

Icom IC-756 Pro III HF – 6 m all-mode transceiver

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The IC-756 Pro III transceiver is the fourth in the 756 series, following the precedent of the IC-706 transceiver in which Icom continues to develop a successful design rather than start from scratch with each new rig.

The first in the IC-756 series was originally introduced just on 10 years ago. One of its distinguishing features was the large LCD display. Since then the radio has been significantly upgraded, first of all as the IC-756 Pro about seven years ago, the IC-756 Pro II about five years ago, and now the IC-756 Pro III about three years ago.

The Pro version of the IC-756 saw a major change in the design of the unit with the introduction of 32-bit floating point DSP filtering which has carried through to the later models, the introduction of the TFT colour LCD screen, and the addition of a high stability PLL reference oscillator providing a high frequency stability of ± 0.5 ppm. The IC-756 Pro II saw the introduction of selectable sharp and soft filter shapes.

What does the IC-756 Pro III have and do?

Looking at the IC-756 Pro III in comparison to the IC-756 Pro II, it is hard to notice any discernible difference. However, inside the rig there have been a number of improvements which are noticeable in weak signal reception. Icom say that they have included a number of developments from their high end transceiver, the IC-7800, into the Pro III. These include a new receiver front end which gives a +30 dBm third order intercept point producing a distortion-free high dynamic range. Also included are large inductors in the front end BPF (band pass filtering) stage to enable the receiver to handle both weak and strong signals with lower distortion. To add to this, the BPF switching circuitry has been improved with the use of low distortion diodes to reduce the effect of strong out-of-band signals.

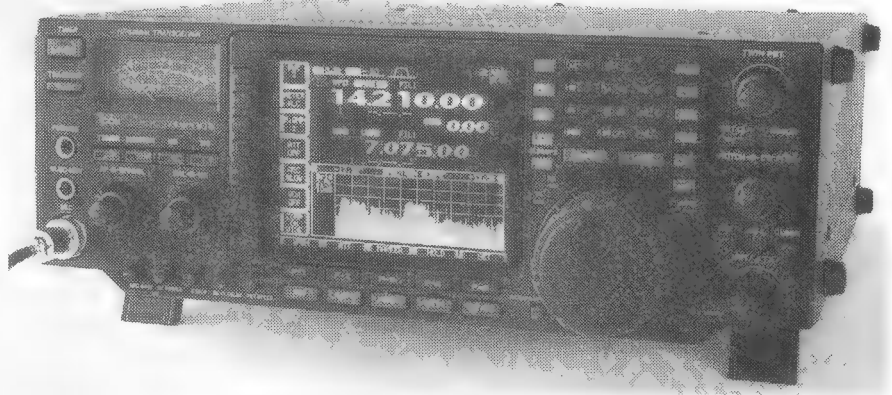


Photo 1: The IC-756 Pro III in operation on 14 MHz.

The Pro III uses a fundamental-mode monolithic crystal filter at 64 MHz as the roofing filter. It has a better shape factor and is less susceptible to intermodulation distortion under strong-signal conditions, and is the same 15 kHz filter used in the IC-7800.

Also, the Pro III preamplifiers use the same basic circuit design as the IC-7800 preamplifiers to minimise distortion and maximise dynamic range.

This combination of design improvements brings the Pro III into a new level of receiver performance for a mid-range transceiver.

As the Icom IC-756 Pro III is a current,

very sophisticated mid-range amateur radio transceiver, it is not possible to fully cover all of its features and capabilities without taking up most of the space available in this magazine. Therefore, this review will cover only those features which the two reviewers found most interesting and which we believe will be of most interest to potential purchasers of this radio.

The Pro III is a high performance all-mode HF and 6 m transceiver. The most noticeable feature of the Pro III when you first look at it is the brightly coloured 12.7 cm (5 in) square LCD display. This screen displays the frequency of the

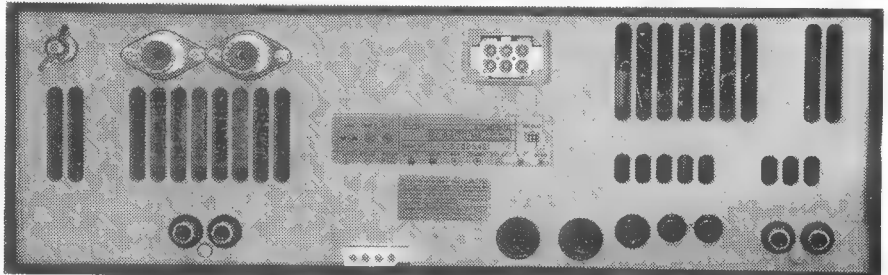


Photo 2: The relatively simple rear panel of the IC-756 Pro III. Note that none of the sockets are labelled.

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main and second receivers, the mode of operation, the spectrum scope, a graphical display of the IF filters selection, and much more including the multiple menu selections for set-up and operation. Seven different fonts are selectable for the text on the screen. The reviewers preferred *Italic 1*.

The Pro III is 340 mm wide by 111 mm high by 285 mm deep, and mass of 9.6 kg. A built-in

AC power supply is not included. The external PSU needs to supply 13.8 V at 23 A.

The receiver covers from 30 kHz to 60 MHz continuously and the transmitter is enabled for all Australian amateur bands from 160 m to 6 m. A useful feature is the warning beep when you tune past a band edge. All modes are covered including full RTTY receive ability, although you can only transmit up to a 62 character RTTY message from the eight inbuilt memories. For full RTTY performance you require an outboard Terminal Unit,



Photo 3: The large LCD screen displaying the mini spectrum scope and the filters. Note the graphical representations of the 'soft' and 'sharp' filter shapes.

TNC or PC with dedicated software, as is the case with most current transceivers.

The 32-bit floating point DSP and 24-bit AD/DA converters provide many useful DSP features. AGC pumping is completely eliminated, and there is full control over AGC attack and decay times with programmable slow, medium and fast presets.

The DSP-based twin passband tuning is very effective in reducing signal and noise interference to the received signal. With the DSP enabled IF filtering, a variable choice of selectivity options

is available from 3 kHz on SSB out to 9 kHz on AM. This extends into the filter shape which can be set to 'sharp' (a flatter top to the filter shape which actually produces a wider frequency response) or 'soft' (which produces more of an analogue filter bandpass). The reviewers found the 'sharp' setting to be preferable on SSB, whereas the 'soft' came into its own on CW.

A strong feature of the Pro III is the DSP noise reduction facility. The level and intensity of this can be adjusted by turning a rotary knob. It is fast acting and very effective at removing all sorts of noise and static, and enhances



Photo 4: The matching SM-20 microphone.

the signal readability without muffling or distorting the recovered audio sound too much. However, it does slightly attenuate the receive audio output when in use. One of the reviewers lives in a noisy suburban environment and uses several DSP noise reduction devices with his transceivers. To his thinking, the Pro III DSP noise reduction facility was outstanding.

In addition, the Pro III has a standard, adjustable noise blanker which is quite effective on pulse noise such as that produced by car ignition systems.

To enable rejection of interfering heterodynes on receive; the Pro III has not one, but two notch filters. The manual notch provides an incredible 70 dB of attenuation of a single frequency heterodyne without reducing the performance of the AGC. It is not, however, unusual to hear clicking sounds in the speaker when tuning the manual notch to frequency as the DSP characteristic changes. The automatic notch filter will track two or more interfering signals simultaneously without signal loss or distortion.

The transmitter power is variable from about 2 W to 100 W on all bands on all modes except AM where the maximum power according to the manual is 40 W.

An analogue meter serves as an S meter on receive and on transmit is selectable to show power output, SWR, compression and ALC level. The large LCD screen can also be programmed to show an excellent bar-graph version of the meter.

Band changing is quick and easy with dedicated buttons for each amateur band and one for general coverage. Triple band stacking registers are extremely convenient for band hopping.

There are 101 memory channels, but what is particularly useful is the five channel (or set menu changeable to 10 channels) memo pads which enable the quick writing and recalling of frequency, operating mode and various other items such as bandwidth, AGC, etc. This memo pad facility is in addition to the 99 memory, plus two scan limit memories, channels.

The Pro III receiver has a dual watch function which enables reception of two

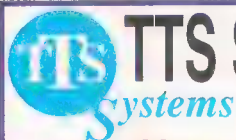
signals in the same band simultaneously. This enables the operator to keep an ear on two frequencies at once. The recovered audio between the main and secondary receive frequencies is adjustable with a balance control. In some ways this is not as good as having two independent receivers but, nevertheless, is a very useful facility.

A handy feature is a digital voice recorder which provides 90 seconds of recording from four memories for transmit messages. On receive, a button push enables the last 15 seconds of received audio to be stored in each of an additional four memories for playback.

An IF DSP speech processor is provided with three band-width settings, treble and bass response adjust, VOX and a transmit monitor.

For the CW enthusiast, a straight key or external keyer can be connected to a ¼ inch jack on the back panel, or a keying paddle can be connected to a ¼ inch jack on the front panel to use the inbuilt keyer. Full and semi break-in is available with a front panel adjustment for delay.

With use of the twin PBT (pass band



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tuning) controls, you can narrow the receive filters for CW down to 50 Hz with an excellent shape factor and steep skirts, and no suggestion of ringing. This is where DSP filtering scores in comparison with standard IF filters.

Rear panel facilities include the usual Icom interfaces for connection to data terminals and automatic control of matching Icom linear amplifiers and ATUs, two SO239 antenna connections (one of which can be setup to be a receive antenna only) and a separate RCA receive antenna socket which are selectable from the front panel (and are stored in band memories), and connections for a transverter.

The inbuilt automatic ATU (antenna tuning unit) matches the transceiver to the connected antenna covering from 0.1 to 60 MHz in 10 bands. Once the ATU matches an antenna, the ATU settings are memorised as a preset point for each frequency range in 100 kHz steps so that when you change the frequency range, the ATU settings are automatically changed. You can deactivate the ATU if the SWR is 1.5:1 or less, and it will automatically reactivate when the SWR exceeds 1.5:1. We found the automatic ATU to be quite fast in operation.

Two 24 hour clocks are displayed in digital format in the top right hand corner of the LCD display. These can be set to any two time zones. We found their time keeping to be quite accurate.

The IC-756 Pro III on the air

When switching on the IC-756 Pro III, an annoying feature is the 10 second delay before operation commences while the screen advises you that calibration of the DSP unit is taking place.

Another intriguing feature is that the LCD screen can take up to 10 minutes before it reaches full brilliance, although it is quite readable from start-up. This delay is mentioned in the handbook and intrigues the reviewers whose LCD TFT computer screens appear to be at full brilliance immediately they are switched on.

A first impression when receiving a signal on the Pro III is the clean recovered audio response. The audio from the speaker built in to the top of the transceiver's case is surprisingly good, but is truly outstanding when using a

good quality external speaker.

One reviewer was particularly impressed with the audio recovered from AM broadcast signals. This was helped by the IF bandwidth on AM being able to be selected to 3, 6 or 9 kHz.

Tuning steps are very convenient and, like most other features of this radio, can be personalised via the extensive menu system. For normal SSB use you would most likely select the 10 Hz step tuning speed. For such instances as digital signal reception, the 1 Hz steps are very useful. For fast movement, the 100 Hz tuning rate comes into its own. In AM, the tuning steps can also be set at 1 kHz steps. In all other steps except the 1 Hz rate, where the dial readout is to 1 Hz, the dial readout is to 10 Hz only.

One new feature compared to the IC-756 Pro and Pro II is enhanced ability to tailor your transmit audio. With the PRO III you can dial in customised upper and lower transmit bandwidth roll-off frequencies for the wide, mid and narrow ranges.

While the PRO III's bandwidth choices are not unlimited, they do allow for low-end selections for each range of 100, 300 or 500 Hz; and on the high end, they're 2500, 2700 or 2900 Hz. This means the absolute maximum SSB transmit bandwidth is 2.8 kHz, somewhat less than the PRO II. The narrowest transmit bandwidth remains at 2.0 kHz.

The reviewers found unquestionably the best SSB transmit audio quality was produced with the widest available bandwidth. We also found that the most pleasant transmit audio was obtained with the equaliser setting at +5 at the high frequency end and -3 at the low frequency end.

One of the reviewers checked the AM capability of the rig by joining the 80 m AM net one evening. The best AM transmit audio quality was found to be when the power output was set at 25 watts rather than the 40 watts as specified in the Pro III manual.

One PRO III improvement that CW operators will appreciate is the newer model's keying. The PRO II shortens the dits when operating in full break-in mode but this shortcoming is totally eliminated in the PRO III. Surprisingly, this improvement is not mentioned anywhere in the Icom advertising for the Pro III. Both radios sound just fine in

semi-break-in (VOX) mode, however.

We plugged a key into the front panel connection to the inbuilt keyer and found the keyer to work very well with a good range of speed adjustment and break-in delay adjustable from the front panel.

Data communication

When the IF filter passband is reduced to 500 Hz or less in SSB data mode, special bandpass filters are automatically selected. This sharpens the filtering for better rejection of interfering signals. At the same time it turns on the ¼ tuning step facility which enables more accurate tuning for PSK31, SSTV or AFSK modes. Your own computer and software is required to use these modes.

The operating 'feel' of the Pro III

The reviewers were pleasantly surprised at the relatively small number of front panel controls for such a complex transceiver. Set up on the desk in front of the operator, use of the Pro III was initially quite intuitive and straight forward. Most facilities were able to be used effectively without recourse to the operating manual.

Later, when we became more used to the rig, we explored the many possibilities available through use of the extensive menu system. Virtually everything is adjustable and most of the menu selection buttons provide different outcomes when held for one second or more rather than simply being momentarily pressed. This is where the fun in using the Pro III really comes into its own.

A very useful feature of the Pro III is the spectrum scope which displays the band activity over a bandwidth of ± 12.5 , ± 25 , ± 50 or ± 100 kHz centred on the receiver frequency. There are two versions of the spectrum display, normal or mini. When the mini spectrum scope is displayed there is room on the main LCD screen for other menu items such as the filter display (see photo 3).

Having used the spectrum scope feature on the Pro III, it was difficult to go back to a transceiver which did not have this facility.

The main tuning control is heavily weighted in keeping with Icom tradition and is smooth in operation. Spinning the knob rapidly increases the tuning rate.

SM-20 microphone

On loan with the rig was the SM-20 desk top, base station microphone. It is a unidirectional electret microphone with up/down frequency switches built into the base and a switchable low cut audio response facility under the base.

There is also a variable gain control located under the microphone base. The SM-20 seems ideally matched to the IC-756 Pro III in both physical appearance and in audio characteristics.

Operating manual

The 117 page manual is comprehensive in its coverage of how to use the many features of the Pro III. What a pity the detailed description and coloured photographs of the transceiver as presented in the advertising brochure were not also included in the manual. Also, it would enable the user to much more quickly find what he is looking for in the manual if it included a detailed index in addition to the Table of Contents.

Conclusions

The Icom IC-756 Pro III sets a standard of operating features which is not equalled in any of the contemporary

transceivers in the same price range. We found it to be a very user-friendly piece of equipment to operate with many excellent features. It will be interesting to see whether there is a Pro IV version in due course and whether it will cover 2 m and perhaps 432 MHz.

Both reviewers were extremely reluctant to part with the rig. Quite apart from the usual excellent facilities one expects from a transceiver of this quality, the features that stand out in the minds of the reviewers include the outstanding transmit and receive audio quality, the effectiveness of the DSP noise reduction, and the usefulness of the spectrum scope.

The reviewers did not try the transceiver on 6 m due to the lack of a suitable antenna, but expect it would perform equally well on this band.

Our thanks to Peter Willmott VK3TQ of Icom Australia for arranging the loan of the review rig.

The list price of the IC-756 Pro III is \$4,449, and that of the SM-20 is \$325.60. However, by shopping around, you should be able to do a little better.

Photos by Bill Roper VK3BR

WIA News continued

and Director Phil Wait VK2DKN on Saturday 30 June 2007.

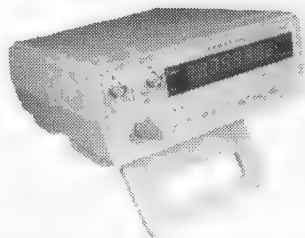
The Club had invited the President to visit the Club some time ago, and the WIA was very anxious to increase its ties with the club, as Westlakes provides the WIA's Outward QSL service, as well as the New South Wales Inwards Bureau, all thanks to QSL Bureau Manager Alec Efimov VK2ZM and his team. The visit gave the President an opportunity to learn more about the Bureau and to seek Alec's suggestions.

At the formal meeting on Saturday afternoon Michael talked about the many current activities of the WIA, particularly as manager of the amateur examination system and as the representative of Australian amateurs at the upcoming ITU conference, and Phil described the current developments in the fight against BPL interference.

Westlakes President Russell Ashdowne VK2KEG thanked Phil and Michael, saying that he hoped that the links between the WIA and Westlakes would be further strengthened.

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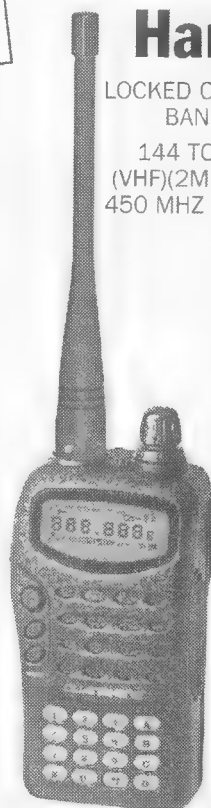
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