

## ICOM IC-718 HF Transceiver

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QST Managing Editor

Anticipating a larger number of HF operators in the wake of license restructuring, many manufacturers are eager to introduce new lower-priced HF transceivers. ICOM's entry in the race is among the first out of the gate: the IC-718.

At approximately 4 × 9 × 9 inches, the IC-718 is a compact desktop rig with a functional "military" appearance. The front panel is dominated by a sizeable amber LCD display, large VFO tuning knob and forward-firing speaker. Concentric **AF** and **RF/SQ** gain pots are positioned immediately below the display along with concentric **RIT** and **IF SHIFT** controls. Buttons you are likely to use most often—**MODE**, **FILTER** and **TS** (tuning step)—are prominent and easily accessible above the VFO knob. Most of the remaining buttons, including the direct-entry frequency keypad, occupy the right side of the front panel. Although the trend during the past several years has been to use modular microphone jacks and 1/8-inch headphone jacks, the IC-718 reverts to the more traditional 8-pin conventional mike connector and 1/4-inch headphone jack.

The rear panel lineup is refreshingly spartan. There is an SO-239 antenna port, a "standard" 6-pin Molex dc power jack, an antenna tuner control jack (for use with ICOM's external autotuners), and a 13-pin accessory jack. Jacks are also provided for computer control (using ICOM's optional CT-17 CI-V level converter), external speaker and CW key or paddle. There are separate RCA-type **ALC** and **SEND** jacks for controlling linear amplifiers.

The IC-718 provides 100 W on SSB, RTTY and CW and 40 W on AM. The RF power output is continuously variable between approximately 5 and 100 W (from 2 to 40 W on AM).

### The No-Manual Test

Like any kid with a new toy, I tend to be more than a little impatient. When I pop open the box and catch the first whiffs of that new-radio fragrance, the last thing I want to do is read documentation. I want to use the radio *now*!

In the time-honored tradition of redefining one's own personality defects as an aptitude for creativity, I've devised the "no-manual" test. Not only is it an expedient way to determine the user friendliness of

a radio, the no-manual test satisfies my inability to defer gratification.

The concept is simple: use the manual to hook up the various cables, then toss it aside. The idea is to see how long it takes to get the radio on the air using your own intuition.

I'm an IC-706MKII user, so hooking up the IC-718 was particularly easy. I just unplugged the IC-706MKII cables and swapped them onto the '718. This included the control cable for my ICOM AH-4 remote-controlled antenna tuner. I use this device to feed a 90-foot length of wire strung between my tool shed and a tree in my backyard.

Pressing the front-panel **PWR** button, the IC-718 awoke with a metallic *ka-thunk*. Let's see... if the IC-718 is anything like my IC-706 the front panel **DN/UP** buttons should step me through the band selections. Bingo. I jumped to 10 meters, selected USB, set the **RF/SQ** control to fully clockwise and turned up the audio.

Nothing!

The S meter was twitching madly, but the speaker was utterly dead. Was the

### Bottom Line

The ICOM IC-718 offers a nice collection of the more desirable features that are typically absent from transceivers in its price class.



control set for maximum squelch? I spun the ring full counterclockwise, which I assumed would be the open-squelch position. Still nothing.

Now what? Was it time to admit defeat and read the manual? After a few more minutes of futile experimentation I decided to resort to the manual.

Sure enough, the answer to the mystery appeared on page 15. I discovered that the default configuration of the ring is to function as an RF gain control between the 7 o'clock and 12 o'clock positions, and a squelch from the 12 o'clock to 5 o'clock positions. I followed the instructions in the manual, set the control to 12 o'clock and was rewarded with a flood of audio.

Subsequent manual reading revealed that you can access the IC-718's menu system and redefine the dual-function ring configuration, choosing to have the ring act strictly as an RF gain or squelch control. I used a set-mode menu to set the ring to function solely as an RF gain adjustment and lived happily ever after.

The IC-718 makes use of two menus—a "quick set" and an "initial set" menu. There are 13 quick set menu selections that include the RF power output level, a three-step display dimmer (high, low or off), mike gain and VOX settings, and a handful of choices related to CW and RTTY operation.

The initial set menu includes selections for controlling a peak-hold function for the meter, a mode lockout feature, key beep, CW sidetone level, scan speed and resume condition, **RF/SQL** control behavior, key type and paddle sense, and some additional settings associated with the optional accessories.

The various menu selections are identified with alphanumeric character strings up to 8 characters long, so it's easy to find the specific setting you're looking to change.

Once the mystery of the ring was solved, the rest was easy. I punched the **TUNER** button and my AH-4 dutifully responded,

tuning my end-fed wire for a 1.3:1 match on 10 meters. I answered a CQ and received a fine signal report from a station in Spain. On-the-air reports indicated that the supplied hand mike produced clear transmit audio, even when I activated the '718's fixed-level speech compressor.

**Table 1**

**ICOM IC-718, serial number 001069**

**Manufacturer's Claimed Specifications**

Frequency coverage: Receive, 0.03-30 MHz; transmit, 1.8-2, 3.5-4, 7-7.3, 10.1-10.15, 14-14.35, 18.068-18.168, 21-21.45, 24.89-24.99, 28-29.7 MHz.

Power requirement: Receive, 2.0 A; transmit, 20 A (maximum).

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

**Receiver**

SSB/CW sensitivity, bandwidth not specified, 10 dB S/N: 1.8-30 MHz, <0.16  $\mu$ V.

AM sensitivity, 10 dB S/N: 0.5-1.8 MHz, <13  $\mu$ V; 1.8-30 MHz, <2  $\mu$ V.

Blocking dynamic range: Not specified.

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

Third-order intercept: Not specified.

Second-order intercept: Not specified.

S-meter sensitivity: Not specified.

Squelch sensitivity: SSB, CW, RTTY, <5.6  $\mu$ V.

Receiver audio output: 2 W into 8  $\Omega$  at 10% THD.

IF/audio response: Not specified.

Spurious and image rejection: 70 dB.

**Transmitter**

Power output: SSB, CW, FM, FSK, 5-100 W; AM, 2-40 W.

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

SSB carrier suppression:  $\geq$ 40 dB.

Undesired sideband suppression:  $\geq$ 50 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 (hwd): 3.8 $\times$ 9.4 $\times$ 9.3 inches; weight, 8.4 pounds.

Note: Unless otherwise noted, all dynamic range measurements are taken at the ARRL Lab standard spacing of 20 kHz.

\*Measurement was noise-limited at the value shown.

Third-order intercept points were determined using S5 reference.

<sup>1</sup>Sensitivity degrades below 100 kHz. Noise floor at 30 kHz is -53 dBm.

<sup>2</sup>S-meter has a rather narrow range between S1 (7.8  $\mu$ V) and S7 (17  $\mu$ V) with a much larger change from S7 to S9 (preamp off figures given).

An expanded test result report for this transceiver is available on the ARRL Members Only Web site. Printed copies are also available for those without Web access.

**Measured in the ARRL Lab**

Receive, as specified<sup>1</sup>; transmit, 1.8-2, 3.4-4, 7.0-7.5, 9.9-10.5, 13.9-14.5, 17.9-18.5, 20.9-21.5, 24.4-25.1, 28-30 MHz.

Receive, 1.7 A; transmit, 18 A. Tested at 13.8 V.

As specified.

**Receiver Dynamic Testing**

Noise Floor (mds), 500 Hz filter:

|         | <i>Preamp off</i> | <i>Preamp on</i> |
|---------|-------------------|------------------|
| 1.0 MHz | -120 dBm          | -129 dBm         |
| 3.5 MHz | -129 dBm          | -137 dBm         |
| 14 MHz  | -130 dBm          | -139 dBm         |

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

|         | <i>Preamp off</i> | <i>Preamp on</i> |
|---------|-------------------|------------------|
| 1.0 MHz | 5.4 $\mu$ V       | 1.8 $\mu$ V      |
| 3.8 MHz | 1.8 $\mu$ V       | 0.7 $\mu$ V      |

Blocking dynamic range, 500 Hz filter:

|         | <i>Preamp off</i> | <i>Preamp on</i> |
|---------|-------------------|------------------|
| 3.5 MHz | 123 dB*           | 121 dB*          |
| 14 MHz  | 120 dB*           | 119 dB*          |

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

|         | <i>Preamp off</i> | <i>Preamp on</i> |
|---------|-------------------|------------------|
| 3.5 MHz | 88 dB             | 87 dB            |
| 14 MHz  | 87 dB             | 85 dB            |

|         | <i>Preamp off</i> | <i>Preamp on</i> |
|---------|-------------------|------------------|
| 3.5 MHz | +10.4 dBm         | -2.3 dBm         |
| 14 MHz  | +6.8 dBm          | -9.3 dBm         |

Preamp off, +54 dBm; preamp on, +55 dBm.

S9 signal at 14.2 MHz: preamp off, 149  $\mu$ V<sup>2</sup>; preamp on, 38  $\mu$ V.

At threshold, preamp on: SSB, 6.4  $\mu$ V.

2.3 W at 10% THD into 8  $\Omega$ .

Range at -6 dB points, (bandwidth):

CW-N (500 Hz filter): 324-849 Hz (525 Hz);

CW-W: 182-1980 Hz (1798 Hz);

USB-W: 136-2315 Hz (2179 Hz);

LSB-W: 178-1988 Hz (1810 Hz);

AM: 27-2069 Hz (2042 Hz).

First IF rejection, 14 MHz, 92 dB; image rejection, 14 MHz, 93 dB.

**Transmitter Dynamic Testing**

CW, SSB, FM, typically , <1-113 W; AM, typically <1-38 W.

54 dB. Meets FCC requirements for spectral purity.

As specified. 60 dB.

As specified. 64 dB.

See Figure 1.

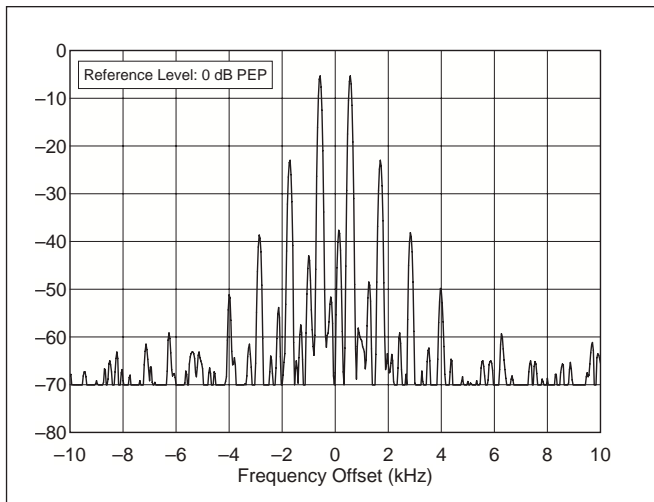
6 to 48 WPM.

See Figure 3.

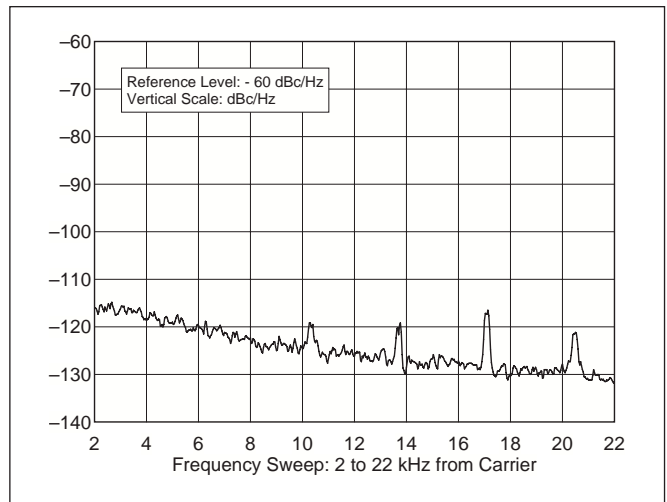
S9 signal, 290 ms.

SSB, 12 ms. Unit is not suitable for use on AMTOR.

See Figure 2.



**Figure 1—Worst-case spectral display of the IC-718 transmitter during two-tone intermodulation distortion (IMD) testing. The worst-case third-order product is approximately 25 dB below PEP output, and the worst-case fifth-order is approximately 39 dB down. The transmitter was being operated at 100 W output at 7.200 MHz (see text).**



**Figure 2—Worst-case spectral display of the IC-718 transmitter output during composite-noise testing at 14 MHz. Power output is 100 W. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 2 to 22 kHz from the carrier.**

I found that the IC-718 was very easy to operate with a minimum of “manual” intervention.

Those of you who actually do spend time reading manuals will be very pleased with the provided documentation. It is complete, well organized and easy to follow. Separate foldout sheets with detailed schematic and block diagrams are included.

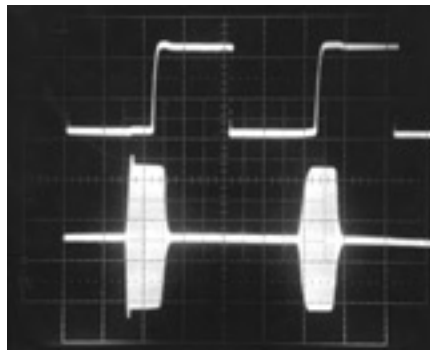
### Familiar Features and Characteristics

As an IC-706 user, I found much that was familiar in the IC-718. Other than the fact that the '718 lacks FM capability, or 6 and 2 meters, it performed much like my '706—and shared many of the same features. I found myself wondering if the IC-718 was a direct design descendant of the '706.

Receive performance was very similar, right down to a similar tendency to become overwhelmed when too many signals populate the band. Before you interpret this as a criticism of the '718, bear in mind that this radio, like the IC-706, was never intended to have high-end “competitive” receive characteristics. The selectivity and dynamic range are more than adequate though—just what you would reasonably expect from a radio selling at well under \$1000.

The ARRL Lab measurement data presented in Table 1 confirms that the IC-718's receiver performance numbers are very close to those that we reported for the IC-706MKIIG that we reviewed in the July 1999 Product Review column. These numbers compare favorably with—and in some cases slightly surpass—those of the other currently available transceivers in the '718's price class.

Another—less desirable—'706-like behavior that is evident in the IC-718 is the



**Figure 3—CW keying waveform for the IC-718 showing the first two dits in full-break-in (QSK) mode. The equivalent keying speed is 60 WPM. 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 14.2 MHz. Note that both dits are somewhat shortened. Only the first dit is shortened in semi-break-in mode. Also note the higher-power “spike” on the leading edge of the CW waveform (see text).**

existence of a leading-edge high-power “spike” in CW or continuous carrier modes (see Figure 3). A brief power surge might trip protective circuitry or possibly cause damage to some amplifiers. Even with the transceiver's RF power output level throttled back to 25 W, a spike on the order of 50 W was observed.

Our IC-718 had the UT-106 DSP option installed—this is the same accessory unit that's applicable to a number of different ICOM transceiver and receiver models. The DSP board adds an automatic notch filter

and a noise reduction feature.

The adjustable noise reduction worked extremely well, doing an outstanding job of cleaning up noise. The automatic notch filter was a pleasure. When you're operating SSB and the inevitable “tune-up” interference appears, you jab the front-panel **ANF** button once and—*poof*—it's gone.

It may have been my imagination, but the IC-718's IF shift seemed to be particularly sharp. With both CW and SSB signals, I was able to manipulate the IF shift to eliminate or reduce interference successfully in many instances.

### Getting Around the Bands

As I've already mentioned, selecting a band is as easy as punching the front panel **UP** or **DN** buttons. You can use this method to hop from 160 through 10 meters in no time.

If spinning the VFO is more to your liking, the IC-718 makes it easy with the **TS** function, which allows you to vary the tuning increments to cover a lot of spectrum very quickly. In addition, as you spin the **VFO** knob faster, the tuning speed increases automatically.

If you know exactly at which frequency you wish to operate, just press the **F-INP/ENT** button on the IC-718 keypad, punch in the frequency digits, then press the button again. That's all there is to it.

Of course, the IC-718 has frequency/mode memories—101 of them, in fact. You can store all of your favorite frequencies into memory, then use the **CH** button in combination with the **UP/DN** buttons to step through the channels. Alternatively, you can simply enter a desired memory channel number into the keypad. Spinning the **VFO** knob allows you to tune above or below the selected memory channel frequency.



The IC-718 supports two VFOs for split-frequency operation and the splits can be stored in memory as well.

Two scanning modes are offered in the IC-718. The memory scan steps through the designated memory channels. There are no provisions however, for locking specific memory channels out of a memory scan operation.

The programmed scan seeks signals between two specific frequencies. With the wide variation between signal strengths and the random noises encountered on the HF bands, programmed scanning can be problematic and, frankly, doesn't work all that well in most HF transceivers.

## Digital Operation

Operating RTTY or PSK31 with the IC-718 was a breeze. The audio inputs and outputs, along with the transmit keying lines, are available at the 13-pin accessory jack. The pin designations matched my IC-706 closely enough that I was able to merely plug in my existing cable and go.

Although wiring up a 13-pin connector can be a considerable test of your soldering skills, at least you'll find clear descriptions of the connector pin outs for all of the jacks in the documentation. (Incidentally—a plug for this accessory jack is not packed with the transceiver.)

The fixed-level audio from the '718's accessory output was robust (somewhat stronger than what is available with my '706) and very clean. Working RTTY, the IC-718 kept its cool at full output during long ragchews. The cooling fan vents through the bottom of the enclosure. The noise level produced by the fan was not excessive.

Frequency stability was excellent as well—and there's even an optional high-stability crystal unit available. If you prefer FSK to AFSK RTTY, the IC-718 *does* provide an FSK keying pin at the accessory jack—FSK operation is not offered on the majority of the other low-end transceivers.

The IC-718 performed equally well on PSK31. Using my sound card interface I had no RFI or ground loop problems. According to the reports I received on the air, my signal was clean and stable.

I have some concerns about the performance of the IC-718 on the "burst modes" (PACTOR, G-TOR, AMTOR, Clover). While I was using the transceiver on SSB, I noticed that it seemed to take a while for the receiver to fully recover after releasing the PTT switch on the microphone. While this has little effect on SSB, RTTY or PSK31 operation, fast transmit/receive recovery is critical for the burst modes. The transceiver must be able to transmit a signal burst and switch back to full receive sensitivity within a very short amount of time (measured in milliseconds). If it cannot, it may not receive the beginning

of the return burst from the other station and the link will eventually fail.

Lab measurements, taken using the keying connections available at the 13-pin accessory jack, confirmed my suspicions. The transmit/receive turnaround time measured on our review unit was about 290 ms. For proper 'TOR operation, the transmit/receive turnaround time should be less than 35 ms. ICOM reports that they have developed a modification that reduces the turnaround time to 25 ms, which meets the 'TOR requirements. Contact them for details.

## CW Operation

The IC-718 will win the hearts of some CW operators with its built-in electronic keyer. The speed is adjustable from about 6 to 60 WPM and you can fudge the weighting as well. The CW pitch is adjustable from 300 to 900 Hz and the sidetone level is continuously variable. ICOM has even included a CW-reverse mode—often a very useful tool for reducing interference from nearby band activity.

You can plug your paddle or straight key into the rear-panel jack, or wire it into an 8-pin microphone plug if you prefer (the manual describes how to do this). You can even use a menu setting to assign paddle functions to the **UP/DN** keys on the hand mike—though effectively using these keys for generating readable code is probably going to take some practice!

Full break-in CW is available and it seemed to work reasonably well—although there is a bit of a racket from the transmit/receive relay. Again, it helps to remember that the IC-718 is designed primarily for casual CW operating.

## Several Points Worth Noting

The IC-718 allows you to install one optional IF filter. We installed the 500-Hz filter in our unit and found that it performed well in crowded CW and RTTY conditions. If you're going to be using the transceiver primarily for CW and RTTY, the 500-Hz filter is a worthwhile investment. Alternative optional filters include a 250 Hz CW/RTTY filter and 3.3 kHz, 2.8 kHz and 1.8 kHz SSB filters. An optional AM filter (a desirable item for shortwave and utility listening) is not available.

Although the IC-718 shares many of the same filter choices as their '706 series transceivers, an optional filter installed in the '718 must be soldered into place—push-in sockets are used in the '706s. While the solder-in installation procedure is not particularly difficult, some '706 owners have expressed that they enjoy the flexibility offered by the plug-in arrangement. With the '706 it's a pretty simple operation to pop off the cover and swap in the desired filter for a specific application—SSB, CW, RTTY, etc.

Yes, the IC-718 offers a noise blanker, but

this one is *continuously adjustable*—something you don't often see even in the high-end radios. To vary the level you press and hold the **NB** button for one second, then turn the **VFO** knob to select the desired level of noise reduction. In my brief experiments the noise blanker did a good job of suppressing pulse noise—ignition noise in particular.

As is the case with the comparable economy-class HF transceivers by the other manufacturers, the '718 does not include a built-in automatic antenna tuner—two optional external tuners are available.

Unlike some of the others however, this transceiver *does* include built-in SWR metering capability—a very welcome feature in any HF transceiver—and especially in one with dimensions that make it ideal for portable operation.

Phone operators will be pleased to hear that ICOM has included VOX in the '718. This is another example of a feature that is typically absent in HF radios in this price class.

Finally, a voice-synthesizer option is available. We didn't test this feature, but it is worth mentioning for the interest of visually impaired operators. The UT-102 synthesizer announces the operating frequency, mode and the S meter reading.

## A Couple of Nits to Pick

The first nit focuses on FM—the lack of it, that is. Ten-meter FM is a more active mode than many believe. Listen to 29.600 MHz or any of the 10-meter repeater output frequencies when the band is open and you'll always hear signals. The IC-718 covers this frequency range, but without FM capability you can't take part in the fun. (The best you can do is switch to the AM mode and slope-detect the signals.) This feature would also be attractive to those that might want to connect the '718 to a transverter. While including FM in the IC-718 would have undoubtedly added to the final cost, it would have been nice if ICOM had at least made it available as an optional.

The second nit concerns the automatic gain control (AGC). You cannot vary the AGC setting in the IC-718. The AGC is fixed; there is no way to select fast or slow AGC. This is unfortunate because the ability to choose a fast or slow AGC response can make a substantial difference in received signal quality. You wouldn't expect a continuously variable AGC control in a rig of this type, but the lack of even a fast/slow AGC menu selection is puzzling.

## Conclusion

For casual HF operating you don't need to spend thousands of dollars on a transceiver. Those multi-kilobuck rigs are outstanding for hard-core DXing and contesting, but the casual operator will never use or need most of their advanced features and specs. Instead,

all you really need is a radio that is easy to operate and gets the job done at a reasonable price. The IC-718 meets all of those criteria and includes several useful features that are not found in some of the alternative economy-class transceivers.

*Manufacturer:* ICOM America, 2380 116th Ave NE, Bellevue, WA 98004; 425-454-8155; fax 425-454-1509; **75540.525@compuserve.com**; **http://www.icomamerica.com**. Manufacturer's suggested retail price: \$899. Typical current

street price, \$750. Suggested list pricing on accessories: UT-106 DSP Receive Unit, \$166; UT-102 Voice Synthesizer Unit, \$74; CR-338 High Stability Crystal Unit, \$81; FL-52A 500-Hz CW/RTTY filter, \$245 (alternative filters range in price from \$190 to \$245).