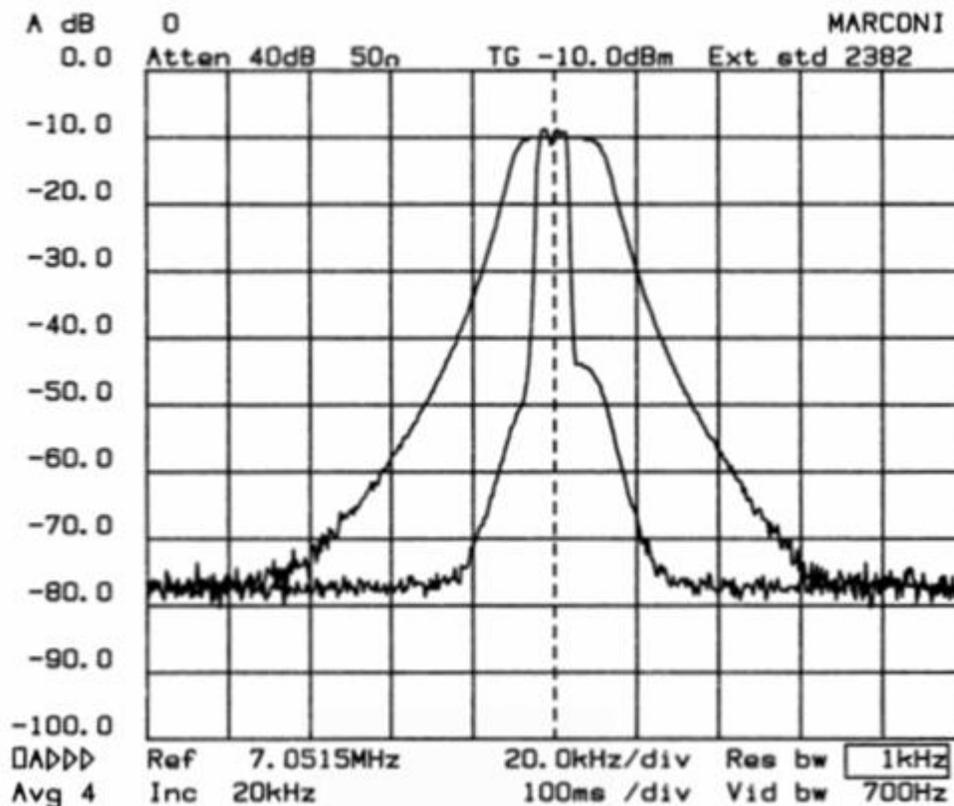


IC-756Pro3: Installing the Inrad Roofing Filter Mod

The Icom IC-756PROIII 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 in an IC-756PROIII 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 15 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.

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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?

No, the roofing filter is in the circuit before the noise blanker sample is taken. The filter delay is added to both signal and noise. Since less noise and fewer strong signals are able to reach the noise blanker, it actually improves its operation. 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 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 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 both the RF-A board and 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. Prepare one 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. See Figure 2 for more information on the cable preparation.
5. 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 six tabs which hold the subject shield in place. Place a protective mat on the radio before setting the board down. An old QST would work. Using a solder sucker, solder wick or other means, remove the solder from around these six 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 3/32" (or #41) drill to make the holes. Prepare the coax cables and eyelets as shown in Figure 2. Set these aside.

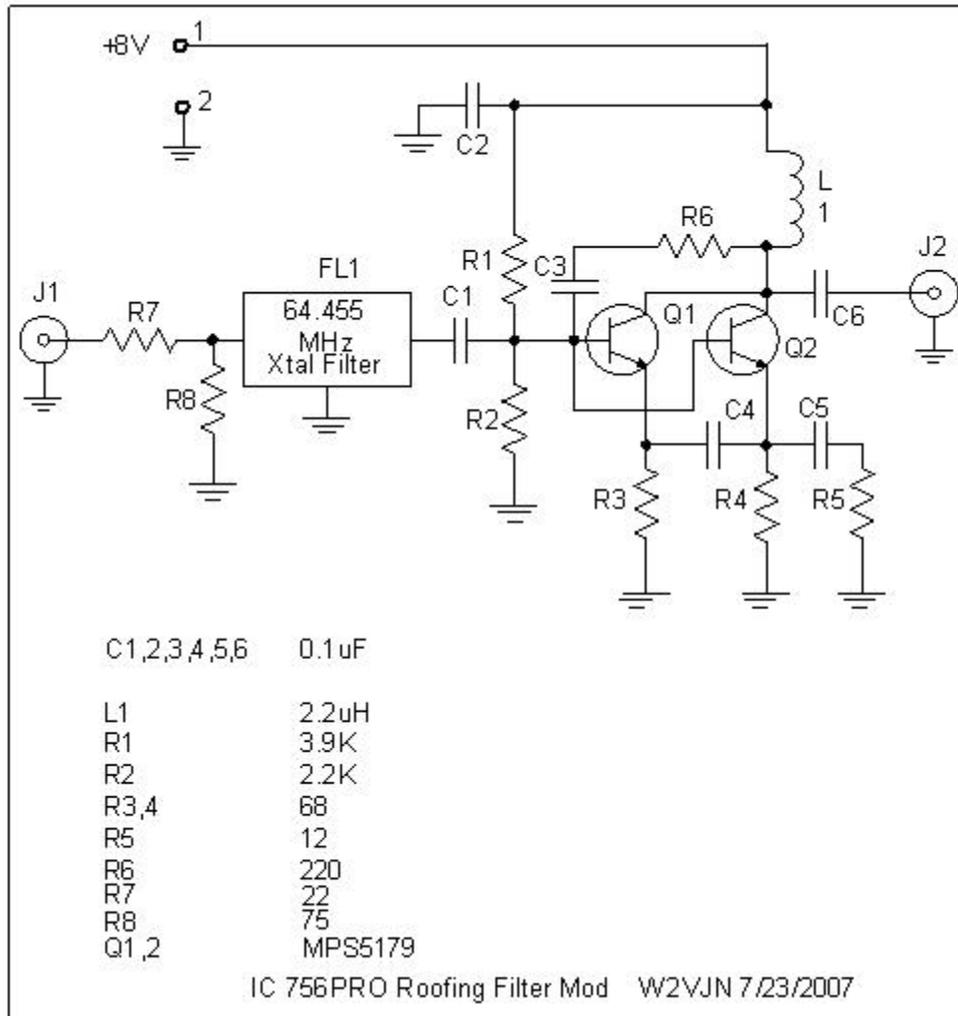
6. Refer to Figure 3 to locate R216, a 15 ohm surface mount resistor on to of the board inside the shielded area where the can has been removed. Verify that you found the correct part with an ohmmeter. Carefully remove R216 and clean the pads of excessive solder. Install the 0.1 uF capacitor and 15 ohm resistor supplied with the kit as indicated in Figure 3. Figure 4 shows how the work area should look at this point.
7. Reinstall the shield can with the coax cables attached. Solder the six tabs on the bottom of the board. Use care to avoid bending the two components standing on end. Solder the coax center conductor nearest to the 0.1 uF cap to it. This will go to J1 on the Inrad board. Now solder the coax center conductor nearest the 15 ohm resistor to it. This will go to J2 on the Inrad board. Trim excess lead lengths.
8. The pc board, RF-A, can now be reinstalled in the radio. Set it in place and replace the four mounting screws. Plug the various Icom 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. 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 the short side of this pin on the bottom of the plug in strip. The ground pin is next to the B+ pin. Solder the black wire to this pin. Trim the excess pin length beyond the solder connection. Snip off the other three pins.
3. Feed the two coax cables up through the opening in the radio. The INRAD kit will go in the space between the speaker and the front of the radio, beside the fan. See Figure 5. Feed the two coax cables up through the opening in the radio into this space. Insert the INRAD mod with the B+ and ground wires attached into the radio opening. Feed the power wires through to the underside.
4. Plug the two coax cables into the mod connectors using care to get them into the proper jacks. The coax from the 0.1 uF cap goes to J1 and

the coax from the 15 ohm resistor goes to J2 on the Inrad board. Seat the connectors firmly into the jacks.

5. Using the template provided, cut the protective sheet using the outline shown in Figure 1. 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 the bottom side of the assembly. Fold the protective sheet over the mod and tape it in place. The small end of the paper should be wrapped over the bottom side and taped in place. Note that this protective sheet is a strong insulating paper used in transformers with a voltage breakdown rating of 1000 volts if not punctured.
6. 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 6. 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 (2nd) pin from the end closest to the back of the radio
7. 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.
8. 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.
9. Install the top and bottom covers of the radio.
10. 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
 - Protective sheet (uncut)
 - 5 pin piece of pin strip header
 - 2 tie wraps
 - 2 eyelets
 - 15 ohm resistor
 - 0.1 μF capacitor

Figure 1. Template.

Protective sheet template

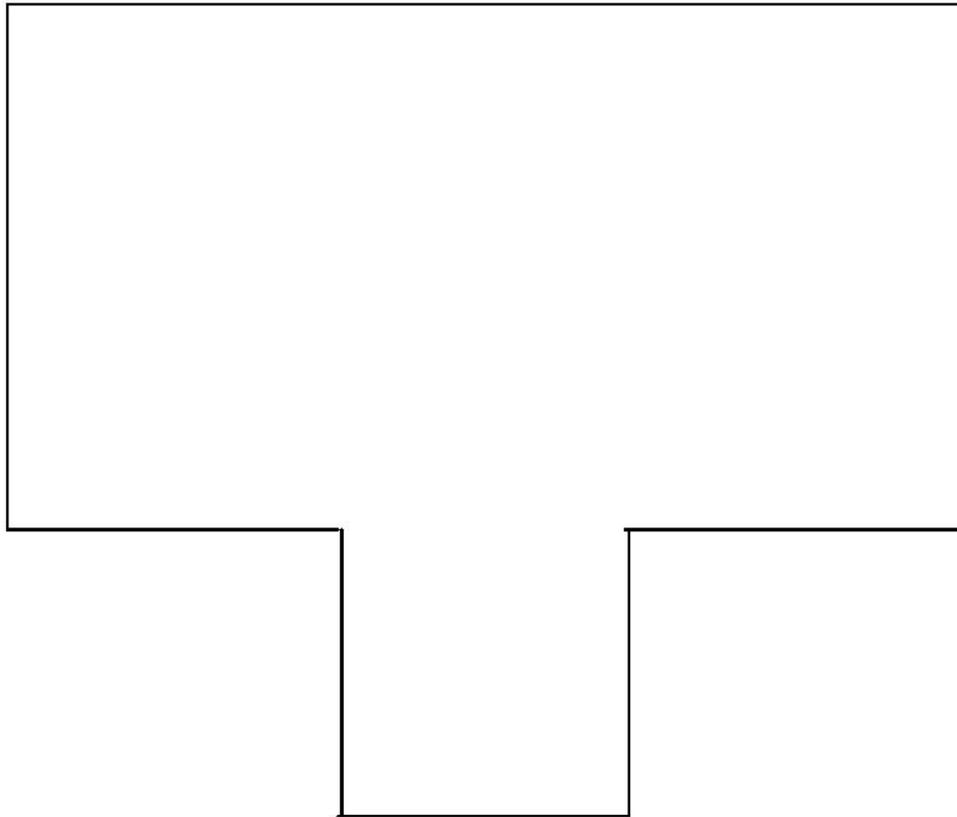
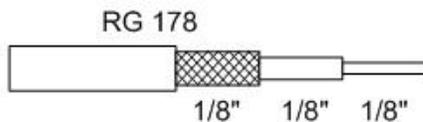
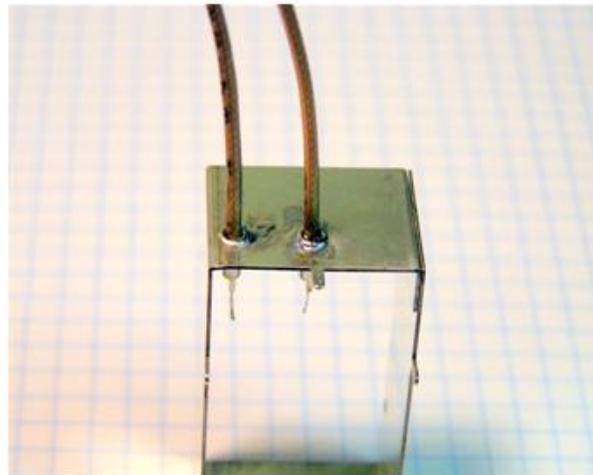


Figure 2. Cable and shield preparation.

Prepare one end of each coax cable to accept a TMP connector as shown.



Prepare the unterminated ends of the two cables as shown. Drill two holes in the end of the shield can about 1/4 inch up from the board side and towards the left of center as shown in the photo.



Drop the two eyelets into the holes and tack solder around the edges.

Insert the coax cables partially, one at a time. Apply solder to the shield and eyelet and when it flows, push the cable down so the outer jacket is at the eyelet. Repeat with the second cable.

Set the assembly aside.

Figure 4. After component placement.

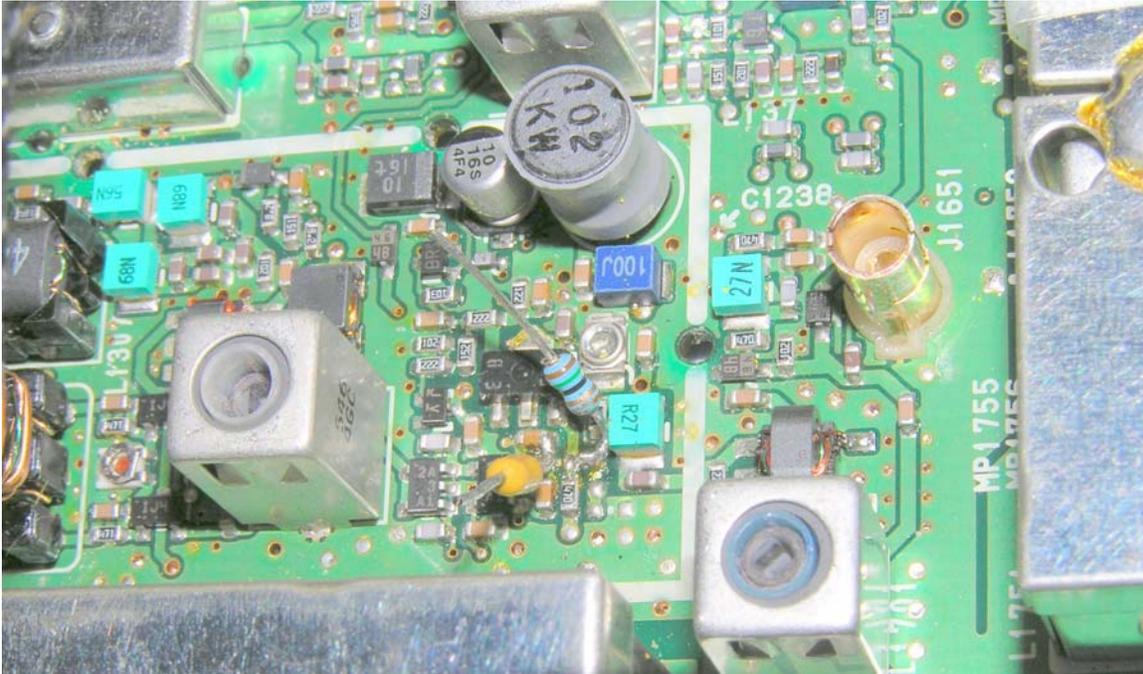


Figure 5. Mod wrapped in protective sheet and inserted into the opening in the radio.

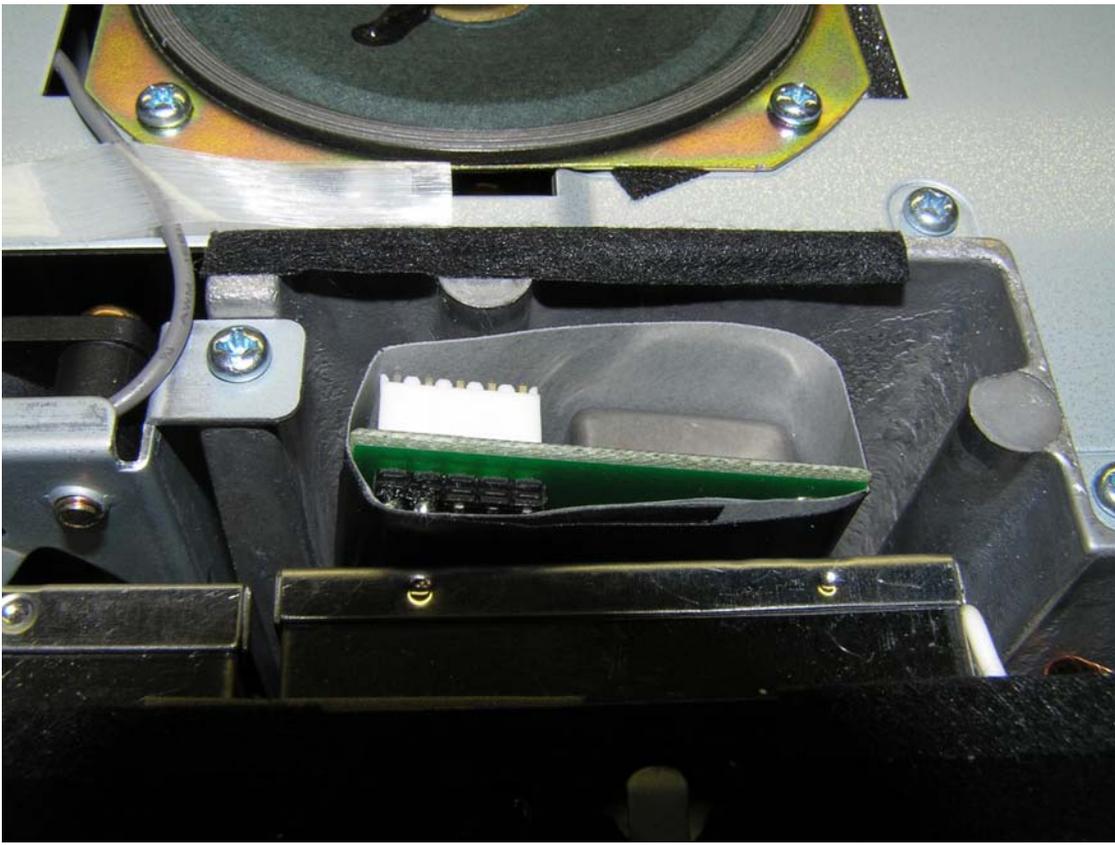


Figure 6. Locating the B+ and Ground connections on the Main Unit.

