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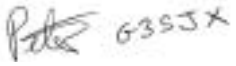

International Radio roofing filter for FT-1000MP

San even the best transceivers be further improved? Peter Hart installs an INRAD roofing filter to his Yaesu FT-1000MP. This is what he found...

International Radio (INRAD) is a US company specialising in providing modules and filter upgrades for a wide range of transceivers. They are particularly known for their huge range of high performance IF filters for virtually every radio marketed in the last 30 years, but they also provide performance enhancement modifications and modules such as front-end filters, VOX units and keyer modules. The Yaesu FT-1000MP and its later variants is probably the most popular radio for the serious DX and contest operator and International Radio has recently made available a narrow bandwidth roofing filter module to improve the close-in dynamic range.

Most high performance radios have a respectable dynamic range when strong unwanted signals are well separated from the frequency to which the receiver is tuned. However, at closer spacings when strong adjacent channel signals fall inside the roofing filter bandwidth of the first IF, the receiver dynamic range is considerably reduced resulting in possible blocking and intermodulation effects. Such problems can occur with crowded band conditions and particularly in major contests and DX pile-ups. Most roofing filters have a bandwidth of around 20kHz which can be achieved quite cheaply and which accommodate the wider bandwidth modes such as FM. Narrow bandwidth roofing filters are now appearing in top-end radios such as the Icom IC-7800 and Yaesu FT DX 9000 (due to become available shortly) in order to give a better close-in dynamic range. However, the ultimate in adjacent channel dynamic range is still achieved in amateur band-only radios such as the Ten-Tec Orion, Omni and Corsair, which place their channel filters immediately after the first mixer and avoid the use of an up-conversion architecture.

FITTING THE FILTER

The INRAD filter module comprises a metal cased narrow bandwidth quartz filter unit for 70.455MHz and a two transistor amplifier to compensate for filter loss, all contained on a small printed circuit board measuring 63 x 40mm with a height of 18mm.

After removing the bottom cover of the transceiver, fitting the roofing filter module is straightforward. Yaesu conveniently provides a plug and socket breakpoint in the signal path between the RF and IF circuit boards at a point following the standard 70MHz roofing filter. Inserting the INRAD filter module into this cable link places both the Yaesu and INRAD filters in series. There is space on the adjacent AF board complete with mounting holes and power connections where the roofing filter board can be mounted. INRAD provides all necessary mounting brackets, screws, cables and instructions. With the FT-1000MP, the modification is purely plug-in and requires no soldering. With the Mark V or Field model, two solder links are required to apply power to the module. The overall fitting time is just a few minutes.

I found that the overall IF gain of the radio was about 8dB higher with the new filter board fitted, resulting in slightly higher S-meter readings. The gain of the radio can be reduced to give similar S-meter readings via extended menu setting 9-1 (extra menu items 9-0 to 9-9 are accessed by holding down FAST and LOCK at power-on). I set the IF gain to '9' from the default of '12' but this may vary with different filter losses in different units and is slightly at variance with the instructions.

With the bottom cover removed a small modification to the main receiver audio board is worthwhile: a 47nF capacitor clipped across C3015 located near the centre of the AF-Unit PCB reduces significantly the high frequency hiss on CW. INRAD provides a capacitor for this purpose.

MEASUREMENTS AND RESULTS

With the new filter board fitted in my FT-1000MP and the IF gain set to give similar S-meter readings, the before and after measurements shown in **Table 1** were made on 14MHz CW. 500Hz bandwidth filters were selected for both IFs to enable very close-in measurements to be made and the receiver preamp was switched out (IPO). The before and after results show a similar level of intermodulation dynamic range at frequency spacings well outside both roofing filter bandwidths. This is to be expected and represents the dynamic range of the RF front end. Similarly, at very close spacings well inside both roofing filters the results are similar and this represents the dynamic range of the second mixer. However, at frequencies offset from the operating frequency in the 3 to 10kHz region, the INRAD filter improves the dynamic range by up to 10dB.

I measured a 2dB improvement in sensitivity with the INRAD filter board fitted, possibly indicating a lower noise post filter amplifier fitted on the INRAD board.

The 2.4kHz IF bandwidth setting was narrowed very slightly by 75Hz which will make little discernible difference on SSB. The THRU/6kHz bandwidth setting was narrowed from 7000Hz to 4880Hz which will still give reasonable quality AM but is not really suitable for FM. The sub-receiver should be used for wider bandwidth AM and FM modes.

CONCLUSION

In most operating situations fitting this filter will not make much of a difference. However, those whose interests lie in contests and DXing will appreciate the improvement in close-in performance when band conditions are really crowded.

The filter module may be obtained directly from International Radio, 13620 Tyee Road, Umpqua, OR 97486, USA; e-mail: INRAD@rosenet.net at $165 plus shipping (expect also to pay a UK Customs & Excise import VAT charge). It is now available in the UK from Vine Antenna Products, Taranaki, Four Crosses, Powys SY22 6RJ; tel: 01691 831111; e-mail: info@vinecom.co.uk

I would like to thank Fred Handscombe, G4BWP, for the loan of the review module. ♦

TABLE 1

	ORIGINAL FT-1000MP		FT-1000MP + INRAD FILTER	
SIGNAL SPACING	3rd order intercept	2-tone dynamic range	3rd order intercept	2-tone dynamic range
1kHz	-25dBm	67dB	-28dBm	66dB
2kHz	-23.5dBm	68dB	-21dBm	71dB
3kHz	-14.5dBm	74dB	-7dBm	80dB
5kHz	-11.5dBm	76dB	-1dBm	84dB
7kHz	-4dBm	81dB	+8dBm	90dB
10kHz	+2dBm	85dB	+17dBm	96dB
15kHz	+14dBm	93dB	+20dBm	98dB
20kHz	+23dBm	99dB	+21dBm	99dB
25kHz	+23dBm	99dB	+22dBm	99dB
>30kHz	+24dBm	100dB	+24dBm	101dB

Table 1: Intermodulation results with two equal interfering signals.

WEB SEARCH

International Radio (INRAD):	www.qth.com/inrad
Vine Antenna Products:	www.vinecom.co.uk