Collins S-line Replacement Filters

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Update:

As most of you know, the Collins S-line gear has been holding their own in value for many years. As time roles on, the availability of parts has become a chore for many of us that want to have their gear running in top shape. The filters for SSB, A.M. and CW are one of the most expensive to replace these days, this can make or break the enjoyment of owning a Collins S-line. Well, thanks to Trey and Mark at INRAD, there are replacement filters available at a reasonable price. NOTE: Now INRAD is owned by Vibroplex. The filters have various bandwidths and are mounted on circuit boards with other components so they can plug right into the 73S-3 series receivers, see figure 1. This takes care of the receivers, but now what about the 32S-3 series transmitters, they don't have that luxury and are more involved in replacing, if they go bad.

Solution:

I want to start out talking about the article that Rob Sherwood (NC0B) did in the September 2009 (#244) of ER. Rob got things going when he discussed how an INRAD filter could be used in a 32S-3 series transmitter and there were many folks wondering what ever happened after the original article. INRAD has come up with something that should work very well thanks to Rob's article.

The stock filters have a 'balanced' output. The INRAD filters by themselves are 'unbalanced' with a common ground between the input and output terminals. So now INRAD has come up with a solution to solve this with a toroidal transformer and various parts to completely replace a stock 2.1 kHz filter in the transmitter and make it like new again with their new 2.0 kHz (2.1 kHz really as you will see). If need be, you can increase the bandwidth to 2.5 kHz or 2.9 kHz with their newer wide filters. The filters are manufactured in a plastic case and are easily mounted in the 32S-3 transmitter and as you will see, not hard to install.

Parts Included For 2.0 kHz Bandwidth:

1- Instructions with pictures
1- INRAD #720 filter 2.0 kHz 1.9:1 shape factor 8-pole
1- Toroidal Core
2- feet of #28 bifilar wire red and green
1 - 75 pfd silver mica cap

1- 2 k ohm resistor
1- 10 ufd cap
2-100 pfd silver mica caps

The original 2.1 kHz filter is a solder in type. The late 32S-3A (RE) transmitter uses a plug in type filter like the late model receivers do. The Original Equipment (OEM) 'carrier oscillator' crystals for Lower Side-Band and Upper Side-Band are still used for the new 2.0 kHz (#720) filter. When going to the 'wider' filters 2.5 kHz (#706) and 2.9 kHz (#726), then the 'carrier oscillator' crystals have to be replaced in both transmitter and receiver to set the carrier set-point correctly. Now this will also let you transceive on frequency with the wider filters. Since the new crystals are very close to being on frequency, I did not find a problem with the new ones being far off for transceiveing, a few cycles was noted. The new crystals are provided with the 2.5 kHz and 2.9 kHz kits from INRAD.

NOTE: the 'Upper Side-Band' vfo adjustment has to be re-done also with the 'carrier oscillator' crystals being replaced.

The 'carrier oscillator' crystals are listed below in the order starting from the stock type to the rest as the bandwidth is increased.

2.1 kHz and new 2.0 kHz (#720) = 453.650 LSB and 456.350 USB (same OEM crystals).

2.5 kHz (#706) = 453.450 LSB and 456.550 USB New crystals with kits.

2.9 kHz (#726) = 453.250 LSB and 456.750 USB New crystals with kits.

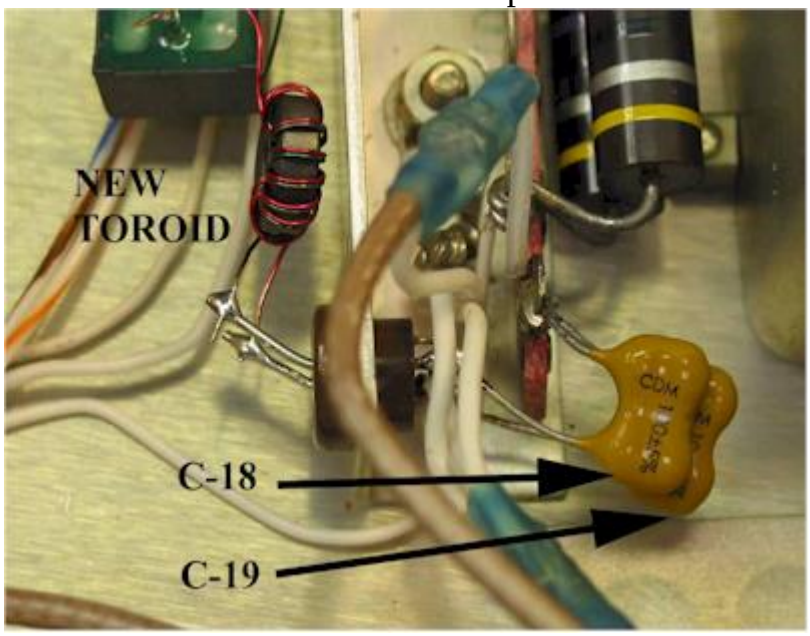
Getting Started:

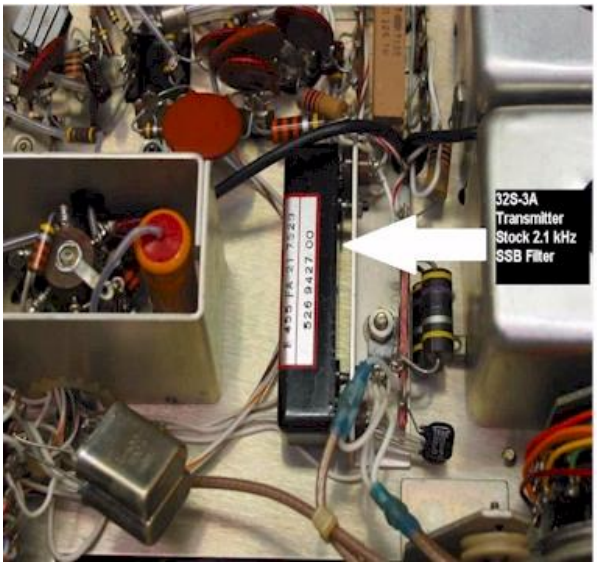
I made sure the alignment for the 75S-3C receiver and 32S-3A both round emblem (RE) were done to factory specs. I also took sweeps of the stock 2.1 kHz transmit filter using a B&K audio sweep generator and RIGOL Model DSA-815 T/G Spectrum-Analyzer. I wanted to get a real good test with the microphone amplifier and balanced modulator into the filter for the best picture of what is really happening in real time. I can store the original stock 2.1 kHz filter sweep in a memory and in its' own color, then sweep with the new filter and put it in another color and superimpose it on top of the original and see the difference, what a great way to compare filters, the set up can be seen in Figure 2.

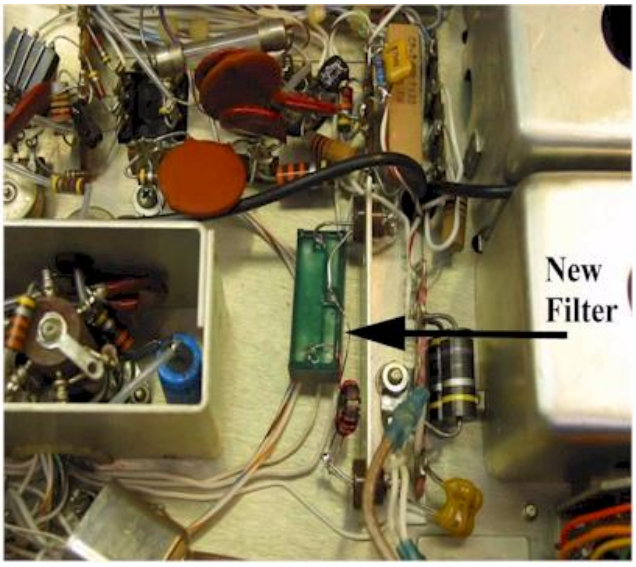
The INRAD kits include instructions for winding the toroidal transformer and also installing new components to help with making low frequency response better and also the 'ripple' across the filter much flatter. I did use the original caps and no resistor to see if that was true and sure enough, the new parts do make a large difference about 2 to 3 dB. It is worth the time to do so, about 2 more hours

of work. I spent many days taking my time with all three filters and then re-installing the original 2.1 kHz filter and parts back in both radios. I have to admit, I really like the 2.5 kHz filter the best and I did notice it took a little more drive to fill the audio spectrum with the wider filters and the 2.9 kHz was the one that I had to drive the hardest.

The schematic in Figure 3 shows the filter, toroid coil and capacitors needed to complete the installation of the new filter. The pictures for the current filters that



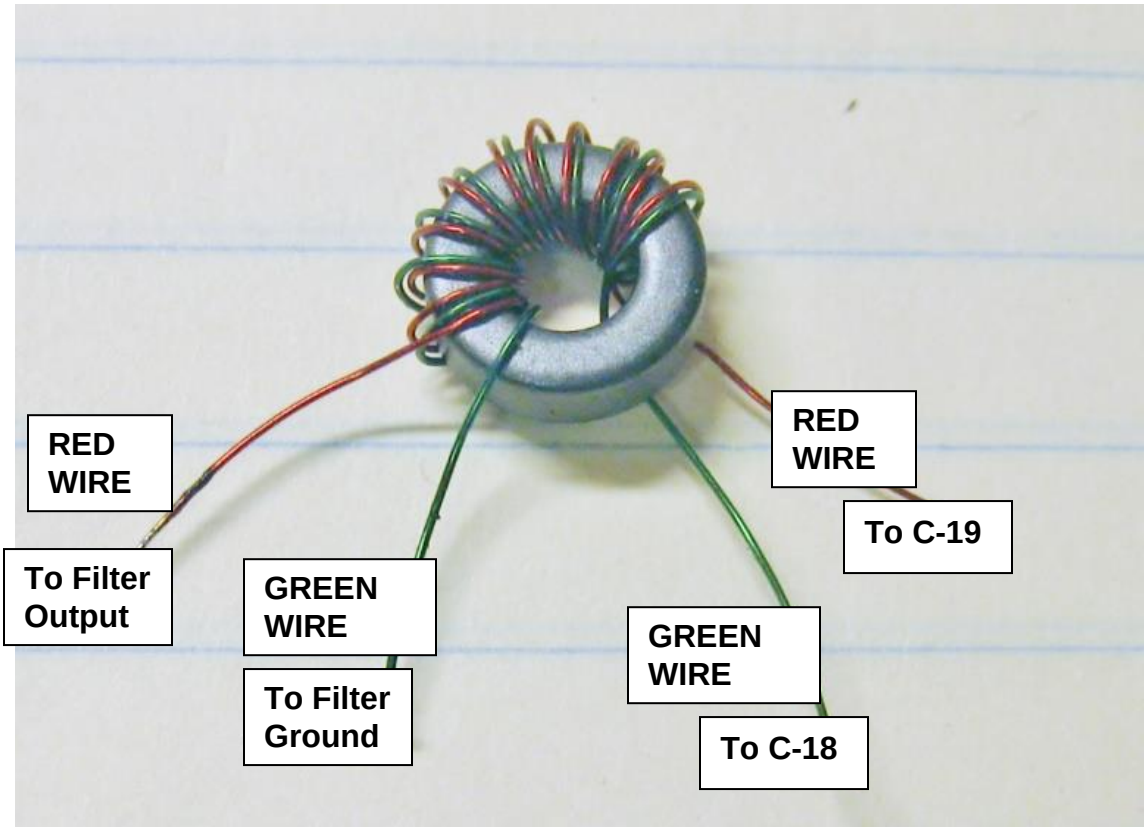


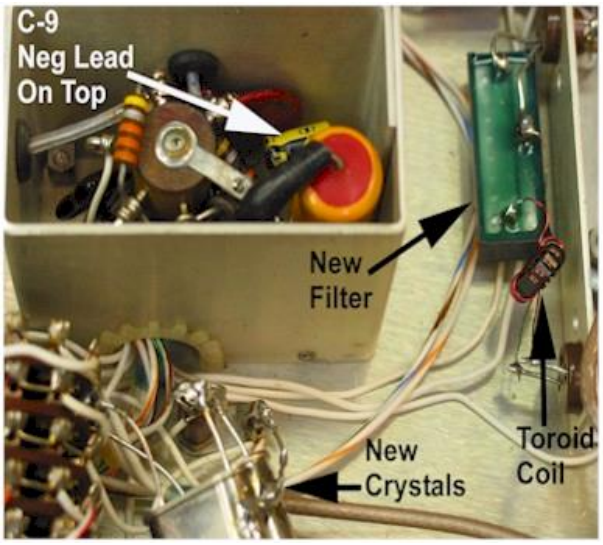


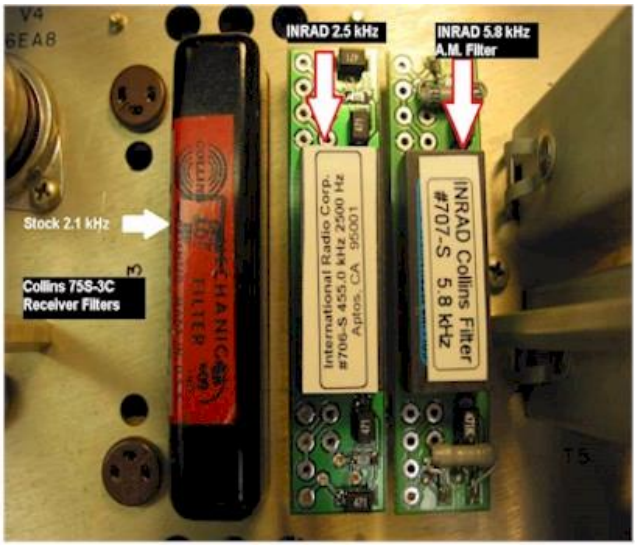
INRAD has now, are for the older models and these are being updated with the few pictures I have from my transmitter, so they will be available by the time this article is published. I am showing how I installed the filters in the transmitter, which is a late model 32S-A (RE), to see how easy it is to install. The 'carrier oscillator' crystals are soldered in type and the cases are grounded with buss wire in the late models, see Figure 4.

Here is a picture of the toroid as pictured in the INRAD instructions. The schematic drawing Figure 3 just shows a box and I wanted you to see what it really

looked like for reference. See Figure 5 for the stock filter and then Figure 6 for the new filter and note the toroid coil. Figure 7 and 8 show the rest of the capacitors that replaced the original caps.







Spectrum Sweeps:

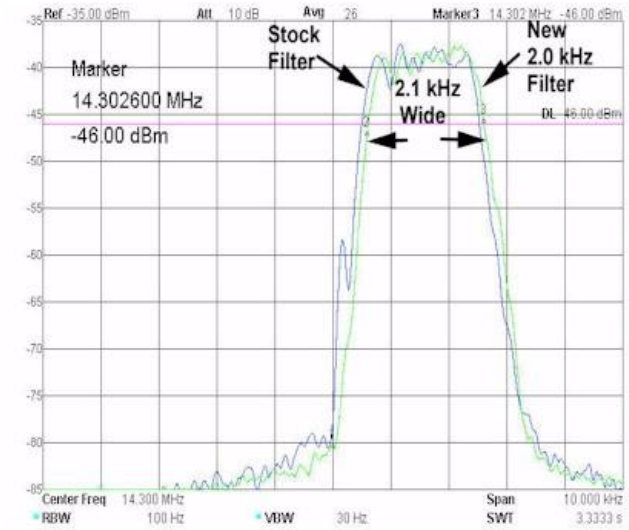
The sweeps are in the following sequence with the original stock 2.1 kHz filter, look how close the new 2.0 kHz filter is to the original at 2.1 kHz. The later sweeps show how wide you can go if you want the wide bandwidth 2.5 kHz or 2.9 kHz and you will have to change out the ‘carrier oscillator’ crystals in order to keep the wider pass-band in the correct side-band or else you will be into the

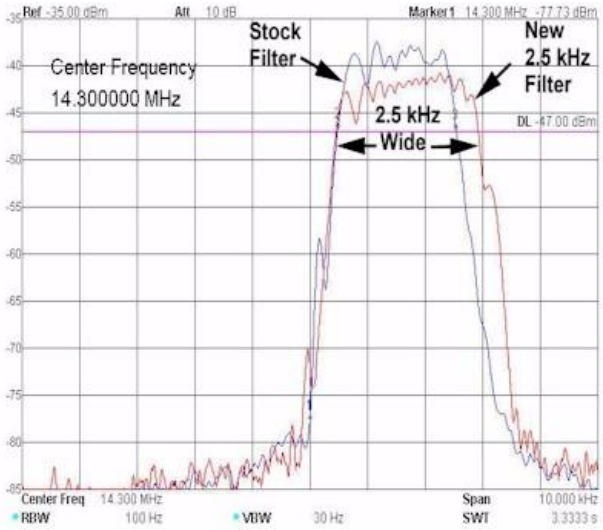
opposite side-band if not done correctly with the new crystals. As seen, the sweeps were taken on 14.300 MHz USB and note the low end of the sweeps are all about the same on all the filters, so the ‘carrier offsets’ are in line with what they should be.

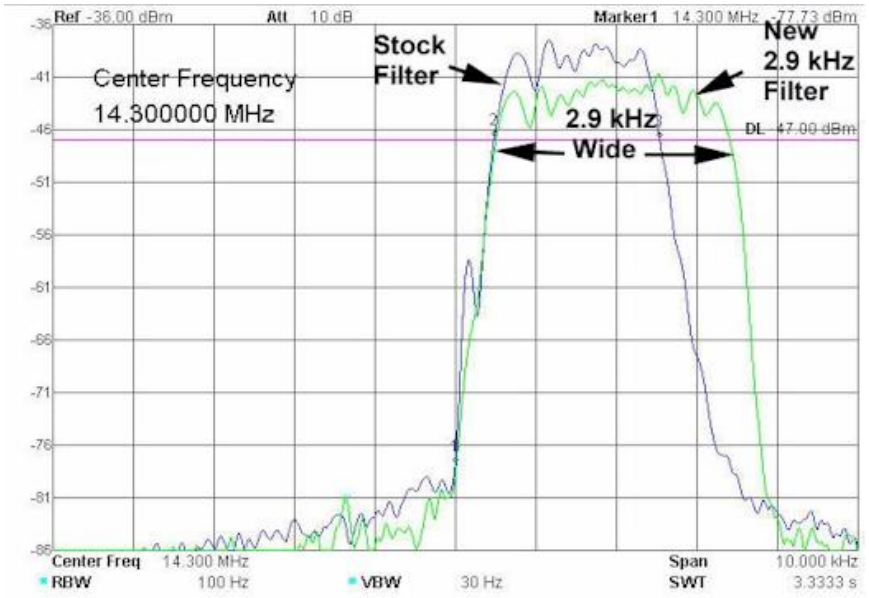
Figure 9 is the stock 2.1 kHz filter

Figure 10 is the new 2.0 kHz filter and note it is nearly the same as the stock 2.1 kHz.

Figure 11and 12 are the new 2.5 kHz and 2.9 kHz filter compared to the stock 2.1 kHz with the crystals for the ‘carrier oscillator’ installed. Note: The low end (300 Hz) can be seen on top and exactly with the stock filter as they should be with a wider response at the top end.







I hope this article will help folks in the event they have to replace a filter in either transmitter or receiver. You might try the receive SSB filter for starters and that is to order an INRAD #717 (2.3 kHz wide 10-pole) filter with a plug-in circuit board for the S-line, then you can mount this filter on its side with buss wire on the board and plug it into your 75S-3 receiver and see how nice the filter sounds. No crystals for offset needed and it sounds great. I have seen many of the 455 kHz filters go bad in servicing Collins gear for many years and usually the filters will move off frequency, have a drop in level, or just open up. This is a great solution to getting your Collins S-line back on line with a little effort.

I've had good reports with the 2.0 kHz and 2.5 kHz filters, and for those 'Enhanced' SSB folks, the 2.9 kHz should fill the bill for your endeavors. By the way, I have also done my A.M. carrier insertion mod and use the 32S-3A transmitter for A.M. and the 2.9 kHz filter does help for that, since now you're almost 3 kHz wide. One more note on the 73S-3C receiver. I did the AGC and Product-Detector mod that Rob Sherwood wrote about in the same ER #244 article and it really works well, so thanks Rob for that.

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