of differing signal strength that were almost on the same frequency by using the 200 Hz filter setting coupled with the APF working

in tandem with the NOTCH. It wasn't easy copy on either station, but I *was* able to put the points in the log.

The manual doesn't seem to mention this, but you can disable the DigiSel function and instead use the DIGI-SEL knob to adjust the otherwise-fixed APF. The DIGI-SEL button does nothing in this instance. It strikes me that the adjustable APF should be the default control, not the DigiSel.

Digi-Mania!

The ability to operate RTTY or PSK31 without a computer on the IC-7700 is a huge plus and adds a whole new dimension of fun without using an external computer and software. The IC-7800 offers similar capability. Like the PROIII, the IC-7700 includes a twin-peak audio filter for RTTY.

PSK31 operation using the '7700 differs from the typical soundcard/software method. You must tune signals manually rather than clicking on them on a PC waterfall display and having them spring into place. Using the finest (1 Hz) tuning step eases tuning, but you have to be dead on before the signal starts to decode on the screen. The tiny signal phase indicator is nearly useless when viewed on the radio's display panel, but it's easily visible with an external monitor. A small waterfall display assists in tuning, and it looks pretty much like the one used with popular computer software.

RTTY and PSK memories are separate, so you can tailor one without having to disturb the other. Attempting to toggle between RTTY and PSK could be smoother, however. Pushing the button to switch from RTTY to PSK or vice versa does not automatically display the decoding screen for the new mode. You *also* must exit from the decoding screen that's there and bring up the correct one. The radio does display a text advisory — in red letters — that you have to select the other mode's decoding screen.

The decoded text on the radio's display screen is small, and if your eyesight is at all degraded, you'll have trouble reading it. This is where connecting an external monitor to the port on the back apron really comes in handy. Otherwise, the IC-7700 works just fine for casual PSK31 and RTTY operation. Those who contest seriously in these modes most likely will continue to prefer their favorite software running on a PC instead.

The Written Word

The *Owner's Manual* reflects the IC-7700's status as a high-end radio. This is no paper-cover, center-stapled collection of mangled sentences and typographical errors. The '7700's manual comes in a rugged *four-ring* binder and includes a fairly



Figure 4 — The rear panel of the IC-7700 includes four antenna connectors, provisions for a separate receive antenna or preamp, and various accessory connections.

comprehensive table of contents, a full set of schematics and block diagrams (get out your magnifying glass, though) and detailed user information. Step-by-step instructions range from such activities as how to install the main tuning knob — which arrives *unattached* to the radio to prevent possible shaft or encoder damage during shipping — to programming and editing the various memories and making the multitude of menu selections.

The manual is well organized, with sections for basic operation, receive and transmit functions and the transceiver's various features, such as memories, digital voice recorder and automatic antenna tuner. It does lack a comprehensive index, however. On a couple of occasions I could not find sufficient information about a particular feature (DigiSel comes to mind), but for the most part this well-designed and written manual tells you nearly anything you need to know about the IC-7700. Updates and an even closer look at some features are available on ICOM's Web site, www.icomamerica.com.

The Spoken Word

At the press of the SPEECH button, a virtual female voice announces the current S meter reading and the frequency (out to four decimal places, 100 Hz — for example, “seven point zero two three six megahertz”). Press *and hold* the SPEECH button and the announcement adds the operating mode. Oddly, there's no beep or double beep to distinguish between pressing the button and pressing *and holding* the button, so initially this was confusing.

Our particular model included a choice of English and Japanese. The menu offers “high” and “low” (speed) voice rates plus the ability to turn off the S meter announcement. The speech feature works in transmit and receive.

The digital voice recorder (DVR) is competent. It lets you set up four canned messages of up to 90 seconds each (the

remaining time is counted down on the screen) that you can transmit. The user must step through a few menu screens to get to the spot where it's possible to record or play back transmit memories (it's the same for the other modes). You may apply names to DVR/CW/digital memories. It's possible to save both receive memory and transmit memory contents to USB memory.

Unfortunately, the handy VOICE MEMORY REC and PLAY controls on the front panel only let you record audio off the air, if you're so inclined. The radio can record up to 30 seconds of audio (a total of 209 seconds across as many clips as you record). Press the PLAY button to hear the most recently recorded clip. Sorry, but I don't see myself taking advantage of this function and would prefer these controls somewhere other than on the front panel. It is a great feature for shortwave and broadcast band listeners, though.

Audio Tailoring

Like most higher-end transceivers these days, the IC-7700 includes provisions to tweak both receive and transmit audio to suit your personal taste, although I felt the IC-7700's equalizers were a bit rudimentary and limited for a transceiver in this price class. The menu offers two ways to accomplish these tasks.

To equalize your receive audio, the IC-7700 has separate EQ controls — essentially treble and bass controls — for *each* voice mode plus the option of accomplishing the same thing by setting high-pass and low-pass filter (HPF/LPF) limits within a range of 100 to 2900 Hz (a maximum bandwidth of 2.8 kHz). *Only* HPF/LPF limits are available for CW, RTTY and PSK reception. These menu settings let you get the audio timbre just right for whatever mode you're using and can help decipher any really muddy audio you might encounter.

On the transmit side, the menu permits adjusting TX TONE using similar treble and bass controls. There are separate TX TONE

A Contest Operator's Perspective

The hardest part about using an IC-7700 is simply getting it out of the shipping box! It is packed very well, no doubt about it, but get someone to help you carry the box and empty its contents. The rack handles are not attached to the rig from the factory, so you need to get the rig out of the box without them. If you install them first, it will be easier to move the radio to its final resting position. But then you will want to remove them as they do interfere with easy access to frequently used knobs.

The radio is gorgeous in every respect. (Unless, of course, you really can't stand the appearance of modern sleekness with a high-tech flourish and vivid colors wrapped into a shiny black form.) There is just the right amount of space on the front panel between buttons and knobs, especially compared to the '7800. The LEDs on the black, momentary switches are highly useful and can be adjusted via a menu. For fun, and it ended up being useful, I plugged a USB-powered fan/spotlight into the rig's front panel USB port. The light can illuminate your dark keyboard!

On the Air

I didn't have a lot of motivation to get on the air with the IC-7700 as the station is mostly disconnected for summer and I'm just a bit burned out with it all right now. As I hauled the box into the shack, though, I thought of my time with the IC-7800 and how much I enjoyed using it. That little spark was all it took for me to jump in and explore the '7700.

Five minutes later it was on the air. Rick, WW3DE, who wrote the full review, had set up the rig prior to my use, but honestly, it was a snap to get this rig going. I didn't have to consult the manual about anything until using it on RTTY and only then to find what key to punch to toggle between transmit and receive (F12 on the keyboard). The only other item I had to look up involved finding the menu item to set the RIT/XIT CLEAR button to "Quick Clear." Out of the box, it was set to require holding the button for one second to clear.

This radio reminds me of my trusty old Kenwood TS-930S because of its excellent front panel layout. The use of the XFC button to listen to your transmit frequency is exactly like the TF SET button on the TS-930. Without two receivers or a Dual Watch function, the XFC operation is a pretty nice alternative. I do enjoy operating split, but never learned to really like using a Dual Watch function. I like not being able to hear my transmit frequency continuously — nowadays when you are in a large, split-frequency pileup, *everybody* seems to be moving up and down pouncing on the last guy called, so the advantage is gone. You either need to be extremely loud or lucky. Now it is frequently better to rely on the skill of the operator at the other end and plant yourself in the clear — which is easily done without even listening thanks to the great spectrum scope. The scope has great resolution and is entirely useful! I can see a time not far off in the future when an application for broadband CW decoding such as VE3NEA's *CW Skimmer* is built right into a rig like this.

The built-in RTTY operation is simple and effective. Plug in a USB keyboard and you're on the air. The North American QSO Party RTTY was going one weekend, so I jumped in and made some contest contacts. The waterfall display is good enough to line up signals, the keyboard function is perfect, and the memories were easy to set up. I was easily able to run two QSOs a minute while logging by hand — using the memories gave me enough time to write. For a serious effort I'd opt for integrated contest logging and RTTY software on a PC, but the '7700 is perfect for casual RTTY operating.

On 6 meters the IC-7700 easily handled the bone-crushing signals of neighbors. I could operate much more closely to the splatter than I can with other 6 meter gear in my shack. The 6 meter receiver is terrific all around. It's very quiet, and I observed no interference from all the loud New England signals. It was a joy to tune around the band. The big tuning knob added to that joy as it is silky smooth and feels very heavy.

Separating CW and SSB signals is a breeze. Running some small pileups while adjusting the PBT and engaging the APF yielded clean copy immediately without having to adjust the RIT. The auto-tune function works well to zero in on CW signals. The CW pitch control is the best I've used. I am frequently asked about QSK (full break-in) operation on various rigs. The full break-in of the '7700 was flawless and nearly silent.

With the IC-7800, the audio output from the front panel never seemed loud enough for me. The '7700 has plenty of audio with the Heil noise canceling headphones I use. The noise blanker instantly removed the pulse noise from a neighbor's electric fence.

IARU Contest Operation

I made a few hundred QSOs with the rig during the IARU HF World Championship using both CW and phone. Depending on band conditions, I found myself trying the preamps on and off and settled on using preamp 1. There wasn't much of an increase in the noise levels with the preamps on, but loud signals with key clicks were more noticeable.

I really enjoyed working phone. The sampled audio sounds spectacular, and the reports received were equally complimentary. Mic adjustments were easily made, and it was hard to overdo it. The simple amplifier connection to my Ameritron AL-1200 amplifier worked flawlessly. The IC-7700's ability to put out up to 200 W allowed me to easily drive this stingy amp to 1500 W without overtaxing the transceiver.

For me, this radio is just about perfect. Some may balk at the IC-7700's higher than average price, but this beautiful piece of equipment basically has everything you need in one box. If you're like me and try to do some on-air operating every day, the cost per use is easily justified. With this radio in the shack, my poor old TS-930 will get lonely. — *Dave Patton, NN1N, Membership and Volunteer Programs Manager*

settings for SSB, AM and FM. In addition, it's possible to establish wide, mid and narrow SSB transmit bandwidth (TBW) settings for voice equalization, again within the 100 to 2900 Hz limits.

The IC-7700's SSB transmit audio quality is commendable. "Sounds really good"

and "Really punches through," were typical reports.

Risky Business?

As with the IC-7800, it's possible to upgrade the IC-7700's firmware. This is accomplished in the IC-7700 either via an Internet

connection using the ETHERNET jack on the radio's rear panel or by downloading the new version onto a flash drive, then uploading it to the radio via one of the USB ports on the radio's front panel. This procedure involves a certain amount of risk, however.

A heart-stopping message greets you at

the upgrade menu: “CAUTION,” it reads. “Updating the firmware is very risky. If you make a mistake, the IC-7700 may not operate properly, and repair at Icom Inc. (Japan) may be the only way to fix it.”

Whoa!

“You undertake the updating of the firmware at your own risk and responsibility,” ICOM’s ominous message continues. “Please refer to the firmware download homepage and/or the *Owner’s Manual* for the correct procedures in updating the firmware.”

Part of the correct procedure requires that you let the IC-7700 format your flash drive first. I passed on upgrading the radio’s firmware, but judging from the manual, it doesn’t appear to be nearly as difficult as the on-screen warning makes it out to be.

ICOM USA noted that the same warning now appears on the IC-7800. Their service staff recommend to those with unreliable power that a computer type UPS be used to power the radio during upgrades. In four years they have not had a report of a single case of this kind of failure.

Kudos

- Some IC-7700 user comments to the Internet singled out the spectrum scope for special praise, and it’s difficult to disagree. One called it “a true spectrum analyzer” and “a real piece of test equipment.” The spectrum scope does cover a greater range than the one in the PRO series. Press the GENT/FIX key and you can view the landscape of an entire amateur band, with the exception of 10 and 6 meters, where the spectrum scope covers just the first 500 kHz of the band. The spectrum scope on this radio is a truly useful feature, in my opinion.

- The automatic antenna tuner seemed to work quietly, quickly and efficiently. It matched nearly every oddball load it had to confront in my shack. It will recall previously established settings (as preset points within 100 kHz steps). I found “manually” tuning (by pressing and holding the TUNER button, worked nearly as well while moving among various bands and modes, typically getting the job done within 10 to 20 seconds and sometimes much faster. To tune an antenna, the ATU needs at least 8 W on HF and 15 W on 50 MHz.

- The ’7700 lets you enable *both* preamps in the LF and MW bands, something not possible with the PRO series.

- The notch works very well to tighten the receive passband as well as to ward off offending extraneous signals. It offers narrow, mid and wide settings.

- The AGC VR is handy to tweak the AGC, although this is not something you’d expect to be doing on the fly in the midst of a contest. It might help in pulling out that very

weak — and very rare — DX station.

- The internal speaker fires upward. It sounds just fine although it’s vulnerable to being covered up by something placed on top of the radio.

- The AUTO TUNE feature is pretty slick. Press the little button, and the transceiver automatically tunes CW or AM signals with precision.

- The ’7700 provides BNC jacks on the rear panel to connect an external preamp or RF filter. A menu setting activates or deactivates this feature, thus eliminating the need for a jumper cable.

- The VSC — voice squelch control — is not something you’ll find on most transceivers, although similar implementations exist elsewhere. Enable this and the transceiver avoids unmodulated signals while scanning. This function could have been relegated to a menu setting.

Quibbles

- The operation of the UP and DOWN arrow keys with the frequency memory list displayed was logical but counterintuitive. Pressing the DOWN icon moves the cursor in descending order on the memory list, which, in fact, scrolls the list in an upward direction. Pressing the UP arrow moves the cursor in ascending order on the list, which scrolls visually downward. On the other hand, the UP and DOWN keys work just the opposite with the DVR, CW, RTTY or PSK memories displayed.

- It’s not possible to “hold” — or freeze — the mini scope. You can still only do this when the full-sized scope is on the display. There may be occasions when you’d want to be able to freeze the mini scope, however, such as when you’ve brought up the transmit memories screen.

- The entire digital metering suite must be enabled to see a graphical display-style primary meter. It would be great to have a choice between the *faux* analog meter and a graphical-display readout, which makes it much easier to determine signal peaks.

- The AF control makes a low humming sound as it’s rotated while in CW mode and using narrow filter settings (500 Hz or tighter). It does not do this on SSB or with wider filter settings on CW.

- The TIMER button could have easily been omitted from the front panel and relegated to a menu. It brings up a plethora of timer setting choices that would likely be of great advantage to an SWL or BCL, but not to the average radio amateur. There are five timers in all.


So, Who’s Buying?

The IC-7700 is a terrific general-purpose transceiver, allowing the user,

as it does, to sample all popular modes without having to go outside the box. I was initially astounded to see an Internet posting from an unlicensed SWL who had purchased an IC-7700 merely for listening; after noting the various features only an SWL or BCL might value, I had a better understanding.

The IC-7700’s attributes seemed shaped more toward the serious contester and DXer, although the lack of a second receiver — or even Dual Watch — could cause those enthusiasts to cross the IC-7700 off their want lists. On the other hand, if they can afford to adapt a second receiver (or transceiver) into their system, that problem’s a non-starter.

So this radio’s appeal may be broader than it might appear at first glance, with features to attract and hold the HF or 6 meter generalist or specialist and even the occasional SWL/BCL. Likely buyers in any category will be those willing to go the extra few miles to own a genuinely superior piece of radio gear that practically does it all — and one that more than fills the average ham’s desires, not to mention ham radio desk.

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

Feedback

Several readers questioned the Blocking Gain Compression and IMD Dynamic Range test results reported in Table 1 of the Product Review of the ICOM IC-7700 [Oct 2008, pp 41-47]. The review transceiver was no longer available for testing, but here are results from another IC-7700, s/n 0201390. At 14 MHz, 500 Hz bandwidth:

Table 1

ICOM IC-7700, serial number 0201390

Receiver
SSB/CW sensitivity, 2.4 kHz bandwidth,
1.8-30 MHz,

Receiver Dynamic Testing
Noise Floor (MDS), 500 Hz filter:
Preamp *off* *1* *2*
14 MHz -126 -138 -142 dBm

Blocking gain compression: Not specified.

Gain compression, 500 Hz bandwidth:
20 kHz offset *5/2 kHz offset*
Preamp off/1/2 *Preamp off*
14 MHz 133/139/132 dB 120/108 dB

ARRL Lab Two-Tone IMD Testing*

| <i>Band/Preamp</i> | <i>Spacing</i> | <i>Input level</i> | <i>Measured IMD level</i> | <i>Measured IMD DR</i> | <i>Calculated IP3</i> |
|--------------------|----------------|--------------------|-------------------------------|----------------------------|---------------------------|
| 14 MHz/Off | 20 kHz | -22 dBm | -126 dBm | 104 dB | +30 dBm |
| | | -7 dBm | -97 dBm | | +38 dBm |
| | | 0 dBm | -73 dBm | | +37 dBm |
| 14 MHz/One | 20 kHz | -30 dBm | -138 dBm | 108 dB | +24 dBm |
| | | -18 dBm | -97 dBm | | +21.5 dBm |
| 14 MHz/Two | 20 kHz | -38 dBm | -142 dBm | 104 dB | +14 dBm |
| | | -25 dBm | -97 dBm | | +11 dBm |
| 14 MHz/Off | 5 kHz | -27 dBm | -126 dBm | 99 dB | +23 dBm |
| | | -17 dBm | -97 dBm | | +23 dBm |
| | | 0 dBm | -42 dBm | | +21 dBm |
| 14 MHz/Off | 2 kHz | -39 dBm | -126 dBm | 87 dB | + 5 dBm |
| | | -21 dBm | -97 dBm | | +17 dBm |
| | | 0 dBm | -31 dBm | | +16 dBm |

Compared with the results shown in the review, the Blocking Gain Compression numbers are significantly higher. IMD Dynamic Range numbers are somewhat lower.