

EQUIPMENT REVIEW

ICOM IC-745 HF, GENERAL COVERAGE RECEIVE TRANSCEIVER

It's surprising that Icom have somewhat played down the IC-745. Looking back through past issues of AR, I found that the last and only feature advertisement for the 745 was in the October 1983 issue. Advertisements for the IC-751, the higher priced model have appeared with much greater regularity. I can only wonder why.

I guess at this point many readers will be thumbing through their past issues to turn up that advertisement for the IC-745 to see just what it is all about and indeed it might be a good idea to have it on hand as you read this review.

My interest in the 745 was sparked when I noted that they were available "on special" at a most attractive price. I really believe that in the past, they were somewhat overpriced. Reference to American amateur magazines showed that over there they were selling in much the same price bracket as the TS-430 and FT-757 GX. The current price now puts the IC-745 at a definite advantage over many of its competitors. I of course leave it up to you to decide the issue.

Well just what is the IC-745 and what does it have to offer? A quick answer would be to say that it is a general coverage receiver version of the now superseded IC-740. While hunting through your back issues of AR, look out the December 1982 issue in which we reviewed the 740. In appearance the 740 and 745 are identical except for one small point. The mode switch to the left of the "S" meter has been replaced with two push buttons on the 745. As we shall later see, several other controls now have quite different functions on the 745 as compared to the 740.

But back to the 745 and see what it has to offer. The receiver is now a full general coverage all mode system. There is a low frequency cut-off at about 100 kHz and four tuning rates of 10 and 50 Hz, 1 kHz and 1 MHz to take you up to 30 MHz. Modes provided as standard are AM, USB, LSB, CW and RTTY with FM as an optional extra. All of these are also available on the transmit side with the exception of AM. Two VFOs are built in and these can be set up on different bands and different modes if needed. Sixteen memories can be entered along with any required mode and instantly recalled. All the memories are tunable, that

is, when selected you can tune up or down from that frequency by any required amount but with the original memory frequency still available at the flick of the memory switch. A lithium battery provides power for an estimated several years of memory retention. All of the other 740 operating aids are retained on the 745. These include IF shift or bandpass, tuning (selectable), a notch filter operating at the 9 MHz IF frequency, off-set tuning for receive, transmit or both, noise blanker with switchable width and variable level, continuously variable AGC decay time, RF speech processor, all mode squelch control, comprehensive metering, VOX with front panel controls and an optional electronic CW keyer. There is also provision for a self contained AC power supply to be fitted thus making the 745 an extremely compact portable transceiver.

Overall dimensions are 111 mm high, 280 mm wide and 355 mm deep. Weight is 8 kg or with the built-in power supply 11 kg.

THE IC-745 ON THE AIR

Depending on the type of transceiver you have been used to operating, you may find the 745 rather different in many respects. However as is often the case, it takes longer to explain the operation side of a new transceiver than it actually does to do things. Let's start out with band selection. There is no band switch on the 745. First it is necessary to decide if amateur band or general coverage operation is required. A push button beside the "S" meter allows the choice. With general coverage selected an LED indicator between the meter and frequency display comes on, then one MHz steps are selected with the main tuning knob after the "Band" button is pushed. With amateur operation selected the same procedure takes place except that the various amateur bands are stepped through either up or down in order of frequency. This can be carried out using either VFO A or B, so that it is possible to have an amateur band using USB on VFO A and the local broadcast station using AM mode on VFO B.

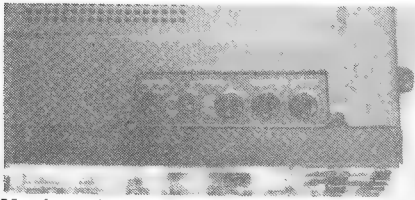
Now if you need to retain any of these frequencies in memory, just set the memory switch to the required position and push the "MW" (memory write) button

and you have that frequency and its associated mode there for future recall. In my case, I set up four local BC stations, six at the edge of some popular short wave broadcast bands, five of my usual amateur band frequencies and the last on the low frequency airport terminal information channel of our local airstrip. All very handy.

With all that we haven't even got to the transmit side yet. But with all the fun of tuning around, it took some time to even think about transmitting. However just one point before we do. For reception below 1600 kHz a separate antenna input is provided. From here down, overall sensitivity seemed to be very low and a wire antenna of at least 10 to 15 metres was needed to bring in the local BC stations at reasonable strength. There is a happy side to the story though which is that cross modulation is quite low. The receiver preamp does not operate below 1600 kHz.

Now to the transmit side of the 745. I used an Icom PS-15 power supply for all tests. Set up on my usual 20 m frequency, I pushed the mike button and spoke. The result, no output. After a good deal of pushing, pulling and checking, I found the problem. Although tuned to an amateur band, I had the general coverage mode selected and all transmit function is inhibited.

A quick stab of the HAM/GEN button put things right. As the 745 is of course a fully solid state transceiver no tune up or loading is required. Just push the right button, set the mic gain and you are in business. While transmitting it would be usual to monitor the ALC on the meter with drive controlled by means of the mic-gain control. This is where a slight "funny" comes in. If you decide to use the compression, the mic-gain becomes the compression control and there is then no way to run at a lower ALC setting except by reducing the compression. Having said that, the audio reports were good, but for some reason the audio quality changed when the compressor was in use. The best quality reports were received when the compressor was in use with about 5 dB of compression. I remember a similar effect with the IC-740 where the transmit audio sounded cleaner with the compressor on. In our tests an HM-12 hand microphone and a SM-6 desk microphone were used. Most



Monitor, Marker, Calibrator and Anti-VOX controls on top of the unit.

contacts preferred the SM-6 but it lacked the up/down scanning facility of the hand microphone. Pity Icom do not have a scanning desk mic.

As I mentioned earlier, some of the controls on the 745 are "different". Perhaps the most different of them all is the mode selector. This works on the sequential method. Push the button once and next mode along is selected. The modes in order are LSB, USB, CW, RTTY, AM and FM. The selection goes in one direction only, so if you want to change from USB to LSB it takes five stabs of the button. This itself is not as bad as it sounds but when going between USB and CW and then to RTTY there is a rather loud plop from the speaker. If you like to use a good quality speaker system, as I do, then you will hear the plop in super hi-fi. One point of criticism I had with the 740 was that the slow AGC position was not slow enough. The full slow setting now has a decay time of about ten seconds from S9+10 dB which is ideal for those strong 80 metre nets. Of course you can have it as fast as you want — just turn the knob.

The IF shift and band pass tuning work in the same manner as the 740. Again it's a pity they cannot both be used at the same time. With the control centred, I found the quality on SSB a little tippy. Things sounded better with a slight offset for LSB one way and USB the other. Either the IF shift or the PBT were useful in reducing the effects of interference. I could not actually find a situation where one was better than the other on SSB however the PBT was effective for CW reception.

While on the subject of CW, Icom have a selection of filters that should please the most ardent CW operator. CW operation is via the VOX system. Unfortunately the initial make and final break as the VOX keys causes a loud plop in the speaker, the actual keying in between is very quiet. Side tone is around 600 Hz and sounds very clean, the level being adjustable with the normal audio gain control.

A notable improvement on the 745 is the operation of the cooling fan. This is now thermostatically controlled and only comes on when the final heat sink reaches a preset temperature. In practise this only occurs after several minutes operating in the SSB or CW modes. Quite an improvement over the 740 where the fan was actuated as soon as the transmitter was keyed. Fan noise was a reasonable level.

THE IC-745 TUNING, MEMORY AND SCANNING SYSTEM

These facilities are so comprehensive that a full description is needed. Tuning is really in four speeds, slow turning of the tuning knob gives a tuning rate of two kHz per knob revolution. If the knob is turned at a rate exceeding about one revolution a second this steps up to about 10 kHz per revolution. The TS button produces 1 kHz steps or 200 kHz per knob revolution and finally the band button increases the stepping rate to 1 MHz or the next amateur band depending whether Ham or General operation is chosen. The normal tuning rates are perhaps not ideal. The old 740 had a 100 Hz selectable step which was usable for most operation and did not require fast turning of the knob. It seems that Icom ran out of positions to place a changeover push button, so we have to settle for a compromise which makes fast band scanning to check for activity a difficult exercise. My solution would be to substitute 100 Hz tuning rate for the 1 kHz rate which is not usable for normal tuning.

We have already touched on the memory system of the 745. To supplement this is a scanning system for the memories and also a selectable band scan.

The memory scan will scan only those memories

that have a frequency entered into them, it will skip any vacant channels. In order to have the scan pause on a channel it is necessary to set the squelch control to provide a threshold. Unfortunately this doesn't work very well, particularly if the signals you want to monitor have widely varying signal strengths. If you set the squelch to suit the signal, the scan will pause for about six seconds (adjustable).

The programmable band scan operates when the first two memory positions are within the same amateur band, then by selecting one of the VFO positions, the set will scan between the two frequencies. Again the system is not entirely satisfactory. The scan speed is too fast and although this is adjustable, cannot be adjusted slow enough to be able to identify an SSB signal as it tunes through. The two adjustments mentioned above are internal and not readily accessible. Finally in this section mention must be made of the noise blanker. As I recall the blanker in the 740 was not operating at all. But the 745 blanker certainly was. Let's look at the effect on the Woodpecker first. It took some time to discover that for the blanker to be effective, it was necessary to speed up the AGC decay time. With very slow AGC selected, the blanker just cannot reduce the gain quickly enough to suppress the Woodpecker pulse. Perhaps Icom might like to mention this in their instruction manual.

Of course the "wide" mode must be selected for Woodpecker blanking. Ignition and general electrical noise is mostly taken care of using the normal blanker mode. At any setting, the blanker causes very little cross modulation, but in the wide mode with full level there is quite a bit of signal chopping, however this is a small price to pay for relief from the various noises that plague us.

THE IC-745 ON TEST

The following equipment was used to produce our figures on the IC-745: Drake W4 watt-meter, Yaesu YP-150 watt-meter dummy load, Kenwood SM 220 monitor scope, Daven audio power meter, AWA F242A noise and distortion meter and a 100 kHz crystal calibrator.

Frequency stability was checked by running the receiver against VNG on the three frequencies audible. Stability was of a high order. In fact it was so good that it proved hard to measure. I can only estimate that total drift did not exceed 25 Hz under any conditions tried.

Power Output. Power was measured with full carrier in the RTTY mode and then checked for PEP output and linearity using the monitor scope —

1.8 MHz 95 watts	18.0 MHz 80 watts
3.5 MHz 95 watts.	21.0 MHz 75 watts
7.0 MHz 90 watts.	24.5 MHz 75 watts
10.0 MHz 87 watts.	28.0 MHz 70 watts.
14.0 MHz 85 watts	

PEP output was much the same with a very clean scope pattern both on speech and on two tone test.

Receiver Tests. With the audio gain at zero, residual noise measured -47 dBm unweighted. This is marginal, and hiss is audible when using headphones or a forward facing external speaker.

The crystal calibrator was fed into the receiver, set for a 1 kHz beat note and the distortion measured. At two watts output distortion was 1.8%. These tests show that the audio performance of the 745 is very similar to the older 740. The action of the tone control has been improved over the 740. At full setting, the output at 2.5 kHz was reduced by 20 dB but the output at 1 kHz was reduced by only 4 dB. This is a good result. The notch filter was checked at several points across the audio band pass. The specification rates it 30 dB. I was able to measure 25 dB. It should be remembered that the notch filter works at 9 MHz in the IF strip and will actually reduce the signal strength and not just the audio level as with an audio notch filter.

However the notch appeared to be rather wide and had a noticeable effect on both the recovered audio quality and audio level.

Receiver AGC was checked by feeding the crystal calibrator into the antenna input to produce an "S" meter reading (preamp off) of S2, S8 and S9+20 dB. The audio output level increased by 1, 2 and 4 dB at these points. This is a satisfactory result and a noticeable improvement over the IC-740.

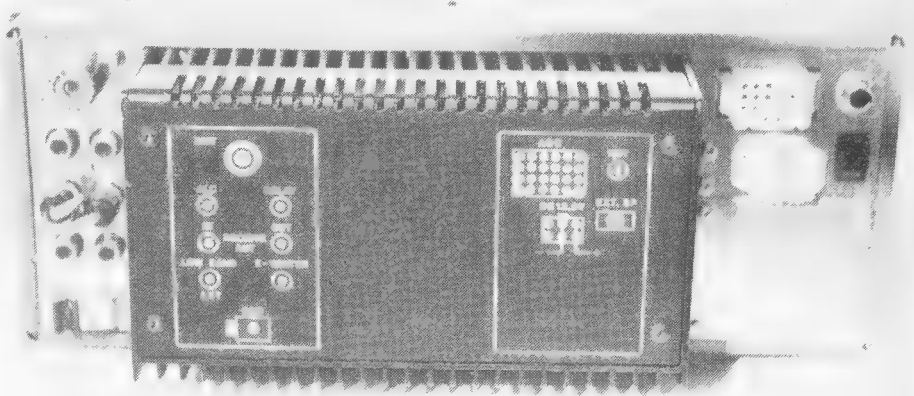
Sensitivity tests must remain comparative for the time being, but rated very well against my standard of comparison. The preamp certainly sparked up the overall gain by around two "S" points, but in no case would it make a weak signal any more readable. I thought that the S meter readings were fairly normal — again by comparison — with the preamp out of circuit. There were times however when I thought a front end attenuator would have been useful, but none is provided. The preamp does not operate below 1.6 MHz. A funny effect with the AGC was that strong broadcast signals sounded rather distorted with the AGC in the fast or medium position but cleaned up with the AGC set to full slow. The receiver sounded slightly fussed when local BC stations got up near full scale on the meter.

Instructions Book. Icom instruction books are in general well written and printed. In the case of the 745, it is up to that standard. However it is an instruction book and not much else. There is no circuit description or any information at all on the theory of operation. Several pages are devoted to the installation of the numerous options such as filters, FM unit, keyer and inbuilt AC power supply.

A full schematic diagram and block layout are included as is a page of operational trouble shooting. A full service manual is available as an option.

CONCLUSIONS

At the present selling price of around \$1000, the 745 is excellent value. It offers a combination of facilities



Rear view of the Icom IC-745 transceiver.

not readily available in other transceivers in this price bracket. The 745 is also compatible with the full range of Icom accessory equipment such as the automatic band switching linear amplifier and antenna tuners

My thanks to Icom Australia for the loan of our review transceiver

EVALUATION AND ON AIR TEST OF THE ICOM IC-745

Serial No 26102187

Rating code. Poor * Satisfactory **
Very good *** Excellent ****

APPEARANCE

Packaging
** Strong carton. Foam inserts. Not quite up to other Icom models.
Size
**** Compact. If power supply built in super compact.
Weight
*** 8 kg — only 11 kg with built in P/S.
External Finish
*** Very clean appearance.
Construction Quality
**** Typical Icom quality.

FRONT PANEL

Location of controls
*** Some concentric controls rather finicky, otherwise good.
Size of knobs
** I think we are getting used to smallish knobs.
Labelling
*** Clearly labelled.
Meter
*** Very clear & well illuminated.
VFO knob
*** Smooth action. See text for comments on tuning rates.
Digital display
*** Bright, accurate but needs 10 Hz display.
Status indicators
** Could use a few more.

REAR PANEL

** Many connections to 24 pin socket for which no plug is supplied.

RECEIVER OPERATION

VFO stability
**** Very stable. See test section.
Digital dial accuracy
*** Needs initial calibration but then spot on.
Memories
*** 16 memories
Scanning
* Icom haven't quite worked this out as yet.
Shift/width
** Both provided but only one usable at a time
Notch filter
** Have seen better, but works OK.
Spurious responses
*** Only a very few at low level.
"S" meter
*** Smooth acting and realistic.
AGC
**** Continuously variable decay time gives excellent results.
Signal handling
*** Very free from cross mod. Only local BC stations cause concern
Clarifier
** Switchable for transmit or receive but no display of offset.
RF attenuator
** Preamp in/out works well, but could also use an attenuator.
RF gain control
*** Progressive and smooth action.

NOISE BLANKER

Line noise
*** Very good with most electrical noise.
Ignition noise
**** Cuts it dead.
Woodpecker
** Works at times, better than nothing.

QUALITY OF RECEIVED AUDIO

Internal speaker
** Reasonable quality.
External speaker
NA Available as option. Not tested.
Headphone output
** OK with stereo phones. Some hiss audible at low level.
Tone control
*** Very useful.

TRANSMIT OPERATION

CW/PEP output
*** See test section for results.
Audio response
** Generally good reports. Icom are not noted for smooth speech quality.
Microphone gain
** Plenty with preamp mic, just OK with hand mic.
Transmit monitor
** Sounded slightly distorted.
ALC action
*** No flat topping. Meter indication better than 740.
Compressor
*** Most effective. But quality change when in use.
Relay noise
*** Quite low.
Metering
*** Most wanted functions available.
Cooling
*** Thermostatic operation. Fairly quiet when working.
Linear switching
**** RCA jack for FL2100 type — or integrated switching for Icom Linear.

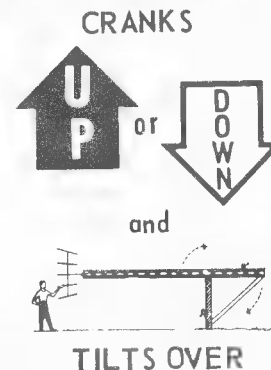
MANUAL

Operating instructions
*** Covers most aspects.
Theory of operation
* Not a mention.
Servicing information
* Only operational problems.

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