

Collins 500 Hz filter sub for Kenwood YG-455C - TS-830S

Written by Chris Kepus, W7JPG; installation test results and comments by Terry Wagoner, K9TW.

My TS-830S was in need of a significant amount of work that required expertise and experience beyond my skill set...not to mention the appropriate test gear that would be needed. I wanted the best possible outcome which I knew was only going to happen if my TS-830S was in trustworthy and skillful hands. After monitoring the KW forum for many years and getting to know the participants, I asked Terry, K9TW, if he would take the project. I was very happy he accepted the challenge and I am totally thrilled with the results. This document is intended to share a part of the story...specifically it chronicles how Terry worked with me to analyze, test, and install a substitute CW filter for the YG-455C. Others looking for an effective and affordable 500 Hz @ 455 kHz CW filter solution will likely find the Collins filter to be very satisfying.

I enjoy CW but my 830S did not have a 500 Hz CW filter. Another key motivator for finding and adding this filter was to be able to take advantage of the 830S VBT capability. According to the Kenwood manual, the combination of the YK-88C and YG-455C (500 Hz @ 455 kHz CW filter) offers the best overall combination (for selectivity and VBT flexibility).

Originally my plan was to acquire and send along a YG-455C with the 830S so it could be installed and checked out while Terry had the rig opened up. However, finding and buying a YG-455C turned out to be a "snipe hunt". Over the past 4 years a couple had surfaced on eBay but I was always outbid. Nonetheless, I continued to look for an affordable solution. My attitude was helped by Steve, K7PZN, who signs his emails with this saying: "Always look for a positive solution then Improve, Adapt, and Overcome."!!

Late in 2014, an eBay seller offered some 500 Hz 455 kHz Collins mechanical filters for under \$100 each that were labeled as a Yaesu XF-115C filter. Hmmm. Correct bandwidth,...correct IF,.. I wonder???.....

I got busy and quickly did research on this filter. This filter is used in several Yaesu rigs: the FT-817, FT-847, and FT-1000MP/MKS. The filter as used in FT-817 is discussed in detail at this site:

<http://www.w4rt.com/fag/fag-817.htm>. In the Filter Q&A, this information is most interesting:

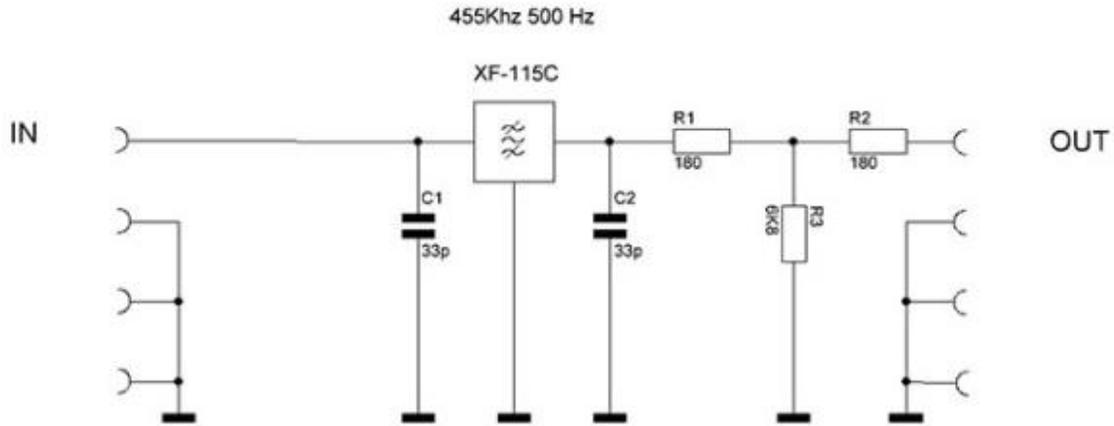
Q: "What are the characteristics of the optional CW filter for the FT-817? Do I need one?"

A: "Although the original Yaesu ad for the FT-817 on the inside-rear cover of QST clearly states that the optional filters are 10-pole Collins filters, the CW filter is actually a 7-pole filter. Yaesu has determined that the ad was in error and has corrected future ad copy. The correction first appeared in the April 2001 issue of QST. The Collins part number of the filter is 526-8686-030. The specifications that Yaesu supplied with the filter are as follows: Center Freq: 455 kHz, Selectivity (-6 /-60 dB): 500 Hz / 2.0 kHz; Poles: 7 poles, and Dim: 56x9x14 mm. The shape factor is a 4 (BW@-60 dB / BW@-6 dB). (note: other sources provide the input/output impedance for the 526-8686-030 which is 2k ohm) "

"How does the filter work in practice? Simply put, if you work CW, then this filter makes CW enjoyable with this rig. "

This was encouraging, especially since the specs compared favorably with the YG455C. I then found a FT-847 service manual schematic that showed the circuitry associated with this filter.

XF-115C for FT-847



When comparing this circuitry to the TS-830S circuitry in the narrow CW slot, it seemed like a very favorable substitute for the YG-455C. The input/output impedance for the YG-455C is 2k ohm shunted by approx 15pf.

I decided to go for it and bought some of these Collins filters....figured that if they didn't work out for the 830S, some of my 455 kHz Boatanchors could use a CW filter.

As it turned out, this filter is a perfect substitute for the YG-455C with only a single caveat which Terry discusses later. Its passband is comparable to, and in some respects, slightly better than the YG-455C.

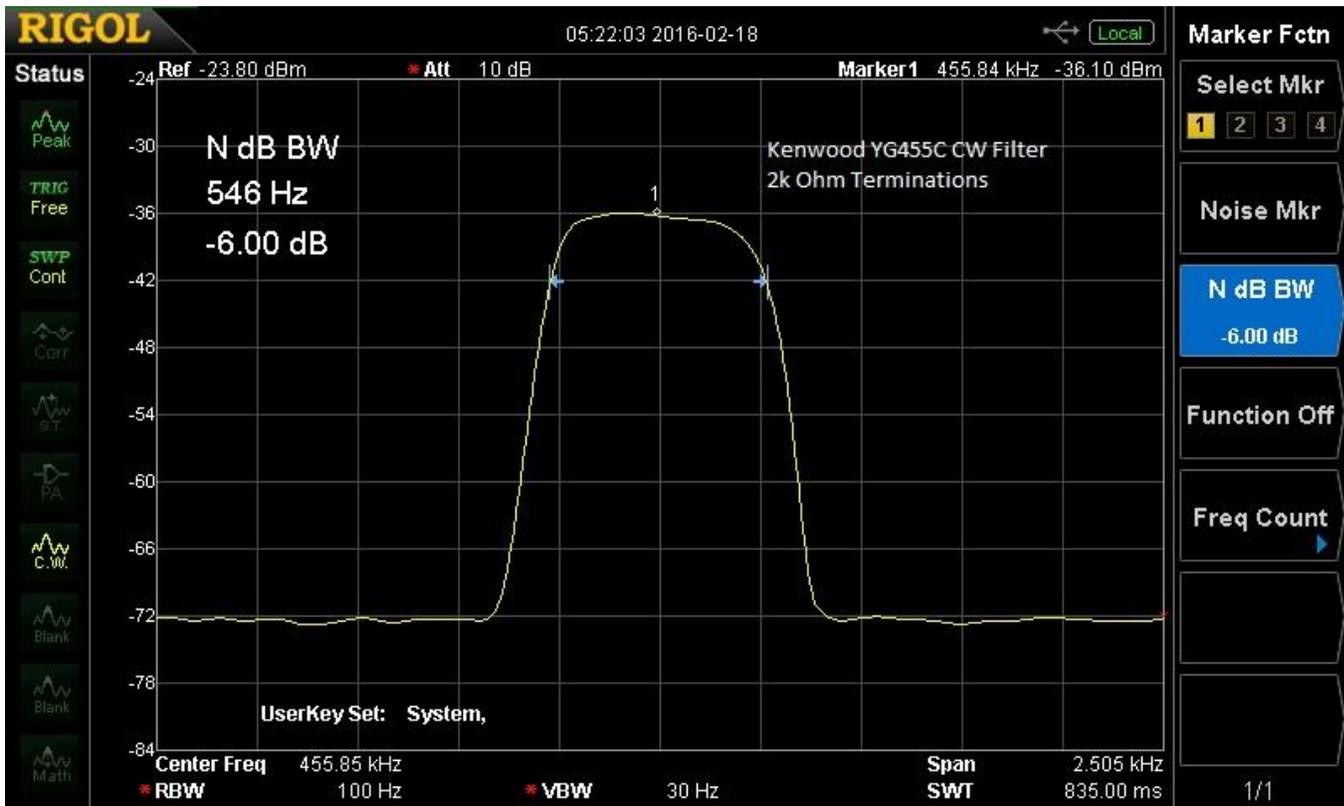
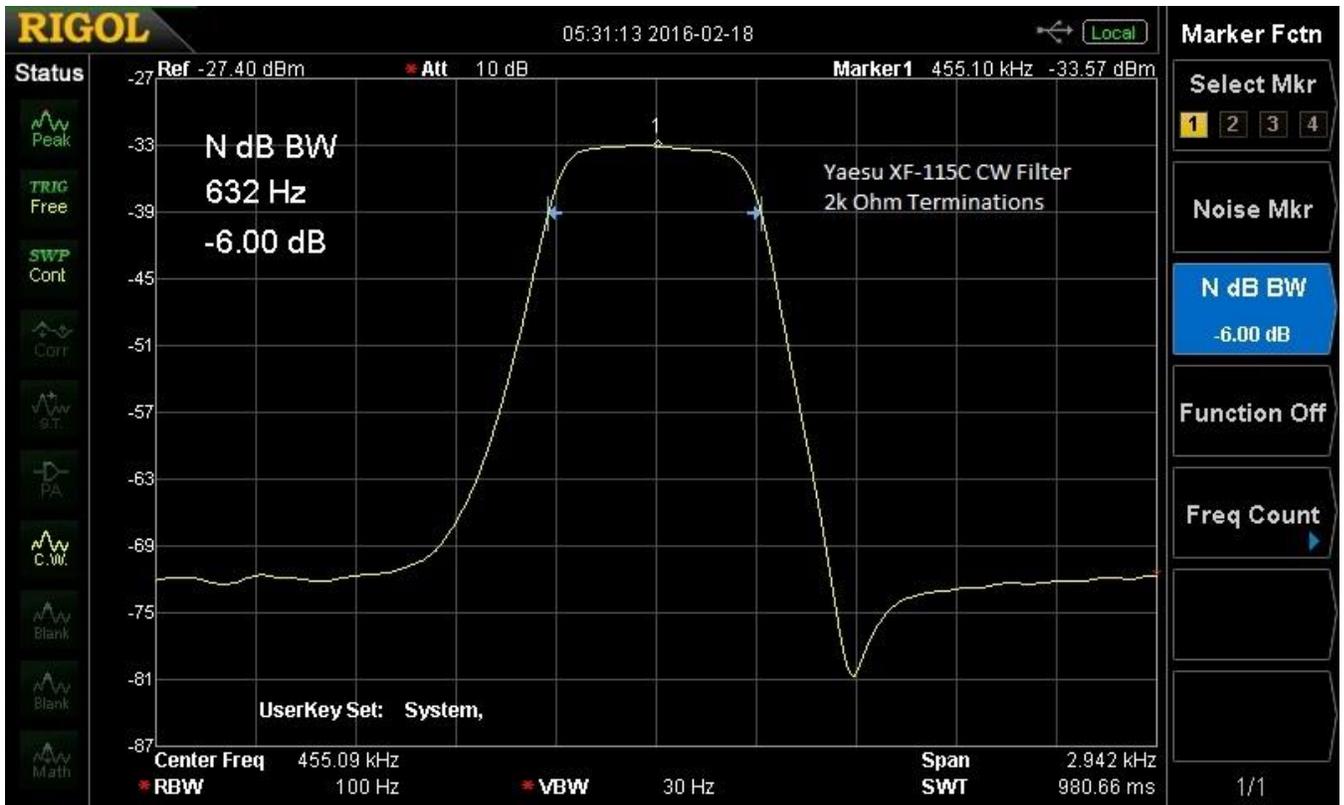
With Terry's permission, I am sharing our conversations and his observations of the filter, it's characteristics along with the spectrum analyzer plots, and pictures of it installed in my 830S.

The following is a chronological summary of our email conversations regarding the filter, which have been edited for brevity.

TW: 1/26/16

Before making a decision to proceed, Terry wanted to sweep the filter to compare it with a YG-455C.

"Here is the sweep of the Collins/Yaesu XC-115C filter and a Kenwood YG455C"



CK: 1/26/16

If I read the sweeps correctly, it appears the Collins filter has slightly less insertion attenuation (2.53 dBm). Passband ripple looks negligible with both. The Collins passband may be marginally flatter than the Kenwood.

The Kenwood is 86 Hz narrower at the - 6 dB marker and 437 Hz narrower @ -60 dB marker

Is there any consequence if the Collins center frequency is 455.10 kHz when compared to the Kenwood SSB filter? Would any additional alignment be needed to get the most benefit from the VBT when using the SSB filter / 500 Hz CW filter combo?

TW: 1/27/16

As to the filter I wouldn't hesitate to use it. Yes would be best to align the VBT. I do it in Tx mode with 2-tone test method. If you go to my website and look under Photos you will see the results. I have done it using the Service Manual Step 23 (Prime) injecting an modulated 1.9mhz into the Ant connector, but I like the 2 tone method better. By the way if you ever attempt Step 23 (prime) the acceptance waveforms are swapped. The one labeled NG should be marked as OK!.

TW and CK 1/27/16 - 2/4/16

Terry and I had a phone conversation about using the Collins filter: At this point, since Terry was agreeable to do the install, I'll simply summarize some of the key points we discussed in this call:

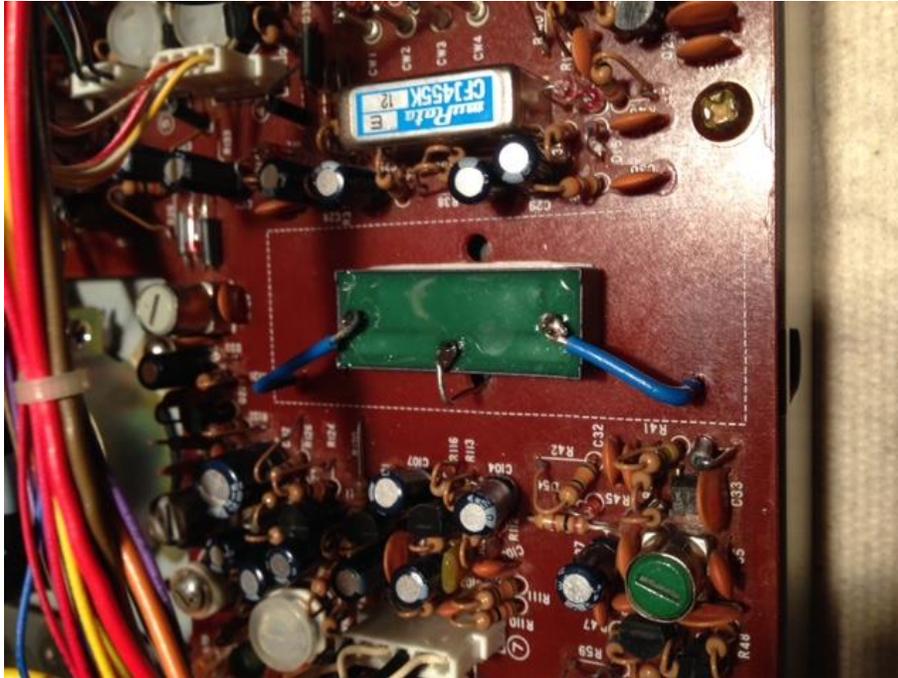
Terry suggested mounting the filter "dead bug" style using double backed tape. I agreed because in my research on mounting and installing this filter, I found nothing that would suggest issues with a dead bug mounting.

He did provide some cautionary comments:

"Have to tell you I have never installed any filters other than KW filters."

"Not sure what effect upside down mounting and short lead wires from filter pins to the PC pads would make. Lead wires would introduce a few more pf fixed capacitance than just thru hole mounting and soldering the filter pins directly to the PC board pads. Of course here's no way to do that. (CK: the Collins filter is physically much smaller than the KW filter) Probably could just install solid conductor lead wires to the filter pins and mount it right side up sort of like a big transistor, but I think better to mount upside down on double stick tape for more mechanical rigidity. Nicest way would be to use an intermediate PC board, but that also would introduce some fixed capacitance. I don't think upside down mounting would affect its operation."

TW: 2/5 Filter Install:



TW: 2/8

Alignment complete. Collins filter aligned, but we have an issue with it. (CK: this is the caveat mentioned earlier)

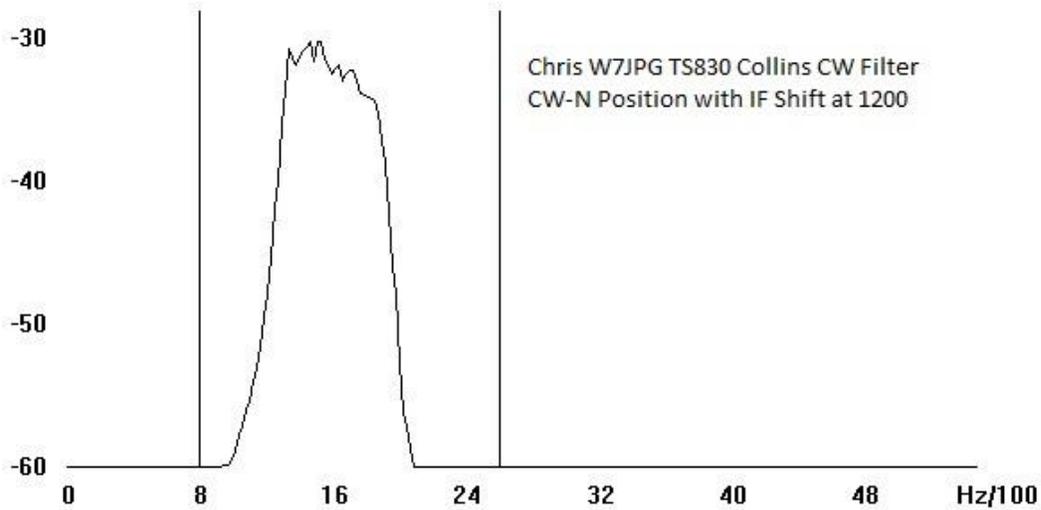
You asked in early on email if the 455 khz Fc (center frequency) would be a problem and I skipped over that question. I neglected to give it proper consideration. The KW YG455C has an Fc of 455.7khz. The result is that with the Collins filter the CW note that is in the center of the CW-N position is approx 1500 hz instead of the 800hz note that KW designed the rig for. Cannot adjust the Carrier Oscillator to shift the pass band as same Carrier Oscillator is used for USB receive and it would grossly change the USB frequency response.

I have run several Audio Spectrum analyzer plots and will attach couple here and couple more to separate email. Suggest you print all and lay in front of you for better understanding of what I am talking about. These plots show the receiver pass band and not just the narrow CW filter. KW enhances CW copy by tailoring the audio response of the Audio amplifier stage. They do this by switching in a low pass filter that rolls off the high frequencies and allows 700 to 800 hz note copy. So you are looking at overall receiver frequency response.

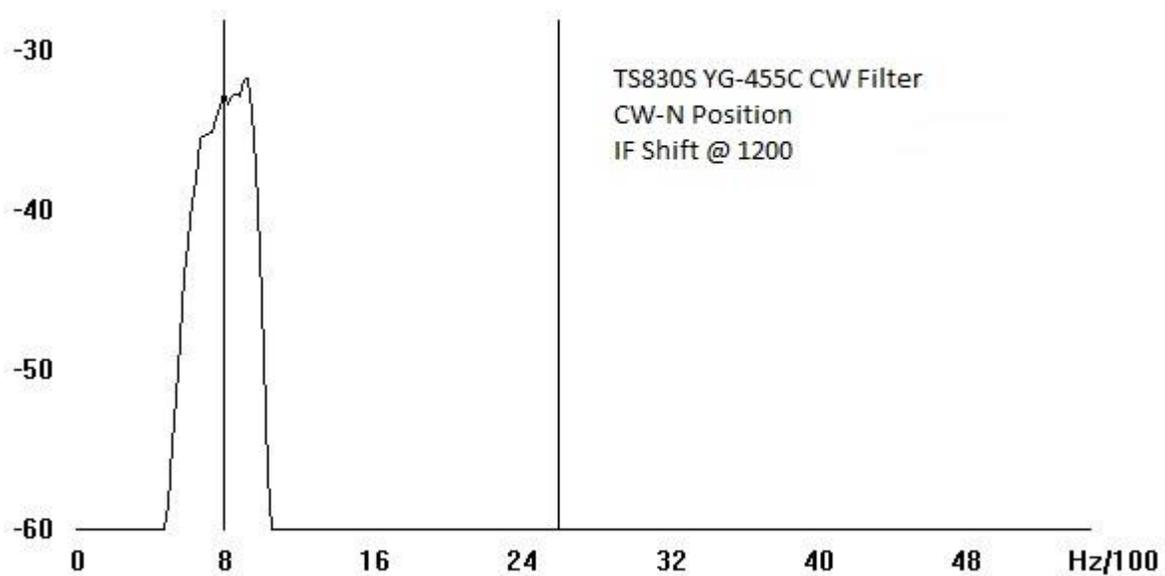
Now the good news is that you can listen to an 800 hz note with the Collins filter if you move the IF shift control CCW from its Zero or 1200 position to approx the 9:00 position. There you will have a CW-N response that mirrors the YG-455C with less ripple in the passband. I copied quite a few CW stations and it works just fine in this manner.

If it were my decision I would leave the Collins filter in and operate with it for awhile. If you find that you don't like it then you can pull it and replace with a YG-455C when you find one. You can align the 8375 VBT oscillator without test gear although better with test gear. Richard Measures has published a method using the Marker and S-meter Zero Beat method in the TS830 Survival Guide. I have tried it and it does work. Study the plots I am sending and then let me know...

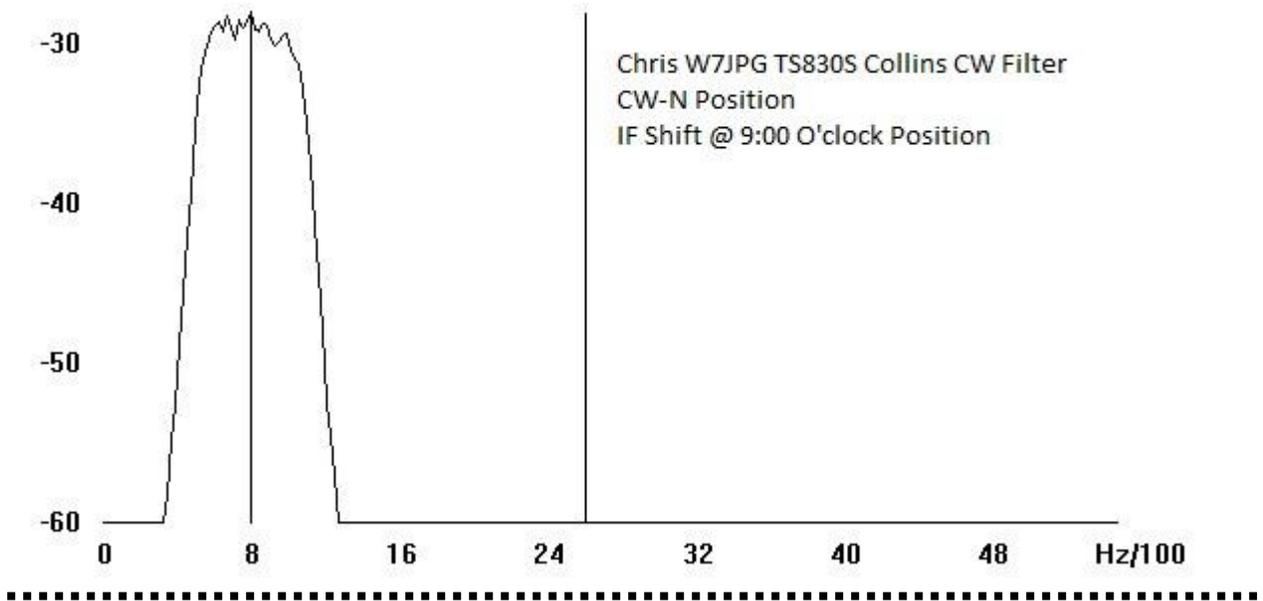
Here is the **Collins filter** with the IF Shift at 12:00 o'clock position



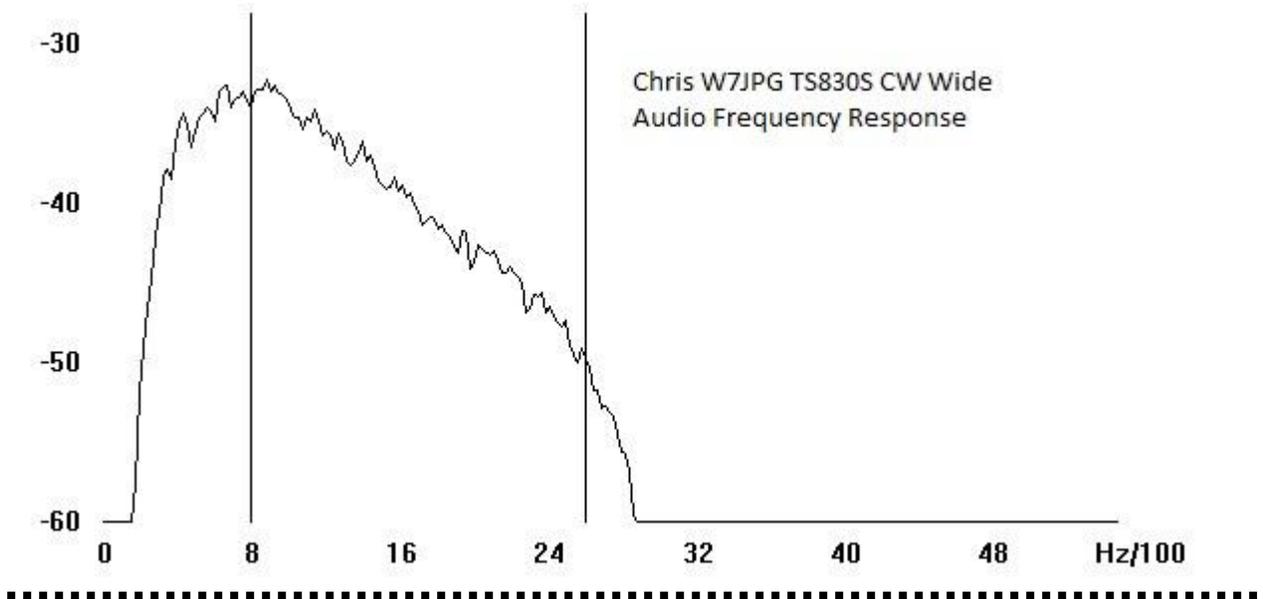
Here is the **Kenwood YG-455C** with the IF Shift at 12:00 O'clock position



Here is the **Collins filter** with the IF Shift at 9:00 O'clock position. Compare it to the YG455C with IF Shift at 1200 position that previously sent you. **The Collins filter has less ripple and better symmetry.**



Also here is your CW- Wide response. This is same as any other TS830. You can see the roll off that the switched in low pass filter in the audio stage produces.



CK 2/16:

I got back into the shack tonight, fired up the TS-830S, and tried the Collins filter so I could spend some time with it so as to be able give you a report. I was very pleasantly surprised to say the least! It is sharp! Used in conjunction with the IF shift, the system acts almost like a Q multiplier. Plus, there is little, if any, insertion loss when switched in, and, NO ringing. It is actually pleasant to listen to CW with it in

CW-N. Played with the VBT in the CW-N position and it was amazing. Used the VBT in the CW-W position and it also was very effective. It will take some additional practice time to really get the hang of it....and it will be fun to see how it does when there's a CW contest going on.

TW 2/17 (CK: this is Terry's response to my asking his permission to share his comments)

: "No problem as long as you mention that the filter Fc is 455khz and not 455.7khz so in order to listen to a 800 hz CW note must use the IF shift to bring the Carrier Oscillator to the filter and OK if someone has a question to refer them to me if they want more detail. You could also provide them with the Spectrogram response curves or I could send them to them.

I likewise found it no problem to operate using the IF shift off it Zero or 1200 position. Copied a few CW QSOs and was able to easily obtain single signal copy and never ran out of IF shift "minus or negative" range. As you say the real test would be during a CW contest.

Glad you are pleased with your TS830s performance. I thought it came in very well and I do see a few of them!"