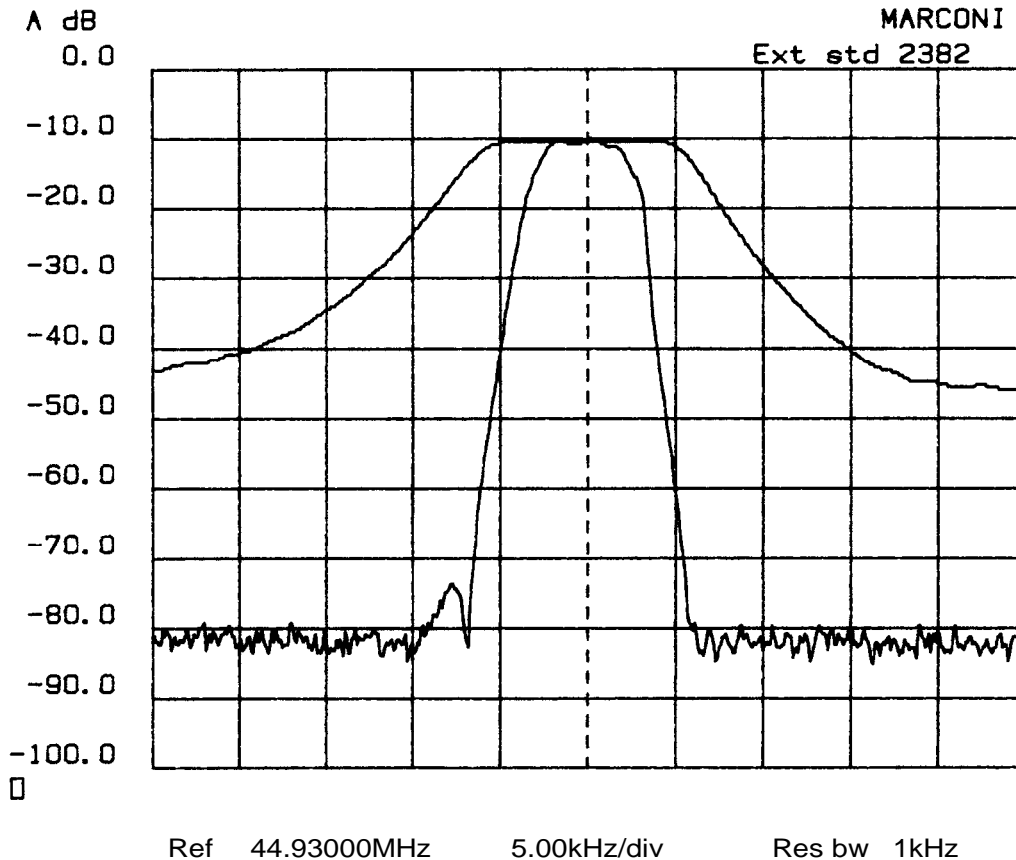


TS-930: Installing the Inrad Roofing Filter Mod

The TS-930 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 override the filter insertion loss, plus an additional dB or two.

The plot below shows the sweep frequency response of the front end and first IF filter in a TS-930 radio. The wider curve is the OEM response and the narrow curve is with the Inrad roofing filter mod added. In the TS-930, the most important part of the roofing filter characteristic is from the pass band down about 35 or 40 dB on each side.



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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 5 to 10 dB for some signal spacings. The main receiver audio response will be reduced about 100 Hz in the SSB mode. Operating the noise blanker will not result in as much degradation of the dynamic range.

1. What can you expect from this mod?

Less IMD in crowded band conditions, particularly from stations at offset frequencies of 2 to 10 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.

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

No, as the overall widest bandwidth of the receiver will be determined by the roofing filter, which is about 5 kHz. Normal 2400 Hz SSB will not be affected.

Description of Operation

The Roofing filter mod inserts a narrow band crystal filter in between the RF assembly and the IF or Main board. An amplifier is included to compensate for the filter loss and to provide a small amount of excess gain. 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. The excess gain slightly improves the noise floor of the radio. During transmit operation the amplifier and filter are removed to allow the signal to pass in the other direction from the IF to the RF assembly.

Installation Instructions

Warning: Modern radios contain components that 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.

Note: If you have a known test signal available before you start, note the S meter reading. After the installation, the S meter should read the same.

1. Remove the AC line cord from the transceiver.
2. Remove both top and bottom covers.
3. Limited space on the bottom side of the radio makes installation of the roofing filter almost impossible. Because of this, the roofing filter will be mounted on the top side of the radio. There is space between the final unit and the antenna tuner. With the radio top side up and the front panel facing you, the final unit is the large shielded assembly in the right rear of the radio. If your radio has an antenna tuner installed, it is in front of the final unit towards the panel on the right side. The roofing filter will be mounted with double stick tape to the front surface of the final unit. See the photo. If your radio does not have the antenna tuner installed, you may use the plastic standoffs to mount the roofing filter.
4. Prepare the roofing filter for installation by soldering the red and black wires to the +12V and GND pads respectively. Insert the coax cables into J1 and J2. Be sure they are firmly seated because if they should come loose it will be very difficult to replace them after the mod is in place. Examine the solder side of the pc board. Make one of the cables to identify after they are pulled through to the bottom of the radio. Trim wire ends on the board down to the solder pads. Any protruding wires may short to the chassis. Apply the double stick tape to the solder side of the mod pc board.
5. Position the mod approximately in place and feed the four wires through the hole in the chassis near the right end of the chassis between the two assemblies. When you have the mod ready, remove the safety paper on the double stick tape and press it in its final position. See Figure 1.
6. Turn the radio over for access to the bottom side. With the front panel facing you, note the small sub assembly fastened to the left hand side of the chassis wall. This is the RF unit. Remove the four screws holding it in place.
7. Carefully turn it so that the coax cables connected to it become visible. Note the short coax coming from the front edge nearest the front panel. The marking says RIF or IF1, depending upon serial number, and it connects to the Signal Unit a short distance away which is marked RIF. Remove this cable.

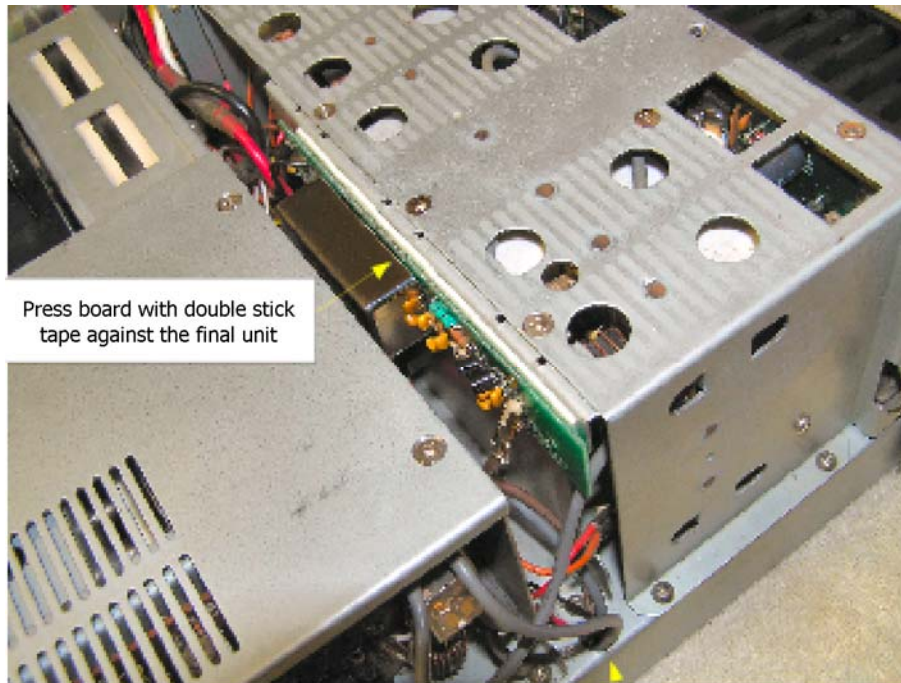
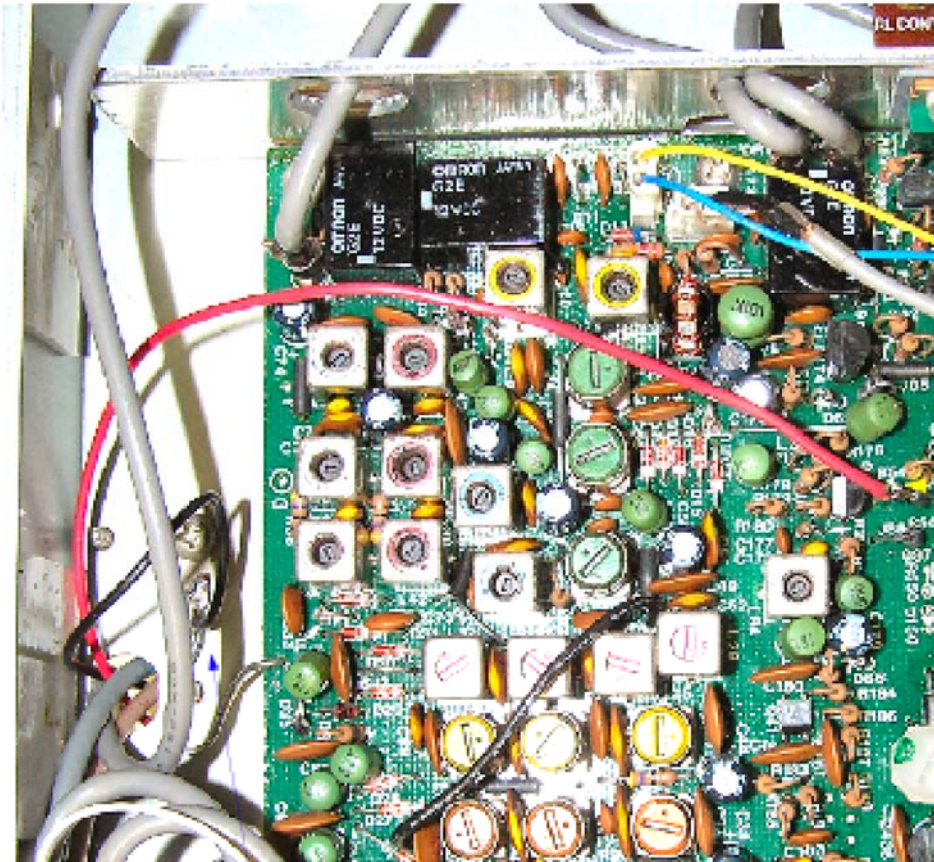


Figure 1

Route cables through this hole

8. Insert the coax coming from J1 on the Inrad board into the RIF or IF1 connector on the RF unit.
9. Insert the coax coming from J2 on the Inrad board into the RIF connector on the Signal Unit.
10. Dress the two coax cables along the chassis underneath the shield so they will not interfere with the RF unit mounting. Replace the RF unit and fasten the four screws.
11. Strip 1/8 inch of insulation from the black wire. Solder to the ground lug near the RF Unit. Cut to fit if it is too long. See figure 2.
12. Strip 1/4 inch of insulation from the red wire. Tin and form a hook on the end. Locate Jumper J87, and hook the red wire on the top of it. Solder. See Figure 2.

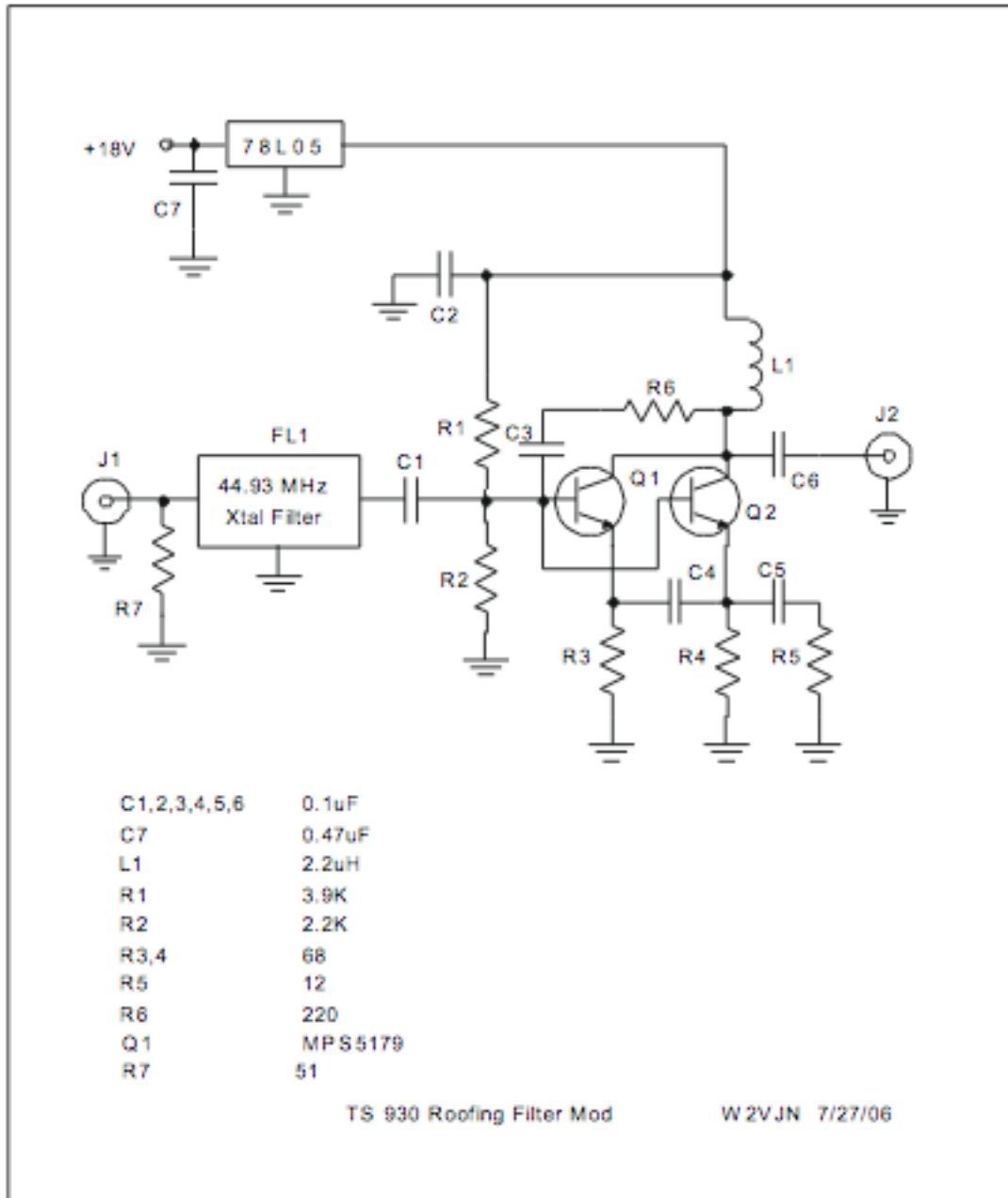
This completes the installation. You may want to connect an antenna and test the radio to be sure you are receiving signals before reinstalling the covers.



Top of
J87

Ground lug

Figure 2



Parts List

- Modified Assembled Roofing Filter board (Inrad 117-930)
- 2 Coax cables 14"
- 4.5" Double stick tape
- 2 Board mounts
- Red and black #24 wire - 11"