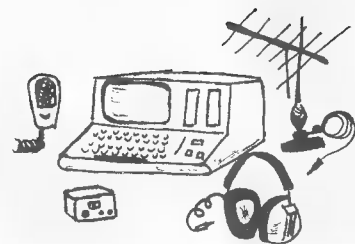


EQUIPMENT REVIEW



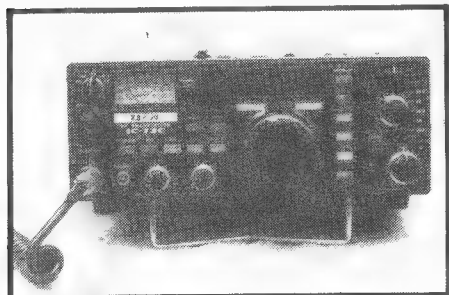
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3 Fairview Avenue, Glen Waverley 3150

A Review of the ICOM IC 730 Transceiver

With the proliferation of new transceivers on the market at the present time, it might be a surprise to many to know that the IC-730 is only the fourth HF transceiver that the ICOM Company have produced. Each of the four have broken new ground and have been quite distinct in the field. Let's look at each for a short time, it will perhaps give a picture of the design philosophy that went into ICOM's latest, the IC-730.

The first, the IC-700, was in three units. An amateur band receiver, a transmitter without VFO that slaved with the receiver and an AC power supply. Solid state design was used throughout with the exception of two 6146B finals for the transmitter. When one considers that this came on the market in 1968, it was perhaps somewhat ahead of its time. Many years were to go by before number two appeared, the first synthesized HF transceiver, the IC-701, again perhaps a little ahead of its time, certainly one of the more technically advanced transceivers of the time. The third, released almost two years ago, the IC-720 introduced an amateur band transceiver with full general coverage receive facilities and with the possibility of full coverage transceive.

And so we come to the IC-730. It goes without saying that we can expect features that will put it ahead of its rivals.



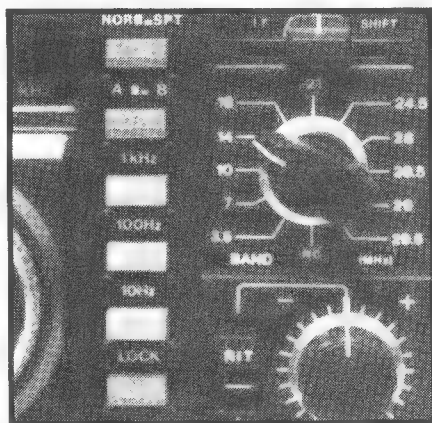
A CLOSER LOOK

Let's look at the 730 in detail and see just what it is and has to offer.

The 730 is a fully solid state HF transceiver with 100 watt output capability. It operates from an external 13.8 volt power source either your car battery or the

optionally available ICOM IC PS15 AC power supply. It covers all HF bands including the new WARC bands but with the notable exception of 160 metres. Dimensions and weight are almost the same as its more obvious competitors, but what goes on under the covers is rather different.

First off, the dimensions are 94 mm high, 241 mm wide and 275 mm deep. It weighs in at 6.4 Kg. The front panel is finished in smooth dark grey and the cabinet in the same colour but with a very fine rough texture. A very pleasing appearance. Each of the band positions covers just over 500 KHz with the ten metre band taking four segments. Reception and transmission is provided for the usual LSB, USB and CW, but in addition to these a wide selectivity AM mode is included.



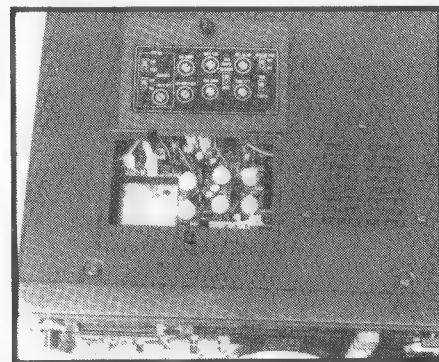
THE FRONT PANEL

As we might expect from ICOM, the tuning system is rather unique. Based on a CPU controlled synthesizer, three tuning rates 10 Hz, 100 Hz or 1 kHz are provided. In terms of tuning rate these work out at 1 kHz, 10 kHz and 100 kHz per tuning knob revolution, surely one to suit everyone. However, in addition to all of this, ICOM have incorporated two VFO's into the 730 to allow split frequency operation. Great, you say, but wait, the best is yet to come. For the first time in any of their HF transceivers, ICOM have included a memory system.

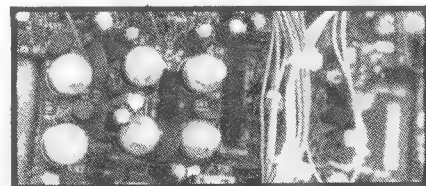
Enter your sked or net frequency on each of the several bands and there it is available any time at the push of a button.



Talking about buttons, most functions are push button operated. To mention only a few, VFO split, tuning rate, dial lock, RIT, MOX, VOX, noise blanker, AGC selection, preamp and the memory facility. An impressive total of fifteen buttons are logically laid out on the front panel but strangely only one LED status indicator is provided and this for the RIT.



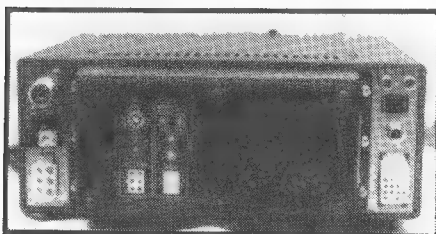
Several other controls are situated under a lift up lid in the top of the cabinet. These are the VOX controls, CW monitor level, SWR set, and switches for processor, SWR and noiseblanker width selection. Operation of some will later come in for some adverse comments.



Frequency readout is digital only. In common with the larger IC-720 no analogue dial scale is included. The digital display is both bright and legible and in common with all transceiver readouts these days reads to 100 Hz. In the selectivity department, the 730 comes with a 2.4 kHz filter installed for normal SSB operation and a 6 kHz filter for AM operation. If you happen to find entertainment value from the broadcast stations on 40 metres then this is for you.

OPTIONS

Several options are offered in the selectivity area. A narrow SSB crystal filter is offered to install in place of the normal mechanical SSB filter. We unfortunately have no data on the characteristics of the new filter, but it should be noted that there is no provision to switch this filter in or out. It has to actually replace the standard filter. A CW filter with a 600 Hz bandwidth can be installed in the transceiver and this is then switched in automatically by the mode selector. In addition an audio filter with 150 Hz band width is available. The transceiver comes with an IF shift and an optional additional filter is available to change the operation of this to a pass band tuning system. None of the optional filters were supplied with the review transceiver so I am unable to comment on their effectiveness. If a transceiver with them installed becomes available in the future they will be written up.



THE REAR PANEL

A cooling fan is built into the final amplifier compartment which operates as soon as the transceiver goes into the transmit mode.

Rear panel connections are a 24 pin accessory socket with outputs for 13.8 volts DC, T/R change over, fixed level receive audio output, plus various facilities for operation of the ICOM IC-2KL linear amplifier or VHF transverter. No matching plug is supplied. As well as this there is the antenna connector, a standard S0239, key jack, external speaker, ALC input from a linear amplifier, memory back up input which requires 12 volts DC to retain memory and dial calibration when the power is switched off, and finally the power input socket and ground terminal.

OPTIONAL POWER SUPPLY

Our review transceiver was supplied with the optional IC-PS15 power supply and, therefore, it seems opportune to include this in the review. It is designed to supply 13.8 volts DC fully regulated to a maximum output of 20 amps. Physical dimensions match the 720 but it is 16 mm taller than the 730. This can be matched up to some

extent by using the tilt bale on the 730 but not on the power supply. Worth noting also is that the PS15 is compatible with the Kenwood TS-120/130 transceivers. Just plug them straight in. No auxiliary DC output terminals are included on the PS15 which is unfortunate, as it is for sure many owners would like to use it as a multi-purpose supply around the shack.

AC switching for the PS15 is taken care of in the transceiver which leads to the possibility of positioning the supply under the desk. The DC lead length on the PS15 is 800 mm.

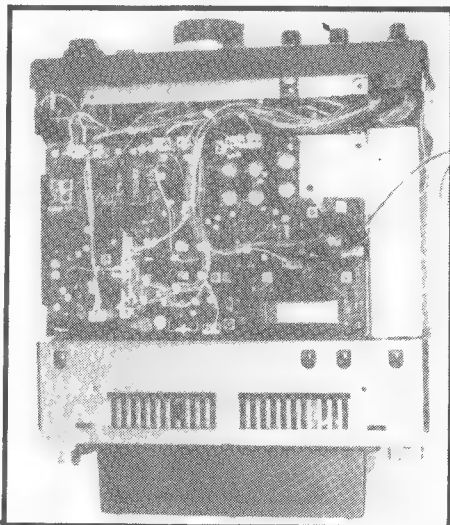


Photo showing top cover removed

THE IC-730 CIRCUIT

Let's now get a general idea of just how the 730 works. First the receiver. The input to the receive section uses the transmitter low pass filter system. The switchable 'Pre-amp' is, in fact, the receiver RF stage and uses a pair of FET's in push-pull. When switched out the signal goes straight into a second band pass filter network and then to the first mixer. First IF is 39.7315 MHz, then to 9.0115 MHz, then to 455 KHz. This is where the main IF shaping takes place with a mechanical filter for SSB, or the optional crystal filters for CW or narrow SSB. It then converts back to 9.0115 MHz and by using a VXO for the common heterodyne oscillator up an down from 455 KHz, the VXO becomes the IF shift control.

The noise blanker has a switched time constant facility which ICOM claim is effective against the "Wood Pecker". In order to reject out of band signals and to provide immunity from overload against strong adjacent signals, crystal filters are included in both the 39.7315 and 9.0115 MHz IF channels. After detection the audio signal is fed through active low pass filters to shape the response and remove unwanted high frequency components. On transmit, we will start at the microphone. The hand PTT microphone supplied contains a single transistor preamp. The microphone amplifier in the transceiver drives the balanced modulator which is also the product detector for the receiver. In the AM and CW

modes this is unbalanced to give carrier output. The signal follows the same conversions as the receive signal and following the final mixer passes through two buffers, two drivers and finally the PA stage. Negative feedback is applied across the three final stages to give uniform gain across each band. It is also hoped that the feedback might also help to produce a low order of intermodulation distortion in the transmitted output.

The heart of the transceiver is the PLL unit and logic unit, and the heart of the logic section is a 4-bit CPU which has been programmed to control all tuning functions in the transceiver. The tuning knob operates a photo chopper which supplies the up/down information to the CPU. The CPU also supplies data for the digital display which is of the high intensity fluorescent type and not a LED display.

The PLL consists of a 13.66 MHz local oscillator multiplied by 9 and mixed with the 132 to 139 MHz output of the VCO. The resultant signal is divided down to 10 KHz and compared with a 10 KHz reference produced by dividing down from a 9 MHz crystal oscillator. The VCO is now divided by 10 and 13.2 to 13.9 signal in one KHz steps which goes to the pre-mixer where it is combined with an output of the CPU to provide the final heterodyning signal to give the required transmit or receive frequency.

Comprehensive metering includes 'S' meter, ALC, RF out and SWR. The RF and SWR is monitored from a directional coupler in the output circuit.

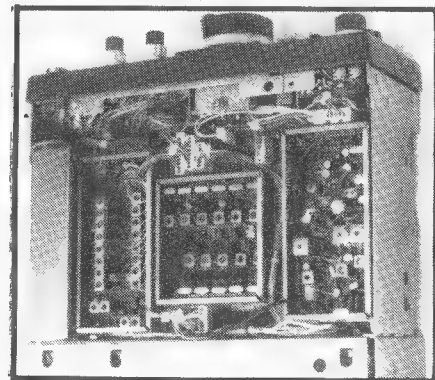


Photo showing bottom cover removed

THE IC-730 ON THE AIR

Plug it in, switch it on and so long as your antenna presents a 50 ohm load on the band you wish to operate, away you go. On initial switch on, the frequency will be 14.101.5 if LSB is selected or 14.098.5 if USB is chosen and the band switch set to 14. The same relative frequency will come up on other bands. With the three tuning rates available everyone should be happy, take your pick of fast, slow or extra slow tuning. I didn't think the tuning control felt as smooth as my old IC-211, but was nevertheless very pleasant to use. The drag on the tuning knob is adjustable by turning a spring loaded screw. With increased tension, however, the smoothness decreased and it produced quite a lumpy effect.

When changing sidebands or to AM or CW the frequency readout changes. In other words it is necessary to retune if you require the same frequency on the opposite sideband. It's perhaps surprising that the CPU isn't programmed to eliminate frequency change with change of mode.

After looking at the 730 brochure several months ago, I was intrigued with the pre-amp button. Would it bring up those 10 metre signals that are down in the noise. NO! it won't—in fact, with it in, the gain and sensitivity sound normal, with it out the set sounds dead. At the same time, I was surprised at the low overall gain and resultant audio output. Under noisy mobile conditions only strong signals would overcome the ambient noise. Even under quiet domestic conditions I found I was running the audio gain at about the half on mark with not a lot to spare.

Audio quality on receive is quite reasonable on the internal speaker and very good indeed on an external speaker. AGC action is very smooth with the slow decay on for SSB and the fast decay coped well with CW and AM signals. ICOM claim that the noise blanker is effective on the "Wood Pecker". I regret that try as I may I could find no detectable difference with the blanker on or off. Its action was good on ignition noise and when the 'wide' position was selected quite good on general electrical hash but with some chopping of the signal and a tendency to produce cross modulation.

The IF shift proved effective in action. Like others of the same type it proved capable of rejecting interference about 1.5 KHz off frequency. Of course, the actual band width does not change so there is always a chance that it might bring in as much interference at one end as it eliminates at the other. In this regard, I would like to try the optional FL-30 filter which changes the IF shift into a band width control.

AM reception is excellent—what a pity the 730 doesn't cover 160.

Transmitter power output was checked on all bands firstly in the CW mode. Exactly 100 watts on 80 tapering down to 75 watts on the high end of 10 metres. PEP output was almost the same and the pattern on the scope looked very clean. Power output is variable from maximum down to about 10W with the RF power control. An internal switch allows 50 to 100 watt operation—ideal for novices. However, there is no mention of this switch in the instruction manual. To access it, remove the top half of the cabinet and you will find it near the ICOM symbol about 3 cm right of the VOX delay control. During the power output tests it was noted that the SWR reading on the 730 meter showed 1.5 to 1 on a 50 ohm load. An internal adjustment can compensate for this but watch out. AM output was checked on air and the report indicated that quality was reasonable with slight distortion when peaking at 100% modulation. The AM is, incidentally, double sideband.

The speech processor gave the transmit audio a worthwhile lift. It should be noted that the processor is a fairly simple audio type and not an RF clipper. Transmit audio gain appeared a bit on the low side. Under no conditions could the ALC be pushed beyond the end of the scale segment. In fact, it appears that the ALC meter segment is too long, and best audio quality reports occurred when talking it up to about the half way mark.

The transmit tests occurred on a day of 30 degree C and while the transmitter heat sink became quite hot to touch, the PS-15 heat sink was too hot to touch. I see that ICOM have a cooling fan available for the PS-15 as an option. Depending on your average temperature it might be a worthwhile purchase.

VOX operation was smooth, the only disturbing factor is the final cooling fan that stops and starts as the transceiver cycles back and forth from transmit to receive. While transmitting, the fan produces a clearly audible but not distracting sound.

CRITICISM

Now to the complaints department. ICOM's idea of putting the lesser used controls under a hatch in the top of the cabinet is a good one. But please make them accessible. The three slide switches used here must surely be the smallest ever made. To add to the difficulty, there is just not enough space to get your finger into the speech processor and SWR switches between the side of the hatch and the two nearby rotary controls. There must be a better way to do this.

Another slight problem arises when you add a linear amplifier that requires an earth on the control line to switch it. ICOM provide for this, but you have the option of linear switching or memory back-up—not both. A slight re-arrangement of the rear panel connectors would overcome the problem to provide one extra connector.

SOME THOUGHTS

Let me say right away that the 730 is a delightful little transceiver and offers facilities just not available in any other rig in this price range.

However, I feel that a few things could be improved with little or no increase in price.

Firstly, perhaps the hatch in the top of the cabinet could be enlarged slightly to give better access to the controls inside. Perhaps the switches for noise blanker, speech processor and SWR selection could be made a little bigger and more accessible.

A few more status indicators would be helpful. A pair of LED's to indicate which VFO is in operation and, perhaps, another to indicate memory condition.

All small points that would make an excellent transceiver superb. I look forward to seeing the IC-730A. I hope, too, that ICOM might bring out a line of matching accessories. I mean this in the sense of physical dimension matching. All the accessories such as the power supply and external speaker were designed primarily

for the larger IC-720. I have no complaint with the electrical compatibility.

INSTRUCTION BOOK

The IC-730 instruction book is well written and very complete, certainly from an operating point of view. Four pages of circuit description with section block diagrams gives a basic idea of set operation. You will need to read up the operations section, particularly with regard to the operation of the two VFO's and the memory system.

A full schematic diagram plus a large sheet showing all printed circuit board layouts.

No service or alignment information is published with the exception of operational fault finding.

VICOM tell me that no service manuals are available at the time of writing, but that they are expecting copies from Japan shortly. Price at this time is not known. It seems that ICOM service manuals have never been easily obtainable; I have yet to see one for any model.

Nevertheless, VICOM are set up with the most sophisticated service workshop in Australia and your new ICOM transceiver carries a 12 month guarantee.

Our review transceiver was loaned by VICOM INTERNATIONAL, City Road, South Melbourne, to whom all enquiries should be directed. ■

Mt. Gambier Convention

The South East Radio Group Inc. in Mt. Gambier will be holding its 18th Annual Convention on the Queen's Birthday long weekend on June 12-13-14.

In an effort to generate additional interest in this already very popular Convention new events have been planned for both amateurs and their families extending over Saturday and Sunday of the weekend.

Usual events such as fox hunts, hidden transmitter hunts and scrambles will be held, plus several beam heading competitions and a feature night fox hunt. For those without DF equipment an observation sightseeing trial is planned for Saturday afternoon. Excellent prizes will be awarded in all events.

Last year's Convention was very well attended by trade exhibitors and this year plenty of trade space will be available with excellent security for the exhibits during the Convention.

One of the main features of past conventions has been the excellent catering arrangements by the ladies' committee, and this area will again be treated with the priority it deserves.

Convention registration forms will be available from most VK3 and VK5 clubs or may be obtained by sending an S.A.E. to The Registrar, SERG, PO Box 1103, Mt. Gambier 5290. Any enquiries can be made by checking into the SERG net on Monday nights at 10.00 UTC on 3.585 MHz. ■