

**RECEIVER POST
DETECTION FILTER**

By K0CQ
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One the most effective receiver design articles ("WHAT'S WRONG WITH OUR RECEIVERS", *Byron Goodman, QST, January 1957*), proposed that the receiver selectivity ought to be as close to the antenna as possible, which was just then becoming practical with high frequency crystal filters. Reasons given were to get selectivity before as many (non-linear) stages as possible to cut the QRM generation in the audio stages from intermodulation in the late (transmit power level) IF stages. I don't recall the author giving any thought to the NOISE of the IF, detector, and audio stages, or leak around the fancy single filter.

As a result of that article all receivers of the last decade (and some before it) do have the filter up near the front and then only enough selectivity after the filter to easily build up the needed gain. The major fault in the 75S3B here is filter leak around out to the limit of hearing plus some IF stage noise from the tubes being run at transmitting ratings to get some gain to overcome the filter loss. In other radios like the SB110A and FT726 it is primarily annoying wideband IF noise that is always present. This is not uncommon in many modern ham receivers.

To cure that several years ago, I built a passive audio speaker level filter. Unfortunately I had only one set of suitable toroidal coils and this year I decided I wanted two more of the filters for the 6m and VHF receivers.

While browsing a Digi-Key catalog recently working up a "wish list" for flea marketing and ham-festing, I spotted what appeared to be suitable coils. And now that I have built another filter I can report that they do work decently and are less expensive new than

toroids would have been.

The filter circuit is that of a 5th order Tchebychev low pass with 0.5 db. ripple. The more pass band ripple you allow in a Tchebychev filter, the steeper the stop band skirt. Capacitors being more readily available and in a far greater selection of sizes, I switch only capacitors and filter impedance for frequency change. The two 70.7 volt to voice coil transformers are handy for that. With their voice coil winding loaded with a speaker the 10 watt tap presents a 500 impedance, the 5 watt 1000 ohms, 2.5 watt 2000 ohms, 1.25 watt 4000 ohms, and the .625 watt 8000 ohms. Working the component scaling backwards a bit having chosen 220 millihenry and 330 millihenry chokes, gives a cutoff frequency of 700 Hz. Doubling the filter impedance with the same inductors doubles the cut off frequency. So with these 10 watt transformers I get the following performance:

Impedance 3 db. freq. Capacitance needed. Tx tap
(theory)

500	700 Hz	0.634 mfd.	10 w.
1000	1400	0.1585	5 w.
2000	2800	0.0396	2.5 w.
4000	5600	0.0099	1.25 w.
8000	11,200	0.00248	0.625 w.

You can detect a filter design engineer by the component designations to three times as many places as the parts are available. I used .66, .15, .039, .01 and .022 mfd in my filter. The .66 was made of two .33 mfd capacitors in parallel. .68 in a single capacitor should be equally effective. After all, the inductors have a 10% tolerance (as do the capacitors) and this is not for a NASA moon mission. Worse yet the coils are significantly affected by their environment.

As I write this, I'm listening to a single CW signal on 7038 with NO QRM. When I switch from the 650 Hz position to the 5 Khz position (and using the ssb filter on the Collins) I find three or four CW

signals. In fairness, the filter is not quite getting rid of all the unwanted, some I am hearing from the output transformer of the receiver and would hear them at the same level with no speaker connected. It might be nice to add some acoustical foam around that transformer. There is some loss in the filter and it is necessary to turn the audio gain control on the receiver up a little bit to compensate.

The transformers are available from Radio Shack (32-1031), Hosfelt Electronics (70.7V), and Mouser (42KB001). Digi-Key and Mouser polyester film capacitors cover the needed values (at least 100 volt rating) at reasonable prices. Digi-Key also carries the J.W. Miller inductors (Miller numbers 70F221AF and 70F331AF). Mouser carries 4 pole 5 position (10WR045) and 6 position (10WR046) rotary switches at very reasonable prices.

Aluminum and tantalum electrolytic capacitors are not suitable in this circuit and ceramic and monolithic types are both excessively temperature sensitive and piezoelectric. The last thing you want in such a filter is a capacitor talking back to you! One could simplify the filter to one frequency selection and no switch or two frequencies with a 4 pole double throw toggle switch (locally available) but you can't really tell how much good the filter is doing unless you can switch it out of the circuit occasionally.

Since I did not shop Des Moines for these parts I have no current information on their availability. There is some chance that all the parts could be purchased in Des Moines or Ames though the inductors will be uncommon in either city. Toroids or groups of toroids to make up the same values will work very well (probably slightly better than the specified J. W. Miller coils) if available.

The transformers should be separated some to minimize the stray coupling between them that could partially defeat the filter

performance. Likewise, the three inductors should be mounted separated and at right angles to minimize coupling between them which is not accounted for in the circuit design. I found it necessary to ground the common conductor of the transformers to eliminate a high frequency leakage.

Mouser Electronics
2401 Highway 287 North
Mansfield, Texas 76063
1-(800) 34-MOUSER to order.
1-800-992-9943 to request a catalog. Domestic and imported components. \$5.00 service charge on orders under \$20.00.

Hosfelt Electronics
2700 Sunset Boulevard
Steubenville, Ohio 43952-1158
(800) 524 - 6464.
Ask for a catalog. An interesting mix of new and manufacturer's surplus. No service charge.

Digi-Key.
701 Brooks Avenue South
Post Office Box 677
Thief River Falls, MN 56701-0677
(800)344-4539 (or 800 DIGI-KEY).
Ask for a catalog. All new merchandise, a place that is extremely prepared to take an order. \$3.00 handling charge on orders under \$25.00. They also assemble nicad battery packs in custom shapes suitable for hand helds, sometimes with significantly increased ampere hour ratings.

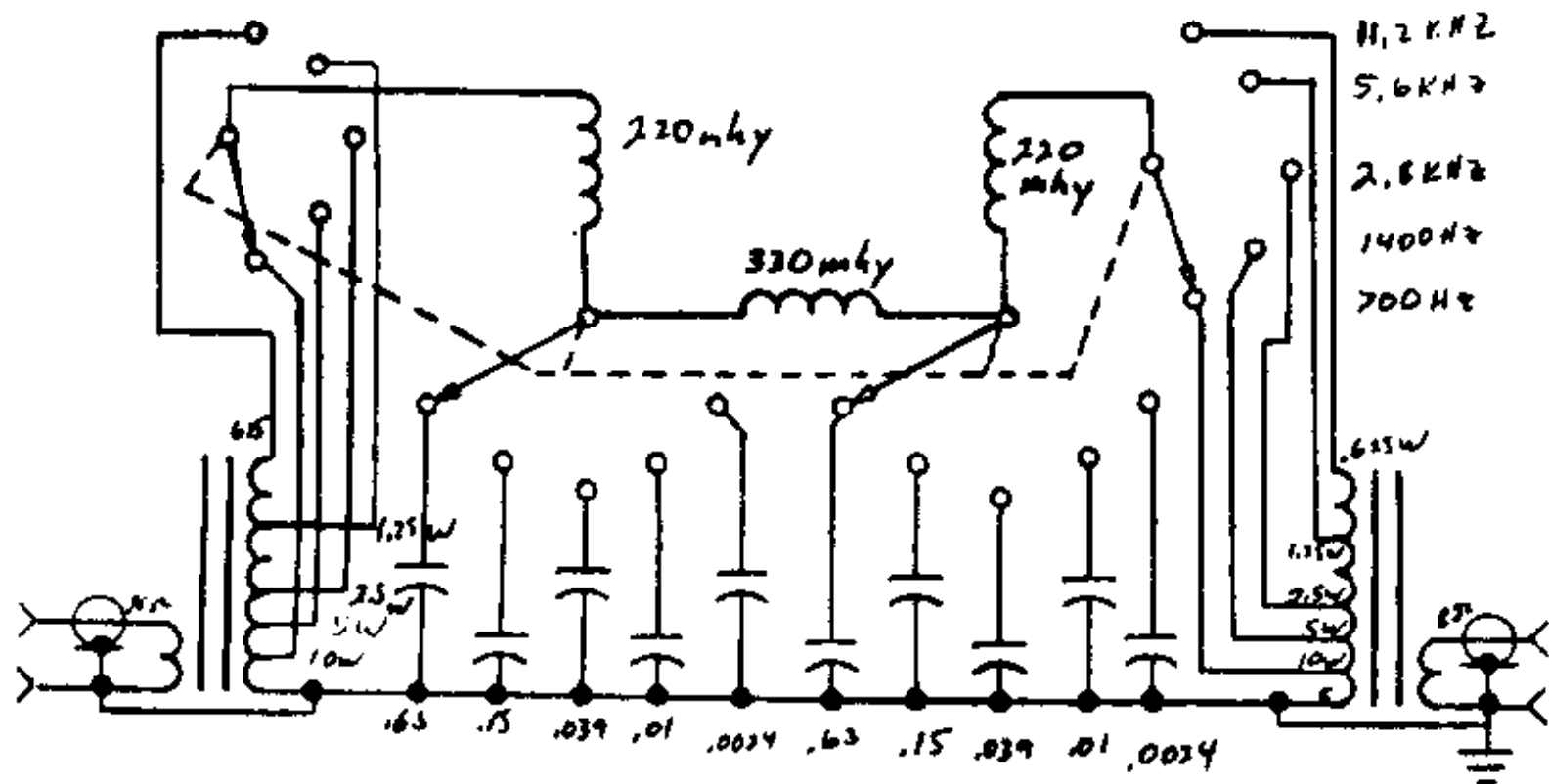
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HAM ADS

FOR SALE: IC298 mobile / portable / base 2 Meter all mode, 1 to 10 watts. Great for Oscar. Sacrifice, \$350. WDØRSW, 244-0770.

FOR SALE: Tandy Daisy Wheel Printer. Excellent. Wide carriage. \$100. Yaesu FT-707 Antenna Tuner, \$100. Homebrew frequency counter, works great, make an offer. Don, W0ANZ, 278-0570.

8PKR FILTER BY KSCQ



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