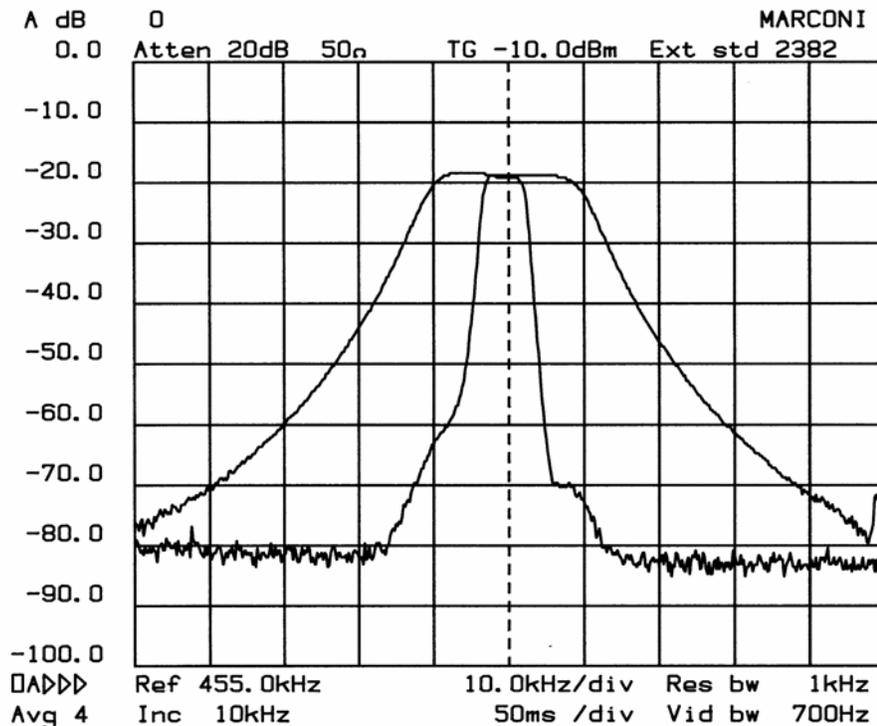


## IC-756Pro: Installing the Inrad Roofing Filter Mod

The Icom IC-756PRO roofing filter mod consists of a 6-pole, 4 to 5 kHz wide filter followed by a high dynamic range feedback amplifier. The amplifier provides enough gain to overcome the filter insertion loss.

The plot below shows the sweep frequency response of the front end and first IF filter to the output of the second mixer in an IC-756PRO radio. The wider curve is the OEM response and the narrow curve is with the Inrad roofing filter mod added.



The result of the bandwidth improvement shown above is the reduction of close in intermodulation from multiple signals. The IMD dynamic range will be improved up to 14 dB for signal spacings from 2 to 20 kHz. Also, the blocking dynamic range will be improved for close in signals. Note that the A-side of the receiver has the narrow roofing filter installed. The B-side still uses only the original Icom filter. Thus a direct comparison can be made by synchronizing the two sides and switching back and forth with the balance control.

## Frequently Asked Questions

1. What can you expect from this mod?

Less IMD in crowded band conditions, particularly from stations at offset frequencies of 2 to 20 kHz on either side of the operating frequency.

2. Will it defeat the noise blanker?

There will be some change in NB performance due to the narrower bandwidth of the mod. In practice, it might not be noticeable.

3. Will this mod allow for wide band SSB, AM and FM reception?

The overall widest bandwidth of the A-side will be determined by the roofing filter, which is about 5 kHz. AM and FM will be degraded, but not excessively. Normal 2400 Hz SSB will not be affected. The B-side is unmodified and it retains the full OEM bandwidth.

## Description of Operation

The roofing filter mod inserts a narrow band crystal filter after the first IF PIN diode attenuator and before the first grounded gate IF amplifier. An amplifier is included to compensate for the filter loss. Reducing the bandwidth at this point in the radio helps to keep strong off-frequency signals out of the second mixer, where they can cause intermodulation. Transmission is not changed, as it does not pass through the roofing filter.

The modification may cause some frequency response variation in the band scope screen output compared to an unmodified unit. This is due to impedance variations outside of the roofing filter passband. A two resistor network has been added before the filter to minimize this effect.

## Installation Instructions

**Warning:** Modern radios contain components which may be damaged by static discharge. Precautions must be taken to eliminate any static electricity buildup between the operator and the radio before any of the internal circuits are touched. If you are not familiar with the proper techniques for this, consult the Radio Amateurs Handbook.

**Warning:** This modification requires a high level of soldering skill, possibly beyond that normally possessed by the average radio amateur. Professional assistance is advised if you are not confident that you have this ability.

**Note:** If you have a known test signal available before you start, note the S meter reading for the A and B receivers. After the installation, the S meter should read the same as before. There may be a slight difference in readings between the two receivers.

## **Preparing the Inrad Board for Installation**

Remove the Inrad board from its packing. Compare the items in the package with the parts list. Strip the insulation from ¼ inch on each end of the black and red wires. The 5 pin, 0.1" section of pin strip header will be used to bring B+ and ground to the Inrad board. Plug the long end of the 5 pin header strip into the white 5 pin socket on the Inrad board from the bottom (solder side) of the board. The B+ pin is closest to the edge of the pc board. Solder the red wire to this pin. The ground pin is next to the B+ pin. Solder the black wire to this pin. Trim the excess pin length. Snip off the other 3 pins.

Using the template provided, cut the protective sheet to the outline shown in Figure 1. Note that this protective sheet is a strong insulating paper used in transformers with a voltage breakdown rating of 1000 volts if not punctured.

Place the INRAD board on the protective sheet with the coax connectors on the bottom. The coax cables and red and black wires will exit from the bottom side of the assembly. Wrap the board with the sheet and tape it in place. The small end of the paper should be wrapped over the bottom side and taped in place.

Set this assembly aside.

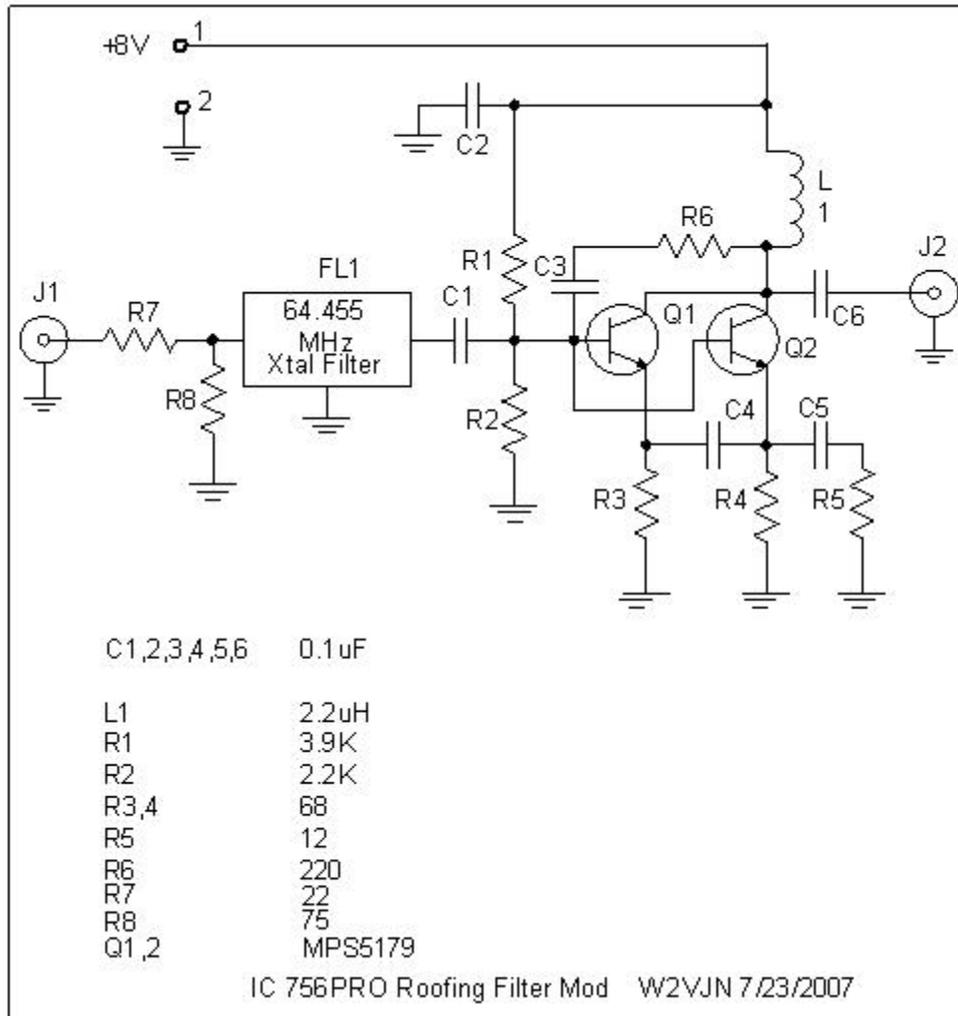
## **Preparing the Radio for Modification**

1. Remove the DC power cord from the transceiver.
2. Place the radio on a soft surface with the front panel facing you. Remove the top and bottom covers.
3. Turn the radio up side down and remove the shield plate on the left side. The RF-A unit is the board at the rear. Carefully examine the position of each coax cable. Taking a minute to trace their positions and colors on a sheet of paper, or even taking a quick photo with your digital camera will save some time during re-assembly. After noting their positions, carefully unplug each cable. Note that the short cable on the rear right side is permanently fastened to the RF-A board and must be unplugged from the adjacent MAIN-A unit. Unplug the ribbon cable. Remove the four (4) mounting screws from the corners of the board, and also the one (1) screw between the receive antenna and the X-verter RCA ports on the back of the radio. Carefully lift the RF-A unit and set it on a soft surface for further work.

4. There are 5 shield cans on the RF-A unit. The center shield in the group of 3 running lengthwise must be removed. Turn the board over and locate the four tabs which hold the subject shield in place. Using a solder sucker, solder wick or other means, remove the solder from around these four tabs and lift the shield can away from the board. The shield can must be modified as shown in Figure 2 to allow coax cables to pass. Use a nibbling tool or equivalent to notch the can.
5. Compare the area that was under the shield can to Figure 3. The trace running across the board near the right edge must be cut between two surface mount components as shown. A sharp pointed exactor knife may be used for this purpose. Leave a gap of 1/16 inch in the trace. The center conductor of the coax cables can be soldered to the surface mount parts on either end of this trace as shown in Figure 3. Just on the outside of where the shield covers, the coax grounds will be connected. Scrape a small amount of green solder mask from the ground areas there.
6. Prepare one side of each coax cable by stripping about ½ inch of outer covering and shield from the end. Strip about 1/8 inch of insulation from the center conductor. Using the bare wire supplied, form a small loop and insert the coax end. Push the loop up close to the shield and run a bead of solder around it. Next, prepare the opposite side of each coax cable to accept a TMP connector by stripping about ½ inch of outer covering and shield. Strip about 1/4 inch of insulation from the center conductor. Insert the center conductor into the TMP connector center pin and solder it in. Then take the dressed braid and solder it to the connector outer shield. The cables should now be ready for the installation. See Figure 4 for more information on the cable preparation.
7. The two coax cables may now be soldered to the trace and ground positions which were previously prepared. Figure 5 shows the area being worked on.
8. Once the coax has been fastened to the pc board, the shield can be soldered back in place. Solder four tabs on the bottom of the board.
9. The pc board, RF-A, can now be reinstalled in the radio. Set it in place and replace the five mounting screws. Plug the various coax cables back into the board using the color codes and the notes taken when they were removed. Carefully re-insert the ribbon cable into its header.

## Installing the Modification

1. Place the radio right side up with the front panel facing forward. Let the panel overhang the table edge by 3 or 4 inches so the mounting position is accessible from the bottom as well as the top.
2. Feed the two coax cables up through the opening in the radio. Insert the Inrad mod with B+ and ground wires attached into the radio opening. Feed the two power wires through to the underside. The Inrad kit will go in the space between the speaker and the front of the radio, beside the fan. See Figure 6.
3. Plug the two coax cables into the mod connectors using care to get them into the proper jacks. Seat the connectors firmly into the jacks.
4. Turn the radio over again. Feed the B+ and ground wires along the inside of the radio near the coax cables. Solder them to the points indicated in Figure 7. They are supplying 7.7 volts and ground to the Inrad mod. The ground wire goes to the center of the three pads. The B+ wire goes to the second (2<sup>nd</sup>) pin from the end closest to the back of the radio.
5. Tie wrap the coax cables and the B+ and ground wires together and be sure they are out of the way when the covers are reinstalled.
6. Install the shield plate over the left-hand side of the radio. Note: the cover ground spring goes on the middle screw, closest to the radio center.
7. Install the top and bottom covers of the radio.
8. Power up and verify that the A side and B side of the receiver both function and the signal levels are about the same.



### Parts List

- Assembled Inrad 115 board
- 2 RG-178 coax cables, 15" each
- 2 male TMP connectors
- Red and black wire-15" each, #26
- 3" bare solid wire, #26
- Protective sheet (uncut)
- 5 pin piece of pin strip header
- 2 tie wraps

Figure 1.

Protective Sheet Template

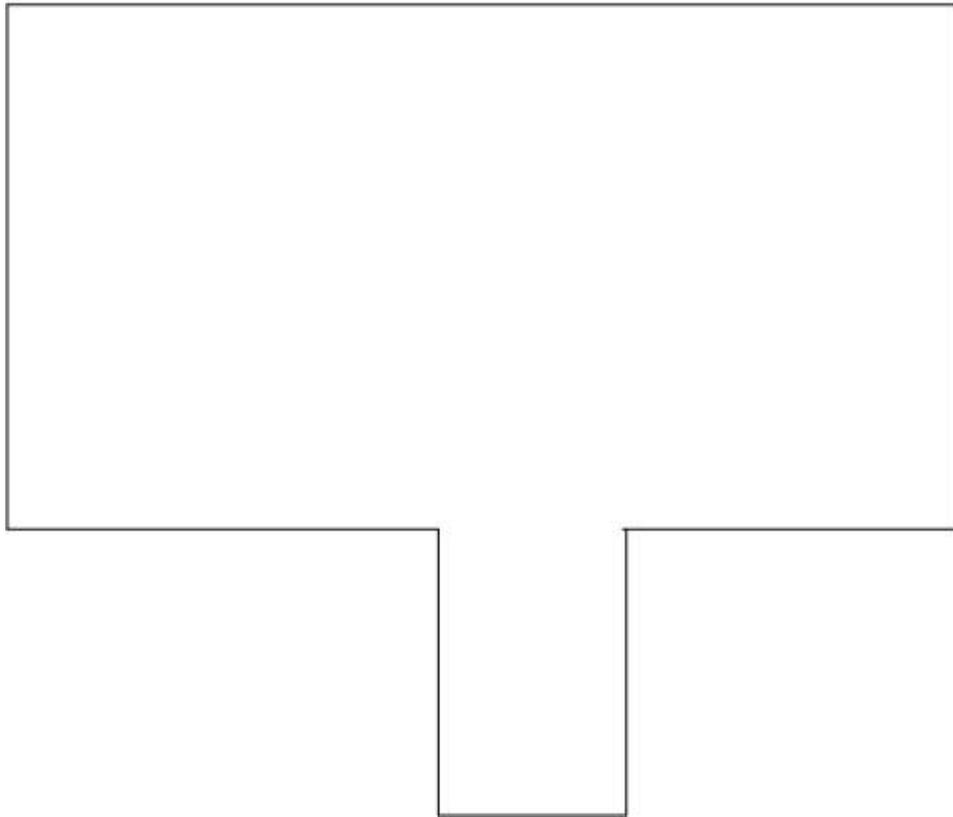


Figure 2. Shield can after modification.



Figure 3. PC board layout showing trace to be cut under the shield.

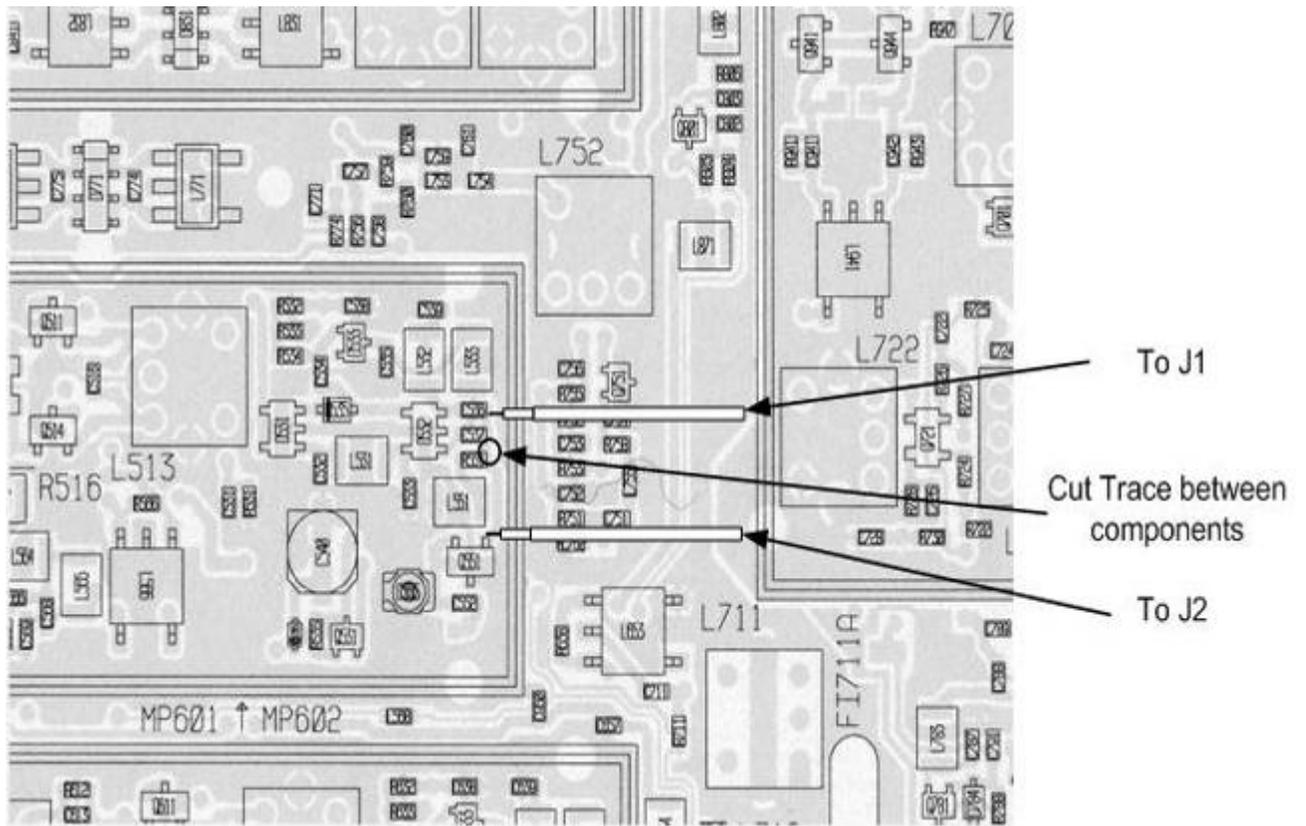


Figure 4. Preparation of coax cable.

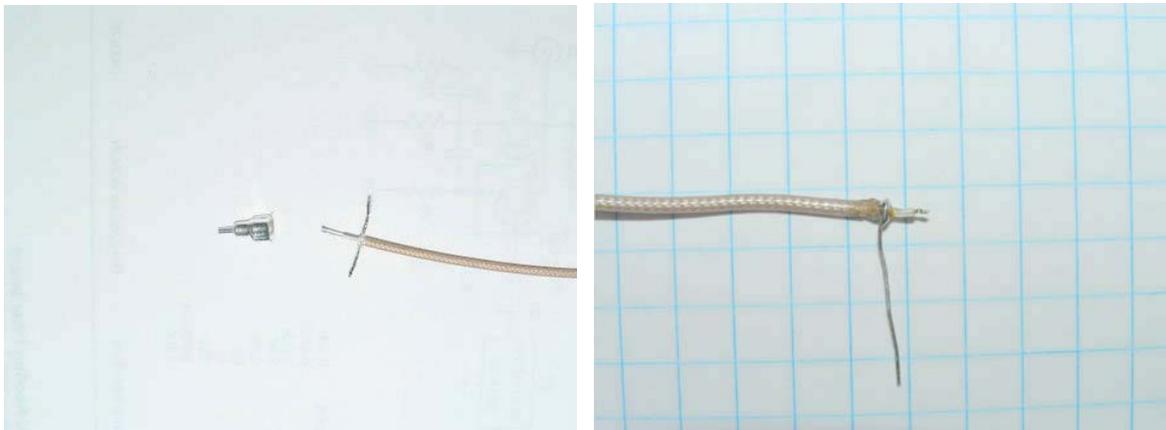


Figure 5. Cable connection.



Figure 6. Mod wrapped in protective sheet and inserted into the opening in the radio.



