R-390A Roofing Filters

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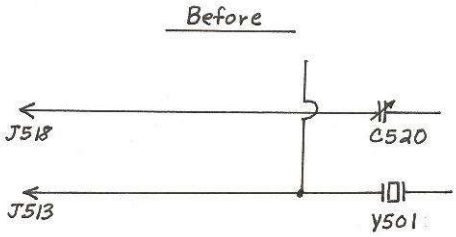
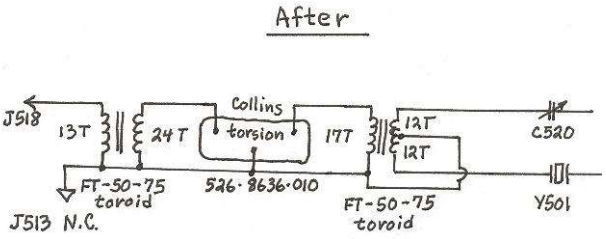
There are two reasons to put a roofing filter in an R-390A: (1) to improve the close spaced 3rd order intercepts, and (2) to provide a more appropriate wide AM bandwidth. The close spaced 3rd order intercepts for 2, 4, 8, and 16 kHz BW's without a roofing filter is about -20 dBm, which can definitely cause 3rd order intermod in high RF environments. With a 6 kHz BW roofing filter placed at the input of the IF deck, the close spaced 3rd order intercepts are improved to better than 0 dBm. The 8 and 16 kHz BW's are too wide for general AM listening in most cases, so a 6 kHz roofing filter kills two birds with one stone.

You could put a roofing filter in the RF deck, immediately after the 3rd mixer, and the performance would be the same. But removing and reinstalling an RF deck is an order of magnitude more difficult than removing and reinstalling an IF deck. Since the signal path from the RF deck to the IF deck is via two minicoax cables and two quick release miniBNC connectors, you could implement the roofing filter external to the IF deck, provided you had appropriate connectors. But it seems simpler to put it in the IF deck. The general idea behind the mod is quite simple. Below are "Before" and "After" schematics for the mod that I do.





This mod is designed for 2000 ohm source and load filters, so you could also use a 6 Khz ceramic filter, like the LF-H4S which typically has a 6.5 kHz BW. But I would recommend a so-called low cost Collins torsion filter (they are definitely not low performance). The part number above is for the old style low cost torsion filter (with a metal case). Contact Collins filter division for current prices and availability of low cost

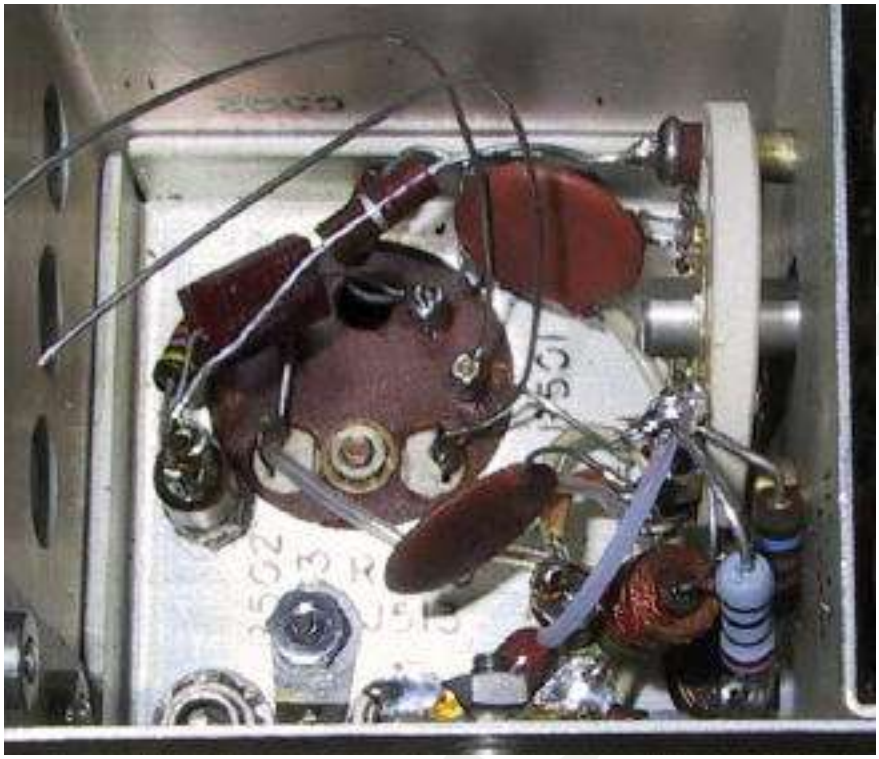
torsion filters. The last time I checked prices, they were about $100 each.

If you look at an R-390A schematic, you will see that the 1st 455 kHz IF transformer (immediately after the 3rd mixer) has a high impedance LC tuned primary, and untuned push-pull outputs which are connected to the IF deck through minicoax using miniBNC connectors. I measured the output impedance of each output as about 600 ohms. To match 600 ohms to 2000 ohms requires a turns ration of about 1.826 (the square root of 2000/600), which is closely approximately by 13 to 24 turns (24/13 = 1.846). In the original R-390A circuit, the push-pull output of the 1st 455 kHz IF transformer worked into a high impedance load. Presumably the number of turns in the output windings of the 1st 455 kHz IF transformer were not chosen to match impedances (since the impedances were not matched), but to establish the desired signal level at the input to the IF deck. The 17 to 12 + 12 turn center tapped output transformer is an artifact from a previous roofing filter design and perhaps could be improved upon (a few more turns on the output? ... a few less?), but it seems satisfactory, so we have left well enough alone. Trying to use high a impedance standard size Collins mechanical filter is probably not a good idea because it would require more complicated impedance matching and it would be difficult to fit everything in the available space. The photos below illustrate the space constraints.

The PC Board Length Is About 2" Or 5.5 CM

In the photo below the two wires from J513 to Y501 and from J518 to C520 have been removed, two long #22 solid tinned copper wires added to the Y501 and C520 lugs, and a ground lug added between J513 and J518. Two shorter wires with Teflon insulation will be added to J518 and to the ground lug; these two wires will be soldered to one end of the PC board. Teflon insulation of an appropriate length will be added to the two longer wires which will be soldered to the other end of the PC board.

A 100 ohm half watt resistor has been added in parallel with R504 560 ohms to recover the filter mod insertion loss.



IF Deck Rear Compartment Prepared For Filter Board

Completed Roofing Filter Mod

Observe that the PC board is slanted from front to back and from top to bottom. It is probably not feasible to use a larger filter for this mod.