

# Review and commentary on the ICOM IC-756 transceiver



(Revised & updated version, April 14, 1999)

Serial # 03795 , FL-222, FL-223 installed

Reviewed by Matt Erickson KK5DR

## INTRODUCTION;

First of all, let me say that this review will NOT be like the ones seen in most ham magazines, mainly because I have no advertisers to protect. So, no punches will be "pulled".

I'm writing it from an average user's point of view, not as an engineer, or a RF lab tech, with use of a lot of high-tech test equipment. I am the typical, average ham that likes high quality gear. I like a bit of practical application testing, and a little humor too.

My background, as a reliable reviewer; I have personally owned about 55 HF rigs, of all makes & models, many are good, some not so good. In the Icom brand I have had the IC-720A, 730, 735, 751A, & 765. I also took 4 years of electronics school. I feel this qualifies me to make the statements I will make in this review. Please keep in mind that my statements are my own, based on my own thoughts & opinions, here for your consideration and judgment. I will not bother with the lab test results, which have already been published in QST.

## **AT FIRST GLANCE**

The IC-756 is a handsome looking rig, with a nice finish. The "stamped-in" ICOM logo on the top cover is a nice change, but must have been a bit of an expense to tool up for. The paint finish is a rough "fingerprint proof", flat black. It appears to be a "powder coat", baked-on type, very tough !

Very few protrusions are found on the rear of the rig. The entire chassis or frame of the unit is a large heat sink of bare die-cast aluminum.

The bottom side is also the same finish as the top side. It has a "drop lip", in the front, and flip down legs to tilt the rig up at an angle. This unit did NOT have any rubber on the feet, so, the rig will slip easily on a smooth table top. A nice set of "grippy" rubber feet would really help keep this rig in place when I plug in or unplug the headphones, or the paddle keyer.

### **The "Business end", front panel**

If you have seen pictures of an IC-781, or seen one in person, you'll see where the inspiration for the front panel of the 756 was born. It is very similar, a smaller version of the BIG 781 - with a bit of influence from its big brother, the IC-775. Imagine if a 781 & a 775 mated; the 756 is the likely offspring.

I won't go into great detail about the front controls, like the "BIG Magazine reviewers". Most are self-explanatory, and common to all ham rigs now days. The VFO knob has a good "feel" to it; personally, I like a little more weighted "flywheel" effect on a VFO knob. But, generally the tuning knob of the 756 is good, and has an easy-to-adjust front-panel "drag" setting.

The meter, is very good, and has good accuracy. The back lighting of the meter and LED indicators, are adjustable via a menu setting. The tuning rate is also controlled by what is now widely known and used as

"fuzzy logic", meaning that the tuning of the VFO knob, increases or decreases the tuning rate with the speed of the spin, applied to it. It's a standard feature on almost all late-model rigs.

KEYER plug on the front of a rig ! OH, WOW! But it's not a new concept; that's the way rigs were back from the beginning of amateur radio up till about the 50-60's. It's about time the modern manufacturers got back to it.

### **The DISPLAY;**

High contrast, hi res. LCD, back lit, and "LOADED" with info. A feature I liked right away, is the fact that you can see in one look, all the frequency info you need, VFO, memories, sub receive. All in a single glance!

The Spectrum Scope, is highly useful, and has a wide enough span, to see if a band is active at a quick look. The lowest span, could have been lower, to allow for a more critical analysis of signals. The vertical gain & sweep should have been calibrated with S-meter readings, but it is not, this would have been even more useful. A variable refresh rate on the sweep would have been a nice feature too.

## **Keypad**

The keypad is a little "tight", for those of us with big American fingers. It is a pretty standard layout, and functions.

## **A look inside the box**

The chassis is 1/8-inch thick cast aluminum, with cast partitions between the various compartments. Nearly the entire chassis is an integrated heatsink. Besides the metal shielding provided by the outer case covers, there are shield plates on the inside top and bottom of the chassis as well. A nice touch!

The circuit boards are nearly 100% SMT, or Surface Mount Technology. They are of top-quality construction, and the soldering is of the highest quality also.

The construction is of a type that I have seen only in NASA space launch equipment. It is highly reliable, and very efficient, generating minimal amounts of heat. ICOM has raised the bar, on the level of design, and construction of HAM equipment. If I were to place a single word here to describe it, I would say "EXQUISITE!" I am very impressed.

## **OPERATION;**

Noise Blanker (NB): First of all, I got to say that I found this function to be mostly "useless", not able to blank noise of any type. It had little or no effect on noise for which this function was designed to remove or decrease. Comparing it to the NB, on my YAESU FT-990, the 990 can blanker nearly any noise, even at extreme levels. Of course, the FT-990 has a variable-level NB setting - something that is missing from the 756. If I had designed the 756, I would have made a menu setting for both level and width for the NB. The most noticeable effect of the NB is distortion it creates by being turned on. A disappointing aspect of the NB function.

(Comment by Adam, VA7OJ/AB4OJ: I have found the NB, in combination with the NR, quite useful in removing power-line and ignition noise on 40 and 80m in the evening. The noise blanker will gate on voice peaks of very strong SSB signals, causing some distortion.)

## **Speech Compressor**

This function works well, but can easily be over done. I was puzzled as to why the control is taking up valuable front panel space. Compressors usually fall into the "set &

forget" category of settings, in my view. It should have been another "menu" setting, and limited to a max of 15 dB compression. This would prevent most of those distorted "DX" guys, from getting too wide. Any thing over 15 dB compression, is DISTORTION!

### **RF/SQL (RF gain & Squelch)**

The default setting of both controls sharing opposite halves of the same knob, got a bit confusing to me, so, I shut the SQL off. Would be a good candidate to place on the speech comp, control I moved to a menu in my "redesigned" 756.

### **TWIN PBT: Twin Pass Band Tuning**

This control is a pair of concentric inside/outside knobs, and operates both the 9 MHz & 455 kHz IF Pass Band tuning, with a digital on-screen indicator of the settings. It WORKS EXTREMELY WELL! I really like it! With the 2.4 kHz & 2.8 kHz filters, it works great! I installed the FL-222 1.8 kHz (455 kHz IF) filter, and the FL-223 1.9 kHz (9 MHz IF) filter. This allows numerous combinations of filters that can be used. Then I listened to 80 meters, during a tremendous storm of static and storm crashes. For several hours I "dug" signals out of the "muck", using the narrow filters, the wide filters were nearly unusable under these conditions. The narrow filters don't give a very good audio response, but they mean the difference between copy and no-copy in very rough conditions. A truly useful & powerful interference fighting tool.

### **Auto-Notch**

Works like the auto notch on the AF, outboard type units, but it's faster, & distorts the signal much less. I did notice that the Auto-Notch desenses a bit on strong signals, mainly because the function is post-AGC. In this way, it allows the receiver to be desensed by the notched signal. If it had been done like the 775's Auto-Notch, it would have been far more effective, with little or no desensing. The Auto-Notch does a nice job anyway, and performed as well as my TIMEWAVE DSP-599zx outboard AF unit, in the auto-notch function.

### **Mic Gain**

About 10 dB short of having adequate gain level. With the hand mic in use, I found I had to use nearly all the mic gain range to get enough drive for full output. When I used the SM-20 desk mic, which is amplified, I was able to lower the mic gain setting on the rig, to about half way up, for my style of operation. The Mic plug has a pin providing 8 VDC @ 10ma MAX. ! This is to power the preamp in the mic, but many non-ICOM amplified microphones will exceed the current limit. That will damage the regulator in this circuit. Suggestion to ICOM; raise the limit on this circuit to about 100ma. A resistor buffer will protect from a short circuit too.

The hand mic gives good clear audio, and received good audio reports on the air.

The SM-20 desk mic has a low cut control, which cuts about 4 dB off the low-frequency end of the audio. I spent a few hours with a friend, on the air, setting up this mic, to sound like my natural voice, using the menu Bass & Treble settings, finally settling on +2 dB Bass, & +6 dB Treble, with the low cut, off, on the mic. No two voices are exactly alike, so everyone would have slightly different settings.

### **NR Noise Reduction**

Works much like the AF outboard units, in the removal or reduction of random noise, with a bit of a difference. There is a level adjustment, which allows you to set the level of aggressiveness of the NR.

This allows less audio "echo", reverb distortion on the signal. I found that the NR, did very well, and out performed my TIMEWAVE DSP-599zx in the random noise removal area. A very good system.

### **CW PITCH**

Adjusts the frequency of the receive CW signal & the sidetone, independent of the actual TX offset freq. which on the 756, is 700 Hz - the same as almost all other modern rigs. It works well, and is a smooth control.

### **APF Audio Peak Filter**

Work exactly like manual notch filter, only in reverse. This control aligns precisely in the same position as the CW Pitch control.

### **CW Sidetone**

I ran into a bizarre glitch in this area. A short time after I got the rig on the air. I found that the CW sidetone would not change in frequency, as it should when the CW pitch control is moved. Then a few days later I checked into the ICOM Net on 20 meters, to query the net about this problem I had on my 756. Other stations reported that their rigs operated properly. I checked my rig again, and the trouble had "cleared" itself, and the rig was operating as the others on the net were. We could only surmise that, do to the RAM / ROM operating areas, and the way these areas are cleared and reloaded with a "fresh" program each time the rig is powered up. The problem had existed on the RAM area, while the rig was operating. And a "new" program was loaded from ROM, the next time the rig was turned on. The "glitch" was cleared and the rig operated as it normally should. A "SELF REPAIRING" rig, EXCELLENT!

### **CW TX Break-in**

These are "on-screen" controls. I like them, separate from the normal VOX controls. This is a nice way to do CW controls.

## **CW TX on the air**

The 756, has a nice clean CW note, very pure. During full break-in operation, I could detect only the very slightest "chopping", of the CW notes during sending. There is also a bit of AGC "pumping", meaning that between CW notes, the receiver fails to recover fully. Falling short of full receive gain level, by a few dB, to nearly 6db. Comparing it to my FT-990, at full break-in, the 990 does it much better, coming close to the "legendary" TEN-TEC full break-in performance.

Weighting is good for me at the "default" setting of 1:3.

## **CW Memory Keyer**

This is a great feature, very usable for Field Day, or Contests, if you re into that type of thing. The memory keyer banks are programmable through a menu, by panel keys, no CW key needed. It would have been really cool if a 10-minute ID function of the memory keyer had been added.

## **MONI Monitor**

What you hear on it is what goes out on the air. Very accurate sound. I listened on an outboard receiver, and it sounds exactly the same as the onboard Monitor. All rigs should have a feature like this.

## **Clock on screen**

A nice feature, I set it to UTC, with WWV. I checked it 2 weeks later, and the clock was only off by 1 second. The clock feature would be really cool if it had a 10- minute ID function. Triggered by a front panel button, to enable it, then disabled by toggling the same button off.

## **Cal marker**

Good for "zero beating" the rig makes it real easy. I set the rig on WWV a few hours after first powering up. The Cal marker showed me that the rig had an over all freq. error of about 15-20 Hz at 30 MHz. I was able to "tighten" this up to about 5-10 Hz. The rig has a great deal of freq. stability, at normal room temperature. The TCXO option is only needed if the rig is to be used in "EXTREME" environmental conditions, such as Arctic expeditions, or desert use. Under normal conditions, the addition of the TCXO unit to the rig, would be an unnecessary extravagance.

## **1/4-turn tuning**

Here is a feature that the digital operator is going to love. When you are in RTTY mode, the 1/4 turn option is on the screen. When activated it slows to tuning rate to only a few hundred HZ per turn of the VFO knob. In addition one can turn on the 1HZ digit by

pressing and holding the TS button, with the 1/4 turn on also, tuning is EXTREMELY slow, and precise. A useful feature.

### **AM mode**

I like using solid-state rigs on 10meter AM; it s a challenge to make them sound good. The IC-756 was pretty easy to adjust for a good sound . The 756 is a bit enigmatic when it comes to the proper carrier level for AM.

With a little work, I found that for some strange reason, the 756 does not forward modulate, unless the carrier output is 20 to 25 watts. Too little, or too much, and it reverse modulates.

AM adjustment procedure using the Spectrum Scope

Select AM mode.

Adjust RF PWR for 20 to 25W carrier output (0% modulation)

Speak into Mic; adjust Mic Gain so that sideband amplitude is 6 dB below carrier on voice peaks.

Using this method, I got very good audio reports on AM. Pretty good for solid state gear designed for SSB. (Contributed by Adam, VA7OJ/AB4OJ)

On-the-air audio reports were good to excellent. The audio is a bit punchy to some. I believe this is due to the nature of the TX audio on AM. It s digitally derived, and thus mathematically perfect. Not quite as smooth as old tube-type AM equipment, but very clear. On RX, the 15 kHz & 9 kHz cascaded filters are super nice for listening to AM. In noisy conditions, narrow filters are needed. Broadcast listening on the 756 is a pleasure, just turn back the RF gain, put on about 12-18 dB attenuation, and kick back to some really nice sounding broadcast AM audio.

### **SSB mode**

There is nice "texture" to the RX audio, smooth sound. On SSB the 756 is totally digital in detection of signal, shaping & processing too. I find the 756 to be a pleasure to listen to, with little or no listener fatigue. But I did have to run at least 6 dB of attenuation, and slightly less than full RF gain. This receiver is "HOT", one of the hottest I ve ever encountered, so it s required to run the receiver at less than full sensitivity, to keep from over powering it with noise and strong signals. This is only true on the HF bands, on 6 meters the receiver is "HOT", by design, to pull in those weak signals found there. Six meters is probably the only band that the receiver can be run full out at max. sensitivity.

### **FM mode**

On ten meter FM, the 756 operates about the same as any other HF rig, with the exception of the scopes usefulness here is a plus. Use the scope to spot "elusive" repeater or simplex activity. The receiver's "super" sensitivity doesn't hurt either.

### **Other observations**

### **SWR protection**

The 756 has a very active SWR protection system. I found that at a SWR of about 1.5:1, the power output is reduced to 50-70 watts. By activating the internal tuner, the output returns to 100 watts, full power.

At a SWR of 2:1, the auto tuner automatically activates, if the setting on the menu is on.

### **Tuner**

By far, the fastest in the west, as in "lightening" fast. Works on receive and 6 meters too.

### **Cooling fan**

Very quiet. It runs every time you transmit, and for a few seconds after TX also. The chassis being a HUGE integrated heat sink, a large noise fan is not needed in the 756. This is one cool running rig!

### **Optional filter slots**

Two is not enough; four would be a good number. Two in each IF would really enhance the rig's capabilities.

### **ALC feedback**

When the IC-756 is connected to an Icom amplifier (IC-2KL, IC-4KL, PW-1) via the appropriate control cable, the ALC is automatically connected. Using a non-ICOM amp usually requires an ALC feedback line, to limit the drive to the amp. When I used the FT-990 with my ALPHA 76A, the ALC level would indicate on the meter, but that was all it would do. There was no reduction in drive, so I was forced to use the RF power output control on the rig to control the drive level. With the 756 hooked up to the same amp, the ALC works great, output is limited to the level I have preset on the amp. I can run the power level control on the rig, at full out, and the rig drive level is nicely controlled and limited by the feedback voltage sent back to the rig from the amp. ICOM's ALC system works like an ALC system should. (Reminder: ALC is mandatory when driving a solid-state amplifier; the ALC is the amp's first line of defense. Adam, VA7OJ/AB4OJ)

### **RX Phase noise**

Here are a few words on phase noise, on the 756 receive. There is a very small amount, but it can only be heard when in the presence of a strong signal, within 10 kHz of your freq. Mostly, phase noise can only be heard coming from a signal with strong phase noise components transmitted in it. This is usually the case of "older" PLL type rigs, which have a less pure synthesizer signal.

You really have to listen close to even detect the small amount of phase noise that rarely surfaces. When you're more than 10 kHz away from any "dirty" signal, no noise is heard at all.

All PLL rigs have some phase noise, even my FT-1000D had some. The 756 noise is livable and manageable. As Direct Digital Synthesis gets better and more pure signals, phase noise is going to become less and less of a problem. Unlike the early PLL rigs, that were "LOADED", with phase noise. As "dirty" older PLL rigs are gradually retired, and DDS rigs are improved, phase noise will go the way of "spark gap".

## **Hints and Kinks**

### **Amp keying**

The 756 has a somewhat "light-weight" amp-keying relay, rated at only 16VDC @ 0.2 A. It is subject to damage if operated at higher levels. The damage is contact "fusing", due to high currents and/or keying back-pulse transients. Back-pulse transients are a result of the collapse of the T/R relay magnetic coil field, sending an inverse current back down the keying line, jumping the contact gap, arcing and fusing is closed.

My ALPHA 76A keys with 24VDC @ 160ma, which is not that much compared to other amps. So, I designed and built a "damper" circuit, to use in-line with the 756. The damper consists of a 1ohm 5-watt resistor in series with the keying line, also a pair of silicon diodes in front and back of the resistor. The diodes are placed anode to the key line, cathode to ground. These diodes cancel out any back-pulse that might come down the line, shunting it to ground. Two diodes can handle up to a 4A pulse, and the likelihood of both diodes failing, is very remote. The resistor handles the current in-rush, when the line is keyed. It also ballasts the line to a limited current level, for a given voltage. In addition there are two disc capacitors from the line to ground, .01 & .001mF, for RF by-pass purposes. All these parts are placed in a metal box with the proper connectors mounted on it.

After a month of using the amp and rig with my "damper" in-line, there are no problems with the rig's keying relay. WARNING ! I would not depend on this circuit with amps that key with 110VDC, ie. SB-220 or SB-200 .

I would say that the safe limit for my "damper " is about 28VDC @ 1A.

I did look into an "improvement " inside the rig, to the amp keying relay. If a person needed to, he could replace the existing relay with a solid state relay from RADIO SHACK, that can handle 200VDC @ 4A.

There is plenty of room in the area of the existing relay. The RS relay activates with only a few volts and very low current. An added benefit is that the relay is silent and virtually instantaneous. I might be tempted to do this modification, once my 756 is out of warranty.

(Comment by Adam, VA7OJ/AB4OJ: [An external auxiliary relay](#), such as the Yaesu FRB-757, is "cheap insurance" when keying a tube-type amplifier with keying voltage > 16V and keying current > 200 mA. The IC-756 will safely key any of the Icom and Yaesu solid-state amplifiers. Prior to connecting any amplifier for the first time, measure the keying voltage & current.)

### **Audio Hiss**

It has been said that ICOM HF rigs have a noise audio amp chip, making it "hiss", noticeable. The 756 is no exception. It is not as bad as some of its older brothers, but it still has the same defect. I have a simple fix for it. The problem is that the audio amp hiss is a product of the drive level, the lower the volume, the less the hiss, but the level required to remove the hiss is too low for most people to hear signals at.

By placing an outboard audio DSP unit in-line, the volume on the rig can be reduced to get rid of the hiss. Then using the audio amp in the DSP unit, the volume can be brought back up to a level that can be heard, minus the hiss. I use a TIMEWAVE DSP-599zx, and it works great to this end. The DSP unit also has other benefits as well. One can "tailor" the audio more than with the rig s controls alone.

### **A Hidden Menu?**

An "urban legend" has been published on the Internet, to the effect that there is a hidden menu on the 756. The procedure that was posted is as follows: Cut D16, power up the rig with the A=B button pressed. This is likely false ! There is NO A=B button on the 756! Secondly, a hidden menu is a "software" function, so WHY cut a diode? This smacks of "disinformation". Don t do it, or try it! It may damage the rig, and if it doesn t, it surely will not do anything.

### **In conclusion**

The ICOM 756 is a very good rig, a significant improvement over "older", analog rigs. If you re serious about your SSB and want a rig that can really "dig" in the dirt and pull out the weak signals under nasty conditions, then it s for you.

However, if your a serious CW op., then you might not like it as much, as some of the other rigs that are designed with CW as the primary concern. If your a casual CW op., like myself, you ll say that the 756 is as good as it needs to be for your use in that mode.

SSB is the primary design concern that ICOM put into the rig, and it does it very well indeed.

### **Addendum April 1999**

#### **NB update**

After using the rig a while, I did finally find a noise type that the NB, could remove, it s a slow pulse type, like ignition/sparkplug noise. The frequency range of the NB, is very narrow, and is active only at higher amplitude levels.

After discussion with the other 756 users on the ICOM net, it was the conclusion of the group, that the 756 NB, should have had a level and width adjustment on the menu, but again we run afoul of the design budget limits. With these features added, it may have cost some other more useful item.

#### **Display weirdness**

The LCD display may have vertical lines that sweep across the screen from time to time, this is a normal occurrence, usually happening when the rig is cold, or the air in the shack is very cold. After the rig is warmed up for an hour, this should disappear.

The display may not light up when the power is turned on, but it will come on in a few seconds after the rig is powered-up. This problem does not happen often, and is normal, but if the screen does not light up with-in a minute of two, it is more serious trouble then.

#### **Color Display?**

An article in APRIL 1999 QST, stated that the display could be made to change colors with a computer control program change, is total fiction. The display can not be changed from the monochrome that it is made to display. APRIL FOOLS!

Read my [PRO review](#) for the latest on this NEW rig.

Best of 73 CUL

Matt, KK5DR

Contact me at: [kk5dr@ev1.net](mailto:kk5dr@ev1.net)

My thanks to [Adam Farson VA7OJ/AB4OJ](#), for his inserted comments, and technical review of this article.

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