THE ICOM IC-740 HF TRANSCEIVER

EQUIPMENT REVIEW

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Perhaps the best way to start this review would be to turn to the April 1982 issue of Amateur Radio and read the review of the IC-730. The new IC-740 has a lot in common with the earlier model and certainly overcomes many of the criticisms that I made in that review.

With this in mind, I feel that the best way to start, is to compare the 740 to the 730. After all, many prospective purchasers will be doing just this. In other words, is it worth spending the extra dollars?

Getting hold of an IC-740 was not an easy task to start off with. It seems that they are unavailable in Melbourne, at least at the time this review was written (late October) but as luck would have it, Andrews Communications Systems of Maroubra Junction, Sydney had plenty in stock when our advertising man John Hill VK3DKK called on them recently. They kindly offered one for review which John brought back to Melbourne.

Well lets look at the 740 and see where it differs and where it compares with the 730.

In appearance the two are similar. It is quite easy to pick the family resemblance of the two transceivers. Band coverage now includes 160 metres plus of course all the amateur bands from there up to ten metres including the new WARC bands. As with the 730, the 740 is an amateur band only transceiver, it does not have general coverage receive capability. Its nice to see 160 metres included, but you just cannot win. In my review of the 730 which did not have 160 but had a very good AM facility, I said it would be good to have 160 to make use of the AM. Guess what — the 740 does not have AM.

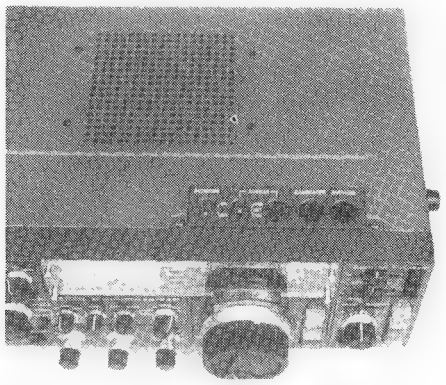
The 740 is larger and heavier than the 730. The dimensions are: 111mm high, 286mm wide and 374mm deep which represents an increase of 17mm, 45mm and 99mm over the 730. Even so, the 740 does not look over large and when it is considered that it is possible to fit an AC power supply inside the cabinet, then the 740 would be by far the most compact complete transceiver available at the present time.

Our review transceiver was not supplied with a power supply and all tests were carried out using the recommended ICOM IC-PS15 external supply. It seems that the internal supplies are not available at the moment and there is no information about them, even in the 740 instruction manual.

The height increase to 111mm now brings it up to the same height as the IC-720 and all the matching ICOM accessories such as the power supplies, antenna coupler and linear amplifier. This overcomes the problem of non-matching ancillary equipment, but, the cabinet of the 740 is finished in a different colour to all the existing ICOM gear. The front panels match OK but the 740 cabinet is now a mid grey, several shades lighter than older equipment. However lets put the cosmetic issues to one side and look at the electronics of the 740.

Some of the new features incorporated in the 740 include: Selectable IF shift or band pass tuning, a notch filter, normal or wide noise blanker, selection with separate level control now all on the front panel, continuously variable AGC decay time from off through fast to slow, a squelch control usable on all modes, an audio tone control and an RIT usable on both transmit and receive. Coupled to all of this is the proven ICOM tuning system as used in the IC-730, which includes variable rate tuning with 10Hz, 100Hz and 1kHz switchable options. Dual independent VFO's with a

memory for each band provide a very flexible tuning system. The present controls of the 730, that were hidden under the top hatch, are now either repositioned to the front panel or on a very neat control panel on the top front of the transceiver just above the digital display. Additional status indicators have been included for receive, split VFO operation and memory as well as a transmit indicator. These are all positioned vertically between the 'S' meter and the digital frequency display. As an option it is now possible to fit an electronic keyer with the speed control doubling with the VOX gain control. Another option is FM which could be useful in conjunction with a VHF converter or perhaps on the FM portion of 10 metres.



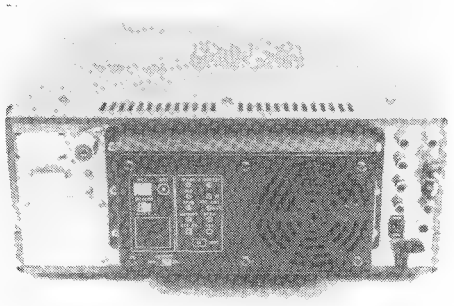
Top panel controls inc. calibrator on/off, calibrator level output, transceiver calibrator and anti-VOX.

Interconnection facilities have been greatly increased on the rear panel, with the most obvious improvement being a separate T/R control for linear operation and the memory backup terminal. These were combined with internal selection on the 730. Other additional rear panel connectors include, ALC output, transverter output, receiver input and output, RTTY keying input and even a spare connector. Perhaps the only things missing are an IF output for connection to a monitor scope, but no doubt this could be connected to the spare terminal and a phone patch in and out, which is available via the rather inconvenient 24 pin socket. Metering has been improved with a six position selector on the front panel giving readings for IC, ALC, Compression, relative RF output, SWR set and SWR read.

A preamp in/out switch allows the RF amplifier to be switched out to improve strong signal handling. As we shall later see, this works better than on the IC-730.

THE IC-740 ON THE AIR

Like most modern transceivers, the IC-740 requires no tuning up. Just connect an antenna



Rear view shows various connectors and facilities — note cooling fan.

with a matched 50 ohm feed line or present a 50 ohm load in any other way and you are under way. The tuning is very smooth, but lacks the spin of the earlier ICOM transceivers. For most requirements, the 100Hz tuning rate is excellent. The 1kHz rate really gets you to the other end of the band in a hurry.

In terms of tuning knob rotation, the 100Hz rate is equal to 1kHz per revolution, the 100Hz, 10kHz per rev and the 1kHz equals 100kHz per revolution.

Received audio quality was generally very good with plenty of audio output. The continuously variable AGC did not come up to expectations. Even when set to the full slow position, the decay time was too fast, particularly on strong signals. With a variable system why not make the slow setting too slow, then everyone should be happy. The IF shift / pass band tuning did not come up to expectations. When used, each produces a similar effect and of course to achieve the best results we need to have both operating together. With the IC-740 only one can be used at a time. They are certainly useful in removing interference but of course when the selectivity is reduced in one direction only, there is a limit to how far one can go and still retain intelligability. With both systems in use it is possible to narrow the band pass from both ends and so retain a balanced response. Perhaps ICOM might rethink this with future models.

The IC-740 also has a filter switch (just below the IF/PBT switch) which apparently allows the selection of an additional filter in the 455kHz IF. Unfortunately the English handbook makes no mention of just what is available to go here. The Japanese handbook seems to cover this in some detail but my Japanese is not up to translating it

In fact, the selectivity appeared to be very good and with a touch of either IF shift or band pass tuning it was amazing just what could be pulled through the QRM.

The dual VFO's allow one to leave one set up on your normal operating frequency and to tune around the band with the other. In addition to this the memory facility can be set up on another frequency for instant selection. A completely separate frequency can be selected for each band with the exception of 160 metres which shares the memory with 80 metres. On transmit, the 740 operates very smoothly. Output power can be set to any level from about 10 watts to maximum with the variable drive control. Quite handy if you enjoy a bit of QRP operation. Setting the microphone gain control seemed to be non-critical but reports on air were not all that complimentary. However, using the compressor improved things to a marked extent. The audio level came up and also the high frequency content of the signal came up. Reports also indicated that the slight edgeness that was apparent before had dissappeared.

Back to the receiver side: it seems that the noise blanker on our review transceiver was completely inoperative. Just as soon as I can get to another IC-740 to check out the blanker I will report on this important aspect. However, one plus for the blanker is that all controls are now located on the front panel. The blanker and AGC controls are rather small and closely spaced for my clumsy fingers but certainly a vast improvement on the miniature hidden controls on the 730.

Metering is very good with most required functions available. It is certainly a great idea to have a built in SWR meter. The forward set for this is actually the RF power control. Other meter functions include RF out (preset), compression, ALC and final amplifier current. The 'S' meter function is automatically selected on receive.

Now to the pre amplifier. The action of the preamp on the 740 is very different to the 730. Receiver sensitivity seemed to be excellent with the preamp switched out with the gain coming up noticably when the preamp is switched in. I would say that, in most instances, you will be happy to leave the preamp out. Strong signals certainly sound better without it, and I could not actually find a case where I could copy a signal with it in that could not be copied with it out.

THE IC-740 on TEST

The following equipment was used to produce our figures on the IC-740. Drake W4 watt meter. Yaesu YP-150 watt meter 50 ohm load. Kenwood SM 220 monitor scope. Daven audio power output meter. AWA F242A noise and distortion meter. AWA G230. Low distortion audio oscillator. 100kHz crystal calibrator.

FREQUENCY STABILITY

Stability was checked against VNG on 7.5MHz and it proved to be of a high order. Over a one hour period, drift did not exceed 100Hz. It was noted that tuning over a strong signal from my external crystal calibrator, that with each 100Hz tuning step, the beat note would vary about 50Hz over a two or three second period, and then would stabilize. In normal use this would not be noticed.

POWER OUTPUT

Power output was measured with full drive under CW conditions and checked for PEP output using the monitor scope. While doing this, it was noted that there was no output on the 18 and 24 MHz bands. It is assumed that operation on these bands has been inhibited in some way, but no mention is made of this in the instruction book.

1.8 MHz 95 watts	18.0 MHz NA
3.5 MHz 90 watts	21.0 MHz 75 watts
7.0 MHz 85 watts	24.5 MHz NA
10.1 MHz 85 watts	28.0 MHz 40 watts
14.0 MHz 80 watts	

The low output on 28MHz is a surprise. As the IC was also low on this frequency, it would appear that the drive to the final was down. PEP output on all bands appeared to be slightly higher than the above figures, perhaps by around 5%. The scope pattern was very clean at all times.

RECEIVER TESTS

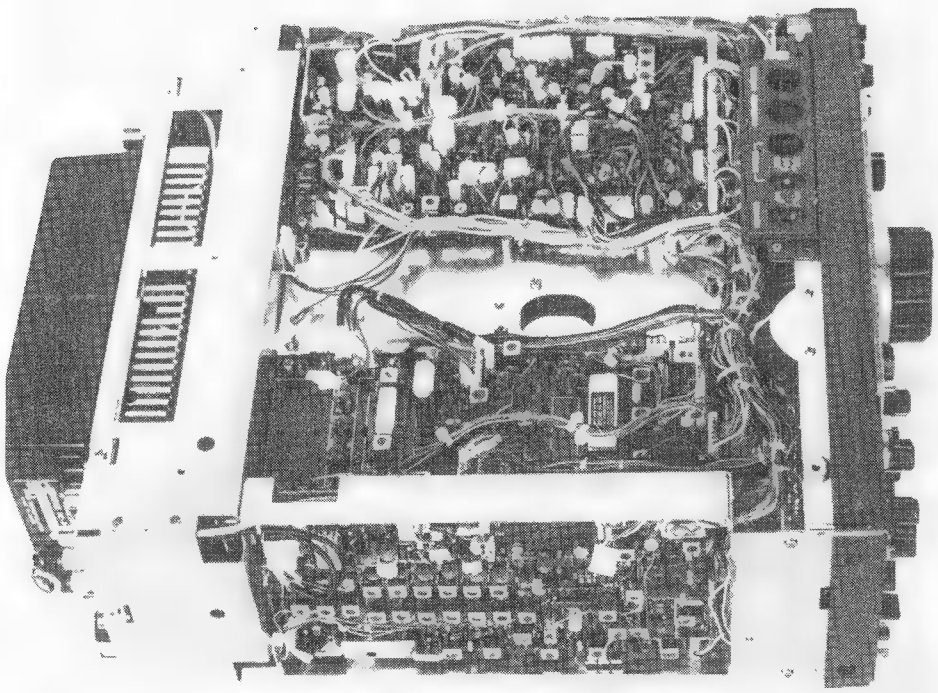
The receiver output was terminated with an 8 ohm load and connected to the noise and distortion meter and the power output meter. Residual noise with the audio gain at zero was –49 dBm unweighted and –42 dBm weighted. This is a maraginal result and accounts for the noticeable hiss when headphones are used

Maximum audio power output is 4 watts but at 32% distortion. If nothing else, this proves that the transceiver has loads of gain to drive the audio output well beyond its normal output capability.

At 2 watts output, distortion had dropped to 1.8% where it remained constant as the power output was dropped. This is quite acceptable. Received audio response was checked by tuning across a signal produced by an external crystal calibrator. The –6 dB points were at 350Hz and at 3kHz. The curve was very smooth between these points with no peaks or dips.

The action of the tone control was next tested. At 2.5kHz it was possible to reduce the output by 20dB. At the same setting it was down 15dB at 1.5kHz, 11dB at 1.0kHz and 8dB at 700Hz. This shows why the overall level of the received signal dropped when the tone control is used. A sharper top cut is required that does not effect the response around the 1kHz mark.

The notch filter was checked at several points across the response of the receiver. It was able to produce a consistent notch of – 24 dB at any frequency. In terms of 'S' points, it



IC 740 with cover removed.

could reduce an 'S'9 beat note down to about 'S'2. This is very satisfactory.

Receiver AGC action was checked by feeding the crystal calibrator in to produce signal strength readings of S2, S8 and S9 + 20dB, the relative audio output level at each point was then measured. Using 'S' 2 as the reference, the output increased by 2dB at S6, another 1 dB at S8 and 7dB at S9 + 20dB. Above this signal level, the increase flattened off. This is not considered a particularly good result.

The IF shift and band pass tuning were checked by measuring audio frequency response with the slider control set well to one side and then switching from one function to the other.

With the IF shift selected, the band pass remained the same but was shifted in relation to the signal. The pass band tuning on the other hand increased the selectivity but in one direction only. Both systems were able to produce a −10dB reading at 1.3kHz at the same setting of the slide control. Of course with the IF shift selected, the response continued out into the opposite sideband where the band pass tuning cut this off at the normal low frequency cut off point. However in use, there did not appear to be much difference in interference rejection, due no doubt, to the fact that the most annoying interference occurs on the high side of the wanted signal.

As a final test, the audio output was measured with an S2 signal. An output of 2 watts produced, which certainly confirms my earlier comments that the IC-740 has plenty of overall gain.

Sensitivity checks have to be subjective as I do not have access to a suitable signal generator. On ten metres, the 740 heard exactly the same signals and in the same way as my comparative receiver. In other words, it's a good receiver but ten metre sensivitity hasn't improved over the last few years.

INSTRUCTION BOOK

Our review transceiver was supplied with two instruction books, one in Japanese and a photo copy of an English edition. The Japanese edition appeared to be very complete while the English one very incomplete. I can only assume, that in time, all owners will receive the proper book. In the meantime, the photo copy will be adequate for normal operational procedures. If I am able to inspect the normal manual in the future, I will comment on it in these pages.

CONCLUSIONS

As we have seen the IC-740 shows many improvements over the 730 but it also shows that in most ways you get what you pay for. For a certain amount of money you cannot have everything. However, that said, it must also be said that the 740 does give a lot for the money spent. Many of the features are not available on other transceivers in the same price bracket. Such things as the dual VFO's, memory system, three speed tuning and the possibility of a built in AC power supply all in an extremely compact unit. The IC-740 would have to be highly recommended. All enquiries regarding the ICOM IC-740 should be directed to ANDREWS COMMUNICATIONS SYSTEMS. Shop 7, Garden Street, Maroubra Junction, SYDNEY, N.S.W.

SERVICE BULLETIN

FT-230R REPEATER MODIFICATION

The FT-230R, as purchased, is set to operate in Simplex Mode, Repeater Mode and Reverse or "Anti-Repeat" Mode. In Reverse Repeater Mode the memory system is not functional, and the FT-230R operates + 600 kHz as if it were a 600 Repeater.

This modification converts the FT-230R for "+/Simplex/−" Split (± 600 kHz). The memory system operates in all three modes.

Remove the 4 screws at the rear of the set and 2 screws on each side which hold on the covers. Remove both covers and unplug speaker leads. Remove the 4 cheese head screws near the front of the unit, 2 per side (not the countersunk screws). Remove the 2 screws holding in the control unit PC board; also the stand offs and screw holding in the switch unit. Carefully move these circuit boards to expose the back of the "RPT" switch. Remove knob, nut, and washer from the "RPT" switch, and remove from the case. Cut the green wire from the switch and resolder to the contact near the black wire of the switch (see Fig. 1). Replace the switch, knob, both PC boards and screws.

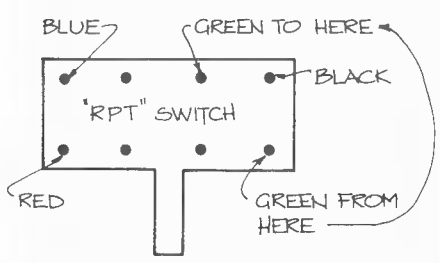


FIG. 1

Locate the CPU IC on the control unit (large square IC on second vertical PCB in front of unit) and the circuit board glued on top of the CPU. Remove green wire and resolder on to the pad next to the anode end of the diode which connects to the same board (see Fig. 2).

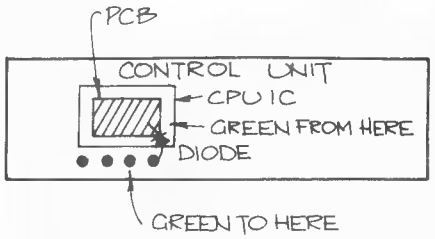


FIG. 2

Re-assemble the radio and remove "REV" sticker on "RPT" switch on front panel ("RPT" switch now reads "−/Simp/+").

This information has been kindly supplied by Dick Smith Electronics, Technical Bulletin No. 74. ■

EVALUATION AND ON AIR TEST OF ICOM IC-740

Serial No. 01141

CATEGORY	RATING	COMMENTS
APPEARANCE		
Packaging	**	Foam inserts. Strong carton. But not quite as good as previous Icom.
Size	****	Considering power supply can be built in, very compact.
Weight	***	Only 8Kg. (Less power supply).
External Finish	***	Very well finished. Clean appearance.
Construction quality	****	Typical ICOM quality.
FRONT PANEL		
Location of controls	***	Some controls rather small but reasonably placed.
Size of knobs	***	See above.
Labelling	***	Clearly labelled.
Meter	***	Clearly calibrated and well illuminated.
VFO knob action	***	Smooth. Three tuning rates.
Dial readout		
Analogue	Na.	
Digital	***	Bright. Accuracy reasonable. Does not slow RIT frequency shift.
Status Indicators	***	Five indicators. Better than previous model.
REAR PANEL	***	Most required facilities available.
RECEIVER OPERATION		
VFO Stability	****	Very stable. See test section.
Digital dial accuracy	**	Needs to be calibrated but good accuracy after that.
Analogue dial accuracy	Na	
Memories	***	One memory for each band except 160 (same as 80 metres)
Shift/width	**	Both provided but only one usable at a time.
Notch filter	***	Produces good null
Peak filter	Na.	See test section of text.
Spurious responses	****	A few very weak beats. Not audible with antenna connected.
'S' Meter	***	Smooth and realistic response.
AGC performance	**	Although continuously variable, not sufficient decay range. Also see test action of text.
Signal handling	***	Very good, but extra decay would help strong signals.
Clarifier	***	Selectable for transmit, receive or both.
Sensitivity	***	On a par with other current models.
RF attenuator	***	Preamp in/out. Works better than most.
RF gain	***	Progressive action.
NOISE BLANKER		
The noise blanker in our review transceiver did not appear to be working at all.		
QUALITY OF RECEIVED AUDIO		
Internal speaker	**	Reasonable quality.
External speaker	Na.	External unit available as option.
Headphone output	**	Quite a bit of hiss audible at low volume setting.
Cooling fan noise	**	Fan only operates on transmit, but fairly noisy.
Tone control	**	HF cut not sharp enough. Drops overall audio level. See test section of text.
TRANSMIT OPERATION		
CW & PEP output	***	See test section of text.
Audio response	**	Rather harsh quality. Not judged on air as first class.
Audio sensitivity	**	Essential to close talk microphone for full output.
Monitor	***	Worked well, but level not compatible with received audio.
ALC action	***	No flat topping noted on scope.
Compressor	***	Most effective. Reports indicated improved quality when used.
Metering	***	Several functions selectable.
Relay noise	***	Quite low.
VOX Operation	***	Good range of adjustment on gain, delay and anti-trip.
Cooling	***	Final runs cool under normal temperatures.
MANUAL (Owners handbook)	*	Only photocopy of English handbook supplied. Did not seem complete.
Further comments:		1. Not selectable sideband. Necessary to retune 3kHz when changing to rev. sideband. 2. If VFO knob is spun fast on 10kHz position will jump to 1kHz steps. 3. I like the SSB NOR/REV switching which obviates switching sidebands when changing bands.

Rating Code: Poor * Satisfactory ** Very Good *** Excellent ****