



## the irca technical column

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The following review first appeared in the CIDX Messenger, and appeared in the July 1984 issue:

### ICOM IC - R71A The Best Just Got Better -- Or did it?

by Don Moman

After the initial charm of the IC-R70 had worn off, the need for an improved operating system - memories, keypad entry, no USB/LSB and MHz rollover quirks etc became very evident. Recently the IC-R71 has been introduced with just such an operating system. The considerable edge in performance Icom receivers have enjoyed over other receivers in the \$1000 price range is now even greater - thanks to the extra convenience and features found in the new R71. And the amazing thing is that the R71 is the same price as the model it just replaced! This has led to some good deals in the second hand market on the R70. In this article/review of the R71 I'll try to sort out some of the similarities and differences of these two.

#### The Basics

The R71 covers 100 khz to 30 mhz with 10hz synthesized tuning steps (readout to .1 khz) with keypad tuning plus a "regular" tuning knob VFO system. The 2 VFO / 32 memory microprocessor controlled tuning system is essentially equivalent to 34 completely independent VFOs. Each retains the mode (AM, USB, LSB, CW, RTTY or FM) and frequency. Options including FM mode, wireless remote control and a speech synthesized frequency readout are available; as well as various IF filters. A computer control capacity is also provided with the CT 10 / EX 309 option. However price and specs of the interface system hasn't been announced as of this writing (Sept 84).

#### Sensitivity

The standard un-modified version of the R71 is capable of detecting signals as low as 0.15 uv (30% mod, AM Wide mode) throughout most of the spectrum. The exception is on the MW band from 500 to 1600 khz where it has purposely been made to be less sensitive (about 1 uv at 1400 khz, slightly better as you go down in frequency). This is due mainly to a resistive attenuator in the MW Bandpass filter section, which may be bypassed by anyone handy with nippers and a soldering iron. Tread carefully here - things are pretty crowded! While you are inside the set, the preamp disable line may also be cut, allowing the preamp to function below 1600 khz. However the improvement is marginal as the preamp soon runs out of gain below 1000 khz (approx.). The majority of R71 owners will not need the extra gain as it would just compromise the high dynamic range needed by the average urban listener. But for anything more than casual MW DXing the sensitivity needs to be improved. On an expedition to a quiet rural location, with a good beverage antenna, the sensitivity of a stock R71 would fall well short of that required. Fortunately, the above mods can be performed quickly to cure this shortcoming. The R70 also suffered from exactly the same problem and benefited from the same cure.

From the R71 review in the March 1984 issue of DX'er's Calling published by DX Australia we have some specs for the front end. The RF amp consists of a pair of 2SK125 junction FETS with a 2 db NF and a +30 dbm output intercept. Noise floor is about 134 dbm in 2.3 khz SSB with the preamp on. Rated dynamic range of 105 db (vs 95 db for the R70) is achieved primarily due to the +27 dbm intercept of the first mixer (vs +12 dbm for the R70). The improvement in resistance to overloading is quite audible when tuning around the MW band at this QTH! Some months ago when I was comparing the Drake R7 / JRC NRD 515 at a particular rural location, overloading on several frequencies was noted. At a site within a few miles of the original and with a similar antenna the R71 showed no serious signs of overload. Care must be taken not to confuse actual overloading with the problems caused by the inferior 6 khz AM filter, as described later in this review.

#### Selectivity

Here's where we open up the proverbial can of worms! First, the specs from ICOM on the previous page are incorrect. Also some of the figures from the DX Australia review are also wrong. There are at least two bandwidths for AM, 6.0 (but not a crystal filter) and 2.8 khz (500 khz or 250 khz too if these CW filters are installed). Also there is no CW narrow filter included, either the FL-63 (250 khz) or the FL-32 (500 khz) must be purchased as options. Filter selection is via two push switches, which have a total of 4 combinations that yield up to 3 different bandwidths, depending on what options you have installed. Perhaps the following table will help to clear things up:

#### Selectivity Bandwidths

	R71 - Stock			R71 - modified FL-44 SSB/FL-63 CW filters		
	NORMAL	WIDE	NARROW	NORMAL	WIDE	NARROW (all freqs in khz)
-6 db BW =	2.8	6.1	2.8	2.4	6.1	0.25
AM Filters: FL70+F14	F15	FL70+F14	FL70+F14	FL70+FL44	F15	FL63+FL44
-60 db BW =	4.7	11.0	4.7	3.1	11.0	0.9
-6 db BW =	2.2	2.8	2.2	2.2	2.8	0.25
SSB Filters: FL30+F14	FL70+F15	FL30+F14	FL30+FL44	FL70+F15	FL63+FL44	
-60 db BW =	3.3	4.7	3.3	3.3	4.7	0.9
-6 db BW =	2.2	2.8	2.2	2.2	2.8	0.25
CW Filters: FL30+F14	FL70+F15	FL30+F14	FL30+FL44	FL70+F15	FL63+FL44	
-60 db BW =	3.3	4.7	3.3	3.3	4.7	0.9

"Normal" is with Wide and Narrow buttons either both in OR out.

Normal and Narrow are identical if the selectivity switch (S1) inside the set is left in the off position (to the right, as you face the set). S1 should be moved to the left upon installation of either CW filter. F15 is the nominal 6 khz AM PBT ceramic filter. F14 is the 2.8 khz SSB PBT ceramic filter. The F14 is replaced by the FL44 high quality crystal filter when this option is installed. The FL-70 (2.7 khz) and the FL-30 (2.3 khz) filters are 9 mhz crystal filters and are included as standard equipment. All figures are my from my own tests, with relatively simple test equipment. I feel they are pretty accurate but others may measure different values. Keep in mind that all the filters have tolerances, and widths may vary - especially with the ceramic types.

Of interest is the fact the R71 no longer has a quality 6 khz AM Wide filter. The R70 uses a quality 6 khz crystal filter (FL 33) followed by an inexpensive 6 khz ceramic filter, used in the PBT circuit. The R71 has just the 6 khz ceramic, the 2nd IF filters are all bypassed in the AM wide mode. Yet initially before I had investigated what filters were employed, I made several comparisons between a FL-44 modified (with AM wide and narrow switch) R70 and a stock R71. In the AM wide mode, for general SWL'ing there was only a small edge to the R70. In narrow, the FL-44 did show it's superiority but again, not by much. I liked the combination of the FL-70 wide SSB filter plus the 2.8 ceramic as used in the AM Normal position for the R71. The 2.8 width left more audio than did the narrower FL-44 and was nicer to listen to. Still, the extra skirt selectivity of the FL-44 could come in handy, especially since it improves the performance of the PBT circuit.

The 6 khz ceramic filter does show it's inferiority though, in the ultimate rejection category. Although I rarely note the problem on SW (signals aren't that overpowering strong up here) the problem often shows up on MW when you are listening 10 khz away from a strong signal, creating a problem that might be mistaken to be front end overload. Because of the poor ultimate rejection of the simple and inexpensive ceramic filter, audio from the strong signal will be heard clearly 10 khz away. Switching to "narrow" removes the offending audio completely, proving that the front end is not at fault. The R70 with the quality FL33 6 khz crystal filter is quite superior here.

A modification that seems possible, although I haven't done it, is to install a FL-33 6 khz crystal AM filter in place of one of the existing 9 mhz filters, likely the CW one which most people (hopefully those most interested in MW DX'ing anyway) wouldn't have purchased anyhow. This should bring the R71 up to par with the R70. Replacement of the 6 khz ceramic with a better model is made difficult due to the lack of space on the circuit board. A better replacement filter would have to be physically quite a bit larger and this could create problems.

#### Frequency Control

The R71 really outshines the R70 in this area with 32 fully tuneable memory channels that store the operating mode plus a keypad entry system enable the R71 to hop about nicely from one frequency to another. Not that a few things couldn't have been done better.... The second tuning rate increment is 50 khz which gives 10 khz per revolution. This is a little on the slow side for my liking. The third rate, 1 khz, gives 200 khz

per revolution but can only be engaged by pressing the "TS" button. It would have been nice to have all 3 speeds controlled by the rate at which one tunes the VFO knob but that may have been too unwieldy to implement.

The keypad entry system is pretty good, although for frequencies less than 1 mhz a leading zero must be entered. If you just enter "14" then press "Enter" it will put in the trailing zeros for you. But if you enter one more digit, i.e hundreds of khz position, then you must enter all the rest of the digits including the .1 khz entry, which is usually zero. The keys are very good and the switching between frequencies is very fast and noiseless. Again the literature from Icom is wrong in that it says you can key in the memory channel from the keypad. You must select the memory channel using the rotary switch labeled as such. But you can do what they say from the remote control unit, which by the way is really a convenient gadget! It duplicates many of the receiver functions including mode, power, volume, and all the tuning features - just the thing for checking the bands on a DXpedition before deciding to abandon that warm and comfortable sleeping bag! Unfortunately, one cannot initiate a memory scan from the remote which is a desirable feature.

Scanning can take place in either the memory channel mode ( in which you may also select only those memory channels that are of a certain mode ) or in the VFO mode. Scanning goes down in frequency, which takes a bit of getting used to. A nice touch is that the memory channel scan rate can easily be adjusted from fast to slow ( see the manual, page 7.3 for the locations of this adjustment - R14 ). Also on this page we see a Scan Stop / Timer switch. Incidentally, the operation ( indeed the existence! ) of these controls are only hinted at elsewhere in the manual. This switch will either stop the scan upon reaching a signal ( this is how it comes from the factory ) or in the timer position, it will resume after 10 seconds. This works all right but a signal activated squelch ( which controls the scan function ) is always of limited use on our noisy SW bands.

#### Miscellaneous Comments

Operation from 12 vdc at 1.2 amps ( the R70 draws only .75 amps ) is possible with the CK70 DC kit. An option that should be factory included in my opinion. The DC connector is already inside the set, they just didn't bother to mount it!

The noise blanker is perhaps the most flexible yet, with two widths and a threshold adjustment. But don't expect miracles from any noise blanker, even this one. Improper setting of the NB Level control can cause excessive distortion on strong signals, and can create spurious responses as well. This is not a fault, just a symptom of the improper adjustment. The 11 o'clock position is a good place to leave the NB Level set at. This gives good blanking action but doesn't create any undesirable NB action.

A remote switch ( squelch activated ) for a tape recorder is provided. This could be handy I guess, but only reliable on signals well above the background noise level.

The small speaker, removed from it's former position on the front of the R70 to make room for the keypad, is now facing upwards on the top of the set. I don't mind the position as such but the small amount of clearance dictates a very thin speaker. It tends to buzz and sound tinny when presented with even a hint of a low frequency note. Also some cases of mechanical feedback ( howling ) were noted, primarily with the optional FL-44 filter installed. The IC-SP3 ( or any other external speaker of reasonable quality ) should be considered.

Two AGC response times plus off are provided along with the usual RF Gain control. Icom designers, the static torn ears of low band DXers thank you for this small relief.

The notch control doesn't function in AM, but does a good job ( null depth at least 60 db ) in the other modes. The reason it doesn't work in AM is that they use a simple series crystal filter and 9 mhz and "pull" it to cover the passband. In AM the passband is too great for it to cover so they disabled it in that mode. You'll recall the R70 notch only functioned on the one sideband. It likely can be dis-disabled so we can get at least some use from it in AM.

The silly rule about USB above 10 mhz, lower below 10 mhz ( as implemented in the automatic switching design of the R70 ) has been done away with. But the system still needs to be retuned when going from USB to LSB. A bothersome quirk, especially if one listens to AM signals in the sideband mode ( a technique called ECSS tuning ). The Kenwood TS 430 performs this task superbly, but Icom still hasn't seen fit to design it in. An unfortunate and undesirable design shortcoming.

I enjoy using the R71 more than any other receiver I've used. The combination of features and performance can't be found in any other receiver, at least in the under \$3000 CAN class. With the modifications described in this article, plus those available from ICOM, the R71 can give excellent performance. The R70, similarly modified, will give very similar performance. If one is not interested in the convenience of memories, keypad tuning, etc then the R70 would be an excellent choice, especially since they can be found on the used market quite readily and at a considerable savings off the original price.