R390A Filter Mod 2 ... by Dallas Lankford

Before

PC Board Layout (bottom view)

After

T = 24 turns, center tapped, and 17 turns, #24 enameled copper wire, on Amidon FY-90A-65, toroid wrapped with teflon tape

Crystal filter to outputs on PC board (continual inputs to these legs)

more C505 and/or C506 as necessary

view of crystal filter comparison on chassis

add two 24% long insulated #22 solid tinned copper wires for inputs to PC board

add two 3/8" long insulated #22 solid tinned copper wires from crystal filter lugs to outputs on PC board

Crystal filter run from J510 and J515

LF-HFS ceramic filters are available from Kona Electronics, Attn. Craig Siegelheifer, 612 South 14th Avenue, Yakima, WA 98902, (509) 455-8429 for about $15.

Several things caused me to eliminate the R390A ceramic filter module. First, I never liked the idea of modifying the chassis because any capacitors or adjustments to the module required removal of the RF chassis, a time consuming process. Second, any changes to the module, such as developing a noise blanket, would be difficult for the user. And third, trouble shooting the RF chassis could require removal of the module, which again was difficult.

A much better place for adding such filters is at J510 and J515, where the RF output of the last IF transformer (on the RF chassis, following the last mixer) enters the IF board. But when I did the first filter module, I added a 1000 pF output impedance for the R390A last IF transformer. I developed impedance matching broad transformer formulas for 2000 ohm source and load filters, implemented my design, and found that it worked as well as my first filter module. This mod, called mod 2, is shown above.

There is not much available space in the crystal filter compartment of the RF chassis. So I decided to use a tiny LF-HFS ceramic filter. The total number of parts required was four: the filter, two broadband matching transformers, and an IC board. Everything fit neatly in the tiny 5/8 by 1 1/2 inch RF chassis. In my first mod, there is considerable loss with this module, because the crystal filter is inside the chassis. For the first mod, signal loss was reduced by adding a 100 ohm half watt resistor in series with the crystal filter, to reduce the gain of the last IF amp.

As with the first mod, and for the same reasons, close-in (within 500 kHz) dynamic range of the R390A is improved for non-crystal filter headphones, with some improvement on signal spacing becoming closer. For one RF chassis, the output LF-HFS ceramic filter in the 1-5 MHz range was improved from 10 dB to 12 dB, while for another RF chassis, the improvement was even greater, to 20 dB. Apparently there is considerable variation in the potential LF-HFS improvement from one RF chassis to another. A third RF chassis was created, and the improvement in LF-HFS was to 42 dB. So it seems that 42 dB is typical of the LF-HFS improvement.

It appears feasible to use a Collins torsion filter for this mod, but larger a RF board, more parts, and a different mounting arrangement would be required. For these reasons, a torsion filter was not used.

The measured characteristics of a typical LF-HFS ceramic filter module are as follows:

- Input impedance: 50 ohms
- Output impedance: 400 ohms
- Bandwidth: 10 kHz
- Maximum insertion loss: 10 dB
- Minimum insertion loss: 5 dB
- Maximum rejection: 40 dB
- Minimum rejection: 10 dB
- Maximum spurious response: 60 dB
- Minimum spurious response: 30 dB
- Maximum distortion: 1%
- Minimum distortion: 0.1%
- Maximum noise figure: 15 dB
- Minimum noise figure: 5 dB

The LF-HFS ceramic filters are designed for use in Collins receiver modules, and are not intended for use in most other receivers. The LF-HFS ceramic filters are not intended for use in Collins receiver modules, and are not intended for use in most other receivers.