

ICOM IC-707 MF/HF Transceiver

Reviewed by Steve Ford, WB8IMY

With an influx of new amateurs and much of the world still on shaky economic ground, there appears to be a movement toward less expensive radios with fewer bells and whistles. ICOM has taken a step in this direction with the IC-707 transceiver. It's as though we've journeyed back to the '60s and '70s when most radios were just *radios*—not boxes with front panels that look like they belonged in the cockpits of Boeing 767s. Of course, even a low-frills rig of the '90s is well beyond the dreams of amateurs 30 years ago. The IC-707 is a 100-W output (adjustable) AM/CW/SSB (and, optionally, FM) transceiver housed within a very compact enclosure. It covers all ham bands from 160 through 10 meters and even has a general-coverage receiver. The package also includes dual VFOs and a 25-channel memory. How far we've come!

Back to Basics

The big question, of course, is what to leave out of a low-cost radio. All you have to do is look at the front panel of the 707 and you know you're back to basics. The myriad controls and switches that decorate most MF/HF transceivers have been replaced by a mere handful. There is the **AF Gain** and **Squelch**, **RIT**, **Microphone Gain** and **RF Output**. The **Microphone Gain** and **RF Output** controls are tiny and almost go unnoticed along the bottom. Switches include the conspicuous **Power** rocker and several small pushbuttons for **RIT**, tuning speed, mode (CW, USB, LSB, AM and FM), noise blanker, VFO lock, antenna tuner, receive preamp/attenuator, and scan. To the right of the VFO control is a set of four push-buttons that control the dual-VFO and memory functions. The speaker is also on the front panel, facing forward, a definite asset for mobile operating.

The upper quarter of the front panel is dominated by a large, multifunction LCD display. The operating frequency is clearly visible in oversized numerals. The S meter takes the form of an eight-segment horizontal bar graph. Operating modes and various other messages also appear in the display. The display is very user friendly and easy to read.

The back panel of the 707 is equally simple. Aside from the obligatory SO-239 antenna connector, there is an ALC jack, a computer control jack, an antenna tuner control port, a CW key jack and an external speaker jack.

The IC-707 also offers two accessory



jacks. The primary jack requires an 8-pin DIN plug (not supplied). It provides connections for a fixed-level transmit audio input and receive audio output, as well as transmitter keying and accessory switching. If you intend to use the IC-707 for HF digital operating, this jack is extremely convenient. The second accessory DIN jack supplies many of the same inputs and outputs, but not all. Its primary use is for linear amplifier switching and interfacing with other (non-ICOM) automatic antenna tuners.

The computer control jack works with the optional ICOM CT-17 interface. (Aftermarket interfaces are also available from several QST advertisers, or you can build your own.) This interface allows the radio to work with many popular software packages that have built-in support for ICOM radios.

Finally, you need an outboard power supply for the IC-707. It requires a maximum of 20 A at 13.8 V dc. ICOM sells a companion PS-55 power supply, or you can use any well-filtered supply that can handle the current (I used my Astron RS-35A).

The IC-707 On The Air

As you can see from the results of the ARRL Lab tests in Table 1, ICOM left in

plenty of basic radio performance. Our IC-707 receiver is plenty sensitive. Dynamic range is on par with other current radios in the \$1000 to \$1500 price range, and *a lot* better than those simpler radios of the '70s that we so fondly remember. It clearly meets or exceeds all of its specifications. But how does it really perform on the air?

Frequency Agility and Stability

Learning to use the tuning speed (or **TS**) function is essential to operating the IC-707. The good news is that it's very intuitive. I had the knack within about five minutes, which is not bad considering that I hadn't read the manual. To switch bands, you press the **TS** button until two arrows appear above the 10 and 1 MHz digits on the display. As you turn the VFO knob, the IC-707 will jump from one band to another. Press the **TS** button again when you've reached the desired band. You can then tune slowly, or press the **TS** switch again to enable faster 1-kHz incremental tuning. Tuning can also be performed from the **UP/DOWN** switches on the hand-held microphone.

The IC-707 features a *band-stacking register* as part of its memory system. This is convenient when you're switching from one band to another. If you're operating USB on 20 meters and CW on 10 meters, for example, the IC-707 will remember these mode/band settings. When you've milked 20-meter phone for all it's worth, you can switch to the 10-meter band and find yourself on CW again, ready to go.

One of my favorite tests for frequency stability is to operate a transceiver on

The Bottom Line

ICOM's newest low-priced MF/HF transceiver offers solid basic radio performance and a good selection of features in an easy-to-use package.

Table 1**ICOM IC-707 MF/HF Transceiver, serial no. 01082****Manufacturer's Claimed Specifications**

Frequency coverage: All ham bands 160 through 10 meters plus general-coverage receive-only from 500 kHz through 30 MHz. Extended coverage at upper and lower band edges.

Modes of operation: CW, LSB, USB, AM, FM (optional).

Power requirement: 13.8-V dc $\pm 15\%$, 2.1 A on receive, 20 A on transmit.

Receiver

SSB/CW receiver sensitivity (bandwidth not specified, preamp on, 10 dB S/N): $<0.16 \mu\text{V}$ (-123 dBm).

AM (10 dB S/N): 0.5-1.8 MHz, $<13 \mu\text{V}$; 1.8-30 MHz, $<2 \mu\text{V}$.

Blocking dynamic range: Not specified.

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

Third-order input intercept: Not specified.

S-meter sensitivity: Not specified

CW/SSB squelch sensitivity: $<5.6 \mu\text{V}$ (preamp off).

Receiver audio output: $>2.6 \text{ W}$ into 8 Ω .

IF/audio response: Not specified.

Transmitter

Power output: SSB, CW, FM, 5 to 100 W.

Spurious-signal and harmonic suppression: $\geq 50 \text{ dB}$.

Third-order intermodulation distortion products: Not specified.

CW-keying characteristics: Not specified.

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

Composite transmitted noise: Not specified.

Size (height, width, depth): 3.7x9.4x9.4 inches; weight, 9 lbs.

*Dynamic-range measurements were made at the ARRL Lab standard signal spacing of 20 kHz. Blocking dynamic range measurements were noise limited at the values shown. AGC could not be defeated.

Measured in the ARRL Lab

As specified. Transmitter range: 1.8-2, 3.4-4.1, 6.9-7.5, 9.9-10.5, 13.9-14.5, 17.9-18.5, 20.9-21.5, 24.4-25.1, 27.9-30 MHz.

As specified. FM not tested.

At 13.8-V dc: 1 A on receive (no signal); 19 A max on transmit (varies from band to band).

Receiver Dynamic Testing

Minimum discernible signal (noise floor) with 500-Hz IF filter:

	Preamp On	Preamp Off
1.0 MHz	-120 dBm	-120 dBm
3.5 MHz	-138 dBm	-129 dBm
14.0 MHz	-138 dBm	-131 dBm

10 dB S+N/N (signal 30% modulated with a 1-kHz tone):

	Preamp On	Preamp Off
1.0 MHz	$4.4 \mu\text{V}$	$4.4 \mu\text{V}$
3.8 MHz	$0.6 \mu\text{V}$	$1.7 \mu\text{V}$

Blocking dynamic range with 500-Hz IF filter:*

	Preamp On	Preamp Off
1.0 MHz	111 dB	111 dB
3.5 MHz	115 dB	116 dB
14.0 MHz	128 dB	121 dB

Two-tone, third-order IMD dynamic range with 500-Hz IF filter:*

	Preamp On	Preamp Off
1.0 MHz	90 dB	90 dB
3.5 MHz	93 dB	94 dB
14.0 MHz	87 dB	87 dB

	Preamp On	Preamp Off
1.0 MHz	$+14.9 \text{ dBm}$	$+14.9 \text{ dBm}$
3.5 MHz	$+1.5 \text{ dBm}$	$+11.9 \text{ dBm}$
14.0 MHz	-7.4 dBm	-0.5 dBm

S9 signal at 14 MHz: preamp on, $15 \mu\text{V}$; preamp off, $48 \mu\text{V}$.
3.8 μV .

2.8 W at 10% THD into 8 Ω .

At -6 dB : CW-N, 532-1082 Hz (550 Hz); CW-W, 425-2481 Hz (2056 Hz); USB, 392-2501 Hz (2109 Hz); LSB, 367-2418 Hz (2051 Hz); AM, 350-2400 Hz (2050 Hz).

Transmitter Dynamic Testing

Maximum power output typically 99 W, minimum power typically 3 W; varies slightly from band to band.

As specified. Meets FCC specifications for equipment in its power output class and frequency range.

See Figure 1.

See Figure 2.

S9 signal, 19 ms.

See Figure 3.

AMTOR or PacTOR from a cold start. These error-detecting digital modes demand stability. Constant drift corrections are annoying and may even cause you to lose the link.

We'll get into the 707's digital operations in more detail later. For now, suffice to say that it turned in an excellent performance on a cold December morning on PacTOR. I glanced at the tuning indicator on my KAM multimode TNC, waiting to

spot the telltale signs of frequency drift as I chatted with a fellow in the United Kingdom. After 30 minutes of operation, the IC-707 was still holding its own. I was impressed.

Receiving

This transceiver has a feature not usually found on modern transceivers: A front-panel speaker. Most people who tried the '707 were pleased with the quality and the

amount of audio from the radio. This feature is especially nice for mobile operation.

The 707's receive performance on SSB is very good. The audio sounded clean and clear. Filtering is adequate, but there were times when I missed having IF shift or pass-band tuning to reduce interference. An external audio filter, perhaps one of the popular DSP units, would help when the band is crowded.

The radio's receive performance on the

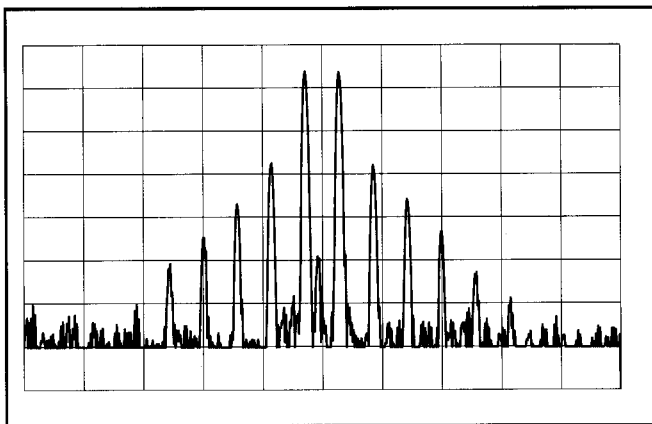


Figure 1—Worst-case spectral display of the ICOM IC-707 transmitter during two-tone intermodulation distortion (IMD) testing. Third-order products are approximately 28 dB below PEP output, and fifth-order products are approximately 36 dB down. Vertical divisions are 10 dB; horizontal divisions are 2 kHz. The transceiver was being operated at 100 W PEP output at 14 MHz.

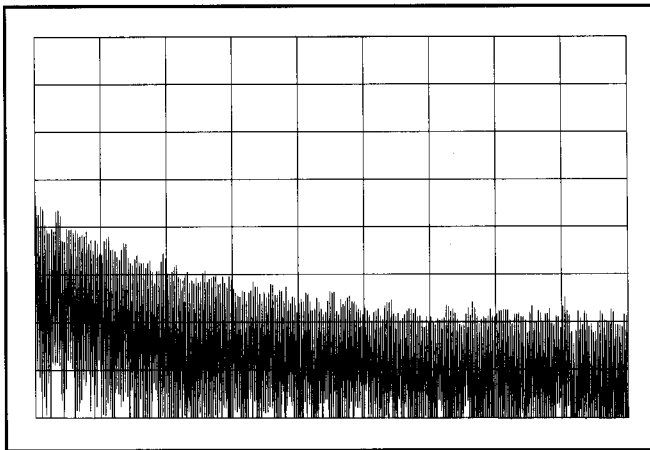


Figure 3—Spectral display of the ICOM IC-707 transmitter output during composite-noise testing. Power output is 100 W at 14 MHz. Vertical divisions are 10 dB; horizontal divisions are 2 kHz. The log reference level (the top horizontal line on the scale) represents -60 dBc/Hz and the baseline is -140 dBc/Hz. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 2 to 20 kHz from the carrier.

digital modes is adequate, but the lack of a narrow IF filtering option in SSB is painfully evident. The human brain is pretty good at sorting out interfering signals, but multimode TNCs are much less flexible. I lost AMTOR and PacTOR links on several occasions when other digital conversations fired up nearby. The IC-707 manual suggests a "workaround" method of switching in the CW IF filter for digital operating. It involves using separate VFOs in the "split" mode for transmit and receive. The technique works, but it's not ideal. If you hope to use the 707 on congested digital subbands—such as 20 meters—you may want to consider installing an external audio filter between the rig and your multimode TNC. This will not work as well as tightening your IF filtering, though.

I enlisted the assistance of Dave Newkirk, WJ1Z, Senior Assistant Technical Editor, to review the IC-707. He had some insightful comments about its CW and AM receive performance:

"The IC-707 uses slow-decay AGC for SSB and fast-decay AGC for CW. The AGC settings are factory programmed and cannot be changed (nor can the AGC be disabled). The fast AGC attacks so slowly that it annoyingly "hardens" moderate to strong CW signals. (You can hear the difference by tuning in a CW signal at the same pitch in SSB and wide CW.) This, in conjunction with the radio's shrieky 800-Hz receiving pitch and audio graininess when its narrow CW filter switched in, makes CW operation with the IC-707 less than a pleasure in narrow CW and just tolerable in wide CW.

"The IC-707 receives AM signals well—if they're all alone on the band. Otherwise, the radio's wide AM-filter skirt

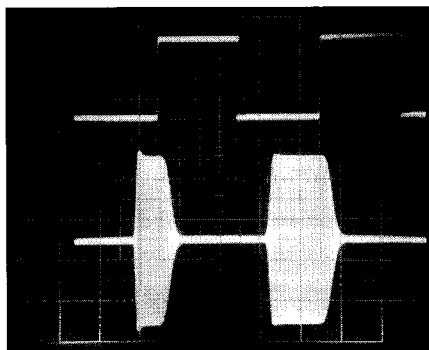


Figure 2—CW-keying waveform for the ICOM IC-707 in the semi-break-in mode. The upper trace is the actual key closure; the lower trace is the RF envelope. Horizontal divisions are 10 ms. The transceiver was being operated at 100 W output at 14 MHz.

response (40 dB down at 20 kHz) will send you leaping to punch **USB** or **LSB** to escape the interference. That done, you're in for a treat because the IC-707 receives AM as SSB very well."

Transmitting

The IC-707's transmit characteristics are excellent. I received consistently good audio reports with a variety of microphones. (ICOM includes a hand mike with the 707.) I was disappointed when I discovered that there was no *VOX* (voice-operated TR switching) function in the IC-707. This is a significant drawback, at least for my operating style.

The most glaring omission for me was the lack of a *MOX* (manually operated

transmit switch). If you buy one of the optional ICOM automatic antenna tuners, the missing *MOX* isn't a problem. You simply press the front-panel **TUNE** switch and the tuner adjusts automatically. If you're like many hams, however, you probably use a manual antenna tuner. To adjust the tuner you need to switch the IC-707 into a continuous transmit mode.

How do you accomplish this? You can use the microphone PTT switch or an out-board switch connected to the PTT line as a *MOX* switch in the CW mode to get a continuous signal. (If you haven't plugged in a key, doing so will transmit a carrier.) Keying the transceiver with one hand and adjusting the tuner with the other is awkward, but it works.

The IC-707 performed very well in the digital modes. Transmit/receive switching time was more than adequate for AMTOR and PacTOR. I enjoyed several digital DX contacts with little difficulty. The 707's performance was particularly impressive when using Baudot RTTY. The manual cautions you to limit your output to 50 watts, but I couldn't resist running it all the way up to 100 watts. During a couple of long-winded RTTY conversations, the IC-707 hardly broke a sweat. Its whisper-quiet internal cooling fan kept the rig from getting too hot under the collar. There's no doubt that the transmitter is plenty rugged. We ran it key-down at full power into a dummy antenna for a half hour without any signs of distress.

Although the purists will tell you there's no substitute for the monster tube-type rigs of the '60s, the IC-707's AM performance is fine. Several stations even commented on the good audio quality. The rig's maximum AM output power is 25 watts. FM is

optional in the IC-707 and this function was not tested.

On CW you can use so-called "semi-break in." Unfortunately, the hang time is adjustable only through an *internal* potentiometer. This is annoying because I often needed to adjust the delay time for operation at different speeds. Most of the time, especially during slow-speed ragchews, I prefer to use a foot switch or flip a front-panel transmit switch to avoid playing "beat the relay." As Figure 2 shows, there is some shortening of the first transmitted character, but the waveform is fine. The

CW signal sounds good on the air.

Summary

The IC-707 provides good basic radio performance for new hams and veterans alike on a budget. ICOM left in a good mix of features to make operating pleasurable and convenient, and the radio is really easy to use. You may miss VOX and a selection of receive filtering options in crowded phone and digital subbands, but the tradeoff is a rugged radio that can withstand considerable abuse. The IC-707 makes a fine mobile or portable transceiver—and it

works well in your home station for many less-demanding applications.

Manufacturer's suggested retail prices: IC-707, \$1032; AT-150 HF automatic antenna tuner, \$539; AH-3 HF automatic antenna tuner, \$594; PS-55 dc power supply, \$265; SM-6 desktop microphone, \$82; CT-17 CI-V level converter, \$105; FL-52A 500 Hz CW filter, \$137; FL-53A 250 Hz CW filter, \$137; UI-9 FM unit, \$80; MB-5 mobile mounting bracket, \$43. Manufacturer: ICOM America, Inc, 2380 116 Ave NE, Bellevue, WA 98004, tel 206-454-7619; Brochure hot line 206-450-6088.

Solder-It Soldering Kit

Reviewed by Mike Gruber, WA1SVF

No doubt about it—soldering is essential to almost any electronics project. As many hams and hobbyists have discovered, it is also a great way to make many home repairs. Unfortunately, solder is not without its limitations and drawbacks. Electronics-type solder, usually a mixture of 60% tin and 40% lead with a rosin-core flux, works on a limited number of metals. And, as Murphy's Law would have it, the most critical soldering jobs are always just out of reach of an extension cord. The Solder-It kit is intended to overcome both of these limitations. The kit includes a refillable butane pencil torch, torch stand, syringes with solder pastes for a variety of materials, and a vinyl plastic storage pouch.

Soldering Torch

I find the quality and performance of the torch to be consistent with its price tag. It seems well made and durable. It's an excellent choice for general purpose and home hobbyist soldering. The torch isn't a replacement for your soldering iron, but it is an excellent choice for soldering wires outdoors.

Butane for the torch must be purchased separately. It's widely available as fuel for refillable cigarette lighters. I purchased a

2.5-ounce container (large enough for several torch refills) for \$2.39. Filling the torch is a snap—just press the butane container nozzle into the torch valve. According to the manufacturer, a refill lasts an hour or more. Although I didn't time it, a fill-up did last a surprisingly long time. Fuel did not appear to leak, even when the valve was closed and the torch left idle for several weeks.

ARRL staffer and resident antenna expert, Dean Straw, N6BV, reports excellent results with a Solder-It pencil torch while at the top of his 120-foot tower. He cautions, however, that even moderate winds have an adverse effect on the torch's flame and heating ability. Solder-It is introducing some optional wind-proof tips, but these were not available for the review. Dean also admits to more than one accidental drop test and recommends a tether line from the torch body to the tower.

The plastic torch stand, which looks a bit like a top hat with the top cut out, holds the torch upright on a flat surface. The kit includes two types of tip attachments: a "blow torch" and a soldering iron tip. Thirteen optional tips, including a hot knife and a variety of chisel and wind-proof tips, can be purchased separately. Solder-It also offers a lighter-duty optional torch that's a little easier to carry around. You can specify either torch with the kit, or buy them separately.

The Solder Paste Syringes

I find the specialty solder-paste syringes handy to use. Flux and solder are contained within the paste, so there are no messy flux brushes to clean or replace. You just apply the paste to the solder joint and heat. It's that simple.

As with any product of this type, the



The Solder-It kit comes with a heavy-duty torch (center) and a variety of solder-paste syringes. The light-duty torch (left) is optional. The torches run on butane normally used to refill lighters (right), which you can purchase from many drug or discount stores.

importance of eye protection and proper ventilation cannot be overemphasized. All of the solder pastes contained within this kit tend to smoke and splatter. Always be extra cautious whenever using a torch or any unfamiliar type of solder.

All of the solders in this kit are specified to have a low, or very low, melting point. The silver-bearing solder, in fact, is even touted to work with the heat of a match or lighter. Keep in mind, however, that these low-temperature claims are relative to solders in general, not to the familiar 60/40 rosin-core solder used in electronics. The

The Bottom Line

The Solder-It kit offers the ability to solder an unbelievably wide range of metals. For the antenna experimenter, it makes a compact package good for extended use in the field and on the rooftop.