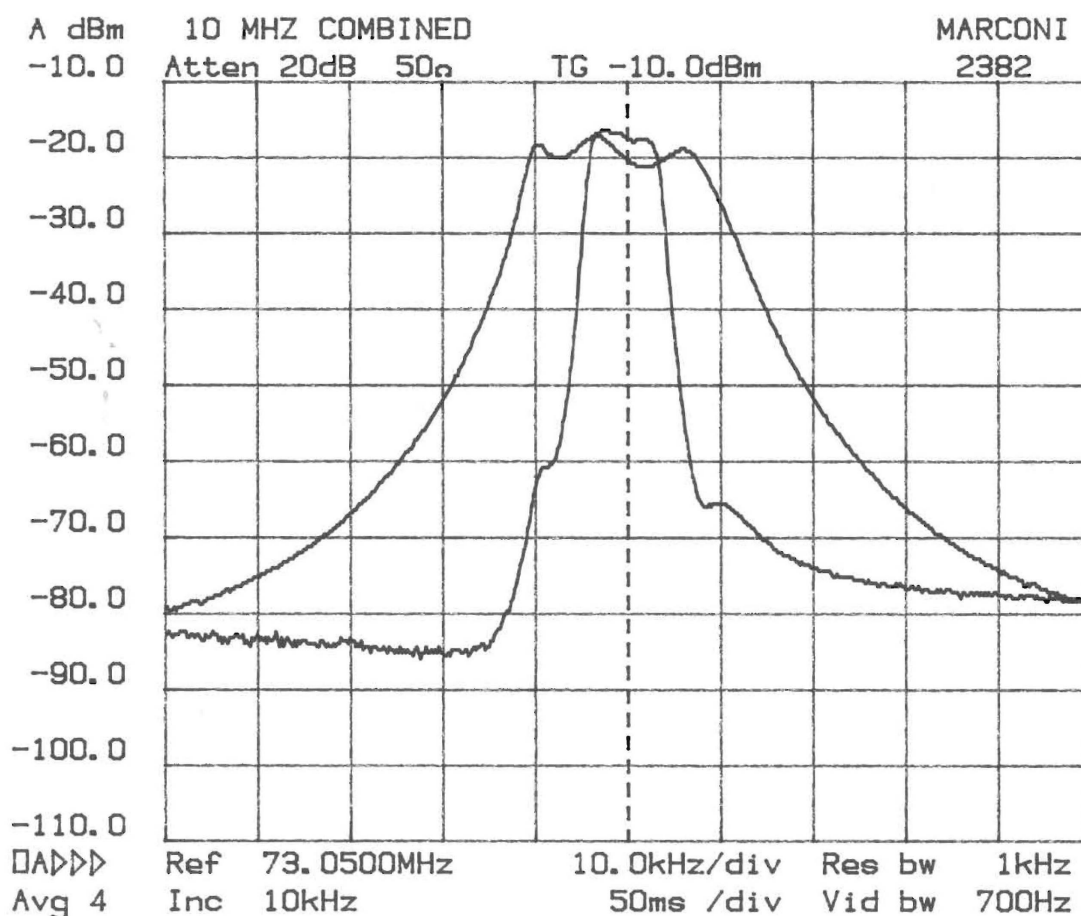


TS-870: Installing the Inrad Roofing Filter Mod

The TS-870 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 with the Inrad roofing filter mod in place. For comparison, the OEM filter is about 15 kHz wide at the -6 dB points.



The result of the bandwidth improvement is the reduction of close in intermodulation from multiple signals. The IMD dynamic range will be improved up to 15 or more dB for signal spacings from 2 to 20 kHz. Also, the blocking dynamic range will be improved for close in signals.

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 the NB performance due to the narrower bandwidth of the mod. In practice, it may not be noticeable.

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

The overall widest bandwidth 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.

Description of Operation

The roofing filter mod inserts a narrow band crystal filter after the first mixer and before the OEM roofing filter. 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.

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 main and sub receivers. After the installation, the S meter should read about the same as before.

Preparing the Inrad Mod for Installation

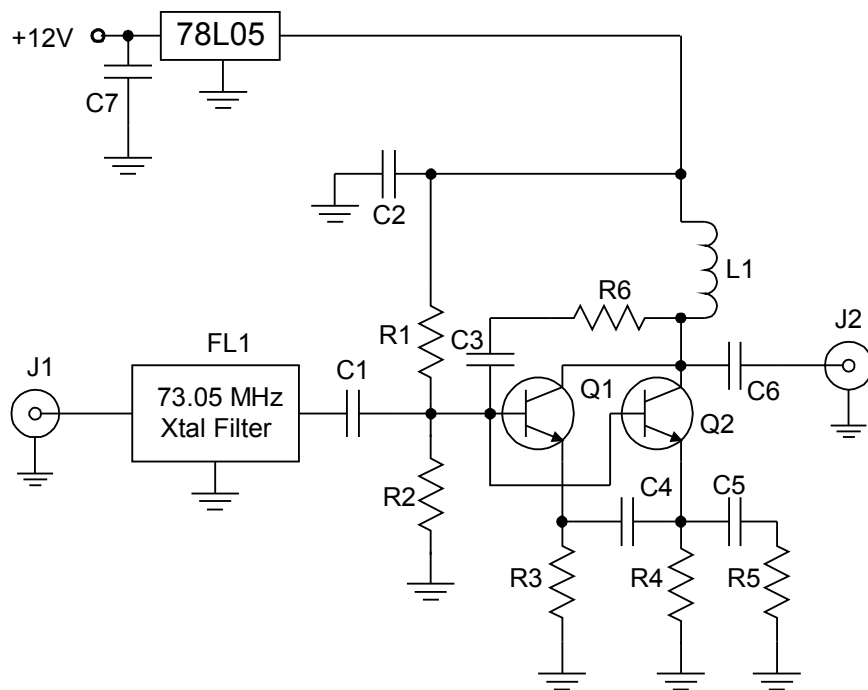
1. Prepare one side of each coax cable by stripping 1/4 inch of outer covering and shield from the end. Strip approximately 1/8 inch of insulation from the center conductor.
2. Next, prepare the opposite side of each coax cable to accept a TMP connector by stripping 1/2 inch of outer covering and shield. Strip approximately 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 1 for more information on the cable preparation.
3. Set prepared cables aside.

Preparing the Radio for Installation

If you haven't already read the instructions completely, please do so now before continuing.

1. Remove the DC power cord from the transceiver.
2. Place the radio upside down on a soft surface such as a towel, with the front panel facing you.
3. Remove the screws holding the bottom cover in place. Remove the bottom cover.
4. Remove the metal shield from the rear of the RF board on the left side.
5. Locate L65 and L67 on the left side of the RF board. This is the area for the mod once we turn the board over.
6. Starting at the rear of the RF board, remove the coax cable coded yellow from CN2.
7. Remove the plain coax cable from CN4.
8. Remove the small ribbon cable on the right side of the board from CN13.
9. Remove the 7 board mounting screws from the RF board.
10. Lift the RF board up and bend it over the front panel. Use a soft cloth or towel to cushion the board as it lies on the front panel.

11. Locate the work area between L65 and L67 on the trace side of the board. Compare it to Figure 2. Carefully remove C179. See Figure 2.
12. Examine Figure 3. The hot wire of the coax cable going to J1 on the mod is connected to the terminal of L65 which went to C179. The pin on L65 is a good place to solder it. The shield is connected to the nearby ground pad.
13. Examine Figure 3 again. The hot wire of the coax cable going to J2 on the mod is connected to the terminal of L67 which went to C179. The pin on L67 is a good place to solder it. The shield is connected to the nearby ground pad.
14. Check that the soldering is secure before turning the board over. Dress the wires to exit in the space between the RF and IF boards.
15. Solder the white wire to the center pin in a group of 3 on L65 as shown in Figure 3.
16. Reverse the removal procedure to reinstall the PC board.
17. Solder the other end of the white wire to the +12V pad on the mod board. Ground will return through the coax shields.
18. Replace the shield.
19. Figure 4 shows the installation of the mod assembly. The two stick down board mounts should be inserted as indicated in the figure. It will be easier to position the mod board if the ribbon cable and other wires are temporarily held out of the way.
20. Insert the standoffs into the two holes in the mod board.
21. Position the mod board with J1 on the left side. Plug in the two coax cables. The one from L65 goes in J1 and the one from L67 goes in J2.
22. Replace the ribbon cable and the other wires
23. Check your work. Replace the bottom cover of the radio.



C1,2,3,4,5,6	0.1uF
C7	0.47uF
L1	2.2uH
R1	3.9K
R2	2.2K
R3,4	68
R5	12
R6	220
Q1,2	MPS5179

TS 870 Roofing Filter Mod

W2VJN 9/14/2009

Parts List

- Assembled Inrad 117 board
- 2 RG-178 coax cables, 9" each
- 2 male TMP connectors
- White wire 9", #24
- 2 board mounts, Mouser 561-LAD187

Figure 1. Preparation of coax cable.

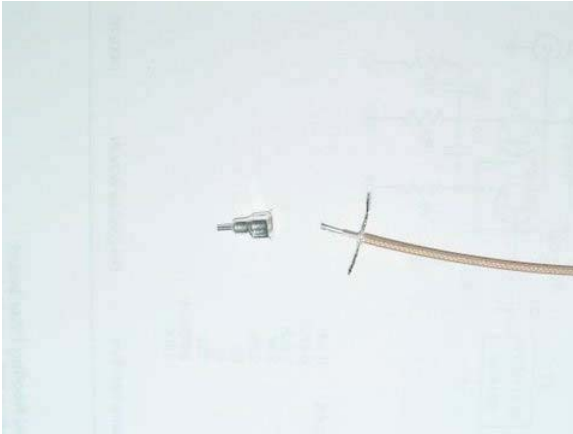


Figure 2. Area for modification. Bottom of pc board.

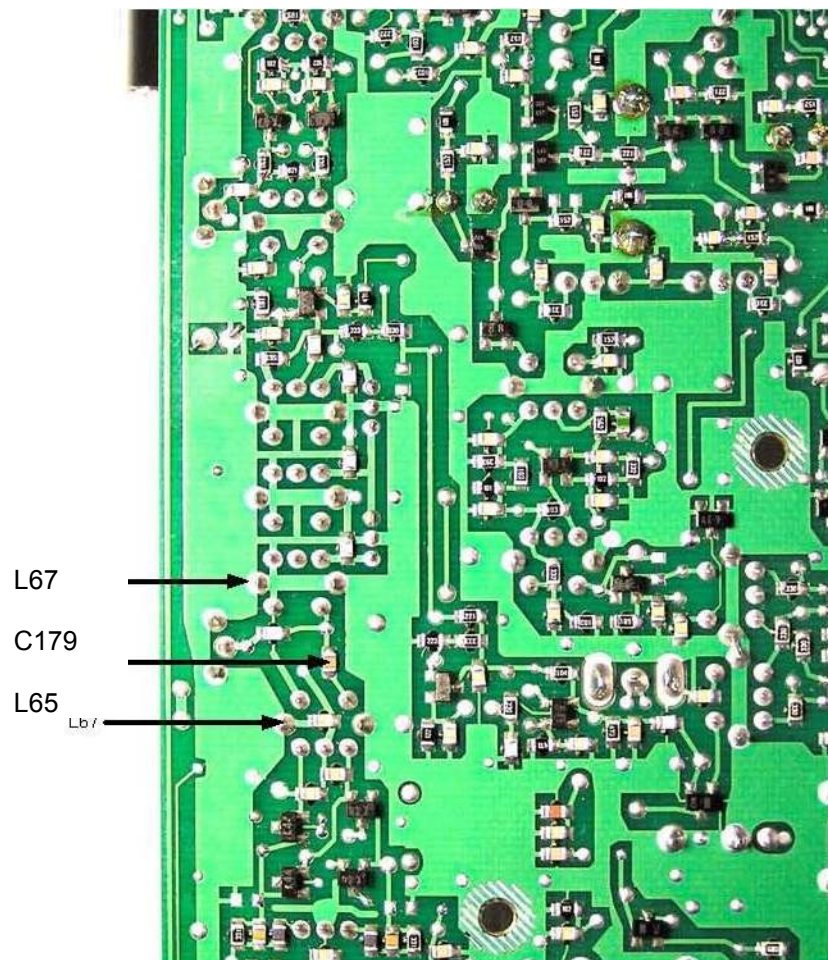


Figure 3. View of the board modification.

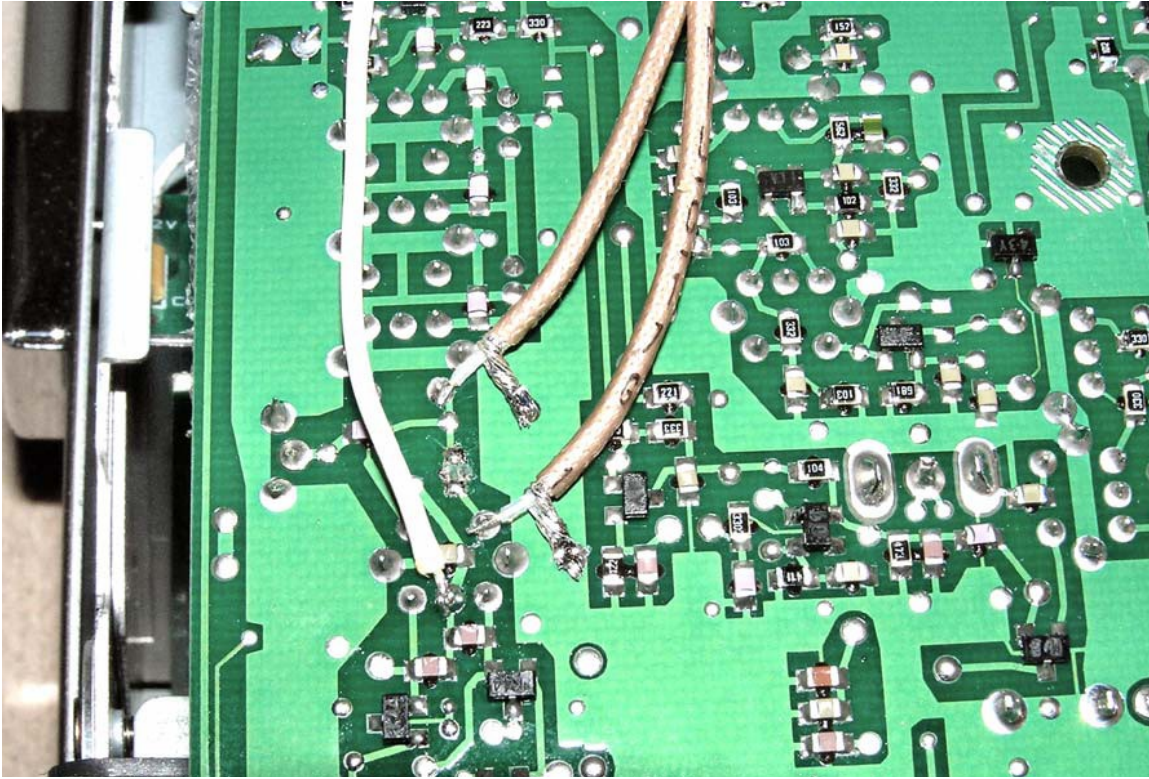


Figure 4. Completed mod.

