

the R-390A mechanical filter

R390A IF Deck Alignment (Chuck Rippel)

R390's made after 1954 and those with mod 2 stamped on the IF chassis have a field change installed to the mechanical filters. Filter input and output trimmer capacitors have been added. The 4 input trimmer capacitors are found by removing the 2 square can on top of the IF chassis using the single nut in the top. The 4 output trimmer capacitors are located behind 4 holes in the left hand side of the IF deck. The IF chassis will need to be loose but still electrically connected to complete these procedures. An accurate counter, analog VTVM and a signal generator capable of outputting 455.00 KC, is required for these alignments. Connect the VTVM to the Diode Load bus on the rear and configure it to read a negative voltage of approximately -7vdc. Set the receiver FUNCTION control to MGC, BFO to OFF and the LOCAL GAIN control to a comfortable level. Lift and tilt the IF deck resting the front captive (green) screw over the front panel. You should be able to gain access to the mechanical filter trimmer capacitors through the large ventilation holes in the main chassis. Locate the cable running from the rear of the IF deck to the *IF OUT* BNC connector in the rear panel, upper left side. Unplug the cable from the IF deck only. Also unplug J-513 and the one next to it. Plug the cable running from the rear IF Out jack into J-513 on the IF deck. Connect the output of your 455.000 kc generator.

Mechanical Filter Alignment-

- Set the 455kc generator output level to cause the VTVM to read about -2.5V.
- With the IF deck oriented so that the bandwidth control is towards you, set the bandwidth to 2Kc and align 1 of the four top trimmers.
 - Adjust C-569 which is at 9 o'clock for a peak on the VTVM.
 - Align the output trimmer in the left side of the IF deck, labeled C-567
- Set the BW to 4KC
 - Align the top trimmer, C-568 located at 12 o'clock
 - Align the side trimmer, C-566 located at rear, bottom.
- Set the BW to 8kc
 - Align the top trimmer, C-570 located at 6 o'clock.
 - Align the side trimmer, C-565 located at front, top.
- Set the BW to 16kc
 - Align the top trimmer, C-571 located at 3 o'clock
 - Align the side trimmer, C-564 located at front, bottom. <snip>

Date: Thu, 9 Oct 1997 23:19:22 +0500

Subject: Re: [R-390] Mechanical filters & insertion loss

> Subject: [R-390] Mechanical filters & insertion loss

>

> The 16 Kc filter in my R-390A seems to have maybe 10 or 20 dB more

- > insertion loss than the other three. When I switch to 16, the signal
- > strength meter drops noticeably and the audio level drops a bit, too. It
- > clearly has more bandwidth than the 8 Kc filter. Listening, it is entirely
- > believable that it is a working 16 Kc filter, but I can't say for sure
- > whether or not its bandwidth conforms to the specification.

Have you set the trimmers at the top and bottom of the filter? I forget the "C" numbers but there are a series of trimmers on the top of the filters and under the 2" square can which are the inputs and another series of trimmers on the side of the IF deck next to the side of the radio.

Run 455kc into J-513 about 10mv and then peak each of the trimmers for both the input and output on each filter. While you are at it, with 455.00kc going in, center up the BFO knob to the exact center of the scale on the front. That way, when you tune an AM signal, zero beating it with the BFO will have the benefit of putting the received signal into the center of your passband which you just peaked on that same 455.00 signal.

Be sure to use an ANALOG VTVM on the diode load jumper in the rear to peak the filter trimmers and NOT THE Carrier Meter. The Carrier Meter is far too coarse to see the whole peak.

Then set the IF gain such that with no antenna, the LINE METER switch set to -10, the LINE GAIN at "10" or max then peak the ANT TRIM on the internal noise of the RF deck. Turn the IF GAIN pot back so the receiver noise (NO ANTENNA!!!) reads -10 on the receiver.

This a rough place to set that by which you can realize maximum sensitivity.

If the ANT TRIM does not give you a peak on the noise, the RF deck has a problem. At the very least, you should see the noise peak up on the LINE LEVEL Meter.

Date: Tue, 28 Oct 1997 09:42:17 +0000
From: crippel@...
Subject: [R-390] Re: Why filters go bad - viz. bad caps

It's C-553, the 0.01 plate blocking capacitor for V-501. Its too low a voltage to begin with; a condition aggravated by the multiplicity error caused by the high voltage transformer. That Vitamin-Q cap shorts and the B+ then has full run of any mechanical filter selected and opens the fine wire inside. Since the frequency involved is 455kc at that point, change C-553 to a 600V 0.01 Orangedrop.

Date: Tue, 28 Oct 1997 17:40:08 -0600
From: Tom Norris <badger@...>
Subject: Re: [R-390] (R-390) Why filters go bad - viz. bad caps

Now THERE is a thought to doubly keep DC off the filters. Might give it a try. Hmmmm. Chuck, you tried it -- looking at the schematic, I see no reason it wouldn't work. Suggestions for a good value for that cap? Another .01 or higher?

Date: Wed, 29 Oct 1997 10:42:08 +0000
From: crippel@...
Subject: Re: [R-390] (R-390) Why filters go bad - viz. bad caps

Change that .01 to a single .01 Orangedrop at 600V and forget about it. There are space considerations unless you slop the cap in. The capacitor should nestle neatly in a vertical position, against the aluminum sides, in the inside corner of the filter output compartment in front of the bulkhead mounted coil and next to the switch. Double caps won't fit properly in the space allotted.

Remember, proper lead/component dress is important.

Date: Mon, 10 Jan 2000 12:25:52 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] Distortion / IF alignment

Aligning the main IFs for maximum gain at 455 KHz may compromise the widest mechanical filter. Peaking the AGC IF only helps control the signal at the AM detector which is where the distortion was happening.

Date: Sat, 18 Mar 2000 07:20:21 -0000
From: "Phil Atchley" <ko6bb@elite.net>
Subject: [R-390] IF Amplifier or Oscillator, that is the question.

Well, I re-capped the IF deck after which it is now a oscillator <grin>, squeals, squalls and makes its presence known. But first a little history. I believe this unit had problems before I started as it sometimes seemed "squirrely" adjusting the RF gain would "peak" somewhat before full clockwise position with a very sharp noise peak like it was oscillating out of the bandpass. Somebody had been in the IF section, rewiring parts of it with far less than "Collins" workmanship.

When I re-capped the unit the gain came up noticeably but now the oscillations are very apparent. I have checked, double checked and triple checked the little beast, even re-wired all the circuitry around the mechanical filters which was the worst case of wiring I'd seen in a long time.

The oscillations "appear" to be centered around the 2nd IF amplifier V502. Removing the tube shield from V502 helps some but not completely. Removing the shield from T501 is even more effective in reducing or removing the oscillations. (Aren't shields supposed to eliminate these spurious oscillations?????) The unit "appears" to have all "Q" reducing resistors in the transformers intact so far as I can tell. Can't measure them in circuit.

If I put an antenna on it and tune in a station it won't oscillate, telling me that reducing the gain by the AGC helps. I replaced every tube in the unit one at a time in case one was gassy, no help. I did a search on the CD ROM for oscillations, one fellow had a similar problem and his had an incorrect gain control, replacing the IF Gain Control and adjusting it cured his, not so in my case. H E E L L L P P P..... This one is giving me more grey hair, that is, what hair I have left. <grin>

Date: Sat, 18 Mar 2000 19:32:59 -0000
From: "Phil Atchley" <ko6bb@elite.net>
Subject: [R-390] IF Oscillation Cured !

Well, it looks like I finally got this puppy stabilized. Not sure exactly which part/work did it as I tackled the job "in mass", shotgun style. We all know how hard it is to troubleshoot the IF as the cable harness just reaches and really doesn't lend itself to troubleshooting in operation, though I suppose if you want to stretch things a little you could try. Here is what I did.

1. Completely re-wired the bottom side of the mechanical filters, making sure they were grounded good. The wiring was a mess.
2. Replaced all the ceramic caps around V502 and V503.
3. Replaced a couple resistors that were about 20 percent low (normally I'd have left em). They were in the Screen grids of V502 & V503, also cathode resistor for V502 which was 20 percent high (which I really doubt caused any problem).
4. Installed a 27 Ohm resistor in the grid of V502, between the tube and the Filter switch. I SUSPECT this was the actual cure, but who knows. I figured if they used 27 Ohm resistors in the grids of the mixers at RF frequencies, then it shouldn't do any harm at 455kHz. I chose V502 because it seemed to be where the oscillation was centered around.

After I did all this, the gain through the IF appears to be a little lower than it was, probably because it no longer has "Re-generation" ;-). Still more than enough, I have the gain pot set about halfway right now. Well, now that is taken care of, I will troubleshoot the 16kHz filter. It works but output is quite a bit lower than the other filters. All filters have 120pF caps on em except the 16kHz. Somebody replaced it and it has only 100pF, I suppose that could detune it enough to lower the gain. THEN, I will probably put those two Diode AGC mod in the unit. You know, the one that is supposed to help SSB.

Date: Sun, 16 Apr 2000 10:44:39 -0500
From: "Dr. Gerald N. Johnson" <geraldj@ames.net>
Subject: Re: [R-390] crystal filters in an EAC module

EAC probably justified the Clevite filters with the magic phrases: "equivalent performance" "LOWER COST" "More compact" "parts available" and maybe "Improved performance". Improved performance might have been based on lower insertion loss, easier impedance matching, and a somewhat different response curve. Lower Cost is the magic phrase that would have been the most effective. "Lower cost with nearly equivalent performance" would have been a clinching phrase to acceptability. In actuality, the ceramic filters probably worked nearly as well as mechanical filters, but because of poorer prediction of center frequency required more selection to get a matched set of filters and then probably custom IF alignment frequencies to match the receiver to the filters. Which thoroughly confused field depot alignment procedures and led to the receivers with ceramic filters sometimes not performing as well as those with mechanical filters. Likely the ceramic filters prettymuch just met the mechanical

filter specifications, but the mechanical filters exceeded the specifications by significant margins and the receiver tester's expected that extended performance in the steepness of skirts and ultimate rejection which the ceramic filters likely didn't show. That's the case where rice boxes use ceramic filters at the 455 Khz IF. Each filter needs a custom set of BFO frequencies, and mechanical filters are sometimes offered as a premium replacement at a premium price.

Date: Sun, 16 Apr 2000 12:47:49 EDT
From: Llgpt@aol.com
Subject: [R-390] Clevite ceramic filters in the 1960EAC R-390A's

This is what was said about the 1960 EAC early run contract by the former Director of Radio for the Signal Corps at Fort Monmouth. " Also about this time we got a bad run of R-390A's from Electronic Assistance in Red Bank that nobody wanted to get stuck with. These turned out to be receivers that they had rebuilt from surplus. Tom Howard of Alltronics Howard in Boston put us on to this when he wanted to get a contract like EAC to rebuild receivers. He had supplied over 300 junkers to EAC ". " All of the Clevite ceramic filters were to have been replaced with mechanical filters when they were scheduled for depot maintenance ".

Sure looks like somebody screwed up.....

Date: Sun, 16 Apr 2000 09:49:29 -0700
From: Bob W7AVK <rsrolfne@atnet.net>
Subject: Re: [R-390] crystal filters in a true Collins R390A

Ben - Can't say and don't know. But might suggest in those times and days the name of the game was to cut costs. [Reason for the R-390 A in the first place] The ceramic filters were a hot new untried item. Maybe the govt purchased these knowing the difference [and very large cost savings] to try in service and quickly went back to the only source mechanical filters.

Date: Sun, 16 Apr 2000 18:43:23 -0500
From: "Dr. Gerald N. Johnson" <geraldj@ames.net>
Subject: Re: [R-390] crystal filters in a true Collins R390A

Art probably did set the prices for filters high, but they were advertised in trade journals of that era (still are). They were pricey, but not significantly different from good crystal filters. Art did try to run the company as if it was still in his garage, though there were 20,000+ employees. He did require buying transmitting tubes from his friend Eitel. (E.g. Eimac). Even though RCA tubes would have been 1/3 the price for the same performance. Same thing for Jennings vacuum variables (though there was little competition to their products).

Date: Sun, 16 Apr 2000 21:29:54 EDT
From: Llgpt@aol.com
Subject: Re: [R-390] crystal filters in an EAC module

I agree with the advances in ceramic filters, they are great, both aurally and for rejection. Kiwa Electronics makes some very impressive ceramic filter modules. I

have used them with spectacular results.

"<http://kiwa.com/>">Kiwa Electronics Les Locklear

Date: Sun, 16 Apr 2000 22:55:36 EDT
From: Radiomatt@aol.com
Subject: Re: [R-390] crystal filters in a true Collins R390A

I'll repeat my question: Why is the filter change documented in the NAVSHIPS manual? Also, the manual says ALL the filters were ceramic. The fact the change is documented seems contrary to a "coverup".

Date: Mon, 24 Apr 2000 16:25:33 -0400
From: "Dale Hardin" <aiti@gate.net>
Subject: [R-390] Maybe bad mechanical filter

I think I may have a bad 2kc filter. I know Fair Radio has some IF decks with filters, but is there a source for just the filter?

Date: Mon, 24 Apr 2000 16:36:31 -0400
From: "Ronald Reams" <wa4mjf@worldnet.att.net>
Subject: Re: [R-390] Maybe bad mechanical filter

At one time Fair had NOS 2 kc filters for sale. They were listed in their special section on the web. You mite sheck to see if they still have any.

Date: Mon, 24 Apr 2000 16:51:52 -0500
From: "Scott, Barry (Clyde B)" <cbsscott@ingr.com>
Subject: RE: [R-390] Maybe bad mechanical filter

Speaking of this, can someone point me to a method to test mechanical filters?

I suppose it would be possible to couple a signal generator to the input and a scope (or a sensitive voltmeter) to the output. Swinging the generator from one edge, through the center frequency, and to the other edge should show attenuation at the edges with little attenuation at the center, similar to checking the resonant frequency of a crystal. Is this plausible or is there a better method?

Date: Mon, 24 Apr 2000 14:41:54 -0700
From: "Kurt" <radiouser@uswest.net>
Subject: Re: [R-390] Maybe bad mechanical filter

Before replacing the mechanical filter make sure the two mica caps are good. In the two receivers that I have been working on this has made a huge difference in filter performance. I have found that the micas with only the color code value, as opposed to the ones with the value printed on them, go bad. Yes it is an absolute pain to change these but I have found the effort to be very worthwhile.

Date: Mon, 24 Apr 2000 18:55:12 -0400
From: "Barry L. Ornitz" <ornitz@tricon.net>
Subject: RE: [R-390] Maybe bad mechanical filter

Barry Scott asked:.....Speaking of this, can someone point me to a method to test mechanical filters?

The ideal piece of test equipment would be a network analyzer with fractional-Hertz resolution, but these are far above my budget. Your method will work fine but remember the filter may need resonating capacitors, and to get the proper idea of the response shape, you have to terminate the filter properly. This means a resistor may be needed at the generator output and on the output of the filter. The filters used in the R-390A are designed for high impedance operation. The modern filters used in later rigs generally are designed with input and output impedances of 2000 ohms. Another thing to remember is that the filter behavior well away from its design frequency may appear to be quite bad. This out-of-band response is attenuated by the normal tuned circuits in the radio.

Date: Mon, 24 Apr 2000 17:01:25 -0500
From: "Dr. Gerald N. Johnson" <geraldj@ames.net>
Subject: Re: [R-390] Maybe bad mechanical filter

All it needs is a bit of impedance matching. Add R to the generator output to increase 50 ohms to the input Z of the filter. Load the filter with the rated output resistor. Both ends need to be resonated.

Date: Mon, 24 Apr 2000 20:23:19 -0400
From: "Dale Hardin" <aiti@gate.net>
Subject: [R-390] Date: Mon, 24 Apr 2000 20:23:13 -0400

Well guys, I must fess up. One of the mods I did was to replace R541 with a "1000 ohm" resistor. Last week, while troubleshooting the low AGC, we discovered that I had installed a 10k resistor. After some discussions about what the effect of changing the resistor from 270 ohms to 1000 ohms would do to the gain of that section, Don, KE4EC, decided to try a 750 ohm resistor (sort of splitting the baby). Well it worked. In my defense, I found that my resistor assortment kit had the wrong values in the 1000 ohm tray. However, I should have checked it rather than grabbing and going. When Don told me he had traced the low AGC problem to a short in the filters, we both thought that the 2 Kc filter we had replaced from his junk box might be bad. However, this afternoon, after work, we got a couple of beers and started troubleshooting with a schematic. I saw pretty quickly that I had miswired the 2 Kc filter, moving a lead to the ground that should have been on one of the other pins. Well, we corrected that and put her back together. Wow. AGC working great. Great SSB signals. No overloading on high power AM stations. Wow. Real good AGC. Wow. What a receiver! Thanks for the help guys (although, you know the job is never complete). Now to paint the case and sneak it into the living room. Pray for me guys, it is VERY gray. Dale, KS4NS

Date: Mon, 24 Apr 2000 23:26:36 -0700 (PDT)
From: John Kolb <jlkolb@cts.com>
Subject: RE: [R-390] Maybe bad mechanical filter

> Speaking of this, can someone point me to a method to test mechanical filters?

Several good replies to this already. It takes a very stable signal generator with a very slow tuning rate to test a mechanical filter. A scope would not have enough dynamic range to get an accurate picture of the filter skirts, although it can see the nose well enough to measure insertion loss to tell you if the filter is defective or not. Best meter to use would be something like a Boonton model 91 RF voltmeter, which will be calibrated in db's, and only has a little capacitive loading, which can be accounted for with the resonating caps.

I used a HP 3590 wave analyzer to test filters, till it got too old. With a 500 ohm output R and a 5 Kohm input R, it could match well enough to the newer filters, but wouldn't match to the older 100 Kohm in/out filters without a fancy capacitive divider for matching Z. Series resistors on the in and out to match caused too much loss, on top of a filter which could hav 20-36 db of loss already.

Although you can't measure the insertion loss of the filter, the best test of a filter is in a receiver that's designed to use it. With the AGC on, feed a signal generator into the rx, and switch the generator attenuator to different levels to determine what level gives S3, S5, ... S9+20, S9+40, etc. Tune the rx across the generator freq and locate the highest point on the filter curve; set the generator level so that is the end of the S-meter scale, S9+60, usually. Tune 10 kcs either side of this with the receiver, leaving the generator on the same freq. (Assuming the receiver has a more accurate dial than the generator - if you can't read the rx dial to the nearest kcs, you might attach a freq counter to the generator and tune it instead) All this usually works best near the lowest freq the rx can tune. Using the previous S-meter calibration, you will be able to tell what freq represents 3, 6, 60 db down from the peak reading. You are measuring the leakage around the filter in the rx also, of course, but there is a good bit of leakage around the filter testing it out on the bench with clip leads and long leaded resonating caps also.

The hardest part of testing a filter on the bench is finding the proper specs - there are lots of filter catalogs around showing filter bandwidth at the 3 or 6 db and 60 db points, and sometimes insertion loss, but it's hard to find filter data sheets to find the resoning R and C values. I have a fair collection of them so shoot me the numbers and I'll look, both the part number 526-xxxx-xx and the type number F455FA-21 sort of number if you have both.

If the filter coil measures opened, it's sometimes possible to open it and repair a broken wire - in one case I found a filter which had slipped out of the factory with a terminal unsoldered - go for it - the filter's no good already, so you can't make it worse.

Now for the sales pitch :) I have a number of filters for sale - - e-mail for list if interested.

Date: Tue, 25 Apr 2000 10:37:49 -0400 (EDT)
From: Norman Ryan <nryan@duke.edu>
Subject: Re: [R-390] Caps on the Mechanical Filters

> I haven't seen a procedure for adjusting the Erie trimmers on the mechanical filters. I've >found some on the RF deck and Oscillator deck that made the radio

louder after they were >"broken loose". My 8 Kc filter is quieter than the others, could be the BW switch, still haven't cleaned it yet.

The mechanical filter Erie caps are adjusted as part of the IF alignment procedure. Should be in the manual. Manual also tells how to handle all the other trimmer caps. Tiny as they are, they make a difference when adjusted right.

Date: Tue, 25 Apr 2000 17:33:46 -0600
From: "jordana@nucleus.com" <jordana@nucleus.com>
Subject: [R-390] Change of subject...Clevite Filters...

Time for a change of subject.... I have been wondering something about the Clevite Filtered IF decks... a close look at the pic posted very recently and the pics of the Clevite Filters shows the same set-up as I have in mine... the trimmer caps on the top of the filter stack are not connected... they are ready to wire in with the proper jumpers etc, but not connected... In my deck the side mounted trimmers are also not connected, in this case the appropriate leads have been dressed with a cloth insulation sleeve.... Now does anyone have a schematic or manual info as to whether this is correct for these filters... Or was it simply an oversight by EAC seeing as the original draft for the IF deck did not include the Trimmers... ??? Any ideas...??? 73 de Jordan...

Date: Tue, 25 Apr 2000 21:52:52 -0700
From: "Gene G. Beckwith" <jtone@sssnet.com>
Subject: Re: [R-390] Maybe bad mechanical filter

For added testimony to the cap checking for the little red monsters, such a cap was the major trouble shooting problem for my recently rebuilt CV591/A...I described the hunt and repair a few months ago here on the list, but bottom line ... never trust those little devils ...check them first before spending dollars and effort on more major repairs...

Date: Fri, 28 Apr 2000 07:58 -0700 (PDT)
From: rlruszkowski@west.raytheon.com
Subject: Re:[R-390] IF Xtal Filter confusion.

From assembly run to assembly run things were placed differently. Not a lot but sum. Your filters may not be where your TM copy shows them to be. Into the deck you go with test equipment in tow. Do ohmmeter checks from the band width switch to the filter cans to locate the filter. Some filters do not even have the label on them any more. There were lots of numbers from different production runs. No one uses the NSN to source parts by today. If you have a dead band you may not have a dead filter. In their younger years filters would go wide band and drop off in output. If the band was dead we went looking for caps and wire problems. Was the B+ blocking cap replaced when you received your receiver with its dead filter? If so then the filter may have been killed when the old cap died. Some one replaced the cap and only one filter was killed. Set the switch to the dead band. Grab your jumper cables and patch the filter leads from the dead filter to a good filter. (Do the input and output) If routing the signal through a different filter works. Then only the parts that are bypassed are suspect. (Do this at the filter pins and only the filter is suspect. If this does not work. Go through the wiring. Put the

receiver on the bench. Pull the IF deck. Stand the receiver on the IF deck end. Find a 4x4 or 5x5 box. Lay the IF deck on its side on the box. plug the harness connector in and power up the receiver. the bottom of the IF deck should lay out where you can ponder it. By turning the receiver and If deck on the bench you can work on both the top and bottom side of it. Start signal injecting on the band switch section that is the filter outputs. Compare the same points on all four filters. You can move back to the filter output and then the filter inputs. Bingo right here does the filter pass the same signal at the same level as the other filters. Continue working back until you locate the exact problem. If you need an 8 you should ask here if any one can help. Some one may have needed a 2 and found a spare deck.

Date: Fri, 28 Apr 2000 21:57:46 -0400 (EDT)
From: Norman Ryan <nryan@duke.edu>
Subject: Re: [R-390] Filter confusion.

The Collins filter, type number F 455 N 20, would be the 2 KC filter, as you probably have figured out, with "20" indicating its bandwidth. In the schematic it is referred to as FL502. With the can removed from the IF chassis and the IF chassis sitting upright with the two shafts facing you, FL502 is the one located toward the left rear.

FL502 | FL503
2KC | 4 KC

|
FL504 | FL505
8 KC | 16 KC
| | <--- control shafts BANDWIDTH BF)Does this help some?

Date: Fri, 28 Apr 2000 22:10:34 -0700 (PDT)
From: John Kolb <jkolb@cts.com>
Subject: Re: [R-390] Filter confusion.

You can tell the bandwidth from the filter from the type number, which is the F455N-20 number for the 2 kHz filter. The first number is the IF frequency, and the second number is the bandwidth in 100's of hz. Works for most, but not all, Collins filters.

The part numbers in the Navships 0967-063-2010 list the filters as 522-xxxx-002, where xxxx is 9163 for 2 kHz, 9160 for 4 kHz, 9161 for 8, and 9162 for 16. The loose filters I have all have the same P/N, except 526-xxxx-00 instead of 522-xxxx. This is a PN change Collins made at some point. Seems like any filter Collins made starting with 522 can be found on lists and catalogues as 526 instead.

The final point of confusion is the R-390A parts list shows the filters as +/- (plus sign over - sign) 1 kHz on the 2 kHz filter, +/- 2 kHz on the 4 kHz filter, etc. A filter + and - 2 kHz wide is 4 kHz wide, but we seldom describe filters that way. Sorry Patrick, if you turn out to need a 8 kHz filter - have 2, 4, and 16's in the spares box, but no 8's.

Date: Mon, 22 May 2000 19:49:53 -0700 (PDT)
From: Joe Foley <redmenaced@yahoo.com>
Subject: [R-390] Peaking the mechanical filter caps

Ok, I did it. I tried to peak the output caps on the mechanical filters but the 4 Kc one showed no peak at all. Tonight I pulled the IF deck and cleaned the bandswitch, surprise! It was real clean!

So I put the deck back on the radio turned sideways so I could get to the input caps on the side of the deck and hooked it up. Couldn't peak the 2 Kc input cap, and still couldn't peak the 4 Kc output cap. All others showed good peaks and much improvement.

So I pulled the deck and took it back to the bench. I've had very good luck so far finding problems by doing a VERY careful visual inspection of EVERYTHING that could possibly be wrong. It worked again! I found that the bottom terminal of the 4 Kc output cap was shorted against the steel plate that holds the caps on the top of the mechanical filters, bent that back and went to the 2 Kc problem.

When I tried to turn the cap the first time it acted like it had big sand grains in it,..... Ok, it had rocks in it. So,.... back to the visual mode. The underside of the IF deck is very clean but I did notice that the terminal on the 2 Kc input cap was a bit tarnished. So I put some De-oxit on it and turned it a few times,.... much smoother!

Put the deck back in sideways and hooked it up, now everything peaked like it should have! The original complaint was that the 8 Kc setting was quieter than the 4 Kc or 16 Kc settings. Not so now, all the same! It's getting better all the time,

Date: Tue, 11 Jul 2000 22:19:54 EDT
From: PABigelow@aol.com
Subject: [R-390] R-390a mech filter deterioration

Is there any data concerning possible deterioration of performance of the R-390a mechanical filters? Are the filters from 1954 as good as those from 1967 (or later)?

Date: Tue, 11 Jul 2000 23:04:22 EDT
From: Llgpt@aol.com
Subject: Re: [R-390] R-390a mech filter deterioration

Not sure if there is any data out there, but the 4 kc mechanical filters are failing at a faster rate now than in the past. Number one reason is the fact that the military used the 4 kc filter more than the others. Number two, they only resonate so many times, guess what? Their time is almost expired (ones with alot of use) I have seen quite a few 51J-4 mechanical filters failing now also.

Date: Wed, 12 Jul 2000 13:44:15 -0400
From: "Ronald Reams" <wa4mjf@worldnet.att.net>
Subject: [R-390] Filters

One of my 390-As requires a very strong signal for reception in the 0.1, 1 and 2 kc positions and the audio must be turned all the way up. The 4 8 16 kc positions work FB.

Date: Wed, 12 Jul 2000 14:26:33 -0400
From: pbigelow@us.ibm.com
Subject: Re: [R-390] Filters

Maybe it's more than one issue:

1. Are the 2kc filter trimmer caps peaked?
2. Bad/weak 2kc filter
3. Weak crystal for the .1 & 1kc filter positions?
4. Filter switch

About the only thing in common to the 0.1kc, 1kc, AND 2kc would be the switch.

Date: Wed, 12 Jul 2000 14:39:13 -0400 (EDT)
From: Norman Ryan <nryan@duke.edu>
Subject: Re: [R-390] Filters

The 0.1, 1, and 2 KC positions all work through the 2 KC mechanical filter. You might have a failing 2 KC filter. If alignment is correct, carrier level should be about the same on the 2, 4, 8, and 16 KC positions.

Check the following:

1. Disconnect P112 and check resistance to ground on pin J512-6 while switching through KC. Reading should be the same: infinity. This is the AGC line.
2. Take resistance readings across the input and output of FL502, the 2 KC mechanical filter. They should be about the same at anywhere from 45 to 55 Ohms.
3. Take resistance reading from each terminal of FL502 to ground-- should read infinity. Dunno if you have to desolder FL502 from the circuit for this or not.
4. Replace C553, .01 mF, with Carl's least favorite capacitor, an Orange Drop. Go for 600VDC. It's the B+ blocking cap that eats mechanical filters. Do it-- that's an order.

While you're in recapping mode, do the same for C549. Let us know how you make out. Good luck.

Date: Wed, 12 Jul 2000 19:27:35 EDT
From: DJED1@aol.com
Subject: Re: [R-390] Filters

Since the 2 Kc filter is in the circuit for all three of those selectivities, it's likely it's

a problem with the filter.

Date: Wed, 12 Jul 2000 17:00:30 -0700 (PDT)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] Filters

I just went through that problem, mine wasn't that bad though. I did a careful visual inspection of the trimmer caps and found that one of the center contacts was shorting against the mount! Another had a very small amount of corrosion on the center contact of the trimmer,..... De-oxid! Those two helped a lot, but tuning the trimmers helped more. The reason I did the visual was that I couldn't get a peak out of the trimmers and so had to look for something else.

Date: Thu, 13 Jul 2000 17:06:40 -0700 (PDT)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] Filters

> One of my 390-As requires a very strong signal for reception in the .1
> 1 and 2 kc positions and the audio must be turned all the way up. The 4 8 16
kc positions work FB.

Well, those all do go through the 2 Khz mechanical filter, so a bad filter would explain it. To test, remove wires from the J shaped leads on the filter, and test filter with ohmmeter. Should read low resistance, and open between either lead and ground. (If filter has 3 J shaped leads at one end, the center one is ground, ignore for ohmmeter test) If filter passes the ohmmeter test, remove wires from 4 KHz filter and connect leads which went to 2 kHz filter before to the 4 kHz filter. Operate the radio and check 0.1, 1, and 2 kHz position. If still bad, problem is in switch or wiring. For double check the 2 kHz filter could also be wired into the 4 kHz switch position.

Date: Wed, 23 Aug 2000 14:16:26 -0400
From: "Paul Bigelow/Austin/IBM" <pbigelow@us.ibm.com>
Subject: [R-390] Collins R-390a mechanical filters

Does Rockwell Collins (for a price) still manufacture new, replacement R-390a mechanical filters?

Date: Wed, 23 Aug 2000 13:19:50 -0700 (PDT)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] Collins R-390a mechanical filters

Rockwell still makes mechanical filters, but not in a case or with the correct bandwidths and impedances for the R-390A.<http://www.collins.rockwell.com>

Modern filters are 2 Kohms in and out. Filters for tube radios, including the F455-Nx filters of the R-390A, are 100 Kohms in and out, so a matching network would be required. Shape factors are now about 2:1 for 3-6 kHz filters, not as sharp at the bottom as the older filters. The modern filters would have less passband ripple however. There seem to be plenty of R-390 filters in junkboxes at reasonable cost, if you post a few wanted messages. I've got several 2 KHz filters

available, amongst others, myself.

Date: Thu, 24 Aug 2000 09:23:34 -0400
From: "Paul Bigelow/Austin/IBM" <pbigelow@us.ibm.com>
Subject: [R-390] Rockwell Collins Mechanical Filter response

Thanks to all the responses. Currently, I do not need mechanical filters. The question was posed to check to see if, by any chance, Rockwell Collins still made any for Government use. Just another *possible* source for parts. Rockwell Collins is definitely NOT "out of business". Here is the Rockwell Collins response: "We haven't built any of these filters in decades, however we could build a few if necessary by making some special parts. The price would probably be in the neighborhood of \$700/\$800 each."

Date: Wed, 15 Nov 2000 05:35:22 EST
From: G4GJL@aol.com
Subject: [R-390] Mechanical Filter rebuild

I have a 4kc mechanical from a St Juliens rig which has a diaconnected winding. The cause of this as is so common, was from the inertial stress placed on the wire itself as the rig is transported. The original foam shock absorbant material inside the filters is now likely to be in an advanced state of decay. I guess more of us will see this type of failure resulting in dead positions on the selectivity switch. Interestingly, my other blue striper has a dis 2 kc filter. Now the Questions!

1. Does anyone know how many turns are on the actuator windings of these devices
2. Does anyone know how to form replacement windings. bothe the input and output windings are formed in two pies, about 0.2 inch diamater. The centre hole allows clearance for the actuator pin driving the resonant disks. The wire is (predictably) microscopically thin.....I guess at 40 or 42 Wire Gauge (At those sizes the difference between AWG and BSWG is mperceptible!!!)

Date: Wed, 15 Nov 2000 09:35:06 -0600
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] Mechanical Filter rebuild

At 40 to 42, the difference between AWG and BSWG may be imperceptible but its still about twice the diameter. #40 AWG breaks at about 3 ounces tension, about half the friction over my index finger. Winding #40 I found required a more sophisticated tension device and one stolen from a sewing machine worked fine. I also found that I had to mount the feed spool on ball bearings, the friction of the metal spool over a dowel was more than the wire could pull. I've found the best way to measure the diameter is with a pocket 100x microscope with .001" divisions reticule. Its far more accurate after stripping because the insulation film varies quite a lot in thickness, relative to the wire size. Stripping is only practical with chemical or a flame. A match flame several inches below the wire end will heat it to a read glow and burn off most insulation. Its worth the bother to find an insulation that will strip by being immersed in solder.

If the pies are layer wound, it would be practical to get close on turn count by measuring cross section of the pie and look up turns per square inch from a wire table (knowing wire size, of course) but the pies are probably honeycomb wound to cut the distributed capacity (which makes rewinding by hand more difficult) which destroys the calculation. Probably its better to use a Q-meter to measure the coil inductance away from the filter pass band. Or just figure the inductance from the actual resonating capacitance.

Date: Wed, 15 Nov 2000 14:58:04 EST
From: G4GJL@aol.com
Subject: Re: [R-390] Mechanical Filter rebuild

Thanks for the reply and info. I have had another look at the coil in daylight and really it is quite a horrifying design. It is not honeycomb wound but seemingly random in rough layers. The pies are self supporting being heavily laden with varnish: perhaps Glyptal. Least wise neither ethyl or methyl alcohol will soften / loosen it. The coil looks like it is wound on a small two pie bobbin, but the truth is that the centre divider and end cheeks are only held by the glyptal. I will attempt a rewind on a needle as a former once I recover the cheeks from the original unit. I know I am going to struggle to get wire that thin. I think the smallest I have is 36SWG, but I havent had a chance to look in the shack properly yet. Im off to get my VHF Admittance bridge out for the measurements.... Good project for a winter's night, eh?

Date: Wed, 15 Nov 2000 16:46:08 -0600
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] Mechanical Filter rebuild

Sounds like the divider and end cheeks are just flat washers stuck in place by the glue on the wire. It could easily be that the wire is more randomly wound (as if by hand) than by machine. That could explain the need for trimmer capacitors in later radios. That being the case, perhaps the main thing is being able to tune the coil to resonance with some reasonable capacitor in the 80 pf +80, -40 pf range and all that having a different number of turns will do is change the proper termination R and the voltage "gain" through the filter. I'd think new cheeks of sturdy card stock would work just fine.

Last time I bought a half pound of #40, it cost \$15 or more, but it last a long time... There must be several miles to the half pound. A bit over 16,000 feet according to the table in the back of Radiotron. #40 AWG is .003" diameter at the conductor, 40 SWG is .005" diameter at the conductor. As far as a project for a winter's night, depends on how loud the wind Howls... There's wind and snow predicted here for tomorrow.

Date: Wed, 15 Nov 2000 20:43:52 -0800 (PST)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] Mechanical Filter rebuild

Your best bet might be to replace the coil with one from a different mechanical filter - I believe you said you also had a second bad filter. I've got a number of bad filters here I could remove a coil from, but none of them are F455N series filters,

so might be hard to find a matching size. I managed to transplant a coil once - don't remember the details now.

Most of the filters I managed to repair had the wire broken near the terminals so it was possible to splice.

Date: Thu, 16 Nov 2000 19:49:40 -0500 (EST)
From: Norman Ryan <nryan@duke.edu>
Subject: Re: [R-390] AGC

Welcome to the group. First thing you might check is whether you have AGC on any one of the BANDWIDTH settings. I had a bad mechanical filter that shorted out the AGC and eventually traced the trouble to a defective filter. There's a good chance your set might have out of spec resistors or leaky paper capacitors. Start with the IF deck. Fun, fun. Have the tubes been tested?

Date: Sat, 18 Nov 2000 09:46:02 EST
From: G4GJL@aol.com
Subject: Re: [R-390] Mechanical Filter rebuild

I fixed the 2kc filter yesterday. I soldered two more tails to the top of the inside of the can after removing it and then I soldered these to the original wires on the filter element inside, and resealed it. It works fine now.....actually better than the one in my LAB housed EAC68..... and the busted filter spent a few nights out doors at St Julians!

The 4kc one remains in pieces and in a rather sad state. I am going to build a purpose made coil winder with my boys' Meccano set, lets see what results can be achieved.

The tension device on the sewing machine here is looking increasingly attractive... Dr J's suggestion could result in another divorce statistic !!!

Date: Sat, 18 Nov 2000 10:03:59 -0600
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] Mechanical Filter rebuild

Its far safer to purchase a thread tensioner from a sewing machine repair shop than to steal from a working sewing machine.

Date: Sat, 3 Mar 2001 19:26:53 -0500 (EST)
From: Thomas Antil <t_antil@email.com>
Subject: [R-390] mechanical filters

Can any body tell me if there is a way of testing the mechanical filters to see if they are good?

I have a full set of them from another module

Date: Sat, 03 Mar 2001 19:36:29 -0600
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>

Subject: Re: [R-390] mechanical filters

1. Receiver

2. Signal generator and scope or RF millivolt meter or wide band AC volt meter. An ohmmeter can be used to test for grounds and open coils. The wire is fairly small so the lowest resistance range on the old VOM might supply a bit excess current.

Date: Sat, 3 Mar 2001 19:44:36 -0800 (PST)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] mechanical filters

Well I test them with a HP Wave analyzer with a high resolution DDS oscillator as an external LO for a stable freq source :) Minimum setup for a good test would be a stable signal generator, freq counter, and a RF Voltmeter. It helps to know the specs of the filter so you can match the filter input and output impedances. Tune the oscillator SLOWLY across the filter passband and slopes, recording freq and measuring the output level. Plot on graph paper to see the curve. Filters for sale - e-mail me for my latest list.

Date: Thu, 5 Apr 2001 08:25:39 -0400
From: "Warren, W. Thomas" <wtw@rti.org>
Subject: [R-390] R-390A Mechanical Filters

Anyone had any experience testing the mechanical filters outside the IF deck? I've just bought a deck with all 4 filters, but most of the other circuitry is gone, so looking for a way to test the filters without rebuilding the stages before and after the filters. Collins is certain to have had a way, but it may amount to rebuilding the stages before/after the filter. Isn't there a simpler test setup?

Date: Thu, 5 Apr 2001 05:49:49 -0700 (PDT)
From: "Tom M." <courir26@yahoo.com>
Subject: Re: [R-390] R-390A Mechanical Filters

I've done this, not sure if it the proper way to do it. Inject a 455 kcs signal in one end and test for the signal at the other with a scope. use a low level of signal and make sure that the filter passes only the low level 455 kcs signal. Rebuttals welcome because again, I'm not sure if this is the proper method.

Date: Thu, 5 Apr 2001 09:27:48 -0400
From: "Warren, W. Thomas" <wtw@rti.org>
Subject: RE: [R-390] R-390A Mechanical Filters

Tom, I generally agree. I'm looking for more detail though. As an example, with a simple setup like the URM-25D driving the filter, what kind of frequency response should one expect from the filters. I've got a counter, URM-25D, and an accurate Line Level Test Meter (good to about 0.1dB accuracy), so I could (slowly) test the entire filter passband. However, the components around the filter will make a difference, and what I'm not sure of is how much effect they have. Could be that there's so much effect that there's no choice but to build up the proper input/

output circuitry or else you're just measuring garbage. I simply don't know.

Date: 05 Apr 01 07:49:17 -0700
From: "Richard McClung" <richard_mcclung@tcibr.com>
Subject: RE: [R-390] R-390A Mechanical Filters

The Army -35 manual has a chart that depicts the desired bandpass wave form of the filters. I don't have a copy at hand to give you the page number....

Date: Thu, 5 Apr 2001 10:49:20 -0400 (EDT)
From: kkibbe@golden.net
Subject: [R-390] Frequency response of filters

When measuring the frequency response of a circuit with a scope and a frequency generator one detail must be observed, the input and output impedance of all measurement tools and the device to be measured. I don't know what the input and output impedance of this filters is but it must be found out before it's response can be measured with any accuracy. For example most RF filters today are 50 ohm (not to be confused with its DC resistance btw) and to measure the frequency response with a signal generator the generators output impedance must match the filter, in this example 50 ohm. Then to connect the scope to the output of the filter a 50 ohm resistor must be connected to ground and the input of the scope.

This makes the normal ~1M ohm input impedance of the scope 50 ohm. Then you are ready to sweep the generator and record the output level on the scope. For measuring the response of a filter below 20 kHz most DVM's can be used provided it's input impedance is matched to the output impedance of the filter. (Again with a resistor of the same impedance of the output of the filter.) Many audio circuits use 600 ohm maybe this is the value of the mechanical filters used in the R-390A, I don't know. I hope this helps some... if not please email and I'll make a diagram that makes this a bit more clear....

Date: Thu, 5 Apr 2001 07:50:21 -0700 (PDT)
From: <jlap1939@yahoo.com>
Subject: [R-390] Prev. probs, w/align.

Wish to thank respondents, on the problems, w/align. Still have no answer, but am making progress, and will follow a list of possible faults, from Walter. Seems wise, and let me say, many of you suggest one or more of the same, as well. Thanks again!

I can now say, w/careful carrier meter prep., that the sig. loss on the 16 kz filter is almost always 10 db. on that meter, when I switch frm. 8 kz filter (I am doing this on bands other than 8-16). Feel that might preclude a grad. loss in the filter itself (???) Comments? (adjs. have been made on caps, but caps may not be checked) Wonder if there is a more simple, to the point way to re-check BFO Neut., or, do you think it is necessary, if deck has been re-built? (or at least, re-capped)? Also, I am going to leave off any serial #, as it seems frm. the recent reply s, that there is no sure way to know.

Don't know if it really matters..I do feel that there is little doubt that it is Stewart Warner, 2nd order #, as the whole radio reads that way except for the power sup. module. Just want to be sure if anyone else ever has it, that they are not believing it is something else,(Don't guess that really matters much in this case, anyway...) Also, Dr Johnson, if you are out there, how are you? also, Dallas..and others,... Regards to all,(sorry, I'm a bit boring I know)

Date: Thu, 5 Apr 2001 11:38:31 -0400
From: "Warren, W. Thomas" <wtw@rti.org>
Subject: RE: [R-390] Frequency response of filters

Actually, it may not be all that difficult to figure the input and output impedances of the circuits feeding the filters. Just a bit of analysis knowing the resistors, capacitors there plus equivalent models of the tubes. Would be a lot simpler if someone could dig out the Collins specs on the input/output complex impedances (notice I didn't say resistances). Then compare what Collins says to the impedances derived from the analysis, then proceed from there to do a test rig. Of course, the best test rig is a good IF deck, but I don't have a spare good one. Also, it's a bit of a bother to Remove/Replace the filters in a good deck, so would rather do the testing externally on the bench before the R/R movement into a good deck. That's the whole point, that is to avoid the R/R moves into a good deck.

Date: 05 Apr 01 08:51:51 -0700
From: "Richard McClung" <richard_mcclung@tcibr.com>
Subject: RE: [R-390] R-390A Mechanical Filters

Do you get Hollow State News? Dallas Lankford had quite a series on mechanical filters with some good information on impedance matching and aligning filters. You mabe able to find what you're looking for there.....

On 01/04/05, Warren, W. Thomas wrote: Yep, I know about that diagram. Those diagrams are almost certainly for the filters installed in the radio (and probably includes the other frequency selective elements of the IF strip, although those other elements should be wide compared to the filters). One thing that would greatly aid this discussion (and I wish I had the time to do it, but I don't at the moment) is to set up known good filters in a very simple test rig and measure their responses. Then presumably, when they are loaded properly (when installed in a complete IF deck), they should result in the desired responses.

Date: Thu, 5 Apr 2001 15:31:02 -0400
From: "Barry L. Ornitz" <ornitz@tricon.net>
Subject: [R-390] Testing Mechanical Filters

Thomas Warren, W4PG, asked about testing mechanical filters, specifically if there is a way to do this without rebuilding the stages before and after the filter.

Short answer - yes and no.

Several people suggested using a signal generator on the filter input and a scope on the filter output. This will tell you if the filter is completely dead, but little

else. Kevin, VA3SU, has the right idea about filter impedance matching. This is an absolute MUST DO. Without this, you have little chance of getting meaningful results. And even when doing this, you have to do the tests with great care.

First you must know the filter input and output impedances. The new Collins mechanical filters of today are generally designed for 2000 ohms input and output impedance. But the filters of earlier days had widely varied impedance characteristics.

The R-390A filters were designed to be driven from a plate load into the grid of the next stage. Their input and output impedances are thusly different from most other filters found in later receivers. The input impedance of the R-390A filters is somewhere in the vicinity of 5000 to 10,000 ohms (I do not have the exact value handy). The output impedance is high, typically 50k TO 100k. Both the input and output must be resonated with external capacitors too, which is different from most modern filters which have the capacitors built in. The typical (quality) signal generator has a 50 ohm output impedance, while an oscilloscope generally has a 1 Megohm input impedance. A line level meter will have its own input impedance too. All of these will need to be matched to what the filter expects.

For a 50 ohm signal generator, place a resistance in series with its output, the value being the desired filter input impedance minus the generator internal impedance, or one half this impedance (see below). The signal generator output meter may be calibrated as the output voltage into a 50 ohm load, or the output voltage with no load - you need to know which for your particular generator. If it is into a 50 ohm load, then you will need to terminate the generator with a second resistor such that the impedance in parallel with the series resistance of the other resistor and the filter input provides 50 ohms. In this case the first resistor is the desired filter input impedance minus 25 ohms. If the signal generator output circuit is calibrated to read the open circuit voltage, the second resistor is not needed and the first resistor is the filter impedance minus 50 ohms.

Whew! This sounds complicated - lets do an example. Let's assume the filter input impedance is 500 ohms and the generator output meter reads the voltage into 50 ohms. The resistor between the generator and the filter is $500 - 50/2 = 475$ ohms. The sum is $500 + 475 = 975$ ohms. To get a 50 ohm parallel combination, a resistor of 52.7 ohms will be needed from the generator output terminal to ground. The 475 ohm resistor will connect to the generator output terminal and to the filter input terminal, the other filter input connection being grounded. The actual voltage input to the filter will be $500/975 = 0.5128$ times the generator indicated voltage, or 5.8 dB lower than the generator output.

Now if the generator output meter reads the open-circuit voltage, the series resistor is $500 - 50 = 450$ ohms. The filter input voltage will be one half the indicated generator voltage or 6 dB lower.

Similar calculations can be done to match the output impedance of the filter.

In the case of an R-390A filter, the 5 to 10K input impedance is so much higher than 50 ohms that you can use a 50 ohm shunt resistor and a series resistor of the same value as the input impedance with little error in the first case and just a

series resistor equal in value to the input impedance in the second. The filter input voltage will be about 6 dB below the generator voltage or approximately one half.

Likewise on the filter output with an R-390A filter, you can load the output with a 50 to 100K resistor and the scope probe and not use a series resistor.

To test, tune the generator to 455 kHz and set the output voltage to a convenient value. [In modern filters designed for low impedance circuits, you should remember to not over drive the filter or you will get nonlinear responses.] Adjust the filter matching capacitors to give the maximum indicated voltage on the scope. You can then move the frequency slightly to measure the filter response.

You might think that a sweep generator on the input and an RF probe on the output would display the filter response curve. It will, but not without a considerable amount of care.

First the sweep rate must be extremely low. Then the RF probe output must be exceptionally linear down to small signal levels.

The ideal way to measure the filter response is with a network analyzer, and I have done this. I used an HP-3577 network analyzer on a number of filters I have purchased at hamfests over the years. To get the published response from a narrow CW filter (250 Hz BW), I had to carefully match impedances and then sweep the bandpass so slowly that the full filter bandwidth took over a minute to sweep. I then had to average about 10 of these sweeps to get a nice clean curve. If you sweep too fast, the filter rings and displays all sorts of spurious responses. Note too that if you sweep an unknown filter over a broad range to determine its center frequency, you may be surprised to never see anything useful. Since the filter has a sizable time delay associated with it, you can easily pass through its passband before you ever see any output. Even if you know the filter center frequency, you will have to experiment with the filter impedances. With that particular CW filter, I used small potentiometers to adjust the 50 ohm input and output impedances. Minor changes in adjusting these potentiometers caused large changes in the shape of the filter response. Usually the most perfect response (square bandpass, minimum ripple) will only occur with the proper impedance matching.

Also when sweeping over broad frequency ranges, expect to see numerous spurious responses. It is not uncommon to see 455 kHz filters also respond around 300 and 600 kHz, and on integer multiples of the published response. There can be dips and peaks all over the HF region. So with the typical home equipment most of us have, do not expect to duplicate the filter response curves shown in the manual. In the case of the R-390A filters, if the response is roughly symmetrical at about the right center frequency and it does show something looking like a reasonable bandpass, the filter is likely good. Even if the bandpass looks a little funny from your crude measurements, the filter is likely good.

I am sure I probably confused many people with this limited explanation. If so, make sure you understand why proper termination is necessary. Then do the math. I can assure you that to get anything resembling the published response

curves from your measurements, you will need to take great care. If you just want to do a quick and dirty check of an unknown filter, it will be easier to solder it in and just try it!

73, Barry L. Ornitz WA4VZQ ornitz@tricon.net

Added note: Please observe that I did not quote the full text of a dozen earlier posts. This is a real waste of bandwidth, especially for those who prefer the digests. Turn off your automatic quoting unless you are willing to edit it down to just the parts that are significant. Thanks.

Date: Thu, 5 Apr 2001 15:36:34 -0700 (PDT)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] R-390A Mechanical Filters

The filters can be tested by first checking the coils with an ohmmeter to make sure they are (1) not open (2) not shorted to the case, then sweep a signal generator across their passband to see they pass the desired freqs and reject off freq signals. An AC voltmeter such as a HP 400E works well to measure the signal at the filter output. To accurately measure the filter, you need a stable generator you can adjust in small steps, and perhaps a freq counter to measure the output freq. For R-390A filters, you would place a 100 kohm resistor between the generator and the filter coil with the proper resonating cap in parallel with the coil to provide the proper source impedance. The receiver BFO could be brought out to provide a stable generator source, but wouldn't sweep far enough on either side to check deep skirt selectivity. Likewise a scope could be used to measure the output to see the shape of the nose well, but wouldn't work well to try to find the 60 db rejection points. e-mail for a list of available filters for sale.

Date: Thu, 5 Apr 2001 16:10:28 -0700 (PDT)
From: John Kolb <jlkolb@cts.com>
Subject: RE: [R-390] R-390A Mechanical Filters

> Tom, I generally agree. I'm looking for more detail though.

To get more specific than my last reply -

The F455N-20 data sheet lists the test conditions as: signal input V 5V RMS max source and load resistance 100 K +/- 5% input and output C 130 pF +/- 20

The +/- 20 pF variation on the 130 pF input and output C indicates it wouldn't have a large effect on the performance, but it should be remembered that the R-390A started with fixed C and later went to adjustable C's. Part of the 130 pF C to resonate the coil to freq will be provided by a fixed mica cap in the R-390A, and part by stray C, wiring and tube C in the 390.

The only other effect of the R-390A circuitry will be leakage around the filter. Two parts to this, the part you might introduce with sloppy techniques, and the part inherent to the R-390A, which I would expect to be pretty good, but never measured it. Test leads with 3-4 inches of unshielded wire at each end, and unshielded input and output leads close to each other will certainly destroy the

measurements.

Disconnecting the R-390A wiring from the top of the filter and connecting the shielded cable to the transmission test set directly could possibly give measurements even better than realized with the filter as used in the R-390A.

I hope your transmission test set has BNC connectors, not banana jacks. Tin foil around the banana to BNC adapter might help. General Radio once made a nice shielded adapter. Also hope your transmission test set has a high Z input, not 600 ohms, as the filter wants to see a 100K load R.

The URM-25 also has a lower output than desirable for this sort of test. AC voltmeters typically have a bottom range of 1 mV, -60 dBm full scale, readable to -10 db on the meter, so readable to -70 db. If your highest output from the URM-25 is -10 dBm, you only have a 60 db measurement range. If driving the filter with +10 db, about 2.5 V RMS, you get an 80 db range, better for resolving the low end of the filter. The filter is spec'ed for 25 db max insertion loss, so you need all the measurement range you can get.

The URM-25 will work fine if you only want to look at the filter nose, and insure a filter is not 45 db insertion loss instead of 25.

Date: Thu, 5 Apr 2001 17:23:37 -0400
From: twleiper@juno.com
Subject: Re: [R-390] R-390A Mechanical Filters

I agree with Tom. A set of known good filters will get you more reliable information than endless speculation as to the QC measures taken by the manufacturer. If I had to do the test right now, I think I'd take one of my receivers with non-mechanical filtered wide selectivity capability like an R-392 or non-a in the 16 Kc mode, and I would center-tune it to a carrier from the signal generator.

Then I would couple the IF output of the receiver via a 1K resistor or 470pf cap to the input side of the known good filter and hook my scope (1 meg) to the output side and see what I get. I'd probably have to slap on some parallel capacitance on the input and output of the filter to get it to resonate reasonably well. I would then tune the receiver up and down, and note the maximum signal and "offset" (where it occurs vis-a-vis the "center" frequency) as measured on the scope (or my TS-487U rf voltmeter), and then see if the "test" filter had the same response when hooked up to the same configuration. If that didn't work, I'd pull out my 1964 Collins AF-401 automatic mechanical filter tester I bought this past Sunday and just clip the filters in and get a complete print-out of the response and deviation from specification in about 15 seconds.

Date: Thu, 5 Apr 2001 20:41:06 -0700 (PDT)
From: John Kolb <jlkolb@cts.com>
Subject: RE: [R-390] Frequency response of filters

> Actually, it may not be all that difficult to figure the input and output...

I've got 1 or 2 dozen data sheets for individual filters - none show complex

impedances. They show source and load resistances and series or parallel terminating capacitances. Some also show a transfer impedance expressed as a simple, not complex value in ohms. The F455Z-16, for example, has a test circuit with 130 pF caps in parallel with the filter coils, 100 kohm source and load resistances, but 5.0 kohms transfer impedance. Can anyone explain transfer impedance?

Date: Fri, 6 Apr 2001 07:13:14 -0400
From: "Warren, W. Thomas" <wtw@rti.org>
Subject: RE: [R-390] Frequency response of filters

If I had some time to go back to my texts, I can explain transfer impedance. I believe it's essentially the output voltage variation caused by an input current variation. As one example, the transfer conductance of a tube is an ordinary measurement and that is the output plate current variation divided by the input grid voltage variation (partial derivative of plate current versus grid voltage). Then the transfer impedance is simply the inverse of transfer conductance. I forget which parameter set it is (likely the Z parameters), but transfer impedance is one of the terms in the 4-parameter description of a network (A parameters, B parameters, Z parameters, G parameters, H parameters, one other one I can't remember, S or scattering parameters are a little special set useful everywhere, but used lots in UHF and beyond, and so on). Unfortunately, I've long been away from circuits analysis, so working on shaky ground.

Date: Fri, 6 Apr 2001 20:39:04 -0400
From: dmclaughlin3 <dmclaughlin3@neo.rr.com>
Subject: RE: [R-390] R-390A Mechanical Filters

Look at drawings SM-D-248860 thru SM-D-248863 on the R-390A drawing disk from Jeff Adams web site. <http://users.erols.com/eengineer/> The specs and how they were measured is described on the drawings. Dennis

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Mechanical filter postmortem
Date: Mon, 8 Apr 2002 12:01:09 -0500

><http://www.lanset.com/buzz/misc/filter/390Afilter.html>

Kinda reminds me of the Area 51 "autopsy" pictures...

From: "Steve Goode" <goode@tribeam.com>
Subject: Re: [R-390] Mechanical filter postmortem
Date: Mon, 8 Apr 2002 12:08:28 -0500

Buzz, Is there a second page to the link as you say you got 3 bad filters and show two on the page? Were you able to fix these?

Subject: Re: [R-390] Mechanical filter postmortem Kudo's
From: "Roger L Ruskowski" <rlruszkowski@raytheon.com>
Date: Mon, 8 Apr 2002 10:12:52 -0700

Buzz, wonderfull pictures. Great job on the web.

From: David Wise <David_Wise@Phoenix.com>
Subject: RE: [R-390] Mechanical filter postmortem Kudo's
Date: Mon, 8 Apr 2002 10:48:23 -0700

What he said. Great job, Buzz. When C553 pops, we don't have to get out the hara-kiri knife anymore. Now, where're some bad filters for us to fix?

Date: Mon, 08 Apr 2002 13:42:56 -0400
From: James Miller <JamesMiller20@worldnet.att.net>
Subject: Re: [R-390] Mechanical filter postmortem

What say? Does this mean that it may be possible for some enteprising individual to actually repair bad filters and give them a new lease on life?

Date: Mon, 08 Apr 2002 11:53:21 -0600
From: Jordan Arndt <jordana@nucleus.com>
Subject: Re: [R-390] Mechanical filter postmortem

I have repaired several Mechanical filters in Yaesu gear, but they open a lot easier than the Collins filters do... In the Yaesu filters, it is usually migration and decay of the 'foam' padding that causes an increase in loss through the filters... Yes I have had to resolder a couple of the pick-up coil leads also.. 73 de Jordan...

Subject: RE: [R-390] Mechanical filter postmortem Kudo's
From: "Roger L Ruszkowski" <rlruszkowski@raytheon.com>
Date: Mon, 8 Apr 2002 10:57:48 -0700

David, I think this is a real leap you took in logic here. When C553 pops and places full B+ on that ittit bitti wire inside the filters, there is no assurance the point of opening will be repairable.

Buzz, just got lucky on a small sample and reported what he found. We can keep this in mine as a way to look for fixes. As as morning after pill for not doing preventive C553 I think is a stretch. But we sure had better look before we toss the filters.
Roger.

Date: Mon, 08 Apr 2002 13:34:19 -0400
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] Mechanical filter postmortem

>You wrote I have repaired several Mechanical filters in Yaesu <snip>

Did you replace the foam stuffing? If so, with what? Is it necessary?

Date: Mon, 8 Apr 2002 14:02:18 -0700 (PDT)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] Mechanical filter postmortem

> Did you replace the foam stuffing? If so, with what? Is it necessary?

When I repaired a couple of Kokusai filters, I used loose cotton from the filler in a medicine bottle. Someone recently (Barry?) reported using a sheet of closed cell foam, which sounds like a better idea to me. Comments on Buzz's postmortem - GREAT!

That wire he pictures "sticking up in the middle" that's the magnetostrictive element - if that breaks off, writeoff the filter.

Judging from my experience with the Kokusai filters, yes the polyfoam in the Collins filter could get on the disk elements and cause them to become more lossy. If the filter bias permanent magnets became weaker, that could also be the cause of a weak filter.

I've repaired a small number of Collins filters with open coils - if the wire breaks at the terminals, it's an easy repair - once found a filter with a terminal that had never been soldered. With care, a wire broken halfway between the filter coil and the terminal can be spliced. If the wire breaks at the coil on the outside of the winding a little can be unwound and extension soldered on.

If at the end of the body but coming from the coil pi winding from the other end of the coil, it can be loosened from the glue blob and extended. If the broken lead is from the inside of the coil - the part next to the core, the coil is toast. I have, however, done a coil transplant from another filter.

After spending lots of time holding a 250 watt iron trying to unsolder the case on D/E case or the small V case filters, I gave up and just cut off the filter end with a mototool with cutoff wheel. Save the end piece and glue it back on with hotmelt glue. <SNIP>

Date: Mon, 08 Apr 2002 15:14:32 -0600
From: Jordan <jordana@nucleus.com>
Subject: Re: [R-390] Mechanical filter postmortem

Yes the foam sheet I have used is a form of closed cell foam....I don't know how well it would hold up if you were resoldering the filter case, the Yaesu filters are not soldered near as much as the Collins filters are, but then the foam was used when they were both originally soldered, so....? 73 de Jordan...

Date: Mon, 08 Apr 2002 19:02:24 -0700
From: Jerry Kincade <w5kp@swbell.net>
Subject: Re: [R-390] Mechanical filter postmortem

Since we fearlessly get into molecules on this list, I'll throw this one in: Many types of foam = many different chemicals in their makeup. Stick some in a small sealed container with several types of metal for a while, especially under heat, and no telling what chemical migration will or won't attack the metals inside. Maybe there's more to this than just grabbing some handy foam and putting it in. OTOH, if it's blown to start with, what the heck....

From: Buzz <buzz@softcom.net>

Date: Mon, 08 Apr 2002 20:42:40 -0700
Subject: [R-390] Mechanical filter postmortem response

Listers, I had many emails so I thought that I'd reply through the list rather than individually. I only opened two of the three filters because I figured that number three would be the same as one and two. I haven't yet attempted to rebuild the filter, but after reading the comments I think that I'll go with the closed cell foam. I was able to wash most of the foam goo off with brake cleaner, but would like to use the vapor degreaser where my neighbor works before I put it back together.

I started taking things apart when I was a kid. I'd drive my parents nuts. They would give me a toy for xmas or birthday and I'd play with it for a few days then take it apart. Sometimes I'd get it back together, but most times not. As I grew up I worked on motorcycles, then cars, then I started on electrical things. I day I took an old battery charger apart, then the transformer, then the selenium rectifier stack. I was dumbfounded when there were no moving parts inside? A few years later when I went in the Navy I signed up for avionics and, as the saying goes, the rest is history.

Thanks for all of your nice comments re: the pictures and the web page. If something else comes along I'll do it again. Now get busy and repair those filters!!!!
Thanks, Buzz

From: "Kenneth Crips" <w7itc@hotmail.com>
To: r-390@mailman.qth.net
Subject: Re: [R-390] Mechanical filter postmortem
Date: Mon, 08 Apr 2002 21:51:56 -0600

RE: rebuilding

I was wondering the same thing. More and more parts for these radios will have parts which will have to be refurbished instead of replaced. It strikes me there maybe a market for refurbished Collins Mechanical filters to the best of My knowledge new ones are no longer manufactured for the any of the old stuff. Just think one of you techneers out there could become the Peter Dhal of Mechanical filters.

Subject: RE: [R-390] Mechanical filter postmortem
Date: Wed, 17 Apr 2002 10:03:15 -0400
To: <r-390@mailman.qth.net>

Before you get carried away on building new, check out
[http://www.rockwellcollins.com/otherbusinesses/collins-filters/low-cost-series/.....](http://www.rockwellcollins.com/otherbusinesses/collins-filters/low-cost-series/) There may be a way to retrofit their "low-cost product line" to replace the original filters.

Date: Fri, 19 Apr 2002 15:01:17 -0700 (PDT)
From: John Finigan <john_finigan@yahoo.com>
Subject: Re: [R-390] Pricing of Collins Low Cost Filters

It slipped my mind to post this earlier, but I got a quote from Rockwell a few

months ago on these filters. Prices were around \$90 for 1 to about \$48 for 25+. I guess the prices have gone up. It would be nice if some distributor bought in bulk passed the discount on, but I never found one on the web.

> =====

> Rockwell, Filter Products is pleased to provide you with the following
> pricing information on the LOW COST SERIES of filters. The LOW COST
>SERIES of filters have all three bandwidths are centered at
> 455 kHz. The pricing on these filters is the same for all three filters,
> 526-8693-010 (500Hz B.W.) 526-8694-010 (2.5kHz B.W.),
> 526-8695-010 (5.5kHz B.W.) and is as follows:

>

> Quantity Unit Price

> 1-4	\$ 75.55	5-9	\$ 62.17
> 10-24	\$ 50.81	25-49	\$ 43.12
> 50-99	\$ 38.44	100-249	\$ 33.43

>

> Prices are FOB our plant and are per filter part number. Prices DO NOT include
>local taxes if required, or shipping costs. Delivery will be from stock on the
>LOW COST SERIES.

From: "Mike Hardie" <hardiem@intergate.ca>
Date: Fri, 19 Apr 2002 18:16:32 -0700
Subject: [R-390] Intermittent Filter

The 4 Kc filter in my '390A is "intermittent". It works OK when the radio is first switched on. After warming up even slightly, if the mode switch is moved to standby then to AGC, or if a different filter is selected then 4 Kc reselected, the audio is extremely weak. (Almost not there.) If no selections are changed after the radio is first turned on, the 4 Kc filter works normally. The other filters work normally so far as I can tell. Does anyone have an idea before I start the honest-to-goodness trouble shooting?

Date: Fri, 19 Apr 2002 18:55:12 -0700 (PDT)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] Intermittent Filter

Dirty bandswitch, dirty trimmer cap, maybe a short to ground on the center contact of the trimmer. Just generally do a poke around in there to see what you can find.

From: David Wise <David_Wise@Phoenix.com>
Subject: RE: [R-390] Intermittent Filter
Date: Tue, 23 Apr 2002 09:24:22 -0700

I have one of the older IF decks, with hand-picked fixed mica caps instead of trimmers. One of these (8kHz in my case) turned out to be intermittent. However, it didn't respond very strongly to heat/cold; only just enough to make me suspicious. I used brute force and slapped in another mica. End of problem. Later I went back and hand-picked for maximum response. The old cap went in the "Bad R-390A parts" baggie. Not much in there, it was a good radio to start with.

Date: Tue, 7 May 2002 22:32:04 +0200
From: Fabio Liberatori <liber.fab@iol.it>
Subject: [R-390] Dittmore-Freimuth mechanical filters

I have found here (and bought...) a particular 2 Kc filter for my 390A, new and never used; in fact it is built by Dittmore-Freimuth, so I assume it has been built around/after 1968. Does anybody know if the quality of these filters is as good as the Collins ones ?

From: Llgpt@aol.com
Date: Tue, 7 May 2002 17:08:10 EDT
Subject: Re: [R-390] Dittmore-Freimuth mechanical filters

The Dittmore-Freimuth mechanical filters are superior to the Collins mechanical filters. They were installed in the 1968 run of R-390A's. Manufacturing techniques were much improved over the Collins type filters and they exhibit much less loss. Les Locklear

Date: Sun, 30 Jun 2002 22:36:57 -0400 (EDT)
From: "Paul H. Anderson" <pha@pdq.com>
Subject: Re: [R-390] looking around for r390-a

> The mechanical filters with "goo" problems are only a
> particular series of Japanese Kokusai brand filters -.....

Buzz wrote a thread awhile back about repairing failed collins filters -the pictures are his web site: <<http://www.lanset.com/buzz/misc/filter/390Afilter.html>>

That is what I was referring to as I have never opened one up myself. I'm tempted, as I've got a failed one (probably failed for other reasons, though).

Date: Wed, 17 Jul 2002 15:57:20 -0400
From: Norman Ryan <nryan@intrex.net>
Subject: Re: [R-390] AGC problems

This sounds like a problem in the AGC line-- possibly a leaky cap, an off value resistor or bad mechanical filter. Do you experience this at all Bandwidth settings? The audio distortion may be related to the AGC problem. Before considering modifications, eliminate the problem first. You may find the audio to be OK.

1. Remove the IF deck.
2. Attach the knob to the Bandwidth switch shaft.
3. Do resistance measurements according to the manual. When you find a resistance value way off normal, turn Bandwidth knob to see if the value changes.

If it's a bad mechanical filter, resistance measurements at the connector will differ depending on whichever position the bandwidth switch is set. Ordinarily, the resistances should not vary significantly no matter where the Bandwidth is set. Chances are you can isolate the fault simply by measuring resistances and comparing them to the chart in the manual. Good luck-- please let us know how it

goes.

Date: Tue, 23 Jul 2002 08:27:40 -0400
From: martin benoit <martin.benoit@sympatico.ca>
Subject: [R-390] 4 kc filter

Hello in my Motorola R390A the 4 kc filter is defective (20 db attenuation)
I am wondering where i can find a solution to fix it.

From: Buzz <buzz@softcom.net>
Subject: Re: [R-390] 4 kc filter
Date: Tue, 23 Jul 2002 08:16:50 -0700

Take a look at my page at: <http://www.lanset.com/buzz/misc/filter/390Afilter.html>

From: "scott" <polaraligned@earthlink.net>
Subject: Re: [R-390] 4 kc filter
Date: Tue, 23 Jul 2002 12:37:56 -0400

Look here for info on new replacement filters: <http://www.r390a.com/html/Curry.html>
Fair Radio sells IF modules that they guarantee has good filters. Little expensive at \$125.00 <http://www.fairradio.com/hfrece.htm>

From: Llgpt@aol.com
Date: Tue, 23 Jul 2002 18:17:37 EDT
Subject: Re: [R-390] 4 kc filter

They might be good 'now', but the 4 kc filter is/was the most used filter on the R-390A. They will only vibrate a certain number of times before they go kaput! And, that time has approached judging from the failure rates being reported now.

From: "Biddle, Richard" <s-biddle@ti.com>
Subject: Re: [R-390] 4 kc filter
Date: Wed, 24 Jul 2002 12:32:14 -0500

I have seen these options:
Buy a spare deck and hope.

Get a new Longwave Products 5 kc replacement mechanical filter. These go for \$200/each for the Collins 75A4. (Chuck Ripple has details.) Then you can restart the 50 year wear-out clock

Use an R-390 IF deck in an R-390A.

Has anyone tried replacing a single mechanical filter with a readily available crystal filter, preferably one that does not cost an arm and a leg? I wound up with two spare IF decks - one Collins and one Motorola. I had hoped to swap for a Dittmore-Freimuth 1968 DAAB05-68-C-0040 IF deck in good non-hacked condition. Then all I will need is a matching contract power supply and all the modules will match. I know it doesn't matter and I'm not too worried about it, but I

think any radio I keep in an oak case deserves it.

Date: Wed, 24 Jul 2002 15:58:14 -0400
From: Norman Ryan <nryan@intrex.net>
Subject: [R-390] Mechanical Filter Repair

Thanks for pointing me to the Collins list for hints on mechanical filter repair:
<<http://www.collinsradio.org>>

I clicked on the archives and typed in the search window "mechanical filter repair" here: <<http://mailman.listserv.com/archives/collins/>> and got several good hits including Kokusai's website translated into funky fractured English:

<http://translation.lycos.co.jp/web/result.html?url=http%3A%2F%2Fwww.ksky.ne.jp%2F%7Et-kato%2Fhamf%2Fmyexp%2FMF-Repair.html&u0=3>

>

John "The Filter King" Kolb guesses the magnet wire size to be #36. I poked around with a Google search and found DC resistance to be 0.4148 Ohm per foot at this site: <<http://www.mswire.com/insdia2.htm>>

Any more hints, tips, experiences with mechanical filter repair from the group?

Date: Wed, 24 Jul 2002 12:43:53 -0700 (PDT)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] 4 kc filter

> While I'm here, anyone know the enameled wire size on the bobbins? How
> many feet of wire for 50 Ohms DC resistance? I've got a couple of duds
> I'd like to try and revive some time.

Very, very fine, much smaller than 30 ga. Probably varies with the filter, smaller with the newer, smaller filters.

> Other than resoldering a broken lead inside, has anyone successfully
> revived one of these either by rewinding the bobbin or replacing plastic foam?

I've restored a couple of Kokusai filters by replacing the foam with cotton - don't recall seeing any foam in Collins filters, only rubber fittings. Haven't been inside the type "N" filters used for the R-390A, so don't know how they are supported. I haven't rewound a bobbin, but have transplanted a bobbin from a different filter for a repair.

Date: Wed, 24 Jul 2002 15:16:08 -0600
From: Jordan <jordana@nucleus.com>
Subject: Re: [R-390] 4 kc filter

I have had to rewire a bobbin in Kokusai filter as it had broken.. I simply unwound 3 turns, out of the hundred or so turns on the bobbin, clean the end, and solder it back on.. worked like a charm... The trick with some of the Collins filters is removing the filter assembly and the rubber fittings without causing more damage

From: "Dallas Lankford" <dallas@bayou.com>
Subject: Re: [R-390] 4 kc filter
Date: Wed, 24 Jul 2002 17:40:00 -0500

<snip> Has anyone tried replacing a single mechanical filter with a readily
> available crystal filter, preferably one that does not cost an arm and a
> leg? <snip>

Many crystal filters are 2000 ohms source and load, so you would have to
impedance match, probably with two mini IF transformers like I did. Depending on
the size of the crystal filter, there might not be enough space to do a nice job.
Just for fun I put a NTK 3 kHz BW ceramic filter (no longer available) in one of my
IF decks. I impedance matched with two Mouser 43IF303 20K:5K ohms, 6:1
turns.

Mouser doesn't carry this part any more, but the 42IF103 or 42IF303 should work.
I didn't expect them to do a good job of impedance matching, but it worked fine.
For my first try I mounted a PC board with filter and IF transformers in the hole
where the 16 kHz mechanical filter had been. But filter leakage made the filter
ineffective. With two PC boards soldered to a copper flange, and a rectangular
hole cut in the flange which flush fit the filter, and the flange bolted to the R-390A
IF chassis, like an N type filter, filter leakage was greatly reduced.

If I did it again, I would use a 3.3 kHz BW torsion filter with a metal case
(occasionally seen on Ebay) to eliminate residual leakage. For 4 kHz, I believe
Sherwood Engineering still sells the 15 resonator Murata CFS-455J ceramic
filter, typically 4.3 kHz @ -6 dB, 7.0 kHz @ -60 dB. I don't know of a 4 kHz BW
crystal filter.

Date: Wed, 24 Jul 2002 20:17:21 -0700 (PDT)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] Mechanical Filter Repair

> John "The Filter King" Kolb guesses the magnet wire size to be #36. I
> poked around with a Google search and found DC resistance to be .4148
> Ohm per foot at this site: <<http://www.mwswire.com/insdia2.htm>>
> Any more hints, tips, experiences with mechanical filter repair from the group?

Just measured 2 open filters and a loose bobbin and got wire diameters about
0.0062 and 0.0070 ("V and Y case filters), which would be 34 or 35 gauge
enameled wire.

Date: Wed, 24 Jul 2002 23:50:24 -0400
From: Norman Ryan <nryan@intrex.net>
Subject: Re: [R-390] Mechanical Filter Repair

Thanks for the new info. Do you know what the impedance should be? I get
similar DC resistances from input and output, thus expect impedance is the same
each way.

Date: Thu, 25 Jul 2002 00:12:34 -0700 (PDT)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] Mechanical Filter Repair

> Do you know what the impedance should be? I get similar DC resistances
> from input and output, thus expect impedance is the same each way.

What's the filter number? I have a number of data sheets, and might be able to look it up. I just measured an R-390A filter which is 100K Z at 50 ohms in and out resistance. A F500Y-70, which is 1K input Z, 330 ohms output Z measured 40 ohms for both the input and output side - just a rough measurement on a 260, but clearly the resistance is not proportional to Z. The R-390A filters, like most of the older filters designed for tube applications were spec'ed for 100K Z. Newer filters designed for solid state were most often 2K in and out.

From: "Bob Tetrault" <r.tetrault@attbi.com>
Subject: RE: [R-390] Nearly OT - Wave winding ?
Date: Tue, 6 Aug 2002 14:21:41 -0700

It's called pie wound and helps to minimize distributed C. Re-wind? YMMV.

From: ToddRoberts2001@aol.com
Date: Tue, 26 Nov 2002 20:23:45 EST
Subject: Re: [R-390] Dead Filters

Hi Tom, sounds like a good project. From what I have learned and read over the years, I believe the number one failure mode of Collins mechanical filters is CORROSION. The filters are supposed to be hermetically sealed, but from what I have seen myself and in other pictures, the filters are notorious for having corrosion inside. What usually happens is corrosion eats away the fine wires from the transducer coils usually at the solder joint to the feedthru connector. When the filters are opened up what was once some kind of foam rubber cushioning inside has "dissolved" and there is likely to be greenish corrosion all over the metal parts inside. I believe 99% of all troubles inside are failure of the transducer coil due to corrosion, and sometimes due to electrical faults (short-circuit of B+ to ground thru the filter).

Date: Mon, 16 Dec 2002 12:47:32 -0500
From: Barockteer@aol.com
Subject: [R-390] Re: [Boatanchors] IF Filter testing...

Testing filters (and IF transformers) isn't that difficult, assuming you have access to a calibrated RF generator and means of measuring low level RF signals. This could be done with a modern general coverage HF receiver, assuming it covers the passband of interest. (Getting down to 50 KC might be a bit tough, but most rigs go down to 100 KC). The receiver S-meter can be calibrated using a step attenuator. Or, you can use a substitution method to achieve the necessary measurement accuracy.

The hardest part is the requirement that the source and load impedance of the filter needs to be terminated in the proper impedance for the filter to perform

nominally. Often, the source and load impedances are not know, such as for older Collins mechanical filters. Also, some filters rely on external reactances (capacitors) to tune them.

If you can test them 'in situ', in the equipment where they are used, then signal injection/measurement techniques can be used and the termination issue is taken care of by the rig itself. The easiest way to do it is with a \$20,000 network analyzer. However, it can be done with the kind of gear found in most ham shacks (once the termination impedance issue is addressed).

If there is interest, I would be willing to write up a sample testing procedure...

From: "Tom-WB3AKD" <wb3akd@arrl.net>
Date: Fri, 10 Jan 2003 09:07:15 -0500
Subject: [R-390] R-390 Related Activities

Mechanical Filters: Well, finally found a cost effective 8KHz filter for the -A and swapped it out. This offered the dead one for tinkering so messed around with some graphite (all kinds of black dust) and came up with a crude resistance soldering setup to open up the dead filter. As was explained on this list a while back, the wires were indeed broke, and the foam was real gummy. Took the filter out and gently cleand the majority of the gunk off it, removed the paper and remains of the foam and cleand the sticky stuff out of the tube with IPA. Lined the tube with Kapton Tape, then took some newer foam and cut then wrapped it around the filter and put the whole thing back together. Swept it with the HP3336B with initially satisfactory results (no resonating capacitors on the filter so its pretty bumpy in the pass band right now, and I am not presently presenting the right impedance). Still, positive results so far. The plan is to sweep it some more with the proper terminations and then see about sealing it up after a little baking to remove the moisture. An interesting experiment. <snip>

Date: Mon, 10 Feb 2003 17:50:00 -0500
From: MURPH <rickmurphy1001@earthlink.net>
Subject: [R-390] 8k filter

Has anyone experienced a decrease in signal strength of about 20 db in the 8k filter position? Sometimes mine will read like the other filter (within +/- 2db) positions until the radio is turned off, then back to the 20db decrease. Any Ideas?

From: R390rcvr@aol.com
Date: Mon, 10 Feb 2003 18:07:53 EST
Subject: Re: [R-390] 8k filter

It is likely that the filter is failing. They often will show such a decreased sensitivity before they fail outright. Sorry!

From: "Barry Hauser" <barry@hausernet.com>
Subject: Re: [R-390] 8k filter
Date: Tue, 11 Feb 2003 07:33:31 -0500

Uh, Hey Wally ... Uh, ummmm .. I don't think the kids wanna know that about

mechanical filters. Beaver Seriously though, some run their '390's 24/7 or nearly. $20,000/24 = 833$ days over $365 = 2.28$ years, roughly 2 years, 3 months. Even taking a mere fraction of that daily usage, it would seem a lot of our filters are on borrowed time. Then, again, I've come across quite a few bad crystals. "A diamond is forever", but maybe not quartz. OK, time for somebody to start working on direct replacement DSP filters. Tough part is going to be stuffing them into those shiny little cylinders. ;-)
Barry

From: "Jerry Kincade" <w5kp@direcway.com>
Subject: Re: [R-390] 8k filter
Date: Tue, 11 Feb 2003 06:29:44 -0600

Filter could be going down the tubes, I guess, but looking closely at the IF deck bandswitching contacts might be worthwhile before hunting a new filter. Maybe a touch of Deoxit on a toothpick.

Won't hurt, might help, especially if the problem appears and disappears with bandswitch (bandwidth) changes.

From: "Jerry Kincade" <w5kp@direcway.com>
Subject: Re: [R-390] 8k filter
Date: Tue, 11 Feb 2003 06:33:51 -0600

Did I say bandswitch? I meant bandwidth. Sorry. Jerry

Subject: RE: [R-390] 8k filter
Date: Wed, 12 Feb 2003 14:28:22 -0800
From: "David Wise" <David_Wise@Phoenix.com>

When I had this symptom, it turned out that one of the mica capacitors used to tune the input and output coils of the filter had gone intermittent.

From: "Jerry Kincade" <w5kp@direcway.com>
Date: Thu, 6 Mar 2003 21:55:09 -0600
Subject: [R-390] Testing 390A mechanical filters

Anybody know of a quick and dirty test to see used filters are still ok? Have accurate millivoltmeter, scope, HP sig gen, etc. etc. available.

I'd just dive in and try some things but don't want to take a chance on frying a good one in the process.

Date: Thu, 6 Mar 2003 22:11:20 -0800 (PST)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] Testing 390A mechanical filters

First step would be to measure the coil resistances. A F455N-160 filter (R-390A 16 kHz) here measures 41 ohms each coil, A F455FA-21 measures 53 ohms. Don't use the X1 range of a VOM as the low range puts more current through the measured resistor. (and you can hardly measure 40-50 ohms on the low range anyway) Each coil should read open from the coil to the case or gnd terminal.

The next test would be to drive one coil with a signal generator and put a scope or AC or RF voltmeter across the other. Most Collins filters are spec'ed as 2 or 2.5 V RMS max for recommended operating conditions, so keep the signal generator down around 1V RMS to be safe. You would have to terminate the filter coils with the proper resonating caps and load resistors to run accurate curves, but tuning across the expected passband freq will tell if the filter passes anything or not. Filter insertion loss can be as low as 5 db high as 25 or 30 db, so it helps to have a data sheet for the filter you are testing. The filter type number will tell you a little about the filter F455FA-31 has a carrier or center freq of 455 kHz and is 31 times 100 hertz (3.1 kHz) wide at the nose, and is in the "FA" case. This system works for most filters, but not all. Specifically, it doesn't work for "Q" or "Z" filters. "Z" filters (F500Z-10, etc) are generally either LSB or USB, rather than centered on the listed freq, and anywhere from 2 to 3.5 kHz wide. A full data sheet will give passband wt the 3 or 6 db points and also at the 60 db points, as well as impedance, resonating caps, insertion, case dimensions. Full data sheets are rather rare. I have a small number of them so may be able to look up some filters.

Date: Wed, 12 Mar 2003 10:10:35 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Old Men Threads of The Coil

>of mechanical filters. ...Well, I have a non-functional 4 KHz mechanism a philharmonic >whose old men coils (input and output) both show continuity and are not shorted to ground. >Haven't opened it up but I suspect those little disks may have become loose on the wire.

Unlikely but possible.. the coupling wires were spot welded to the disks.

> from those filter caps and magically migrated cross-deck into the little > disks, immobilizing them.

BINGO, or almost. The filter was made with foam supports for the mechanism. The foam is likely transmogrified from foam to ukkumpucky, or a relative of ukkumpucky. I suggest you disembowel your "mechanism a philharmonic" and look closely. Do not be surprised to find ukked-up foam contaminating the once-free-to-vibrate resonator disks and coupling wires. Cleaning with delicate brushes or other instruments, and maybe solvent keeping that away from the coils, may solve the situation. Please report your findings!

From: "Jim Miller" <jamesmiller20@worldnet.att.net>
Date: Tue, 29 Apr 2003 22:25:34 -0400
Subject: [R-390] 16khz filter failure when hot

My 16 khz filter appears to "quit" when operating temperatures rise after an hour or so of operation. Carrier meter drops to near zero, although signals can still be heard weakly in the 16 khz position (other positions are fine). Use some component cooler to cool the 16k filter down, and it springs back to life after a brief noise. Is this a usual failure mode for this filter? Anyone ever open one up to attempt repair? Jim N4BE

Date: Wed, 30 Apr 2003 17:40:37 -0700 (PDT)

From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] WTB 16 kHz Filter

Well, yes, as a matter of fact I do, listed on my new web site I've put up in the last two days. <<http://members.cts.com/king/j/jlk>> Info on Mechanical Filter testing, Kokusai filter repair, my For Sale list, with more to come as I learn more about html. Please let me know if you have any problems with it.

From: "Jim Miller" <jamesmiller20@worldnet.att.net>
Subject: Re: [R-390] WTB 16 kHz Filter
Date: Wed, 30 Apr 2003 21:39:19 -0400

I get a "Page Cannot Be Found" error when I try your page. Also, I think I found the problem, I hope. I reheated all the solder joints on the filter and while doing so noted that a bare wire from one of its pins was barely touching the metal case... I think it was shorting to ground as the case heated and expanded and contacted the wire..., or possibly a bad solder joint. Anyway it has been working without failure for a couple of hours now. Knock on wood. Thanks,

Date: Wed, 30 Apr 2003 21:36:25 -0700 (PDT)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] WTB 16 kHz Filter

Sounds like a cure. Reheating might fix even a poor connection inside the filter, although I once saw a filter where one of the wires had never been soldered to the inside end of the terminal. No proper cure for that without opening the filter.

From: Llgpt1@aol.com
Date: Wed, 11 Jun 2003 19:25:05 EDT
Subject: Re: [R-390] R-390A Mechanical Filter replacement

> The KIWA is expensive,

Cheaper than mechanical filters these days, and yes, it does sound better.

From: "Bob Tetrault" <r.tetrault@attbi.com>
Subject: RE: [R-390] R-390A Mechanical Filter replacement
Date: Wed, 11 Jun 2003 17:05:14 -0700

Also waaaaa-ay cheaper than a new stagger-tuned L/C retro-fit into an A I.F. deck. The early mech filters were much more peaky in the passband than what was later considered good in the late 75A's and 75S's. As much as 6dB!

Date: Thu, 12 Jun 2003 10:46:58 +0200
From: "Bryce Ringwood" <BRingwoo@csir.co.za>
Subject: Re: [R-390] R-390A Mechanical Filter replacement

I have a 455kHz "Ferritronics" LC Filter ~16kHz bandwidth - This uses several coils wound on pot cores and is the same general size and shape of the R390 mechanical filters. For those of you contemplating that route, my (thankfully limited) experience of winding 455kHz IF transformers, adjusting the coupling and

fiddling with a sweeper is that its very time-consuming indeed. Apart from the windings at each end of a mechanical filter - how do they fail ? Are the Kokusai type which use piezo crystals as bad or worse ? Just curious - Bryce

Date: Thu, 12 Jun 2003 08:31:56 -0400
From: "Veenstra, Lester" <lester.veenstra@lmco.com>
Subject: RE: [R-390] R-390A Mechanical Filter replacement

Pointer to KIWA data: <http://www.kiwa.com/kiwa455.html> It says "The Standard Filter Module is an encapsulated filter consisting of three ceramic filters with input and output buffer amplifiers". So if that is not suitable, why not do what they did, stating with standard 455 ceramic filters, and possibly some of those there terminal monolithic RF amps for isolation. Inside the box for the four mechanical filters, there is plenty of room to put a substitute.

IMHO \$50 does not sound unreasonable compared to a new Rockwell mechanical filter. However the Ceramic filters (CFM2 from Digikey) prices are less than \$3 each for 4/6/8/10/12 khz wide Of course these are only two section:

STANDARD FILTERS SELECTION GUIDE TYPE CFM2/CFM3 TOKO
Center Bandwidth Selectivity Ripple Insertion Input/Output Part Frequency (Fo)* at 6dB at Fo?9kHz in Pass Band Loss Impedance Number (kHz) (kHz) (dB) (dB) (dB) (kW)CFM2

AHCFM2-450Z	450?1.0	4.0?1.0	24.0 min.	1.0 max.	7.0 max.	1.0/1.5
AHCFM2-450AL	450?1.0	4.0 min.	18.0 min.	1.0 max.	6.0 max.	1.0/1.5
AHCFM2-450BL	450?1.0	6.0 min.	16.0 min.	1.0 max.	6.0 max.	1.5/2.0
AHCFM2-450CL	450?1.0	8.0 min.	12.0 min.	2.0 max.	6.0 max.	2.0/2.0
AHCFM2-450DL	450?1.0	10.0 min.	9.0 min.	2.0 max.	6.0 max.	2.0/2.0
AHCFM2-450EL	450?1.0	12.0 min.	6.0 min.	2.0 max.	6.0 max.	2.5/2.5

However the 6 element, I suspect, are comparable to the existing Collins filters, two in series would be even better of course.

TYPE LFY/LFYM TOKO

Center * Bandwidth Bandwidth Attenuation Insertion Input/Output
Part Frequency at 6 dB at 50 dB fo ? 100 KHz Loss Impedance
Number (kHz) (kHz) (kHz) (dB) (dB) (kW) LFY

ALFY455H	455?1.0	?3.0 min.	?9.0 min.	35.0 max.	6.0 max.	2.0
ALFY455G	455?1.0	?4.5 min.	?10.0 min.	35.0 max.	6.0 max.	2.0
ALFY455F	455?1.0	?6.0 min.	?12.5 min.	35.0 max.	6.0 max.	2.0
ALFY455E	455?1.0	?7.5 min.	?15.0 min.	35.0 max.	6.0 max.	1.5
BLFY455D	455?2.0	?10.0 min.	?20.0 min.	35.0 max.	4.0 max.	1.5
BLFY455C	455?2.0	?12.5 min.	?24.0 min.	35.0 max.	4.0 max.	1.5
BLFY455B	455?2.0	?15.0 min.	?30.0 min.	35.0 max.	4.0 max.	1.5

Date: Tue, 17 Jun 2003 22:23:35 -0700 (PDT)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] R-390A Mechanical Filter replacement

> Apart from the windings at each end of a mechanical filter - how do they fail ? Are the Kokusai type which use piezo crystals as bad or worse ?

The Kokusai MF-455-10AZ, used in the frDX-400 and similiar vintage receivers has a failure rate perhaps approaching 100 % from the foam in the filter decomposing. The good news is that they are dasy to open and repair. <<http://members.cts.com/king/j/jlk/site/koku.htm>>

I haven't heard of any problems with the transducers on the filter.

From: "Jim Miller" <jamesmiller20@worldnet.att.net>
Subject: Re: [R-390] LC sections for the 390a
Date: Thu, 12 Jun 2003 22:56:20 -0400

Rockwell Collins still makes mechanical filter modules using modern design. You can buy them on small boards as plug ins for the S Line from Inrad. Or you can buy the modules directly from Rockwell I believe. Also I think Longwave Products sells direct replacements for the 75A4 and 390 that uses the Rockwell modules mounted in the metal cans. The modules are small and could easily fit inside an old mechanical filter can. Why not try them?

Date: Sun, 09 Nov 2003 19:24:03 -0600
From: fideroos@mmmpcc.org
Subject: [R-390] A Bunch of Questons About an R390A

<snip> And the final question is what should the DC resistance of the mechanical filters be? Three of mine measure 50 ohms for the input and output and the other one (8 khz) measures 40 ohms for the input and the output. I think I've seem 40 ohms listed several times, but am surprised that I would have three bad filters that measure so closely. And, if there were shorted turns, the resistance should be lower. These are quite the receivers. I can't wait to get it working and actually use it. Thanks in advance for any help/suggestions.

Date: Sun, 9 Nov 2003 21:42:00 -0800 (PST)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] A Bunch of Questons About an R390A

> And the final question is what should the DC resistance of the mechanical filters be? <snip>

I've measured resistances of both 50 and 40 ohms on working R-390A filters - anything in that range should be good. When checking filter coils, I only check to make sure they are not open, and that neither coil is shorted to ground.

Date: Tue, 25 Nov 2003 13:05:53 -0500
From: "Dennis L. Wade" <DWADE@pacbell.net>
Subject: [R-390] Clevite Filters WAS: R-390 IF in 390A

Thanks Tom for posting the article. I've been considering this conversion for a while, of course, deck availability is an issue. A related question comes to mind. Most of us have heard about the Clevite ceramic filters that one contractor (I forget who) tried to use in a run of 390A IF decks. These were subsequently removed and the proper mechanical filters installed. I remember looking at the bandpass curve of a typical ceramic filter and noticing it was much smoother over

the top (less ringing?) and much gentler skirts than a mechanical filter. Can anyone comment on the audio quality of a Clevite equipped 390A vs. the mechanical filter? I know some have survived. I have an almost full set of Clevite filters and was considering an experiment to answer that question... but if I can avoid that kind of surgery I will.

From: R390rcvr@aol.com
Date: Tue, 25 Nov 2003 13:16:03 EST
Subject: [R-390] Clevite Filters

The Clevite filters were used in the 1960 EAC contract (23137-PC-60). I seem to remember only several hundred were so fitted. The consensus is that they were a failure, but I don't recall why. I would be disinclined to go to the trouble of putting them in. Perhaps someone with personal experience with them can comment on their sound? I doubt if there are a lot of them still out there in operating rigs.

Date: Tue, 25 Nov 2003 10:50:32 -0800 (PST)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] Clevite Filters WAS: R-390 IF in 390A

I don't have any experience with the Clevite ceramic filters, but have plotted curves of the R-390A mechanical filters and a number of ceramic filters - plots available at <<http://members.cts.com/king/j/jlkolb/site/mfcurves.htm>>
The ceramic filters are indeed smoother, although very rounded and thus attenuate high freqs more - easily corrected with the tone controls if feeding the 390 audio output through an external amp.

Date: Thu, 27 Nov 2003 13:22:28 -0600
From: Tom Norris <r390a@bellsouth.net>
Subject: Re: [R-390] Clevite Filters

Just a few years ago I had a 1960 EAC 390A with the Clevite filters. The "sound" was more like the 390 non-A. Not as sharp as the mechanical filters, but they did seem to attenuate the higher freqs. I should have at least kept the IF deck, but I rebuilt and sold the radio some years ago.

As to why they were a failure? That was apparently a contract issue, the characteristics of the ceramic filters are quite a bit different than those of mechanical filters, and I believe an action taken against EAC for not meeting specs on that run of receivers.

Date: Wed, 24 Dec 2003 20:08:17 -0800 (PST)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] More USB & LSB Filters

> I believe I got the ...061's from Surplus Sales Of Nebraska for \$100 each.....

It's hard to find accurate information on mechanical filters. The 1976 Collins Mechanical Filter Catalog lists the 526 9364 000 as a F455Z-1, USB 2.7 kHz @ 3db Y(long) case, and the 526 6365 000 as a F455Z-5, LSB 2.7 kHz @ 3db Y

(long) case. A filter list I picked up somewhere along the way lists the 526-9364-000 and 65-000 as 3.0 @ 6 db and 6.0 @ 60 db and the 64-061 and 65-061 as 3.40 @ 6 and 7.55 @ 60. 2.7 min at 3 db and 3.0 @ 6 db could both be accurate descriptions of the same filter, measured at different points on the filter nose.

The labels on the 64-000 and 65-000 in Dallas's modification article list a BW of 3.4 kHz on the label, but the label from what I can see of it, doesn't look like an official Collins label.

Note that filter specifications are listed as a minimum BW at the top of the curve and maximum at the bottom. They can be quite a bit wider at the top and narrower at the bottom. My favorite filter, the F455Z23C, is spec'ed as 2.85 kHz @ 3 db min, 3.1 kHz nominal, and 4.9 kHz max 4.1 nominal. One example I have run curves on

<<http://members.cts.com/king/j/jlkolb/site/curves/F455Z232.PDF>> is 3.50 kHz @ 3 db, 4.84 kHz @ 60.

Considerably wider than one would expect from the published specs.

From: "Dallas Lankford" <dallas@bayou.com>
Subject: Re: [R-390] More USB & LSB Filters
Date: Wed, 24 Dec 2003 22:43:17 -0600

Yes, the labels are not Collins labels. The Collins (blue) labels were removed so that I could solder the flanges to the filter bodies. Unfortunately, the labels could not be reused. So I typed new labels and put them on the filters, mainly for (my) reference. My Collins filter data lists the ...64 000 as a Z-4, not a Z-1. I didn't measure the 3 dB bandwidths (the 2.7 value is called "nominal" by Collins in my data). I measured the 6 dB BW's of the ... 000's and got 3.4 and 3.6 kHz respectively. Since it didn't matter due to my roofing filter, I called them both 3.4's. The worst I got for one of the ... 061's was 4.0 kHz. But like I said, if you use a 6 kHz roofing filter at the input to the IF deck, then any of these filters will be like a 3.0 kHz filter. Incidentally, measuring deep skirt BW's of these high impedance filters is quite difficult because of RF leakage. Special test fixtures are required to get accurate results.

Date: Wed, 24 Dec 2003 22:39:40 -0800 (PST)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] More USB & LSB Filters

Ah, while my '76 Collins catalog said the 526-9364-000 was a F455Z-1, the '71 catalog did say it was a Z-4. I would expect it to be a Z-4 to mate with the Z-5 as a pair. Can't even always believe the factory literature. Just won a couple of Z-4's on ebay - hope I can find something to pair them with.

From: "Dallas Lankford" <dallas@bayou.com>
Date: Thu, 25 Dec 2003 06:06:32 -0600
Subject: [R-390] SSB Filters Numbers Mistake

I think the 526-9364-000 and ...65-000 are not available from SSNE. They have the -061's.

From: "James Bischof" <jbischof@nycap.rr.com>
Date: Thu, 29 Jan 2004 20:23:03 -0500
Subject: [R-390] bad audio

I was just a thinking about the audio that comes out of a r390a. I must have had about 10, r390's in my hay day. I have never heard good audio coming out of these receivers, never. I think it is impossible if you ask me unless one takes some drastic measures. Many years ago I made a solid state IF amplifier for my r390a. When I did that I got good audio. Of course I did away with the Collins mechanical filters. AS far as I am concerned they are junk. Talking about the old mechanical filters. Maybe the new ones are ok , but I have not played with a newer radio that has them. I Just felt like expressing myself tonight on the subject.
James

Date: Tue, 3 Feb 2004 23:06:53 -0800 (PST)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] RE: HSR-2 vs 390a

> Those sound like some good ideas to check out...I had thought about the IF deck mod

Older mechanical filters such as those used in the R-390A are 100 Kohms in/output resistance. Most ceramic filters, and the new torsion bar mechanical filters are 2 Kohms in/out. So swapping ceramic filters into the 390 would require some additional impedance transformation circuitry. The Yeasu frDX-400 used transformers to get from the tube impedance levels down to the 2K for Kokusai or Murata filters, and another transformer to match back to the following IF amp grid. I've got some mechanical and ceramic filter curves on my site <<http://members.cts.com/king/jlkolb>> Some of the ceramics look pretty good.

Date: Thu, 05 Feb 2004 11:02:56 -0800
From: Dan Merz <djmerz@3-cities.com>
Subject: [R-390] Filter pins

Hi, I'm trying to use a NIB 2 khz mechanical filter of 390a type as a substitute for the single ended type Collins filter that went into a nine pin socket in my Mackay tube radio. I have a couple of questions. Has anyone accomplished this or a similar adaption? I know the input is the upper end but I'm wondering whether the two pins on each end are "equal" with respect to ground - can I put the input connections either way on them? Similarly can I put the output connections either way on the lower end? There will probably be other problems, like getting the leads from the top to bottom to behave ok. My first inclination was to try to make it a plug-in unit with 9 pins but I'm starting to think maybe I should just pull the socket out and mount the filter in the hole, much as it's mounted in a 390a, and feed the top two leads thru added holes in the chassis. Any ideas? thanks, Dan.

From: ToddRoberts2001@aol.com
Date: Thu, 5 Feb 2004 16:01:50 EST

Subject: Re: [R-390] Filter pins

Hi Dan, I believe the Collins-type 9-pin plug-in mechanical filter as used in the Mackay tube receivers is the F455 J series, the same as is used in the 75A-4 receiver. Collins made a whole series of filters to plug in the 75A-4, the F455 J 05 (500 Hz) the F455 J31 (3.1KHz) the F455 J 60 (6.0KHz) and some in-between sizes. I think they made a F455 J08 and possibly a F455 J18 but not exactly sure. I think it would be best to keep the socket in place on the chassis and either look for F455 J series filters or make up your own plug-in replacements. That way you can always swap filters later on if needed or wanted. It is no problem to make up a 9-pin plug-in adapter for the R-390A series filter. Both terminals on each end of the filter are floating so there is really no "polarity" with them. I made up an adapter myself using a 9-pin plug and a short piece of aluminum tubing that would slip over the lower end of the R-390A filter to hold it in place. The bottom pins of the filter are directly wired to the appropriate pins on the 9-pin plug. I ran the top 2 leads down through 2 short lengths of RG-174/U miniature coax and thru a hole in the side of the aluminum tubing at the bottom to connect to the other 2 pins on the 9-pin socket. The shields of the RG-174/U are soldered together at the ground pin on the top of the filter. No impedance matching was needed and the plug-in filter adapter works great. I used an 8KHz R-390A filter for wider selectivity of the 75A-4.

Date: Thu, 5 Feb 2004 13:18:57 -0800 (PST)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] Filter pins

Either end of the R-390A F455N- series filters can be the input and either the output. The filters have 3 pins at each end, 1 gnd and 2 pins for the coil. Either of the two coil pins at each end can be the RF ground side.

Date: Thu, 05 Feb 2004 20:04:27 -0800
From: Dan Merz <djmerz@3-cities.com>
Subject: Re: [R-390] Filter pins

Hi, Pete, John, and Todd and thanks for the helpful comments. I wonder where I can get a male 9 pin plug. I have a vector tube extender but it's a shame to ruin that and it's not really constructed to make it's use easy for my application. I suppose I could make a socket into a plug by putting pins into it that would extend into the chassis socket. Seems like somewhere there would be some 9 pin plugs??? I do like the idea of keeping the original socket on the radio chassis,

Date: Thu, 5 Feb 2004 21:47:40 -0800 (PST)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] Filter pins

It should also be noted that R390A filters sell for around \$40-50 while 75A-4 filters sell for around \$200 - sure helps to pay for a 9 pin plug :)

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Filter pins
Date: Fri, 6 Feb 2004 08:26:57 -0600

> Seems like somewhere there would be some 9 pin plugs??? <snip>

I think Antique Electronic Supply sells them. www.tubesandmore.com

From: "James Smith" <n1xas@comcast.net>
Date: Fri, 13 Feb 2004 19:06:58 -0500
Subject: [R-390] Filters

I am looking for collins mechanical filters 6KHz and 12KHz to use in a EAC R 390A receiver. Are they available? Who might have them? Thanks in advance

From: ToddRoberts2001@aol.com
Date: Fri, 13 Feb 2004 19:47:33 EST
Subject: Re: [R-390] Filters

Hi Jim, Dave Curry Longwave Products makes a 6KHz replacement mechanical filter assembly for the R-390A receiver. It comes in an identical-size cylinder with mounting flange just like the original filter and wires in as a direct replacement with no modifications. The price is high though at \$199 plus \$4.50 S&H. They are available from Electric Radio Magazine store. You can see them online at www.ermag.com. Rockwell Collins also has a line of inexpensive torsional mechanical filters in a wide range of bandwidths. You could check their website. I am not sure about their prices or minimum order size? Their filters are pretty small and one could fit inside of a tube assembly to fit the R-390A if you wanted to make up your own. 73 Todd Roberts WD4NGG.

Date: Fri, 13 Feb 2004 21:35:01 -0800 (PST)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] Filters

Collins didn't make any 6 or 12 kHz filters that would fit the R-390A directly - what they call the "K (special)" case in their catalogs. They made the F455K-60 and F455K-120 with the standard "K" case, which has the mounting flange in the center of the filter rather than towards one end. Those or the smaller Y case filters, F455Y060 and F455Y-120 could be used with some work to fabricate a mounting flange. Dallas Lankford had an article recently on such a filter and has posted it to the files section of this group. As mentioned in another reply Dave Curry makes some modern filters in 390A style cases. The modern filters available directly from Collins generally have a 2 Kohm in and out impedance so would require some matching to replace the 100 Kohm 390A filters.

Date: Fri, 09 Apr 2004 11:56:53 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] 4kc filter repair?

>Has anyone rebuilt a 4kc filter before?

Yes, (but not me.)

> I have also noticed a ..5db ripple across the top of the band pass on that filter.

That is so flat as to indicate the filter is kaput, which you know already.
Usually the ripple is much more than a half db (or did you mean five db.?)

> I suspect that the foam inside the filter is bad

Likely. If a bit of foam gets onto the disks, the thing will be very lossy.

> I am wondering if anyone has tried this and if so any tips?

I can't remember who told about doing this but there is a web site that shows the process. Now I cannot locate that web site. Here are some parts of my notes file that may be of interest:

>From: John Kolb <jlkolb@cts.com>

>Subject: Re: [R-390] Mechanical Filter Repair

>

>On Wed, 24 Jul 2002, Norman Ryan wrote:

>

>> John "The Filter King" Kolb guesses the magnet wire size to be #36. I

>> poked around with a Google search and found DC resistance to be .4148

>> Ohm per foot at this site:

>> <<http://www.mwswire.com/insdia2.htm>>

>>

>> Any more hints, tips, experiences with mechanical filter repair from the

>> group?

>>

>

>Just measured 2 open filters and a loose bobbin and got wire

>diameters about 0.0062 and 0.0070 ("V and Y case filters),

>which would be 34 or 35 gauge enameled wire.

>

>The King :)

Data on the filters is at:

<http://www.angelfire.com/de/vk3kcm/filters.html>

This site tells of inexpensive filters for the 74A-4: <http://www.albany.net/~bg/Mods/AMFilter.htm>

INRAD, International Radio, Inc, sells new filters of many sorts:

<http://www.qth.com/inrad/>

In 2000, the following message started a 10- message thread on filter rebuild. I suggest you search the archives with the subject and read them all:

>From: G4GJL@aol.com

>Date: Wed, 15 Nov 2000 05:35:22 EST

>Subject: [R-390] Mechanical Filter rebuild

>To: r-390@qth.net

>I have a 4kc mechanical from a St Juliens rig which has a disconnected
>winding. The cause of this as is so common, was from the inertial stress
>placed on the wire itself as the rig is transported. The original foam shock
>absorbant material inside the filters is now likely to be in an advanced
>state of decay. I guess more of us will see this type of failure resulting in
>dead positions on the selectivity switch. Interestingly, my other blue
>striper has a dis 2 kc filter.

>

>Now the Questions!

>

>1. Does anyone know how many turns are on the actuator windings of these
>devices

>

>2. Does anyone know how to form replacement windings. bothe the input and
>output windings are formed in two pies, about 0.2 inch diamater. The centre
>hole allows clearance for the actuator pin driving the resonant disks. The
>wire is (predictably) microscopically thin.....I guess at 40 or 42 Wire
>Gauge (At those sizes the difference between AWG and BSWG is=
impereptible!!!)

From: "Don Reaves W5OR" <w5or@comcast.net>

Subject: RE: [R-390] 4kc filter repair?

Date: Fri, 9 Apr 2004 20:30:03 -0500

Roy mentioned the web site describing rebuilding a Collins mech. filter. It was mostly in Japanese, although the pictures told the story. Unfortunately the original link is broken; there is a notice to check another site, but the filter article is missing. I'll see if the author will respond and revive his original pages. Another solution, proposed by George Rancourt was to compensate the gain on the other filters. Well, here is the original posting to the list in 1998, I think. Sorry, I lost the header to credit the author. --snip--

I had a rather enjoyable conversation with George Rancourt (K1ANX) in my quest for a Dittmore-Freimuth (EAC) IF deck. He passed along a helpful tidbit regarding IF deck alignment when one of the mechanical filters is a few dB's softer than its siblings. The filter which is used the most tends to wear out and not pass as much signal. His solution is to detune the rest of the filters slightly using the variable capacitors across the filters to match the soft filter. Then increase the IF gain of the entire deck to compensate. --snip--

I think the original specs allowed only 1 to 2 db loss. Anyway, I think this might make a great on-going discussion topic, as all our filters are due to become extinct. I have some that rattle now with what must be hardened foam bits. What is the *proper* way to get these things apart?

From: ToddRoberts2001@aol.com

Date: Fri, 9 Apr 2004 23:18:57 EDT

Subject: Re: [R-390] 4kc filter repair?

One other way to get around the problem : There is currently an F455 N40 filter on the E-place for \$23.50. Always a good idea to check them from time to time. I

picked up an F455 N80 there a while back for \$12.00 . Not as much fun as trying to rebuild a filter but a lot less frustration!

From: "Bernie Nicholson" <vk2abn@batemansbay.com>
Date: Sat, 10 Apr 2004 13:34:57 +1000
Subject: [R-390] 4khz filters

I dismantled one of these filters the other day and found that the failure mode is that the filters are surrounded by a type of foam rubber or plastic which has dematerialized and become sticky and corrosive and the wires to the transducers were damaged , I have over the years repaired abt 40 recievers and low gain in the 4khz filter is not uncommon luckily I found 5 complete 390a IF strips in a scrap yard many years ago and I have been able to keep my three rx s going , I have seen a site on the net where someone was supplying replacement filters and I think the link was from chuck rippels web site but they were not cheap.

From: "Steve Hobensack" <stevehobensack@hotmail.com>
Subject: RE: [R-390] 4kc filter repair?
Date: Sat, 10 Apr 2004 08:11:16 -0400

Here's how I got one apart. Hang the filter about head high from a garage rafter, use a small wire tied to the end on the solder lug(s). Hang a weight to the outside shell so the filter balances vertically. Sweep a propane torch over the filter. When the solder melts, the shell will drop to the floor, leaving the innards intact.

From: "JamesMiller" <jmiller1706@cfl.rr.com>
Subject: Re: [R-390] 4kc filter repair?
Date: Sat, 10 Apr 2004 09:14:42 -0400

Has anyone been able to clean out the old foam and reconstitute the foam inside the filter to make it function again?

Date: Sat, 10 Apr 2004 11:19:35 -0700 (PDT)
From: John Kolb <jlkolb@cts.com>
Subject: RE: [R-390] 4kc filter repair?

That sounds like it would be pretty hard on the connecting wires between the transducer coil and the end terminals. In trying to open the smaller "Y" case filters, with the shell in a vise while pulling on the end piece with terminals and heating, I found I usually was pulling too hard so the end piece moved too far and broke the wires when the solder liquidified. Not a big problem if the wires break at the terminal end but bad news if they break at the coil. Perhaps Steve's setup but where the filter could only move 1/2" rather than 6'

From: "Bernie Nicholson" <vk2abn@batemansbay.com>
Date: Sun, 11 Apr 2004 16:12:25 +1000
Subject: [R-390] 4KHZ filters

I think that it would be a very difficult job to repair filters a jig would have to be made also the parts internally are SPOT welded together. The smallest welds I have seen ever . to remove the ends off the filters I used a Jewlers gas torch you

have to be quick and when the solder melts you remove the ends abt 1/8 inch so as not to break the fine wires, BUT to get the filter assy. out you have to cut the wires to the end cap on one end then you can slide out the resonator assy. the filters transducers DC resistance is 48 ohms, I think the cheapest way out would be to fit Murata ceramic filters which are available in various bandwidths at 455khz , on a different subject I have just linearized a PTO by making a little jig and using the dial from a ten turn pot to draw graphs untill I got a straight line response It took about 5 hours and when I put the cover on I only had to make a slight ajustment to the end stop and it is within 300 hz from one end of the dial to the other , A win for me anyway.

From: "D. ball" <ke1mb@hotmail.com>
Date: Sun, 11 Apr 2004 06:52:30 -0400
Subject: [R-390] 4kc filter

Well getting the filter apart was easy, I used a hot air rework station to do it, I could find nothing to indicate what the failure was. I even re-assembled the filter, sweep it, then decided to take it apart again determined to find the fault but ended up breaking one of the little wires spot welded inside.. this filter case will get stuffed with ceramic filters, or may buy a modern collins filter.. people have said the most used filter goes bad, ?? something took out my filter over time, not sure what it was.. sure was no foam to go bad, this collins filter had rubber supports inside.

As far as the PTO. it really make me question what causes that.. if you cal the PTO with the dial adjust at .000 and then move 300kc you notice you are off right? ok, I move up to .700 and readjust, same result, dead on for about 300kc either way. because of this i question the the gear train, I think a pencil mark on the shaft of the PTO will tell me what is going on, it is very possible that this is the gear box and that the adjustment you made in the PTO makes up for that.. just a thought.. something like this does not bother me.. I can always re-cal the pto then tune in. but the filter really bugs me, the most amazing thing about the r390a is it's ability to hear a station a few kcs away from a powerful one, i have never heard a radio do that.. not like this thing, plus you can hear the collins filters, it really sounds good, I have found plenty of replacements, just bums me out the 4kc filter is gone.. i just bought this radio.. great shape.. just out one filter..

Date: Sun, 11 Apr 2004 11:10:47 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] 4kc filter

This is turning into two different threads The filters on the 390 come from the land of vacuum tubes. They have very high input and output impedances compared to modern Collins or ceramic filters. That isn't to say you can't make the solid state era filters work, they just won't work quite the same way. If you can get filters that are set up for vacuum tube era stuff it will be easier to drop them in. Since they built a run of 390's with ceramic filters it is possible to get either type. Finding OEM ceramic parts would be tough though. <snip>

From: ToddRoberts2001@aol.com
Date: Sun, 11 Apr 2004 22:18:58 EDT

Subject: Re: [R-390] 4kc filter repair?

A good subject on ways to rebuild or re-work the mechanical filters used in the R-390A. My current thinking is to look into the new Rockwell/Collins mechanical torsional filters and adapt them for use in the R-390A, along the lines of what Curry Longwave Products are doing. The new Rockwell/Collins mechanical filters are small enough to fit inside a 3/4" diameter metal tube that could be cut to similar dimensions of the original filters for mounting inside the filter box cover. They currently list symmetrical filters in 3.80KHz bandwidth that would be close to the original 4KHz wide units. The newer filters have a much lower input and output Z of 2K ohms so a matching network will need to be mounted on the input and output sides for step-down and step-up to the HI-Z used in the R-390A circuits. The whole thing could be mounted on a circuit card small enough to slip inside a 3/4" diameter metal tube with end plugs. I wonder if anybody has looked inside one of the Curry filters to see what kind of matching network was used? Might be a fun project to try to produce a line of replacement filters for the R-390A.

Date: Mon, 12 Apr 2004 20:14:26 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] replacement filters

In general on a filter both the input and output impedances matter. If you don't get them both right you will at least mess up the pass band of the filter.

From: ToddRoberts2001@aol.com
Date: Mon, 12 Apr 2004 21:22:31 EDT
Subject: Re: [R-390] 4kc filter repair?

A good subject on ways to rebuild or re-work the mechanical filters used in the R-390A. My current thinking is to look into the new Rockwell/Collins mechanical torsional filters and adapt them for use in the R-390A, along the lines of what Curry Longwave Products are doing. The new Rockwell/Collins mechanical filters are small enough to fit inside a 3/4" diameter metal tube that could be cut to similar dimensions of the original filters for mounting inside the filter box cover. They currently list symmetrical filters in 3.80KHz bandwidth that would be close to the original 4KHz wide units. The newer filters have a much lower input and output Z of 2K ohms so a matching network will need to be mounted on the input and output sides for step-down and step-up to the HI-Z used in the R-390A circuits. The whole thing could be mounted on a circuit card small enough to slip inside a 3/4" diameter metal tube with end plugs. I wonder if anybody has looked inside one of the Curry filters to see what kind of matching network was used? Might be a fun project to try to produce a line of replacement filters for the R-390A. 73 Todd Roberts WD4NKG.

Date: Mon, 12 Apr 2004 20:51:02 -0700 (PDT)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] replacement filters

You could indeed terminate a low output impedance filter with a 2 K resistor to ground and capacitor couple to a 1 M resistor between grid and AGC line. The

output side of the filter would be happy. If, however, you were using a 7:1 stepdown ratio transformer on the input side (100K:2K match), you would be losing 86% of your IF voltage unless you step it back up with a 1:7 transformer at the output side. The loss isn't that bad, however. the "N" series filters used in the 390A are spec'ed at 25 db loss max. Modern mechanical or ceramic filters will be more like 6db or less loss. With modern filters, you might end up inserting a resistive pad to make the replacement filter have as much loss as the other filters in the set.

- > Ok, now I move one to replace this 4kc filter. So here goes some ideas.
- > There are newer replacements out there as mentioned but they do have the
- > lower input impedance. From what i can tell there are two things to over
- > come. First is the match on the input. I assume you could use an op-amp
- > rated for that frequency as a buffer. You would have to power it off a power
- > supply derived from the 6 volt heater lines. This could work but may degrade
- > the overall IMD performance of that path, this could also be proven with
- > test eqpt. The second is the AGC voltage that seems to be feed thru the
- > output coil to the grid of the 6BA6W. I would think that a 1meg ohm resistor
- > from the AGC source across the new filter output would work.
- > For some reason I do not feel output impedance will matter because you are
- > feeding such a high impedance input to the tube. The voltage level should be
- > the same with no load from the tube to pull it down. I think all I am
- > concerned with here is matching the output voltage of the new filter with
- > the old ones and finding something that will have the same spec. as the
- > original design.

From: "JamesMiller" <jmiller1706@cfl.rr.com>
Subject: Re: [R-390] 4kc filter repair?
Date: Tue, 13 Apr 2004 03:02:22 -0400

Curry has filter products already for the 390a. <http://www.r390a.com/html/Curry.html>

From: "D. ball" <ke1mb@hotmail.com>
Date: Wed, 14 Apr 2004 06:46:21 -0400
Subject: [R-390] 4Kc filter replacement

After weighing all the possible ways to solve this problem of finding a replacement filter I think the easiest way is to try to find an exact replacement. Ok that sounds pretty simple except for the fact that finding the ones in cylinder case styles is a bit harder. After searching e-place for a while I find various Collins filters that have the same center freq. and the same rated bandwidth. They even have the same part number minus the case style. So the idea here is to locate a Collins filter, which does not seem to be a problem, remove the filter element from the existing case and install it into the cylinder case I have left from the 390a. I assume that I would disassemble most any drum head type Collins filter rated at the same spec and find the element inside to be the same or real darn close. The advantage is I can find any case style a lot easier than just one style case. Second is it really should be the same element inside and thus becoming a drop in replacement without matching concerns or really drifting away from the original design. By the way the input I have gotten from other members on the mailing list

on this topic have been great. I would like to give a thank you to all those who have thrown in their input and ideas. Joe

Date: Tue, 17 Aug 2004 14:40:59 -0500
From: "Dennis Pharr" <dpharr53@swbell.net>
Subject: [R-390] Mechanical Filter Repair

I'm afraid I already know the answer to this, but does anyone know if it's possible to repair the mechanical filters in the R390A? I was listening to my R390A EAC last night when the 4kc filter failed. Before anyone asks, I had already replaced C553 before I powered up the unit the first time, so that's not the problem. All the other filters are working OK. I would appreciate any information anyone has on this. I know replacement filters are available, but the price seems a bit excessive (\$175 ea.).

Date: Tue, 17 Aug 2004 17:16:58 -0500
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] Mechanical Filter Repair

The 4 Kc filter is the most used filter in the radio from what I understand. One option is to contact Fair Radio sales and pick up another used 4 Kc filter. They should be able to test it for function before shipping it so you should be able to get a working one. The other option is a new replacement...looks like you already have that info... I have heard of guys getting them open to analyze the failure but I have not heard of anyone having success in repairing one and getting it back together.

Date: Tue, 17 Aug 2004 19:04:36 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Mechanical Filter Repair

I seem to remember that American Trans Coil had IF decks with all the filters on them for about \$72 a while back. They are at <http://www.atc-us.com/ATCSHOP/> If they still have them that's a lot less than \$175. There's no guarantee that the filters on their units are good, but the ones I have gotten from them in the past have worked fine. The new proprietor of the R-390 end of ATC is a regular list member so he might know a bit more about what they do and don't have. I have never attempted the repair process on the filters so I will leave description of that to others here on the list

Date: Tue, 17 Aug 2004 21:28:47 EDT
From: ToddRoberts2001@aol.com
Subject: Re: [R-390] Mechanical Filter Repair

Dennis, some people have opened up the R-390A mechanical filters and repaired them. The usual failure mode is one of the fine wires from the transducer coils to the terminal pins breaks causing an open circuit. This can be repaired without too much trouble unless the wire breaks somewhere inside the turns of the transducer coil, then it would be almost impossible to fix. Checking across the terminal pins with a DVM can determine if the input-output coils are open-circuit confirming a break in the wire somewhere. If both input-output side terminals

have continuity then the trouble could be in the disc assembly somewhere and would be very unlikely to fix. The filters have been known to suffer from corrosion inside which can cause the fine wire to break. The corrosion seems to come from foam-rubber packing that disintegrates over time inside the sealed filter cans. Also I think corrosion can occur over time where the fine wires are soldered to the terminal pins. Good luck 73 Todd Roberts WD4NGG.

Date: Tue, 17 Aug 2004 22:19:27 -0500
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] Mechanical Filter Repair

Check with Barry Hauser...he has possession of all the R-390A parts that ATC lists on their web page...if i'm not mistaken. He is marketing all that stuff for Mark.

Date: Wed, 18 Aug 2004 07:55:45 -0500
From: "Laird Tom N" <LairdThomasN@JohnDeere.com>
Subject: [R-390] RE: Mechanical Filter Repair

>From the WC9M archives: Hope this helps, Tom Laird WC9M

Success with the 75A-4 filter repair. The solder on the end opposite the pins does not have to be removed. It is only for sealing the filter. I used a small butane torch, and removed the shell. No foam, but 2 rubber supports. Everything looked ok. Played with it, but could not get it to work. Both coils at the ends checked ok at about 44 ohms. Gave up, and went to bed. Next AM, I was looking throughout the KWS-1 manual, and looked at the drawing of the mechanical filter. There is a small wire that comes from the coil assembly, and is attached to the second disk at each end. On looking at the filter again, found that one wire on the top of the filter (opposite the pins) was missing. Tapped filter, and the wire came out of the coil and touched the disk. I applied a small amount of super glue and let it sit for the day. Works fine. No signal loss when switching to this filter now. Do not know how the wire was originally attached, but the super glue seems to be working. Ken, WW3KP, soon to be W3KMP

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I was thinking about a common topic on the net about the failure of the 4 Khz filter, and the problem with the failure of the dc blocking cap that feeds them. If I remember correectly, the common failure mode is that the input wire (around #36 in size) to the input transformer breaks near the solder connection. We used to just send the filter back to the line, they would open it up and resolder the wire. You have to carefully unsolder both ends of the tube, and withdraw the total assembly. I suspect that the failure mode would be the same for the shorted cap, and the metal fatigue type, a break near the solder termial. If you don't care to try, mail a couple to me, and I will see if my educated guess is correct. The address is:

John Watkins
302 Cheshire Circle
Seguin, Tx. 78155

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Rockwell Collins still makes mechanical filter modules using modern design. You can buy them on small boards as plug ins for the S Line from Inrad. Or you can

buy the modules directly from Rockwell I believe. Also, I think Longwave Products sells direct replacements for the 75A-4 and 390A that uses the Rockwell modules mounted in the metal cans. The modules are small and could easily fit inside an old mechanical filter can.

Date: Wed, 18 Aug 2004 10:37:15 -0500
From: "Dennis Pharr" <dpharr53@swbell.net>
Subject: [R-390] RE: Mechanical Filter Repair

Many thanks for the responses to my question. It looks like my options are the following:

1. Purchase a spare IF strip module from American Trans Coil (\$72) and hope that the 4kc filter is good.
2. Purchase a replacement filter through ER Mag (\$175).
3. Purchase a new Collins filter from Inrad (\$125) and still have to deal with the impedance matching issue.
4. Look into the cheap ceramic filters offered by Toko and Murata and also deal with the impedance matching issue.
5. And finally, try to repair the filter, but reports are that the success rate, had by others that have tried, has been very low.

Right now I'm looking at pursuing options 1 and 4. I think \$72 is a reasonable price to pay for an entire IF strip module, even if some of the filters are bad. Also, the Toko and Murata filters are cheap at about \$2 each and they would be fun to play with, although I don't expect to see performance equal to the mechanical filters. All in all, I suspect I'll get what I pay for.

Date: Wed, 18 Aug 2004 12:20:37 EDT
From: Llgpt@aol.com
Subject: Re: [R-390] RE: Mechanical Filter Repair

Another option. Purchase a filter module from Kiwa Electronics. They have a variety of bandwidths. The shape factors are much better than the mechanical filters. They are 3 filters cascaded in a small module. They have much better audio characteristics than the mechanical filters too. [_http://www.kiwa.com/kiwa455.html_](http://www.kiwa.com/kiwa455.html) (<http://www.kiwa.com/kiwa455.html>)
Les Locklear

Date: Wed, 18 Aug 2004 22:17:37 -0700 (PDT)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] RE: Mechanical Filter Repair

Failures in mechanical filters could be of two types. Some filters have foam supports that decompose into a gummy, sticky mess that increases the attenuation, and I've heard that R-390A filters do that, although very seldom, unlike Kokusai filters. This would be easy to fix, once the filter has been opened. A sudden failure such as you report, however, is much more serious, caused by either a coil failing, or a mechanical failure such as Tom Laird reported. I haven't seen coils fail internally, although they would if C553? fails. I have seen the connecting wire between the coil and the terminal break or have a bad solder

joint at the terminal. The wire can be spliced and lengthened if it breaks in the middle or right at the coil on the outside - unwind a couple of turns from the coil to get something to splice to. A break at the coil on the end going to the inside of the coil is best repaired by replacing with a good coil from a different filter. If the filter is broken, nothing is lost by trying to repair it. A loss of signal in one filter position is not always the coil, however. It occasionally can be the switch or the capacitors at either end of the filter. A 6th choice is to buy a used tested and plotted filter from me, <<http://members.cts.com/king/j/jlkolb>> - I've just added a number of R-390A filters - or a filter from that auction place - about 80% of the filters I've bought there are OK.

Date: Thu, 19 Aug 2004 17:00:41 -0500
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] Mech filters

Well I've had my fill of crow for a while. (tastes a lot like chicken) I had no idea so much was being done with defunct IF filters. That's great news....it adds to our ability to support these great radio's well into the future. I for one vote that no filter gets thrown in the trash....at least until someone knowledgeable in filterage deems it un-repairable. Beats the land fill. Who knows there may be a core charge on purchasing repaired filters in the future....or a deposit like on soda bottles years back to keep them out of the land fill.

Date: Thu, 19 Aug 2004 19:55:05 -0400
From: "Steve Hobensack" <stevehobensack@hotmail.com>
Subject: [R-390] RE: Mechanical filter repair

Dennis, If you figure out how to match those Toko or Murata filters, post it on it on the net. Maybe a tech from those companies or Kiwa will know how to install them in Collins tube rigs. I know the filters limit bandwidth to 3 khz on my Sony 2010, and work well. As I remember, the speck sheet that comes with those filters shows typical installations only on transistor circuits.

Date: Thu, 19 Aug 2004 22:44:22 -0500
From: "Dennis Pharr" <dpharr53@swbell.net>
Subject: [R-390] RE: Mechanical filter repair

Will do Steve. Actually, I've been looking at several alternatives in the ceramic Filter/resonator line. One other choice suggested by Les Locklear is: <http://www.kiwa.com/kiwa455.html>

These appear to be ceramic filters with a solid-state preamp to overcome the slight insertion loss. Also, they come pre-packaged so they might be easier to install. However, my plan was to gut the existing mechanical filter housing and insert the ceramic. But, of course, I would breadboard the thing first to make sure it works before destroying the already defunct filter.

>From everything I've read the mechanical filters in the R390A exhibit a 25db loss. The 6BA6 stage following the filters makes up this loss. So, since the ceramic filters want to see a low impedance source and load, I would think it would be relatively easy to design an attenuation/impedance matching network

for each end of the filter. This would insure that the filter 'sees' the driving and load impedances it wants and also that the 455kc RF levels seen by the following 6BA6 stage are closely matched to the output level of the other filters.

I have found one interesting product by Toko in the Digikey catalog:

<http://dkc3.digikey.com/PDF/T042/0701.pdf>

<http://www.tokoam.com/passives/filters/ceramic/pdf/cfm2.pdf>

Also, here's an interesting tidbit - in the R390A-Y2K-Release-1.pdf manual on page 3-16 under the NOTES at the bottom of the page it states:

3. R-390A/URR MFG by EAC Serial No. 1 thru 460 have ceramic filters. Replace with mechanical filters when ceramic type are defective.

Apparently, the early EAC's had ceramic filters. So, I guess it can be done.

Date: Fri, 20 Aug 2004 10:43:50 -0400

From: Bob Camp <ham@cq.nu>

Subject: Re: [R-390] RE: Mechanical filter repair

The early EAC's did indeed have ceramic filters in them. Of course they were designed to match tube input and output impedances. Needless to say that made them very different parts than the ceramic filters you can buy today. If you are going shopping for filters be careful to check out both the skirt selectivity and the ultimate attenuation numbers. It would be a shame to go to all the work of matching them into the radio and find out that the selectivity of the radio had been degraded. IF filters are *very* sensitive to matching impedances so it will be a fair amount of work to get it right There is a note in one of the Collins reports on the R-390A that suggests the original requirement for the ultimate selectivity of the radio was not met in the final design. There is no further elaboration on exactly what the issue was. If they are referring to an IF issue then there may not be a whole lot of extra margin on the filter chain.

Date: Fri, 20 Aug 2004 11:27:49 -0400

From: Roy Morgan <roy.morgan@nist.gov>

Subject: Re: [R-390] RE: Mechanical filter repair

Please consider running a little DC into the reworked filter case for any needed amplifier. This could be delivered either by a DC supply in the case, or external to it, that runs from the radio filament supply. There would be challenges in keeping "blowby/leakage" and noise controlled. Filament lines are notorious for carrying noise and unwanted signals. Notice the filtering in the B+ and filament lines to the oscillator module in the HP 606 signal generators, for instance. These are necessary to limit leakage. The same basic situation exists in the R-390 IF module.

> But, of course, I would breadboard the thing first to make sure it works
> before destroying the already defunct filter.

I imagine a bit of 5/8" copper tubing with end caps held on with screws. <snip>

Date: Thu, 09 Dec 2004 11:38:26 -0500
From: Bill Abate <wabate@dandy.net>
Subject: [R-390] Re: [Collins] R-390A Filters

After multiple tests I determined that my 4 KHZ filter was shot. With nothing to lose I decided to open it up and I think I found a cause for the failure. The input and output terminals are shunted with a 20 pf mica and a 200K resistor. They were fine. What wasn't fine was the filter itself. It had separated into two pieces between the resonating discs and another one of the spot welds was half broken.

Collins had originally put a brown foam type substance in the body to provide a shock mount. The foam had all but disintegrated into a goo. The filter was free to rattle around inside like a ping pong ball in a coffee can! Somewhere in its life it must have been shocked, dropped, etc. and died. If this failure is not peculiar to my filter the future could hold time bombs. To correct this situation would take a lot more patience than I have.

If I wanted to test the rest of my filters (?) I would remove the filters and gently turn it upside down to see if I can feel any movement (without causing a failure). If the filter needed new foam I would open the filter, remove the old stuff and put in new, reseal the filter and hope it still worked (connections are about #40 wire that is hard to see, let alone solder). Definitely not something I would want to try or recommend.

Date: Thu, 09 Dec 2004 09:35:55 -0800
From: Buzz <buzz@softcom.net>
Subject: [R-390] Re: [Collins] R-390A Filters

Here's a postmortem on one of my filters. <http://webs.lanset.com/buzz/misc/filter/390Afilter.html>

Date: Thu, 9 Dec 2004 13:56:54 -0500
From: "John KA1XC" <tetrode@comcast.net>
Subject: Re: [R-390] Re: [Collins] R-390A Filters

> If this failure is not peculiar to my filter the future.....

I believe you are right Bill, this is a not uncommon failure, and as the decades progress so will the deterioration of the foam mounts. It's almost certain that at some future time the mechanical filter failures will approach the frequency of molded capacitor failures, and the very thorough R-390A restorer will then be faced with re-filtering in addition to re-capping :^(

> If I wanted to test the rest of my filters (?) I would remove the
> filters and gently turn it upside down to see if I can feel any movement.....

Too bad these filters weren't plug-in, then the above efforts might be worthwhile.

>From my experience the filter loss starts to increase rapidly just before failure.

So I'd say that the state of the filter innards in any 390A is indeed a crap shoot, even in the multi-kilobuck "museum quality" radios that pop up now and then for sale. The only thing I do different now is to try minimize any mechanical shocks or vibration when moving or transporting a 390A, for example putting it on a cushy mat or blanket when transporting one in the back of a car or truck, not for the sake of the tubes but for the filters. It's ironic that although the R-390 is a much older beast than the average R-390A it is not as fragile in this respect.

Date: Thu, 09 Dec 2004 16:58:29 -0500
From: JMILLER1706@cfl.rr.com
Subject: Re: [R-390] Re: [Collins] R-390A Filters

Is that because the older 390 (non A) did not use mechanical filters like the ones in the 390a? I have experienced a similar failure in an 8 khz filter but it was heat related... the filter worked fine until the box warmed up and then would fail. Some have talked about opening them up with blow torch or solder iron, then replacing the innards with a "new" Collins mechanical filter module, similar to what has been done with 75A4 filters by Curry Longwave. Curry also sells "modernized" filters for the 390a... see: <http://www.r390a.com/html/Curry.html>

Date: Thu, 9 Dec 2004 16:19:33 -0600
From: mikea <mikea@mikea.ath.cx>
Subject: Re: [R-390] Re: [Collins] R-390A Filters

Yes. The R-390 (non A) uses LC filters, and (IIRC) crystal filters.

Date: Thu, 9 Dec 2004 17:37:45 -0600
From: Tom Norris <r390a@bellsouth.net>
Subject: [R-390] Impedance of R-390A filters?

On the subject of filters, what is the impedance of the mechanical filters used in the 390A?

Date: Sat, 18 Dec 2004 20:56:05 +1100
From: "Bernie Nicholson" <vk2abn@batemansbay.com>
Subject: [R-390] 4KHz filters

There have been many instances of failure of the 4 KHZ filters I have personally seen 4 If strips where this has happened but I was suprised to find that these filters are available on Fair radios site they are the exact part no 526 9160 009 and are 65\$ US I ordered 2 the other day and they seem to have a gud supply The date code is 1967 they were probably produced for the EAC contract, Go to fair Radio and look for MECH Filters .

Date: Sat, 18 Dec 2004 05:34:54 -0500
From: Llgpt@aol.com
Subject: Re: [R-390] 4KHz filters

The 4 kc mechanical filter in the R-390a was the most used filter by the military

and will fail long before the other filters do. Most have reached the end of their life cycle by now and will continue to fail at a rapid rate. The mechanical filter will only resonate a given number of of times before it's life cycle is reached.

Date: Mon, 03 Jan 2005 09:02:41 -0800
From: Leigh Sedgwick <bipi@comcast.net>
Subject: [R-390] Mechanical Filter Issue

On the a different subject. My restoration R-390A project is just about finished. I rebuilt the RF deck and recapped the IF deck and AF decks. The smoke test was positive with signals on all bands, although it is way out of alignment. But I have a couple of issues.

1. Three of the four mechanical filters appear to work fine. But, when I switch to the 0.1, 1, and 2 bandwidth positions, there are no signals. Is there any quick check I can make to ensure it is the 2 khz mechanical filter and not something else in the circuit? It looks like a bit of work to replace and I would hate to go through that effort only to find out it is actually something else. <snip>

Date: Mon, 03 Jan 2005 17:49:25 -0800
From: Leigh Sedgwick <bipi@comcast.net>
Subject: Re: [R-390] Mechanical Filter Issue

Thanks all for the responses to my questions. I appreciate the help. A couple of finds today.

1. Either Figure 3-6, page 3-16 of the Y2K-R2 manual is wrong or my R-390A is wired differently than most. All of the input trimmers shown in this figure are correct but the output trimmers are all incorrectly marked. This is what I find:

FL502 2 khz filter - input C567/output C570
FL503 4 khz filter - input C566/output C568
FL504 8 khz filter - input C565/output C571
FL505 16 khz filter - input C564/output C569

Can anyone confirm these findings? If so, might be a candidate pickup for revision 3 of this fine manual (thanks to all for the hard work on this great resource).

2. Based on going through the 2 khz filter circuit, it appears the 2 khz filter is indeed bad and I am in the process of replacing it, ugh!

3. I looked at the slug racks in the RF deck, and they all appear to be identical (i.e., RF versus IF). The RF slugs are all marked identically with both a white and red dot. The variable IF slugs have no markings. Thanks again....

Date: Mon, 03 Jan 2005 18:40:36 -0800
From: Leigh Sedgwick <bipi@comcast.net>
Subject: Re: [R-390] Mechanical Filter Issue

Very sorry for my last post. I had the trimmer numbers cocked +90 degrees. The

Y2K manual, figure 3-6 is correct. My humble apologies to the list for my mistake!
Other data in the post stands as is :-)

Date: Thu, 06 Jan 2005 17:31:17 -0800
From: Leigh Sedgwick <bipi@comcast.net>
Subject: Re: [R-390] Mechanical Filter Issue

<snip> On to a new subject. I read that one can check the AGC capacitor C551, by switching between fast, medium, and slow AGC attack and that the signal strength should not change. Well, when I switch to the slow position, the audio increases dramatically and the signal strength, as measured by the carrier meter, drops approximately 20db. Should I replace C551? This cap is a fixed paper dielectric, 2.0uF +-10% rated at 500VDC. There are no direct substitute caps available that I am aware of. I have a 2.2uF electrolytic rated at 450VDC. Has anyone replaced this cap with a an electrolytic with success? I guess I'll leave it installed in the chassis and install the replacement cap below. Any thoughts?

Date: Thu, 06 Jan 2005 19:49:26 -0800
From: Leigh Sedgwick <bipi@comcast.net>
Subject: Re: [R-390] Mechanical Filter Issue

Well, for the record, the 2.2uF electrolytic worked fine in replacing C551 but did nothing to cure the problem describe below. So, more investigative work is required to correct this issue. In the process of repeaking the IF and RF alignment, however, I found a significant problem with with the IF can, T207. As it peaks up, there is a pop and the sensitivity immediately drops way down. It can be brought back up by detuning the coil slug and then adjusting it back slowly. When peaked, the voltage slowly decays back down so I'm guessing I've got a bad cap in here to replace. I'm having fun now. I won't bother the list anymore until I get this puppy running correctly. Thanks to all for the help.

Date: Sat, 12 Mar 2005 13:57:07 -0500
From: WA0HQQ <r390@al.tirevold.name>
Subject: [R-390] Collins versus Curry IF Filters

I recently replaced the failing Collins mechanical filters in my 67 EAC R-390A with three of Dave Curry's Longwave Products filters. So many people asked me to share my measurement results that I wrote a report and published it. The report is available in the "Tutorials" section of the "References" page on the R-390A FAQ web site - <http://www.r-390a.net> Or - from this direct link: <http://www.r-390a.net/Collins-Curry-Study.pdf> 73, AI, WA0HQQ

Date: Fri, 15 Apr 2005 23:30:53 -0400
From: "Jon" <jonlinkhamer@comcast.net>
Subject: [R-390] Mech Filters/Ohm Reading

I'm wondering if anyone can answer a question for me. I'm basically going over the IF Deck, which is out of the radio and at this point. I'm taking some ohm readings at J512 and everything checks out. Great. Now I took the cover of the Mech filters and looking across the terminals expected about 40ohms according to the book.

However I'm reading 0 ohms across 3 out of the 4 filters. I'm getting nervous at this point. The 4th filter (4K) does actually read 41 ohms. Another data point is that I lifted the cap off one terminal of a filter that reads 0ohms and also took the wire off it. It turns out that with the wire off I'm reading about 58 ohms with or without the cap. I'm going to bed now and saying a little pray. I guess I'm looking for some help from the group. I'm preparing myself for the worst. Thanks in advance,

Date: Sat, 16 Apr 2005 01:52:00 -0400
From: "John KA1XC" <tetrode@comcast.net>
Subject: Re: [R-390] Mech Filters/Ohm Reading

You can sleep easy Jon, it's supposed to be like that.

Two sections of bandwidth switches S502/S503 select the filter used while the other two sections short out the 3 filters not in use to prevent unwanted signal leakage through them. The IF bandwidth was in the 4 KC position when you took your measurements.

Date: 06 Jul 2005 13:50 GMT
From: "Joachim R Groeger" <0519352653-0001@T-Online.de>
Subject: [R-390] Collins mechanical filter - help with identification

I have salvaged three mechanical filter from a circuit board but cannot identify the filters themselves nor the equipment they came out of. Can anyone help me with the characteristics of these beasts? They are marked: F450 Z1C F450 Z2C F450 V60F

Any help is greatly appreciated.

Date: Wed, 06 Jul 2005 21:25:45 -0700
From: John Kolb <jlkolb@jlkolb.cts.com>
Subject: Re: [R-390] Collins mechanical filter - help with identification

F450 Z1C USB filter 450 kHz carrier freq 2.7 kHz @ 2 db, 4.4 kHz at 60 db 20 kohms source and load resistance, 30 pF resonating caps 4 db insertion loss. V case.

F450 Z2C same as above, except LSB

F450 V60F AM filter, 450 kHz 5.25 kHz @ 6 db, 23 kHz @ 60 db specified. 8 db insertion loss. V case.

I have the plot of one on my web site which is probably much closer to typical. <<http://www.jlkolb.cts.com/site/mfcurves.htm>>

When receiving mechanical filters mounted on a board, it's always good to trace out the circuitry around the filters to try to get an idea of how the filters are matched to the tubes or transistors. Information on the frequency and bandwidth of filters is fairly widespread, but information on the impedances required to

properly match the filter are rather rare.

Date: Sun, 21 Aug 2005 00:24:01 -0400
From: "Ian Gallimore" <iangallimore@rogers.com>
Subject: [R-390] R-390A restoration Questions

I am working on an R-390A which I purchased from Fair, and I wonder if I could trouble you with three questions which would help me greatly.

1) When I select the 4 kc bandwidth, there is no signal. There is signal at all other settings, with the results that one might expect as the bandwidth is changed. Is it correct to assume that the 4 kc filter is faulty and should be replaced? <snip>

Date: Sat, 20 Aug 2005 22:57:06 -0700
From: John Kolb <jlkolb@jlkolb.cts.com>
Subject: Re: [R-390] R-390A restoration Questions

While I would be happy to sell you a replacement filter :)
<http://jlkolb.cts.com/site/fs_mf.htm>

there are other possibilities - there could be problems with the bandwidth switch or the shunt capacitors, either fixed or variable. Measure across the terminals at each end of the filter with an ohmmeter. The two coils should measure between 40 and 60 ohms. None of the 4 terminals should read zero ohms to gnd. If the terminals read open circuit at either end, the filter is defective and needs to be replaced. A short circuit to gnd from any terminal might be inside the filter, in which case, replace, but might be external also. Disconnect the wiring to the filter and measure again. There have been reports of foam inside the filter degrading to cause a high insertion loss. If that's the case, I would expect the 4 kHz position to have a much weaker signal than the other filter positions, 30 or 40 db weaker, but not completely dead. In this case, a few hardy souls have managed to open the filters and clean them, restoring them to proper operation. No reason not to try if the filter's bad anyway.

Date: Mon, 29 Aug 2005 09:03:35 -0400
From: Steve Byan <stevebyan@mac.com>
Subject: Re: [R-390] 16kHz filter and SWL/BC listening

On SW and BC broadcasts, the transmitted signal is bandwidth-limited, so there isn't much more bandwidth to let through with the 16 KC filter, especially if the 8 KC filter is tuned off to the side a bit. On SW broadcast, you're lucky to get 5 KC of transmitted bandwidth.

Date: Mon, 29 Aug 2005 09:16:43 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] 16kHz filter and SWL/BC listening

.....the 16kHz filter setting always sounds pretty much just like 8kHz just with more hiss....

I suppose the 2/4/8/16 kc bandwidth progression represents somebody at Collins

liking powers-of-two. (Note the 1-2-4-8-16 kc bandswitching...) For my usual purposes of CW listening it'd be nicer to have the mechanical filters at 1/2/4/8 but I'd need a time machine to fix that! Do any other receivers have the power-of-two progression in IF filters? Almost all the other ham, commercial, ex-military radios I use have less mathematical and more one-for-each purpose approach, e.g. narrow for CW, wider for SSB, widest for AM, with maybe an option for an additional one for somebody who likes really-wide AM or really-narrow CW.

Date: Mon, 29 Aug 2005 09:38:02 -0400
From: Sheldon Daitch <sdaitch@ibb.gov>
Subject: Re: [R-390] 16kHz filter and SWL/BC listening

I can only discuss IBB transmitters, not other SW broadcasters, but our transmitters will all pass 5 kHz audio, unless there is something wrong with them. Our proof of performance requirement for MW and SW transmitters is: "Audio Frequency Response - The audio frequency response of the transmitter shall be measured over the range of 100 Hz and 5000Hz. Within the range, the level of the demodulated test tone shall not deviate more than +/- 1.0 dB with respect to its level at 1 kHz and 85% negative modulation of the carrier." In fact, the Orban audio processors will allow up to 20-dB boost at 5 kHz, although we don't run that amount of high frequency boost. In the "old" days, when we had limited bandwidth audio circuits, i.e. phone lines or microwave circuits, those circuits, too, had a minimum of 5 kHz bandwidth. Today, IBB uses satellite systems for program distribution and almost all the circuits have at least 15 kHz bandwidth. It is overkill for HF and MW broadcasting, or course. In many cases we are also using FM transmitters, and we need the extra audio bandwidth for technically quality programming. Your observation of simply more hiss is essentially correct. In theory, there should be a slightly better audio response in the 16 kHz position, as the 8 kHz filter should roll off transmitted audio in the 4 to 5 kHz range, which the 16 kHz filter should pass. I think if you look at the historical use of the R-390 family, the 16 kHz filters were designed when the receiver was used for 4 channel point to point communications networks, which required the full 16 kHz.

Date: Mon, 29 Aug 2005 11:00:06 -0400
From: Steve Byan <stevebyan@mac.com>
Subject: Re: [R-390] 16kHz filter and SWL/BC listening

Sorry, I shouldn't have made unwarranted aspersions. I was thinking of the tropical band broadcasters that I usually listen too, and situations like Egypt's English language programming, which is famous for its muddy audio. The major broadcasters have well-maintained equipment and better audio.

Date: Mon, 29 Aug 2005 11:35:36 -0400
From: Dave or Debbie Metz <dmetz@ntelos.net>
Subject: Re: [R-390] 16kHz filter and SWL/BC listening

If my recollection is right, the reason for the 16 KC was to copy the mulit-channel broadcast which had 16 channels that could be broken down in the "black" and then sent to individual TTY decryption machines such as the KWR 37's. Each channel could have it's own keycard depending upon the use, Hicom, Intelligence, broadcast, supply, security group, etc. Never used for voice, only

data. dave

Date: Mon, 29 Aug 2005 13:09:38 -0400
From: Steve Byan <stevebyan@mac.com>
Subject: Re: [R-390] 16kHz filter and SWL/BC listening

Dallas Lankford had a series of articles (I think in Hollow State News, but maybe they were in the NRC's DX News) on replacing the 16 KC filter with something more useful. I think he tried some 6 KHz ceramic filters and the new 6 KHz Collins torsional filter. Maybe you could do something similar with a Rockwell/Collins 500 Hz or 300 Hz mechanical filter. (They don't seem to offer the 1.2 KHz torsional filter as a stock item anymore.)

Date: Thu, 29 Dec 2005 20:22:20 EST
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Trim Caps on Mechanical Filters

>Was the modification that installed variable caps (C-569 through C-571) in the
>input and output of the mechanical filters in the If module applied at Depot
>during rebuilds, or just put on newly manufactured modules?

There are two flavors of mechanical filter caps in production. What you see is what you get. The field never went back and "upgraded" the caps in the IF deck. Early production had selected fixed caps.

Later production had 4 caps under the can and 4 more on the side of the deck. These units also had 4 more holes in the side of the frame to access the side caps. If you have an IF deck with side caps and no side holes in your frame, you have a swapped in IF deck. Conversely if you have holes in the frame and no caps you have a swapped out IF deck. This will start some chatter and likely get us another dead carcass. So near the new year and such tasks to be dealt with.

There was much to do about what to do if you had to replace a mechanical filter in a deck that did not have trim caps. The last word in 1975 as I was getting out of service was still to just put the filter in and ignore the cap optimization problems. Wisdom from management powers was that once the caps were properly trimmed they needed no further adjustment. If you measured the output before you tweaked on the trim caps, you likely found your diddling produced no further gain. Experience in the field did not support this wisdom from higher management. It was standard procedure to tweak all the filter trim caps on every PM event. We wondered why there was no modification work order to at least add the top caps to the IF decks. We could see why no one wanted us drilling into IF deck and installing caps in the bottom side.

I think if we look at decks with and without trimmers on the bottom side, we will see that the decks have a lot of differences to allow the caps to be inserted. There was just not a big blank chassis wall space there waiting for additional caps. The extent of these changes may have been why no field modification was ever kited and fielded. The idea of providing new decks with caps was just a non starter from spending and contract point of view. Letting someone drill holes in the frame to trim decks in place was not a popular subject.

We always wondered how much better a deck would have been if it had had adjustable caps. Decks without trimmers still passed signal to noise test like every other receiver, so we believed the assembly folks did a good job testing and selecting the fixed caps. One myth was the early production was "selected" to closer specification. Once Collins had a big pile of good but not good enough filters, a proposal was produced and sold to get the trim caps in and the less exact filters in. Myth was that a well trimmed deck never needed adjustment. I have no evidence to support that statement. Hope this provides you some insight on the subject.

Date: Fri, 30 Dec 2005 20:44:32 EST
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Trim Caps on Mechanical Filters

OK so now you have looked under the two different types of IF decks and find ample space to place four trimmer caps.

Before the end of 2006 as a new year resolution please provide the R390 reflector here a very concise write up equal to a field modification procedure. Exactly detail how to modify the non cap chassis to a cap chassis. Please provide a detail list of parts. Please provide mechanical drawings such that the mechanical mounting parts can be fabricated from the drawing to provide some of the parts to make up the complete parts kit. Please include in the field kit installation, a template for drilling the side of the receiver frame. You get the parts list and detailed instructions and I know we can find the parts to do kits.

I write that prior to 1975 the military looked at the problem a couple times and chose not to spend the money on it. Your response is there is room on the deck to do it. If that was the only item I am sure the military would have done it. Because I said there was not room on the chassis and you think there is room every thing else I posted is mostly not credible. You rate eight good years of my life as fiction. I try to write this really boring trivia with some humor. Some Fellows today wonder what the engineers in the past were thinking and why they made the choices that were made. I call these choices compromises. I find most are motivated by return on investment. How much bang do we get for the buck? There is value to be taken away from these questions and answers.

>From these questions and answers I take way a lot of humor and get much practice with my typing and writeing skills. I am sorry it falls on you to grade my work. A boring job but some one has to do it. I do try to keep it on the R390 subject while varied. While most days I do enjoy taking a cut at providing some insight and sharing what I saw go down in my life, I am sorry my post are not up to your exacting critical reading expectations. I believe if I had more writing skills, I could have been a good author and would not have had to make a living prior to my retirement at age 55, assembling auto engines, repairing radios, being an electrician, and a computer scientist. I will continue to share my response to questions here on the R390 reflector and try not to worry as much.

Here's your chance. I bet lots of fellows own R390/A decks without the variable caps and would like to have the write up to make the modification. It sure would

be a very nice addition to the R390 resources.

I am looking forward to your work and the chance to modify one of my decks from your wonderful work. While the military considered and rejected the idea having the IF decks field modified, that would not stop some R390/A owners from taking on the task and doing it very successfully. Many Fellows have many more resources today for doing the task than were available back in the old days.

How about the can on top, Will it need to change size or can we squeeze every thing in the original can?

How much improvement will we get in the signal to noise ratio?

How will the band pass be effected?

What gain will one get for the pain?

Just because one can make the change should we make the change?

Roger

Date: Fri, 30 Dec 2005 21:04:46 -0500

From: shoppa_r390a@trailing-edge.com (Tim Shoppa)

Subject: Re: [R-390] Trim Caps on Mechanical Filters

Wow, Roger, didn't mean to tick you off.

I enjoy questions that are easily answered by looking under the covers, poking around with ohmmeters and voltmeters and signal generators, and comparing/contrasting small technical details. So if you say "it wasn't done for reason X", I read what you write with enough interest to go look and see reason X for myself. Don't take that as a mistrust of your facts, but take it as me being interested in what you write about. If I misinterpret your intended-to-be-factually-incorrect-for-humorous-intent statements as being actual mistakes, I apologize. I do seem to have rubbed you the wrong way a couple times in the past couple of weeks, putting me in the "bad guy" column way more than anyone else on this list. Who knows, maybe I'll get kicked off the list the next time I look under the covers of my R-390A instead of trusting the word of a respected poster.

Date: Sat, 31 Dec 2005 16:58:37 EST

From: Flowertime01@wmconnect.com

Subject: Re: [R-390] Trim Caps Science Experiment.

I do not have a sweep generator and would like someone to conduct a science experiment for us using said test equipment. Selecting an IF deck with filter trim caps. Applying the sweep generator to the IF at 455Khz plus and minus 16 Khz. Monitoring the output of the IF deck with suitable scope to go with sweep generator. While sweeping a mechanical filter and observing the output band pass, slowly vary the trim caps. Repeat this procedure for each mechanical filter and adjust both top and bottom cap for each filter.

While a test conducted on one item is a statistic of zero value would you attempt to report your observations on the following.

Does the filter band skirts change in width with changes in cap setting?

Does the filter bandpass shift in center frequency with changes in cap setting?
Does the filter become more peaked with changes in cap setting?

If the filters do not shift frequency or bandpass width, then any other change in filter response from adjusting the trimmer caps can be "faked" by making other adjustments else where (IF gain adjust) in the receiver. Thus rendering the trim caps nice things to have and diddle with but not required to make the minimum passing receiver.

Thanks for taking on the project and reporting your results. Just what do them caps really do for us? Roger AI4NI

Date: Mon, 02 Jan 2006 13:28:33 -0500
From: "Drew Papanek" <drewmaster813@hotmail.com>
Subject: [R-390] Re: Trim Caps Science Experiment

The same could be done without a sweep generator although much more laboriously. The test would reveal something about the relative Q of the mechanical filter drive and pickup coil circuits. If the Q were quite low then the peak from adjustment would be quite broad and adjustment would have little effect.

>If the filters do not shift frequency or bandpass width, then any other
>change in filter response from adjusting the trimmer caps can be "faked" by
>making other adjustments else where (IF gain adjust) in the receiver.

That would be true in the low Q case. If the Q were higher yes, we might still be able to compensate using the IF gain adjustment but then there would be excessive gain ahead of the filters. The total gain of the IF strip would meet spec but the higher gain before the filters would make the receiver more susceptible to intermod from close-in signals. (Perusing the "Cost Reduction" Engineering Report" revealed that most of the intermod came from the first IF amp stage, ahead of the filters.) Would that really matter? How many of us use our R-390a's in close proximity to multi-kilowatt transmitters?

>Thus rendering the trim caps nice things to have and diddle with but not
>required to make the minimum passing receiver.

Fiddling with the adjustments is part of the joy of having one of these radios. The joy would be compounded if the adjustments were done as part of a modification that YOU did. There are risks involved in adding the caps to a non-cap deck. The foam innards of our aging mechanical filters likely have deteriorated, making the filters very susceptible to damage from mechanical shock. So, during the drilling and blasting that cap installation would entail, it might be best if the filters were removed. Would the benefit exceed the effort? How about selecting fixed caps to resonate the filters just as it was done at the factory? That would be simpler and safer. How about soldering small ceramic trimmers across the filter terminals? Mouser and others carry some very compact units which look like they could be used here. Likely one would have to add some fixed capacitance in parallel, but the end result would still be adjustable. If for convenience, perhaps just the most-used filters could be resonated in that way. One could procure a deck

having the caps but no filters (I think Fair Radio still has decks so un-equipped) and transplant the filters from the functional but capless deck.

>Thanks for taking on the project and reporting your results. Just what do
>them caps really do for us?

I am an armchair "engineer" and leave that exercise to someone else less
"motivationally challenged" than I am. Drew

Date: Mon, 2 Jan 2006 18:42:42 EST
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Re: Trim Caps Science Experiment

It's the old adage a picture is worth a 1000 words. I was hoping someone has the equipment to do the test. A nice bandpass sweep on the scope to look at as one varies a cap. We do not need exact values from the test. What was in mind was a short afternoon test and a paragraph report. Then we would all have some idea of what happens when you twist those caps around. Are we shifting bandpass, bandwidth, depth of filter (signal to noise floor) (peak). Or even none of the above and something else. I thought it would make a nice short explanation for a web page.

Date: Tue, 3 Jan 2006 18:29:31 EST
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Mechanical Filter Band Pass Pictures.

Norman J McSweyn, One big bear hug to you from Roger AI4NI I was able to download the attachments. I popped them open and run a min and max one behind the other on my screen. It was nice to toggle between the two screen shots and watch the response line change. Very nice job. exactly what I had in mind for the experiment. I read your word file and see all the detail you put into the testing. Worry not about the calibration of the equipment. Every R390/A is going to act a little different and doing the couple decks like you did with some equipment that was "more calibrated" would not bring more exactness or understanding to the table.

The screen shot files do a very nice job to show what happens to the mechanical filter response as you vary the trim caps. This was exactly what I wanted to know and share with every one. You put these in a direct mail to me. Can I share them with every one? I think I can mail them to AI and we can ask him to put them on the web page for every one to view. We can wait for you to get home again and respond to you mail. Understand you are on the road again for a few days. This is your work and when it hits the web you need to get your credit for it.

Thank you again.

Date: Tue, 3 Jan 2006 21:42:13 -0500
Date: Tue, 14 Mar 2006 02:31:16 -0500
From: "Steve & Carol" <srosenb2@nycap.rr.com>
Subject: [R-390] Curry Longwave Products 6 Khz AM filter

Has anybody installed one of these filters in there R390a and if so what do you think of it for the price? \$199

Date: Tue, 14 Mar 2006 06:31:01 -0500
From: "Walter Wilson" <wewilsonjr@gmail.com>
Subject: Re: [R-390] Longwave Products 6 Khz AM filter

I've only had experience with this one time. I remember it sounding better than any other R-390A filter for AM.

Date: Tue, 14 Mar 2006 10:06:34 -0500 (EST)
From: Phil <tubesareking@yahoo.ca>
Subject: [R-390] Dave Curry 6 KC filter for R-390A

Steve, I bought one of these for my R-390A but have not yet had the chance to take my 1955 Collins R-390A out of its Hammond table top rack case as yet. Partly this is because I recently got a Stromberg-Carlson[Collins designed] R-392 and have been enjoying playing with it! Whether \$199 is a good deal or not - well, that depends. In my case, my 4 KHz filter is dead. 4 KHz filters are probably the most likely to go bad and the hardest and most expensive to find. So I will use the 6 KHz Dave Curry filter to replace the 4 KHz filter, giving a filter line up as follows:

0.1 KHz CW 1.0 KHz CW 2.0 KHz SSB
6.0 KHz MW DX, SW and "high fi" AM modulated HF amateur radio
11.0 KHz MW general and "high fi" SW [described as 8 KHz but actually 11!]
16 KHz MW local

I'm primarily a MW DXer, with a secondary interest in SWL and a tertiary [my big word for the day] interest in ham]. I also like HiFi audio, so nobody can convince me to give up that lovely sound 16 KHz. If my 4 KHz filter worked fine, I would not spend the \$199. But if my 4 KHz was good but my 8 KHz was dead, I probably would get the Curry 6 KHz filter too. The most common is to remove the 16 KHz filter and put in the 6 KHz Curry unit, but you would never see me do that! The Curry unit uses "PC board" lugs. Translation, use a low wattage soldering iron and work carefully to avoid lifting copper traces. Also, the ER mag reprint which serves as instructions is kind of vague. The gist of it is that you do not use trimmers at all, and do not use the trial and error pf caps either. IF output apparently goes WAY up, so if you have just one Curry filter setting IF gain may be a bit of a compromise. But I have heard great things about them. From a user point of view, having a brand new filter to use most of the time, taking the load off the others, is a fine idea too. Hope this helps and hope others who have actually used and installed one will chime in!

Date: Tue, 14 Mar 2006 10:06:48 -0500
From: Albert Santangelo <ve3ajm@sympatico.ca>
Subject: Re: [R-390] Longwave Products 6 Khz AM filter

I installed the Dave Curry 6kc filter into my R390A in place of the 16kc filter last year and am very pleased with it. The installation took me about an hour, and the supplied instructions were very helpful. For me, the 4kc filter can be too narrow

sometimes, and the 8kc position can be a little too wide when dealing with QRM either on the ham bands or SWLing. So the 6kc filter fills in the gap there for me. I see higher gain in the receiver when using this filter, of about 10db, perhaps due to the aging of the original mechanical filters in the set. It is a pricey option, but I could justify it for the most part because I didn't have to pay a high premium for the receiver.

Date: Sun, 23 Apr 2006 15:26:54 -0700
From: "Craig C. Heaton" <wd8kdg@worldnet.att.net>
Subject: [R-390] Collins Mechanical Filters

In the past I've come across some great material on this e-mail reflector. Now, it is my turn to share. Since there is only one receiver in the shack, a R-390/A, my experience isn't as great as others posting here. But, I've got some information to pass on. With out much effort, tools, or experience, I managed to open a Collins Mechanical Filter (2KC) from my R-390/A without damage. It can be fixed. Because, I've been unable to find drawings, photographs, or any real information pertaining to the construction of these filters; here is a link to a little website I've put together. It tells how to open a Collins Mechanical Filter for a R-390/A and includes photos. If I can find some finer than frog's hair wire, I'll post more. One last tid-bit, if you have never removed the 2KC filter from the IF deck, you haven't lived. In the event you want to try, I can describe how to avoid the pitfalls. Might add that to the website later after repairing the coil. <http://collinsfilter.tripod.com>

Date: Sun, 23 Apr 2006 23:46:19 -0400
From: roy.morgan@nist.gov
Subject: Re: [R-390] Collins Mechanical Filters

Thanks much for the website and phtotos on the mechanical filers. It seems to me that your next steps are:

- 1) find the required number 39 wire
- 2) find out how to dissolve the "black material" that was applied to the windings so you can: a) remove them b) count them so as to rewind them with the right number of turns.

I have a suggestion for 2): Mix up some "de-gooper": one third each acetone, MEK, and acetic acid. This stuff is bad for you, but you only need a little bit. Immerse the coil in it for day or five and see what happens. I have used this stuff in the past (back in the 60's) to remove some epoxy potting compound on some IBM logic modules. It strips some component markings but you don't care about that. Likely it will dissolve the black stuff. It may dissolve the coil form but it's worth a try. I may have some number 39 wire but I'm in the middle of a major upheaval with most of my Junque and Treasure gone to storage as I get ready to move to a new and better place for radios, including my collection of R-39x sets. Soo.. I may not be able to locate any of the fine wire I have. I do have at least two 4kc filters here that have failed: it sounds like your methods will come in handy. Thanks for posting them.

Date: Mon, 24 Apr 2006 00:38:13 EDT

From: ToddRoberts2001@aol.com
Subject: Re: [R-390] Collins Mechanical Filters

Hi Craig, thanks also for your website address and pictures of how you opened up an R-390A mechanical filter. I have repaired one of these in the past. Luckily the problem was one of the fine wires from the input coil broke right at the filter terminal inside and I was able to resolder it to the terminal and that fixed the filter.

One trick I have used to remove the enamel insulation from ultra-fine magnet wire is to dip the wire end into a little bottlecap with a small amount of Klean Strip KS-3 Premium Stripper paint remover. If that is not practical then just paint the end of the wire with a little of the paint remover and let it sit for 15-20 minutes. The paint remover will dissolve the enamel without hurting the wire. Wipe the end of the wire clean with a soft cloth moistened with alcohol. Scraping or heating the fine wire to remove the insulation will likely destroy the wire. Also I have found you need to be very careful when soldering ultra-fine wire. Too much heat and solder and the wire will literally dissolve. Use a fine-tip soldering pencil and solder as quickly as possible with minimum heat.

If the coil has an internal break and it is impossible to unwind the coil without destroying it then a possibility would be to measure the inductance of the other good coil with an inductance meter, then re-wind another coil with similar size wire on a similar-size coil form and by trial and error find the number of turns that gives the same inductance. Collins allowed for a little variation in the coils by using fixed capacitors + trimmer capacitors across the filters to peak resonate the coils at the filter frequency, although some earlier R-390As used fixed capacitors only across the filters.

The number 39 wire will probably break easily but with some practice one should be able to handle it carefully and wind a coil without breaking the fine wire. 73
Todd WD4NGG

Date: Thu, 27 Apr 2006 13:12:34 -0700
From: "David Wise" <David_Wise@Phoenix.com>
Subject: RE: [R-390] Collins Mechanical Filters

My wire measures 0.002 inches*, which is about 44-gauge. I'm sure it would be okay for the filter coils; after all, they have no current going through them. At worst they won't peak as sharply. Give me your mailing address offline and I'll stick 30 feet into an envelope and mail it to you.

Date: Tue, 30 May 2006 22:43:11 EDT
From: WA3FRP@aol.com
Subject: Dave Curry Longwave Products Mechanical Filter Still Available?

I recently found out about the Curry Longwave Products Mechanical Filters. I'd like to find out if the R390-A 500 Hz mechanical filter is still available but the links I've been able to find point me to the ER Store which seems to be non-functional. I'm using my R-390A every day on the ham bands for RTTY and the 500 Hz filter would be great during contests and when the bands are crowded. Can anyone help with a purchase source or provide a filter?

Date: Tue, 30 May 2006 21:07:46 -0700
From: "Greg Werstiuk" <greg_werstiuk@msn.com>
Subject: RE: Question - Dave Curry Longwave Products Mechanical Filters- Still Available?

Dave Curry Longwave Products
P.O. Box 1884 Burbank, California 91507

Longwave Product's Homepage: <http://www.75a-4.com/> Appears you'll have to inquire as the site doesn't speak of other than the 75A4 6KHz filter.

Date: Wed, 31 May 2006 00:20:39 EDT
From: ToddRoberts2001@aol.com
Subject: Re: [R-390] Question - Dave Curry Longwave Products Mechanical Filters - Stil...

Rockwell-Collins sells a line of Low Cost Torsional Mechanical filters. I believe these are the ones used in the Curry Longwave Products filters. You can order these directly from Rockwell-Collins in small quantities. They are small enough to fit inside a round metal tube the same size as the original R-390A filters. With a little ingenuity you can make up your own custom filter for an R-390A using one of the Low Cost Rockwell-Collins filters. Available bandwidths are : 300Hz, 500Hz, 2.5KHz, 5.7KHz, 7KHz and 10KHz. 73 Todd WD4NGG.

Date: Wed, 31 May 2006 08:11:39 -0400 (EDT)
From: Phil <tubesareking@yahoo.ca>
Subject: [R-390] Curry filters

I have been in touch with Ray at Electric Radio over the last few months regarding the Curry filters. Apparently Dave Curry had the misfortune of receiving some incorrectly labeled parts and several filters he made [R-390A filters] were defective. I received one. I had installed it and it didn't work. I tested it using a 455 KHz sweep generator and my scope to verify it wasn't my IF deck. I bought a used 4 KC filter from a nice ebayer in Israel, installed it, and the ebay filter works great, thus proving my IF deck is fine.

Ray has told me that Dave will be making new ones, but there will be some lead time involved. When Ray has them in stock, they will pop back up on the ER site. If interested, I'd suggest you contact Ray.

Ray is a great guy and ER is a great mag. He has offered me a refund and I will be sending my defective filter back. I will continue to buy products from the ER store and hopefully when the day comes that one of my Collins filters goes bad, Dave Curry will still be making them. Many highly respected people in the R-390A world have had great luck with the Curry filters. Thus, I hope that Dave's excellent reputation will survive his misfortune with a parts supplier.

Date: Mon, 7 Aug 2006 13:00:19 -0500
From: "Mike" <mike46@cwjamaica.com>
Subject: [R-390] IF Filter Disassembly

Does anyone have information on how to take one of these apart? I can remember seeing something on the 'net a while ago.

Date: Mon, 7 Aug 2006 15:38:43 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] IF Filter Disassembly

Yes, I remember how to get an R390/A mechanical filter apart. I hope that is your question. You can unsolder the leads to the cylinder and unbolt the mechanical filter from the chassis. Watch for some more mail and the web page with the photos.

Once you have the filter out of the chassis, you hang the filter by its chassis mount tabs and bolt holes from the ceiling (or a tree). You tie a long lead to the electrical connection tabs on one end. Obtain suitable safety equipment and a letter from your mother or significant other to proceed from here. I am not responsible when you burn your self.

You heat both ends of the cylinder sleeve to melt the solder. You pull on the long wire you attached. When it gets hot enough on both ends of the cylinder to melt solder, the guts will slide out of the cylinder. You can preheat and solder suck some of the solder out of the way first.

On a good day this works well. Just understand you are working down hill in a gravity well with molten solder above your arm and hand while the other hand is busy with a flaming torch. Long sleeves, good gloves, and safety glasses are all in order. A small torch works better than a big torch. But any torch works better than a solder iron as it will get the whole mass up to the critical temperature much neater than an electric iron.

The guts clean up and mostly can be repaired. Most common failure is a broken wire inside the filter.

Date: 7 Aug 2006 19:35:21 -0000
From: "n4buq@knology.net" <n4buq@knology.net>
Subject: Re: [R-390] IF Filter Disassembly

It seems like you could save yourself some time and just grab a hot soldering iron with your bare hands, couldn't you? Seriously, it would seem that having the filter body above the heat source is not the best choice. Couldn't you secure the body to something near the ground and pull the wire up as you heat the body (or even sideways would work)?

Date: Mon, 7 Aug 2006 15:57:58 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] IF Filter Disassembly

The things you say are true and far safer. But my memories are full of solder burns

Date: Mon, 7 Aug 2006 16:01:34 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] IF Filter Disassembly

If you have some more questions once you get inside the filter assembly post them on the reflector. There is a lot of the Fellows who have been into these things and have discovered a few things about working on them.

Date: Mon, 28 Aug 2006 07:30:12 -0500
From: "Craig Anderson Ext 1365" <Craig.Anderson@saintpaul.edu>
Subject: [R-390] Dave Curry R-390A Filters

I have a 6 KHz Dave Curry made R-390A filter and I am about to install it in a '68 production EAC. My question is...if someone out there has installed one of these filters before do you leave intact the fixed and variable cap that is across the current mechanical filters. There were no instructions about installation and yet I read an article in ER that recommends bypassing the fixed and variable cap and hooking it up direct. If anyone has any other information I would appreciate hearing from you before I install this in place of my 8 KHz filter.

Date: Mon, 28 Aug 2006 18:45:04 EDT
From: ToddRoberts2001@aol.com
Subject: Re: [R-390] Dave Curry R-390A Filters

Hi Craig, it seems the filter should have come with clear instructions as to whether to use the existing resonating caps in the R-390A when installing the filter. My guess is he used one of the Collins Low Cost Series Torsional mechanical filters inside a metal tube the same size as the original filter. Collins recommends using fixed 30pf caps (mica preferred) across the input and output pins of the filter. I would guess that he installed the correct resonating caps already inside the metal filter tube, so there would be no need and would actually be harmful to try to re-use the original resonating caps as they would detune the filter. Only the original mechanical filters would correctly resonate with the original capacitors.

Date: Tue, 29 Aug 2006 16:14:33 -0400
From: "WD9INP/4" <WD9INP@isp.com>
Subject: Dave Curry R-390A filters

I would suggest leaving the variable cap in place, tuning it for maximum carrier meter deflection. If you see a small change, but no definite peak, try paralleling the fixed capacitor, and see what happens. You may find you get a definite peak on the variable cap. If not, try adding a few more picofarads (e.g., 5 pF) and keep trying combinations till you see a definite peak on the carrier meter.

Too much is left to inference in your query. I have no idea what the article in ER says. In fact, I've never seen "ER." If all else fails, write me direct.

Date: Tue, 29 Aug 2006 16:25:43 -0400
From: "WD9INP/4" <WD9INP@isp.com>
Subject: broken mechanical filter

Charlie (I'm replying to myself), Tell those folks to send more replies. You only got one reply, and that was one that had purty li'l pictures of the innards of a Collins mechanical filter. (No longer talking to myself:) What I'm looking to do is see how feasible it would be set up a mechanical filter facility. I want to get some samples, and I'll pay a few buck\$ (maybe \$5.00, exclusive of postage) to get a few. As you would expect, write ahead before you send your poor busted li'l booger. Done fixed 1 busted MF and opened 'nother n' saw t'warn't too hard to fix 'em. Git with it, R-390A Lunaticks!

Date: Tue, 29 Aug 2006 18:06:41 -0400
From: "Steve Hobensack" <stevehobensack@hotmail.com>
Subject: [R-390] Dave Curry R-390A Filters

Craig, after the filter installation, the small trimmer cap should peak at two places in the rotation. If it peaks at only one position, small amounts of capacitance will have to be added or removed outboard. If you have a midget variable and a capacitance meter, you could find the approximate value experimentally.

Date: Tue, 29 Aug 2006 20:22:30 EDT
From: Flowertime01@wmconnect.com
Subject: Re: Dave Curry R-390A filters

I think your input is as good as we can get. Craig, will know he has enough capacitance when the trim cap provides a double peak. One peak on each side of the cap maximum. If capacitance is added in small step so as not to over run the variable cap range. A trimmer cap could be tried in the circuit to find the correct range. Earlier this year one of the Fellows ran a sweep generator across the mechanical filters and provided picture for all to look at. The thing we learned from that was the trimmer cap provides a match that reduces or increases insertion loss. The cap matching has no effect ("OK very little effect") band pass. A couple of the caps just keep DC off the filter coils. Craig, should be able to get the filter soldered in with little problem. Watch the DC isolation and use those caps. Keep the trim caps in (both ends if existing) [Side chassis and top of filter] Check the signal level compared to the other filters. If the Curry filter has lower signal level than the other filters then start adding larger value coupling caps to the Curry filter. Alternative is to trim the caps on the other filters back to give equal pass on all filters and then reset the DC gain adjust.

Date: Tue, 29 Aug 2006 20:30:02 EDT
From: Flowertime01@wmconnect.com
Subject: Re: broken mechanical filter

Charlie, sure you can fix the filters. Fellows have been doing one off for themselves for years. The guys at Fair Radio have been doing quite a few to meet sales needs. If you can find the old part it is likely repairable. Redoing the resonate slug stack looks like a lost cause.

But open coils can be rewound and broken wires fixed. Likely you can buy dead filters and fix a few. We sure would thank you for taking the time and effort. Not something that will make you wealthy but will make you a bit wiser. Sure hope

you keep asking for filters once a month or so. \$5.00 and postage for dead one sounds fair.

Date: Wed, 30 Aug 2006 07:49:21 -0400 (EDT)
From: Phil <tubesareking@yahoo.ca>
Subject: [R-390] Dave Curry R-390A Filters

I have had some experience with the Curry filters - the 6 KC one - that I'll share. If you buy it from ER [which stands for Electric Radio - a boatanchor magazine which gives a lot of attention to R-390/R-390A receivers, and also has an online store] it should include a photocopy of two articles in ER on how to install them. The first was clear as mud. The second, written a few months later to try to lend some clarity to the process - was not quite as clear as I'm sure the author hoped. One thing is clear however, with the Curry filters you do not use the trimmer cap and fixed cap that are in parallel with the filter!

However, before anyone starts stripping out [electrically speaking] the fixed cap and the trimmer cap, make sure the Curry filter works!!! Mine did not, I went to all the trouble of installing it and my R-390A was dead on that bandwidth setting. I had bought the Curry to replace a dead 4 KC filter. I pulled the Curry filter out, tested it with a signal generator and a scope and it was dead. Ray at ER gave me a refund no problem - he is a good guy to deal with. Ray explained to me that Dave Curry had the misfortune a while back to get some defective parts. Apparently these went into some of his filters. Thus be very wary of any Curry filters up for sale on eBay.

You will note that ER doesn't list any 6 KC filters on its web store page. Hopefully they will have some more in the future. Hopefully this will not discourage Dave Curry from making these filters - they have a very good reputation but for the defective ones. I wouldn't want a good reputation shot down by some bum components.

As for me - I bought a used, tested 4 KC filter from a nice guy in Israel - thanks to eBay. Works great - \$35 very, very well spent. For my MW DX of TAs [trans-atlantic medium wave broadcast stations], the 4 KC filter is perfect. Pulls in Virgin 1215 and Croatia on 1134 every night without fail - even in summer.

Date: Sat, 30 Sep 2006 10:21:39 -0400
From: "Charles A Taylor, WD4INP" <WD4INP@isp.com>
Subject: [R-390] Busted mechanical filters

You all may remember that I wanted to experiment with fixing Collins mechanical filter or similar types (like the Dittmore-Freimuth group). I'll offer \$7.50 for defective units, but please radio ahead: I don't know if I will get no offers or if I will get 1,000 of them.

Date: Sat, 30 Sep 2006 11:00:59 -0400
From: "David C. Hallam" <dhallam@rapidsys.com>
Subject: RE: [R-390] Busted mechanical filters

As I remember, there was a post complete with pictures to this group not too long

ago on how to repair mechanical filters. I'm sure a search of the archives would turn it up.

Date: Sat, 30 Sep 2006 11:03:14 -0400
From: "David C. Hallam" <dhallam@rapidsys.com>
Subject: RE: [R-390] Busted mechanical filters

As a matter of fact I saved the post. <http://collinsfilter.tripod.com>

Date: Sat, 30 Sep 2006 10:21:06 -0700
From: Buzz <muttman@charter.net>
Subject: Re: [R-390] Busted mechanical filters

My filter disassembly info is at: <http://webs.lanset.com/buzz/misc/filter/390Afilter.html>

Date: Sat, 30 Sep 2006 20:11:08 -0400
From: Charles A & Leonor L Taylor <041043@isp.com>
Subject: Re: [R-390] Busted mechanical filters

Actually, the foam isn't that important as long as the filter is reassembled in conditions of low humidity. Then there is the problem of pulling a vacuum in the filter. Any gas will act to dampen the vibration of the metallic disks, and thereby increase the attenuation. I suppose this can be compensated by reducing the resistance the loading resistors on the other filters and compensating by increasing the I-F subassembly gain by adjusting R-519 (GAIN ADJ).

I repaired a plastic-encased Collins mechanical filter in 1973. I had to carefully saw the plastic case circumferentially, and resolder the open transducer lead (#32 AWG, perhaps). I observed no material change in attenuation (about 6 dB) of the filter after gluing the case back together. Incidentally, I believe that I mentioned I set R-519 (GAIN ADJ) by setting LINE LEVEL meter to "100," with LINE METER switch set to "0," and LINE GAIN pot set fully clockwise (that's with the top part of the knob going to the right, for you kids who have never seen an analog clock). That's very close to the prescribed setting, and is a convenient way to observe deterioration of the tubes. I hope that's a good answer.

Date: Sat, 30 Sep 2006 22:41:38 EDT
From: ToddRoberts2001@aol.com
Subject: Re: [R-390] Busted mechanical filters

I don't think repacking the mechanical filter with foam is necessary or even desirable. After all the filter was working for years with a gooey mess inside that used to be the foam. New foam may run into a similar problem 30+ years down the road. I believe the deteriorated foam may be corrosive and may be a factor in the thin wires breaking inside. The filter I took apart one time had a greenish-looking corrosion around the spot where one of the thin wire leads broke, where the copper was bare. I would just reassemble the filter with those supporting discs on each end. If those are deteriorated perhaps a set of new supporting discs could be punched out of some thick felt material that would act like a shock

absorber. The one filter I repaired years ago I put back together without foam and it has worked fine ever since. 73 Todd WD4NGG

Date: Mon, 2 Oct 2006 15:35:45 -0700
From: "Craig C. Heaton" <wd8kdg@worldnet.att.net>
Subject: RE: [R-390] Re: Busted mechanical filters

I forget which website and/or discussion but the cotton balls were used in another style of mechanical filter other than those used in a R-390/A. The 2KC filter which I disassembled from a R-390/A uses something closer to a type of soft black rubber 5/16 of an inch thick. My money says, just about anything which would hold the disks/coils will work. A die to cut out little rubber supports should be a piece of cake for anyone with access to a machine shop. I don't think any of this is rocket science: find something to dissolve the black stuff holding the windings on the coils, count the numbers of turns, rewind with correct size magnet wire, new supports if needed. Or could gather a bunch of old mechanical filters and use the pieces to build a good one. Then test the results.

Date: Sat, 17 Feb 2007 10:31:32 EST
From: DJED1@aol.com
Subject: [R-390] Mechanical filter tests?

Well, I finished recapping and aligning my Amelco, and all looks well with one exception. I found that I have about 10 dB more loss through the 16 KHz filter than the others. Never noticed it before, because I never use that filter. So I'm debating whether to try and replace the filter or not- it's a tight place to work, and I'm not sure what I've got as a spare. I've got one of the ATC IF chassis with filters, but I need some guidance on how to test the filter and what the results should be. I did a quick setup, feeding the filter with a URM-25 and measuring the output with a high impedance AC meter. It measures about 13 dB of insertion loss- is that about right? Thanks for any advice Ed WB2LHI

Date: Sat, 17 Feb 2007 10:40:40 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Mechanical filter tests?

It does not sound wrong, but it may not be right. The impedance these filters operate into is higher than the input impedance of most AC volt meters.

Date: Sat, 17 Feb 2007 17:07:57 -0500
From: "Charles A Taylor, WD4INP" <wd4inp@isp.com>
Subject: Re: [R-390] Mechanical filter tests?

The filters were consistent in their characteristics. Ought not to have been a "selected value" sort of situation. Appears from what you write that the input capacitor that parallels the trimmer has been removed, and a wrong value was been selected to parallel the output trimmer. You need to hand-select the proper values. Navy manual calls for 110 pF total capacitance across either side of the filter. My Motorola has 8-50 pF trimmer either side. That implies somewhere near 47 pf for the fixed padding capacitor. Suggest that as a starting point. I'm putting this on the reflector for informational purposes.

Date: Sat, 17 Feb 2007 17:37:52 EST
From: DJED1@aol.com
Subject: Re: [R-390] Mechanical filter tests?

Thanks for all the suggestion on filter testing, both on and off the reflector. Here's what I finally did, which seems to make sense in light of all the comments: I connected the URM-25 high level output through a 100K resistor to the input of the filter, and tacked a 100 pf air variable across the input. Similarly, I put a variable cap across the output, along with a 100K load. I used my HP 400EL AC voltmeter, which has an input resistance of 10M, shunted by 25 μ F. To decouple the meter more, I used a scope probe at 10X to connect the meter to the setup.

To obtain a reference level, I connected the meter to the input of the filter, then adjusted the trimmer cap for a peak. I then transferred the meter to the output, and peaked the output cap. Finally, while measuring the output, I repeaked the input to compensate for the effect of the meter in setting the reference.

I measured about 9 dB of insertion loss on my spare filter, reasonable ripple in the passband, and a sharp falloff outside the passbands. I couldn't measure levels of filter rejection because I was too close to the lower limit of the meter.

I'm pretty happy with this setup- the filter resonated as expected, the loss is reasonable and the filter shape looks OK. My only problem is one responder said the loss should be about 25 dB. I'll have to try and track down the original filter specs.

Anyone have any further criticisms/suggestions? Now I have to decide if I want to go to the trouble of replacing the filter, given that I never use it. Or should I put the spare in the "someday" drawer with my spare 3TF7s.

Date: Sat, 17 Feb 2007 20:09:22 -0800
From: John Kolb <jlkolb@jlkolb.cts.com>
Subject: Re: [R-390] Mechanical filter tests?

That was me - I've got a copy of the Collins specification document for the 2 kHz filter, 526-9163-000/009, F455N-20, 1970. The 4, 8, and 16 should have similar characteristics except for filter bandwidths. The insertion spec is 25 db max. Doesn't say anything about min or variation between filters.

I can mail out copies of the spec if I have a limited number of requests, or maybe I can get it scanned at work and have pdf's available.

Ed, your procedure sounds like it should work fine. I've been thinking of something similar - rather than use the scope probe for isolation, I'm thinking of a 10:1 divider, 900K over 100K on both sides of the filter from hot to gnd. On the output side, there would be a 110K resistor in parallel, making a total 100K load.

On the generator side, there would be a 110K series resistor, again making a 100K source driving the filter. Variable caps both sides to adjust resonating C. Connecting the 400EL across the 900K/100K junction then should have hardly

any effect on the tuning, avoiding all the retuning as the voltmeter is moved from one side to the other.

Was looking at ebay, but decided I couldn't afford a second 400EL :)

Date: Sun, 18 Feb 2007 09:56:48 -0500
From: "Joel Richey" <richey2@mindspring.com>
Subject: [R-390] filter loss

My 16khz filter showed about a 20 db greater loss then the other filters so I took the one out the spare IF module and put in it in and it also showed approx the same loss, bought another one on ebay and it showed about the same loss, I learned to live with it as I don't use that position much.

Date: Fri, 23 Mar 2007 14:04:28 -0400
From: "Bob Young" <youngbob53@msn.com>
Subject: [R-390] R-390A selector problem

On my Motorola 390A I have an intermittant problem: with the 4,8 and 16 KHz filters the sensivity is good, when I switch to 2,1 and 0.1 the S meter drops about 50 db with corresponding volume loss. This is intermittent however as it will sometimes work evenly on all 6 positions. It does not seem to be a mechanical problem with the selector switch itself as moving it does nothing usually and there is no noise when it is switched, sometime a strong signal will jar it back to normal volume however when it is in the tighter positions. the 2 Khz mechanical filter and the crystal filters all seem good. Related to this, where and what is the killer cap that will take out the mechanical filters if not replaced? Thanks again,

Date: 23 Mar 2007 18:43:18 -0000
From: "n4buq@knology.net" <n4buq@knology.net>
Subject: Re: [R-390] R-390A selector problem

See <http://www.militaryradio.com/R390AMaintenanceTasks.pdf>

Date: Wed, 30 May 2007 17:52:59 -0400
From: "Keith Densmore" <densmore@idirect.com>
Subject: [R-390] Mechanical Filters

I have a bad 4KC mechanical filter. I seem to remember someone mentioning it is possible to have them rebuilt. Is this viable, or is there someone selling replacements?

Date: Wed, 30 May 2007 17:43:58 -0500
From: "Larry WA9VRH" <wa9vrh@mtco.com>
Subject: Re: [R-390] Mechanical Filters

I would checkout Fair Radio's website. <http://www.fairradio.com/> They may still have the 4kc filter available.

Date: Wed, 30 May 2007 23:28:37 -0400
From: roy.morgan@nist.gov

Subject: Re: [R-390] Mechanical Filters

Dave Curry Longwave Products makes filters for the 75A-4 and the R-390A
<http://www.75a-4.com/>
Click the picture link to see the R-390A style filter. The review from ER is at:
<http://www.75a-4.com/REV0.jpg>

You can also order the 75A-4 types from ER Magazine. http://www.ermag.com/index.cfm?v_link=catalog
although the R-390A types are not shown there.

Date: Thu, 31 May 2007 00:13:18 -0400
From: Scott Bauer <odyslim@comcast.net>
Subject: Re: [R-390] Mechanical Filters

About Curry Filters. Buyer Beware is all I can say.

I bought 3 and had Rick Mish install them in my EAC IF module, serial 10,XXX. Rick could not get them to work properly. 6 peaks. Curry told me that he does not do customer support and the filters should be returned to whom they were bought from.

I finally managed to get him to look at the IF module. It turns out he was installing defective crystals. He very politely told me that he would install a set of his personal filters in my IF. I did not notice any difference. Very weak distorted signals. It was awful and I am very disappointed.

I believe I paid a total of \$600 for the 3 filters, 500hz, 3kc, 6kc installation and alignment. I have other IF modules that perform much better with the 40 year old stock filters. The IF is sitting on my shelf for use as a spare. Though Curry was polite and informative, the product is downright poor.

Date: Thu, 31 May 2007 07:24:10 -0400 (EDT)
From: Phil <tubesareking@yahoo.ca>
Subject: [R-390] Curry filters for R-390A

Curry no longer makes filters for the R-390A. A little over a year ago I bought a 6 KC Curry filter through the ER online store. It didn't work. I tested it - nothing. I contacted Ray at ER who is a fantastic guy and returned it. My reason for getting it was that my 4KC filter was burned out. I thought the 6 KC would make a nice replacement. I ended up getting an old 4KC from a great eBay seller in Israel. I installed it, and it worked, and still works, great! BTW, shipping from Israel to Eastern Canada was quicker than from anywhere in the USA! Go figure!

Date: Thu, 31 May 2007 20:19:48 -0400
From: Albert Santangelo <ve3ajm@sympatico.ca>
Subject: Re: [R-390] Curry filters for R-390A

I purchased a Dave Curry 6kc filter from the ER store last year, installed it in my R-390A, and am very pleased with it. There is far less insertion loss with the new filter and its a pleasure to have this bandwidth available. I guess some guys just

had some bad luck with their 6kc Curry filters.

Date: Thu, 31 May 2007 11:00:01 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Mechanical Filters

The Fellows here on the R390 reflector did a whole series on rebuilding the filters here last year. You will need to look through the archives. There were even web pictures and everything when we got done. You can fix the filters if you can solder, We can help. In side the filters was some sponge packing that held things in place. Over time the sponge packing has turned to sticky stuff. This has left the filter part hanging on the very small wire leads. Over time the bumps and gravity will cause one of the wires to break. Thus the filter goes from band pass to full stop. The procedure is to remove filter from the IF deck. Using a larger solder iron the ends are heated and the whole inside will slide out of the round sleeve body of the filter.

Use care the wires are short.
There are three parts inside the sleeve.
The two end caps and the filter part.
The three items are coupled with fine wire.
Heat one end and pull it free.
Turn the assembly over and do the other end.
With both end free, undo the wires.
You can then get every thing apart and clean up the solder joints.
Then you can put it all back to gether.
Some packing foam can be cut for new spacers.
Hang the sleeve with wire through the mounting flange holes.
Tie a second wire from the end terminals.
Hang the sleeve from over head.
Pull down on the second wire.
Take care not to catch hot solder on the human body.
Apply heat to the joint.
You can clean up the sticky stuff and do a wire repair.

The guys at Fair Radio have gone so far as to do a complete rewind on the input and output coils. Install new packing and do a re solder. Others have just done wire fix and re solder. I am still rebuilding my retirement home and have no bench unpacked and set up yet. So I am not doing repairs myself. I hope you receive some mail from other Fellows. One was trying to develop a small market to do repairs and exchanges.

Date: Thu, 31 May 2007 08:27:54 -0700
From: "Craig C. Heaton" <wd8kdg@worldnet.att.net>
Subject: RE: [R-390] Mechanical Filters

Here is an URL to a website that will at least help disassemble the filter. So far, I've had zero luck getting the coil winding apart. Can't dissolve the stuff used as a potting material. The last thing I tried was MEK. Soaked the coil for several hours; nada, zip, didn't faze it one bit. <http://collinsfilter.tripod.com/> But I did find the time to restore another R-390/A, an Amelco. Now repainting the trim on my

house. If someone really knows what dissolves the potting material, I'd like to have the secret.

Date: Thu, 31 May 2007 12:14:26 -0400 (EDT)
From: "Paul H. Anderson" <paul@pdq.com>
Subject: RE: [R-390] Mechanical Filters

If you're looking for last stop measures, consider using methylene chloride (sp? ... in hardware store paint stripper). That'll get it. It should leave the enamel insulation on wire. But everything organic (including any flesh it touches) will be dissolved.

Date: Thu, 31 May 2007 15:17:32 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Mechanical Filters

When I was at Fair Radio looking at parts in a box, I had no idea the potting stuff on the coils was a problem. The guy at Fair said he stripped the wire and every thing and started over with new wire. I think the, magic number of wire turns was 30 turns. Now we do need to get one unwrapped so we can get a good number of wire turns to rewrap the winding on the core. You could just cut the stuff off and count the little bits of wire. Maybe not depending on how much adhesion the stuff has to the core. Some times we would like to just get the end loose to make a repair.

Some day I will get the house done and unpack my stuff. I am tired of E-mail as a hobby and want to smell some hot solder. Its more fun when I can look into a receiver for a reference number rather than look at a book.

I hope we can determine a solvent that will let us devolve the potting stuff.

It may remove fingers and other body parts and not be OSHA friendly, but any radio operator can be struck by lightning even on a clear day so some exposure to hazards is acceptable. What I hate is when my diatribes get classed as spam by a mindless machine masquerading as intelligent.

Date: Thu, 31 May 2007 21:54:44 -0700
From: Buzz <muttman@charter.net>
Subject: Re: [R-390] Mechanical Filters

Here's the url of my web page on Collins filters:
<http://webs.lanset.com/buzz/misc/filter/390Afilter.html>

I posted it here on the list a few times because I figured anyone with a R-390 would be here.

Date: Sat, 02 Jun 2007 08:08:14 -0400
From: shoppa_r390a@trailing-edge.com (Tim Shoppa)
Subject: [R-390] Mech filter REPAIR

Several here and elsewhere have disassembled the mechanical filter cans and

made some nice pictures of the contents. Wonderful work. Some have done a good job of reattaching single wires that had broken off. Wonderful work. Has anyone actually, say, completely disassembled a filter, put new foam in, rewound a burnt in the middle (not just a reattachment) coil, and reassembled the whole shebang to make a working filter?

Right now I'm with exactly the right number of working filters to match all my radios, but I have several "bad" ones that have accumulated over the years. I compare the situation today with where Dallas Lankford was writing about PTO's in the 80's. He clearly understood that there were problems with PTO's that had gone beyond the endpoint adjustment or needed an overall resetting at the corrector stack, but hadn't quite gone as far as doing that. And now today there's a couple websites that have really pristine pretty pictures of the true innards of a PTO, where daring souls have gone in and completely cleaned up and recalibrated from scratch. Those pictures and details let me do the same a year or two ago when I rebuilt my sludged-up PTO. Similarly there are websites showing how to really do a complete teardown and clean of a RF deck today.

Maybe I should stop being frustrated and open up a mechanical filter repair shop, doing all the experimentation that I want others to do myself and showing the results!

Date: Sat, 2 Jun 2007 10:42:15 EDT
From: ToddRoberts2001@aol.com
Subject: Re: [R-390] Mech filter REPAIR

I think the next stage of R-390A filter repair would be to have the ability to rewind the input or output transducer coils if needed. I am sure there are a number of the coils with an open winding somewhere in the middle, not just at the ends. The way I would do it I would guess the first step would be to measure the inductance of a good filter coil with an LCR meter as they apparently resonate with the mica or a mica plus trimmer cap at 455KHz. Next step would be to determine the wire size and possibly count the number of turns if the coil could be unwound from the bobbin. If the coil is varnished or epoxied to the bobbin determine if it can be freed up by a soak in paint remover or some kind of solvent.

It may ruin the wire insulation but at least you could still count the number of turns in the coil. If it is impossible to count the turns then knowing the inductance of a good coil can lead to a target figure by trial and error of number of turns of a rewind. One of the old MoReCo Morris Hand Coil Winders would be nice to have for rewinding the small bobbins. I believe the disc resonators should probably last forever unless the filter was dropped hard or physically damaged. There is really nothing there that can wear out except the wire coil or connections inside the filter and of course the original foam insulation that eventually turns into a sticky corrosive mess.

Date: Sat, 2 Jun 2007 07:44:07 -0700
From: "Craig C. Heaton" <wd8kdg@worldnet.att.net>
Subject: RE: [R-390] Mech filter REPAIR

Someone with the correct tooling could make this wish happen. From the two

websites recently shown on this e-mail reflector, it seems there are different styles of mechanical filters. The only one I've disassembled, the interior is one unit and has to be removed as one piece. Then it could be farther taken apart. Trying to pull only one end off would of destroyed the filter. The coil is the sticky wicket on this one. I'll guess the potting substance covering the #38 enameled copper wire seems to be the same material as the spool!! Once again a guess, it looks and behaves like delrin. This is the same material that was used for the gears in the HP 8640B sig-gens. It shrinks with age, snap goes the wire! With a small lathe, I could trim off the potting material then count the turns of wire. Note, there are two separate windings on the same spool.

At this point, most common solvents have been tried. The potting substance is very hard, just like the spool. So, my limited resources are close to an end. Don't have enough old, broken, failed filters for destructive testing.

Date: Sat, 02 Jun 2007 11:43:25 -0400
From: Dave or Debbie Metz <dmetz@ntelos.net>
Subject: RE: [R-390] Mech filter REPAIR Lankford Trial?

A question for this esteemed group: I seem to remember that in the HSN newsletter a few years ago Dr. Dallas Lankford did a test of using a current filter available from one of the various electronic suppliers. As I recall, it wasn't perfect but was relatively inexpensive. Given the previously noted failures of the existing filters, the options down the road would seem to indicate either a remanufacture process, or a good substitution. Has anyone subsequently tried Dr Lankford's suggestion and could they give us a blow by blow account? I have to sort of believe we need to explore a reasonable cost substitution for a component that cannot directly be substituted. \$600 of filters in a \$600--\$800 radio seems a bit questionable.

Date: Sat, 02 Jun 2007 11:59:27 -0400
From: shoppa_r390a@trailing-edge.com (Tim Shoppa)
Subject: Re: [R-390] Mech filter REPAIR

> I think the next stage of R-390A filter repair would be to have the ability
> to rewind the input or output transducer coils if needed.

Exactly. Don't forget not just opens, but several of my "bad" filters have either shorts to the can or a strongly-temperature-dependent leakage.

>One of the old MoReCo Morris Hand Coil Winders

Even those would be too big. I think we're into watchmaking territory.

> I believe the disc resonators should probably last forever unless the
> filter was dropped hard or physically damaged. There is really nothing there
> that can wear out except the wire coil or connections inside the filter and of
> course the original foam insulation that eventually turns into a sticky
> corrosive mess.

That, indeed, is the hope.

Date: Sat, 02 Jun 2007 12:08:07 -0400
From: shoppa_r390a@trailing-edge.com (Tim Shoppa)
Subject: Re: [R-390] Mech filter REPAIR

I'm not sure you'd have to do it destructively. Knowing the wire gauge (I can't tell you that #38 is wrong, but I can't tell you it's always right either) and the resistance of a good one, you can get a pretty good grasp of the total length of wire. Again using a good one either out of the magnet or far from resonance, you can measure the inductance. At that point it may be best just to wind something new from scratch rather than dink around with the old form and potting agent. In my other, larger-scale coil/choke rewinding projects, I've been using G-10 forms with complete success. Small teflon, delrin, etc. rods are all readily available too, and ought to be good for another half century. Foam replacement is something I understand less, but there's lots of different kinds of foam in the McMaster Carr catalog :-).

Is it likely that all the coils are the same between all the bandwidths, or is it more likely that they are all the same? Clearly the mechanical elements have to be different between the different bandwidths but I cannot tell you whether this implies that the coils have to be different or the same, I just don't know. Its just that all the wires and coils inside the can are so dinky. Like, I've seen larger coils in electronic watches.

Date: Sat, 2 Jun 2007 11:14:25 -0500
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] Mech filter REPAIR Lankford Trial?

I don't remember this specifically but it may be that someone tried a commonly available 455 kc crystal filter module. I do know that KIWA makes two different crystal filter modules that I believe would be good candidates....one has onboard amplification to allow impedance matching and compensation for insertion losses. It was speculated that it would be a good modification to install in an SP-600. I have planned for years to give that a try. The other is just the passive filter adaptable to whatever application one would like to attempt. They are priced very attractively as I remember.... Check out the following links... <http://kiwa.com/errvw.html> & <http://kiwa.com/kiwa455.html>
Might be a good time to give this option a try!

Date: Sat, 02 Jun 2007 12:21:12 -0400
From: shoppa_r390a@trailing-edge.com (Tim Shoppa)
Subject: Re: [R-390] Mech filter REPAIR Lankford Trial?

I was just re-reading Dr Lankford's suggestion yesterday. HSN #30, pages 2-8. He suggests the Collins "low-cost torsion filters", 6kc BW #526-8636-010, 2.5kc BW #526-8635-010, and 0.5kc BW #526-8634-10, along with some misc. chokes, impedance transformers from Mouser, resistors, etc. to match it all into the existing IF deck circuitry with some mods to the IF deck itself.

But I haven't done it myself. Nor have I even tracked down where to buy those filters. What I was really hoping is that someone would give me a blow-by-blow

rundown of how to rebuild the original mechanical filters. That seems like the ideal solution to me, but maybe it's just plain unfeasible for someone who isn't already a watchmaker, or maybe it's just plain impossible even for those who are a watchmaker. (I could see a good binocular microscope coming in handy with those coils!) Maybe I'm destined to be the one who gives the blow-by-blow. Clearly the guys who have wonderful pictures and step-by-steps on PTO rebuild and RF deck rebuild didn't start out as experts, just mechanically inclined guys with the guts to give it a try AND (this is just as important) the skill to write it up.

Date: Sat, 02 Jun 2007 12:53:29 -0400
Date: Sat, 2 Jun 2007 12:54:45 EDT
From: ToddRoberts2001@aol.com
Subject: Re: [R-390] Mech filter REPAIR Lankford Trial?

I can tell you the Collins low-cost Torsion mechanical filters are excellent. I have made up some replacement IF filters for the Racal 6790 and the Icom R75 using the 6Kc (really 5.5KHz) BW torsion filters and was delighted with the results.

If there is any interest out there I would consider making up a few drop-in replacement 5.5KHz BW mechanical filters for the R-390A. They would be mounted in brass tubing the same size and diameter as the originals with a mounting flange and feed-thru insulators on the ends.

Otherwise for the same bandwidths and specs it would be better to rebuild the original filters for the R-390A.

Once someone masters rebuilding the transducer coils the rest is relatively easy. For now the best thing the rest of us can do is hang onto any 'bad' filters you might have - save them for possible rebuild!

Date: Sat, 02 Jun 2007 13:04:05 -0700
From: "Kenneth G. Gordon" <kgordon2006@verizon.net>
Subject: Re: [R-390] Mech filter REPAIR: other filter sources.

There is an outfit over in Washington state which builds filters for practically any frequency for acceptable prices. I have momentarily forgotten their name, but will dig out the info ASAP. Their name is somewhat unusual in that it SOUNDS oriental at first read, but isn't. As I remember it, their filters are the ceramic variety and they have several types in stock which have 455 Khz center frequencies. I am not now sure of the prices, but it seemed to me that they were well under \$100 each...I seem to recall \$45, but my memory is not what it used to be...

Date: Sat, 02 Jun 2007 18:52:47 -0400
From: Scott Bauer <odyslim@comcast.net>
Subject: Re: [R-390] Mech filter REPAIR: other filter sources./Kiwa??

Ken, would that be Kiwa filters??
If so, they sounded great a FRG-100 I used to own.

Date: Sat, 02 Jun 2007 16:29:19 -0700
From: "Kenneth G. Gordon" <kgordon2006@verizon.net>
Subject: Re: [R-390] Mech filter REPAIR: other filter sources./Kiwa??

> Ken, would that be Kiwa filters??

YES! That's it! Thanks a bunch. Here is their URL. <http://kiwa.com/index.html>

Date: Sat, 2 Jun 2007 19:36:19 -0500
From: Tom Norris <r390a@bellsouth.net>
Subject: [R-390] Rockwell Torsional Filters - please read

I found the brochure for low cost line of mechanical filters from Rockwell-Collins

http://www.rockwellcollins.com/content/pdf/pdf_5532.pdf

The in/out impedance of these filters is around 2k ohms - but that's easily taken care of. See Dallas' article at <http://www.kongsfjord.no/dl/dl.htm> where he discusses adding a "roofing filter" to the IF deck. That should give folks plenty of info to get going. And yes, reread Langford's article in HSN #30, etc.

Date: Mon, 4 Jun 2007 19:47:45 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Mech filter REPAIR

The folks at Fair Radio have. Completely disassembled a filter, put new foam in, rewound a burnt in the middle (not just a reattachment) coil, and reassembled the whole shebang to make a working filter? Rewound both ends on a couple. I actually stood around most of an afternoon and watched one get done. It has been done. We are wondering how to do a spot weld for the case where the little slugs have come adrift. That being about the only failure not fixable "yet" I hope you can take the time to do some repairs. Bring a couple back to life.

Date: Mon, 4 Jun 2007 20:29:00 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Mech filter REPAIR

The only part I have not done or seen done is to run the old wire off the bobbin. There are at least two different mechanical bails inside that hold the resonant disk stack. I imagine they have different stuff potting the coil windings. I forget the name of the Fellow at fair who was doing these repairs on a bench that would give OSHA fits and never imagined ESD procedures. Not that either of those asides are required to do these filter repairs.

After every thing else you have done to R390's, doing a filter repair is just another afternoon on the bench. Someday there will be many more pictures on the web to view. Someone will count the sorry little bits to satisfy inquiring minds of the hoary details. The real sticky wicket here is, what is the potting stuff and how do we cut it. The guy at Fair had the parts all cleaned up and sort of waved a hand at it as if it was a none issue. This may only be true in some models. Or it could be a real pain.

My personal best prior to 1975 was just a broken wire and I did not probe the potting gunk or the foam mess. I had no need to inquire and I saved a receiver from the dead line rack. It was better to just fix it and not ask why. I wrote the

problem off as a cold solder joint on filter. I did not explain exactly where. I put the 4 plus hours off as sorry trouble shooting procedures. Hey I'm Polish and stuff happens.

I did spend some time at Fair Radio and swapped war stories as a filter got rewound, rewired and resoldered on the bench and tested with a sweep gen and scope. The guy had worked on that process for some time and was happy someone wanted to actually see some of his work. If I could remember names I would have gone much further in life. Its a curse I have to live with. To find someone who could follow the conversation was a God Send for him. The folks at Fair move a lot of stuff but they are mostly logistics minded not hard deep bench repair types. Wonderful people at Fair who will help you find anything anyway. They just do not relish the smell of vintage solder like some of us do.

The number of disk in the stack determine the resonance. Narrow band filters have the disk spot welded a bit closer to each other.

Tim commented: What I was really hoping is that someone would give me a blow-by-blow rundown of how to rebuild the original mechanical filters. That seems like the ideal solution to me.

I agree. Someday we will get it all written up and photographed and posted. Its amazing how much is yet to be done.

Tim again commented: but maybe it's just plain unfeasible for someone who isn't already a watchmaker, or maybe it's just plain impossible even for those who are a watchmaker. (I could see a good binocular microscope coming in handy with those coils!)

I have been in there and done some.

It is not watch maker work.

It is hard, It is craft, It is not impossible.

I have watched someone go into it further than I have and come out with a working item that after resoldering the sleeve you would never know it was a rebuild.

Tim: Maybe I'm destined to be the one who gives the blow-by-blow. Clearly the guys who have wonderful pictures and step-by-steps on PTO rebuild and RF deck rebuild didn't start out as experts, just mechanically inclined guys with the guts to give it a try AND (this is just as important) the skill to write it up.

Tim, you way be it. Take lots of photos, We never have enough photos. We can rewrite and ghost write any thing if we have the photos. How do we get this potting mix off the coils? The Guy at Fair Radio was just working with an Exacto knife and some solvent to clean up the gunk foam. Maybe some filters have a potting stuff that cleans out and other models have this stuff that we may never be able to work past. Time to melt some filters open and perform some inspection. Fellows, How about you lend R390 owners a hand if you have a bad filter. Pop open what you have setting around broken and tell us what you find. Model number on the can. band width. The bail style and potting mix. You may find a loose wire and fix one while you are at it.

Date: Mon, 4 Jun 2007 20:34:14 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Mech filter REPAIR

Along with the 455 filters are 455 resonators. We think of these as crystals. But they have a band width wider than a narrow crystal. They can be padded to get a little extra bandwidth. But all the same logistic problems for these parts as for the filters. But I think this is a road that needs to be explored.

Date: Sat, 9 Jun 2007 01:18:52 -0500
From: Tom Norris <r390a@bellsouth.net>
Subject: [R-390] Mechanical filters for rebuilding - Fair Radio's Reply

Some of you were talking about rebuilding filters for the 390A. Fair Radio has them, as is. Some may work, most are totally dead for rebuilding. Tom NU4G

> From: Fair Radio Sales <fairradio@fairradio.com>
> We have sold them for rebuilding, mechanical filter as-is.
>
> 2 khz \$25.00
> 4 khz \$23.00
> 8 khz \$20.00
> 16 khz \$15.00

Date: Mon, 11 Jun 2007 12:02:49 -0400
From: "Keith Densmore" <densmore@idirect.com>
Subject: [R-390] Mechanical Filter Repair

Well, I have a 4 KC mechanical filter apart here, and it is at the stage I need the correct magnetic wire to rewind the coils. The finest size I have is 38 gauge but the filter requires 42 gauge .0025 mil. Does anyone have, or know of a source for this stuff? (In a reasonably small quantity?)

Date: Mon, 11 Jun 2007 13:15:11 EDT
From: ToddRoberts2001@aol.com
Subject: Re: [R-390] Mechanical Filter Repair

There is a seller on eBay right now that has a 1000ft roll of #42 magnet wire for \$2.99 but his auction ends Monday at 3:29PM EDT. If you miss his auction and the item doesn't sell you could try and contact him, he may still have it for sale.

Date: Mon, 11 Jun 2007 13:47:59 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] Mechanical Filter Repair

42 AWG is what's used for guitar pickups etc. In the \$25 range for a half-pound roll you can get it at: http://www.stewmac.com/shop/Electronics,_pickups/Supplies:_Wire,_cables/Pickup_Coil_Wire.html

42 AWG copper is about 1750 ohms per 1000 foot, and from memory a

mechanical filter is about 120 ohms, so you would only need about 70 feet for each end. A half-pound is 25000 feet (five miles) so you'd have some left over after doing all our filters :-). I do know that smaller and larger rolls show up on E-bay sometimes. Please keep us updated on your progress with the filter rebuild. I am very, very interested!

Date: Tue, 12 Jun 2007 20:32:23 +1000
From: "Bernard nicholson " <vk2abn@bigpond.net.au>
Subject: [R-390] R-390 Digest, Vol 38, Issue 15 transducer resistance

I have measured the resistance of the transducers in the Mech. filters to be between 47 & 49 ohms

Date: Wed, 13 Jun 2007 16:46:46 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Mechanical Filter Repair

>The finest size I have is 38 gauge but the filter requires 42 gauge .0025 mil.

You do not have to use exact wire. It must be small enough to fit. I do not know how close 38 is to 42 but its likely good enough. One place to find small wire is 110 volt relays and solenoid valve coils in washing machines. That's a scrounging venture. Auto relays are another place. Wind the critter back with what you have and give it a try. Likely you do not have enough RF isolation in the shack to let you detect the difference in the rebuilt filters performance.

Date: Wed, 13 Jun 2007 16:59:45 -0700
From: "Dan Merz" <mdmerz@verizon.net>
Subject: Re: [R-390] Mechanical Filter Repair

Hi, in general the only reason to use 42 vs a bigger size is whether or not you can get the same number of turns on the bobbin with the larger wire as was on there with the smaller wire. If the original wire filled the bobbin, then probably best to use the same size wire. The other consideration in choosing wire is the type of coating. I believe "formvar" will be hard to remove for soldering and abrasion is the most easily done method for the formvar wire I've used.

There's probably a solvent that will work but I never found one that acted very quickly. I've gone to using the later PE coated (I think that's the plastic type) type wire that allows the coating to remove itself under the soldering iron. With #42 you have to be careful if scraping the wire but it can be done. I've bought all the wire I have on eBay but it seems the price can vary a lot. I like the 1 lb rolls; the wire unspools nicely off the end; as the roll gets down it tends to hang a bit at times and can break easily at that point. Don't try unspooling it by rotating the roll unless you're only after a small amount of wire,

Date: Wed, 13 Jun 2007 23:42:04 -0500
From: "Bill Hawkins" <bill@jaxs.net>
Subject: RE: [R-390] Mechanical Filter Repair

"There's probably a solvent that will work....."

Fine enameled wire ought to respond to the flame from a match. No nicks. Polish the copper a bit and away you go.

Date: Thu, 14 Jun 2007 01:35:22 EDT
From: ToddRoberts2001@aol.com
Subject: Re: [R-390] Mechanical Filter Repair

>I believe "formvar" will be hard to remove for soldering and abrasion is the most easily done method for the formvar wire I've used.

I have had very good luck using Strip-EZE paint remover. I put some into a small bottle cap to a depth of about 1/4 inch and dip the end of the wire into it for 5-10 minutes, then wipe the end of the wire with a kleenex. The enamel coating comes right off and the copper is bright and shiny ready for soldering. I use the same method to remove the enamel from small-gauge Litz wire also. It is the best method I have found for safely removing the enamel without hurting the fine wire.

Date: Thu, 14 Jun 2007 07:42:08 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Mechanical Filter Repair

The biggest problem with soldering #42 wire is the solder joint itself. The wire "necks down" as it goes into the solder (strange but true). The effect is not important on large gauge wire. On small stuff it makes it weak right at the joint. The answer is pretty simple. Just put a dot of glue, paint, bubble gum, or what ever you have on top of the joint.

Date: Thu, 14 Jun 2007 07:31:30 -0500
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] Mechanical Filter Repair

I have used fingernail polish to tack stuff down and also to lock alignment settings. Used to have access to some stuff called Glyptol. (spelling?) Probably is still out there but not as easily available as it once was around here anyway...

Date: Thu, 14 Jun 2007 09:50:39 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Mechanical Filter Repair

Oh yes: Glyptal: <http://www.glyptal.com/> "When Thomas Edison founded General Electric, he insisted the company have the highest capability in fundamental material research. For over sixty years, Glyptal served as the liquids research division of G.E. The company would look to Glyptal to formulate and manufacture its specialty needs when no existing product satisfied the requirements. We always got the tough ones. Since Glyptal was spun off in 1985, our technology and manufacturing capability has become widely available outside G.E. The following provides a flavor of the range of our capabilities. However, the best way for you to judge is to give us a call. We're here to help you with your tough ones. Sincerely, William P. Hoag, President " (Of Glyptal, Incorporated.)

>but not as easily available as it once was around here anyway...

I followed their distributors link and found that the GE Supply Company will sell you a quart for about \$20 or a gallon for about \$70 (\$30 minimum). I could not find it at Mouser or Grainger.

Date: Thu, 14 Jun 2007 10:41:24 -0500
From: Dan Arney <hankarn@pacbell.net>
Subject: Re: [R-390] Mechanical Filter Repair

Nearly any motor rewinding shop should have Glyptol in stock.

Date: Thu, 14 Jun 2007 12:12:36 -0400
From: "David C. Hallam" <dhallam@rapidsys.com>
Subject: RE: [R-390] Mechanical Filter Repair

There are several magnet wire insulations that are solderable and don't need to be stripped, Formvar isn't one however. Having worked for a number of years in the manufacturing of magnet wire, I can say that burning off the insulation with a small flame is a standard method for removal of nonsolderable enamels.

Date: Thu, 14 Jun 2007 10:17:58 -0700
From: Buzz <muttman@charter.net>
Subject: Re: [R-390] Mechanical Filter Repair

I have found that magnet wire with green insulation will burn off when tinned. When I have used a lighter to burn off insulation I find that the wire anneals and is difficult to solder. Soldered wire is subject to breakage at the end of the tinning because that is a concentration of stress point hence the use of strain reliefs or potted connectors. For tacking wires locktite makes several products available at electronic stores.

Date: Thu, 14 Jun 2007 14:00:03 -0400
From: "David C. Hallam" <dhallam@rapidsys.com>
Subject: RE: [R-390] Mechanical Filter Repair

Green color insulation on magnet wire quite often, but not always, indicates a urethane insulation which is solderable. When you burn off insulation, you need to remove the oxidation created before soldering. A few strokes with a fine emory cloth will do the job. Magnet wire is already annealed. That's why it can be wound in coils without springing out. The lack of spring back is an important attribute of magnet wire that every manufacturer measures. Soldering causes some alloying of the copper with the tin in the solder and the heat causes some grain growth at the point of application.

The finer the wire, the more important these considerations become.

Date: Fri, 06 Jul 2007 08:09:43 -0600
From: DW Holtman <future212@comcast.net>
Subject: [R-390] R-390A Filters

Are the mechanical filters used in the IF Deck Symmetrical, that is can the signal be put in either end?

Date: Fri, 06 Jul 2007 10:49:44 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] R-390A Filters

As I understand it, yes. Folks may have tested that and report their experience. The term "symmetrical" is also used to indicate that the skirt curve is similar on the upper and lower sides of the passband. I think that Collins mechanical filters that were designed for SSB operation are not symmetrical. They may have steeper curves on the side that the carrier is to be on, and thus provide higher suppression of the carrier. (In addition, the SSB filters may be designated with a carrier frequency not the center of the passband as part of the type number and specs.)

Date: Thu, 12 Jul 2007 09:57:27 -0400
From: "rbaldwin14" <rbaldwin14@nc.rr.com>
Subject: [R-390] Crystal Filters FS

I have a boat load of NOS crystal filters, all with Collins part numbers for sale. If you are interested, I can send a spreadsheet with the part numbers and/or a picture. I also have a bunch of Collins Mechanical filters, including two for the KWM/HF 380, NOS.

Date: Fri, 20 Jul 2007 19:35:36 -0500
From: "Richard" <theprof@texoma.net>
Subject: [R-390] Dittmore Freimuth vs EAC

Is the only thing that differentiates the Dittmore Freimuth models from the EAC the IF deck? My 1968 Dittmore Freimuth has matching contract numbers for most modules and it just looks like an EAC. The IF deck is an old Collins (I changed it out with an EAC). All the posts about the Fowler got me to thinking about it. Is there something "special" so I would want Dittmore Freimuth filters?

Date: Fri, 20 Jul 2007 20:57:33 -0400
From: Scott Bauer <odyslim@comcast.net>
Subject: Re: [R-390] Dittmore Freimuth vs EAC

Well, one reason to want the DF filters is they are newer. They will outlast the 1956 Motorola filters.

Date: Sat, 21 Jul 2007 08:55:29 -0500
From: "Les Locklear" <leslocklear@cableone.net>
Subject: Re: [R-390] Dittmore Freimuth vs EAC

As Scott said, they are "newer." They also had better specs than the older Collins filters. The Collins were fine tuned by using dental drills on the discs to enable them to resonate at the proper frequency. The Dittmore-Freimuth filters were manufactured using much improved techniques. There was another

manufacturer of R-390A mechanical filters: Whitewater.

Date: Mon, 23 Jul 2007 09:46:06 +0000
From: Sheldon Daitch <sdaitch@mor.ibb.gov>
Subject: [R-390] Wire problems in mechanical filter coils and transformers

Test and Measurement World magazine of May, 2007, has a multiple page article on "Wire Ends Yield Failure Clues," discussing a variety of factors that can cause "magnet" wires to break, causing devices such as transformers and inductors to suffer catastrophic failures. This should go to the web version of the story: <http://www.tmworld.com/article/CA6436546.html>

Date: Mon, 23 Jul 2007 09:11:13 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] Wire problems in mechanical filter coils and transformers

I would guess that by the article's categorization: * Coils that fail where the wire goes onto a terminal are "Tensile Failures". * Coils that fail due to an open in the middle of a coil might be "fusing" failures (overcurrent, due to a shorted or just plain leaky coupling capacitor). 42 gauge wire has a fusing current of more than an amp(!!!!!) but if an amp flowed through the approx 100 ohm coil, it'd be dissipating 100 watts, and obviously the wire would open in the coil itself rather than near the terminal (which would actually work as a heat sink). I also have failed mechanical filters with shorts between the coil and the can, and also with excessive leakage between the coil and the can.

Date: Thu, 16 Aug 2007 19:42:30 +0100
From: "Graham Baxter" <graham@delphe.co.uk>
Subject: [R-390] Repairing mechanical filters

Some of you may have been following my accounts of the restoration of an EAC R390A. Thank you to all who have helped and encouraged me. The receiver is now working pretty well, and it is quite clean. I was plagued by 'iffy' mechanical filters, so I decided to take the bull by the horns. Since this is a long winded story which needed pictures I have put a draft copy of an account of my experiences on: <http://www.delphelectronics.co.uk/filter390a/> I would welcome your comments and suggestions for improvements. Think of this as a work in progress. By the way, I am still looking for an audio output transformer that won't look out of place in a 67 EAC. PayPal waiting!

Date: Thu, 16 Aug 2007 14:50:08 -0400
From: "David C. Hallam" <dhallam@rapidsys.com>
Subject: RE: [R-390] Re: [R390] R390A trimmers

Can you translate paxolin to US English? I am having a devil of a time with trimmers in a 75A4 and have about decided I am going to have to take them apart. A job I dread.

Date: Thu, 16 Aug 2007 15:16:35 -0400
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Repairing mechanical filters

Excellent work and beautiful pictures!

Date: Thu, 16 Aug 2007 20:35:37 +0100
From: "Graham Baxter" <graham@delphe.co.uk>
Subject: Re: [R-390] Re: [R390] R390A trimmers

I suppose paxolin is SRBP, synthetic resin bonded paper. The little three legged clip is easily removed by placing a jewellers screwdriver under it close to the pip, and then gently turning it. This jacks the clip out of its hole and slides it out of the groove in the rotor shaft in one operation. The rotor then can be lifted (falls) out. If the disk and rubber are still bonded to the paxolin, resist the urge to lever them off. I think it is better to soak them off. One substance that definitely seems to unbond them is aerosol switch cleaner. I have learned that if they are still stuck, any attempt to lever them free will result in a broken disk. But a good soak in switch cleaner softens the glue without dissolving the silver ink. I then washed all the parts in alcohol.

Date: Thu, 16 Aug 2007 20:41:42 +0100
From: "Graham Baxter" <graham@delphe.co.uk>
Subject: Re: [R-390] Repairing mechanical filters

I think this is likely a question of connection speed. There are really too many pictures for one web page. Perhaps start it downloading and make a cup of coffee. Is there an option to right click the red X and select "Show picture" This I think refreshes individual pictures rather than the whole page. Finally, the pictures are PNG (portable network graphics). They might not work on non Microsoft browsers. Let me know how you get on.

Date: Thu, 16 Aug 2007 15:04:58 -0500
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] Repairing mechanical filters

Good stuff.... Needs to be in the "Pearls"

Date: Thu, 16 Aug 2007 21:07:04 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] Repairing mechanical filters

Remarkable Graham! The wonderful pictures and details of how to do each step have just given me the courage to give this a try-out on a 4kc filter that's got an open coil and several others I have that are leaky. Thank you, Thank you, Thank you!

Date: Thu, 16 Aug 2007 21:47:32 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] Repairing mechanical filters

I should also add that a few months ago I predicted that the kind of guy who could do the work and photograph and describe it fully would also be a watchmaker :-). Me, my dad is an amateur horologist, specializing in railroad pocketwatches but

also dabbling in other movements.

Date: Sat, 18 Aug 2007 17:40:12 +0100
From: "Graham Baxter" <graham@delphe.co.uk>
Subject: [R-390] Filter repairs

Thank you for your kind comments and supportive feedback. I think I am now happy with the latest version of the filter repair article. So, major spelling mistakes excepted, you can consider it stable. The latest version is at:

<http://www.delphelectronics.co.uk/filter390a/>

Please refresh your browser and see what you think. If anyone has a proper R390A site and would like to host this, please let me know. I am a bit limited for space. Would you believe I had a third faulty filter? I had not noticed this before because although faulty, the only symptom was blow-by manifesting itself as twittering noises on SSB. I didn't replace the coils in this one, just a good clean, new foam and a new earth strap cured it. I have taken the opportunity to add a couple more photos courtesy of this filter.

Date: Sat, 18 Aug 2007 11:27:45 -0700 (PDT)
From: Perry Sandeen <sandeenpa@yahoo.com>
Subject: [R-390] IF Filter repair article

With Graham's kind permission I have edited his web posting in toto to a PDF file that is about 800K. For those interested, reply off list and I'll email it to you. It will also be in the Y3K manual.

Date: Sat, 18 Aug 2007 20:06:55 +0100
From: "Graham Baxter" <graham@delphe.co.uk>
Subject: Re: [R-390] Filter repairs

With the radio cold (so the valves don't conduct) unplug the multipin connector from the IF module. The pins are numbered with tiny numerals (at least the sockets are). Look for pin number six. Using your multimeter on its highest resistance range, measure between pin six and ground. Ideally the positive lead should go to ground and the negative to pin six. You will see a low resistance reading initially. As the capacitors charge up it should go higher than a standard multimeter can measure. (Usually > 10 megohms)

If it passes this test, you can either be happy, or if you are like me perform a more rigorous test. I measure mine using a high resistance meter which has a 250 v measuring potential. With this, I am seeing around 50 Megohms for the entire IF AGC line.

If you have a low resistance, less than ten megohms would probably start to have a noticeable effect, the next step is to remove the IF module. Disconnect R507. Pull V502. Measure between pin 1 and ground. Any leakage here can only be a filter or possibly C512. If you have leakage, remove the filter can. C512 is easy to disconnect so it is worth checking first. It is the disk ceramic close to the 2kHz filter. If you still have leakage with it disconnected, it is down to one or more of the

filters.

To decide which filter(s), you have to disconnect them one at a time and measure them individually. Individually I am seeing about 200 megohms at 250V . The thing about the leakage is that it is not ohmic, in the sense that it might be 10 megohms at a volt, but 100 kilohms at 100 volts. So it is difficult to say what is a problem and what isn't, but there shouldn't really be much leakage at all.

> Can you give me a method to determine if my filters are leaking. Not
> working at all is easy to figure, but I am not sure how to measure or quantify the
leaking situation.

Date: Sat, 18 Aug 2007 20:10:15 +0100
From: "Graham Baxter" <graham@delphe.co.uk>
Subject: Re: [R-390] Filter repairs

To clarify, I am measuring between pin one of the socket for V502 and ground.
This gives easy access to the output common to all filters.

Date: Sat, 18 Aug 2007 21:52:00 +0100
From: "Graham Baxter" <graham@delphe.co.uk>
Subject: Re: [R-390] Filter repairs

>....a General Radio Meg-Ohm Meter that I believe I can throttle down to around
250 Volts. It will measure up into that range. Do you think I could use that?

That meter sounds ideal for the job.
Filter leakage will have no discernible effect on MGC.

Date: Mon, 20 Aug 2007 08:37:15 +0100
From: "Graham Baxter" <graham@delphe.co.uk>
Subject: [R-390] R390A mechanical filter repair - new web site

Al Tirevold WA0HQQ has kindly undertaken to host the filter repair article on the
excellent r-390a.net web site. Its new home is: [http://r-390a.net/FilterRepair/
index.html](http://r-390a.net/FilterRepair/index.html) Hopefully this will be much easier to find than its old location in a
backwater of delphelectronics.co.uk

Date: Sat, 25 Aug 2007 19:15:47 +0100
From: "Graham Baxter" <graham@delphe.co.uk>
Subject: Re: [R-390] 2 Dud Mechanical Filters Needed

> Congratulations on the excellent work you have been up to.
> I have run into a problem with 2 and 4 KCS filters that are working but
> about 20 db more deaf than the 8 and 16. (On several sets) How does the
> input antenuation fair when you have rebuilt one? OK, say you take one of
> your rebuilt 2 or 4's --for the same signal level, how do they compare to the 8 or
16?
> I also notice the passband ripple on all the filters is pretty severe. Any
comments.
> I'll let you know if I come up with any 'inards'

I found that the rebuilt ones were very close in attenuation to good untouched ones. I am fortunate to have two EACs here. One has three out of four rebuilt filters. The other has all originals and they are all good. The position of the IF gain pot for the reference -7V at the detector at 150uV in is almost identical on the two modules.

I am under no illusions, I consider myself fortunate to have succeeded three out of three times. However, I would think that you would have to be very unlucky not to improve a filter with 20dB more loss than it should have. Have a look at the state of the foam. Once it gets between the disks it spoils everything. And if you have to rewind the coils, don't forget you can have more than one attempt. Its not nearly so frightening as it looks!

Date: Sun, 26 Aug 2007 14:28:02 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] 2 Dud Mechanical Filters Needed

>Two different paths follow, I also notice the passband ripple on all the filters is pretty >severe. Any comments. Keith, ve3ts

Back in 74, 75 we had a sweep generator and scope in the shop at Torri Station Okinawa. We used it to inspect the filters and do IF deck alignment. We would often see lots of band pass ripple in the mechanical filters. We considered it acceptable and did not replace a filter just because of it ripple on top. The though was the signal level was not running that high in the filter and thus the ripple was not causing that much audio band loss at one frequency or another. Then again out application was CW and RTTY so good fidelity was not a factor. Some though was that the filters with more ripple also had more ring. No real collection of data to support that statement it was just a feeling the operators and mechs shared.

Any bad filter case will work. If you are going to restuff them you care not what they started life as. A call to Fair radio and some talking may get you some bad filter cases for next to postage. Roger

Date: Wed, 07 Nov 2007 16:33:47 -0500
From: Charles A Taylor <WD4INP@isp.com>
Subject: [R-390] mechanical filter failure

After opening up scores of the cylindrical nechanical filters that Collins has in almost all R-390As, I found that the main mode of failure seem to be the contraction of the black foam that encases the resonator discs, and so allows them to migrate around in the encasing cylinder.

If yon take and shake a mechanical filter, and you feel something moving around, you've got a filter that on its way to failure. I've opened several filters and seen the "slug" loose. Just a shake and the tiny #42 AWG wire will break....another broken filter. And sometimes the lead breaks off at the bobbin, leaving no way to splice some more lead in. Trouble. After seeing several of these, I resolved to to do a little experimentation. I know of no source for plastic bobbins that Collins uses in its mechanical filter, so I looked through my many miniature plastic VHF coil

forms. I found one or two that look that they would take enough #42 wire to wind on then to couple to the end of the slug.

Starting first thing one morning, I wound 600 turns of #42 AWG on one of these forms and measured the D-C resistance to be nearly 50.0 ohms dead center.

If looking at the many 2, 4, 6, 8 & 16 kHz mechanical filters transducers, I find that the transducer D-C resistance of both the input and output transducers averaged 50.0 ohms. Rarely does a transducer display 50.0 ohms D-C resistance. There was a variation of as much as 5 ohms between one transducer and another. Which leads me to guess that the original bobbins were hand-wound, and at considerable effort, too. So far, after opening these transducers and finding a broken lead or two, I've spliced a corresponding length of #42 wire to the shortened lead and using a little of my wife's nail polish to insulate the bare lead.

To reposition and fasten down the "slug," I've cut 1/2" wide lengths of fish paper and attached them to the transducer ends cementing them in place with cellophane tape and Duco cement, and rolling up the strips of paper until they just fit into the cylinder. Then I use a piece of cellophane tape and Duco cement to fasten the ends of the coils of fishpaper.

Finally, I slip the "slug" into the cylinder and use a little RTV to fasten the fishpaper at the end of the slug into place so that the "slug" is firmly fastened to the case.

Lastly, fasten (using tweezers to wrap the #42 wire around the tiny terminal), make a solder connection with a 25-w soldering iron and #20 lead/silver/tin solder.

Finally, I resolder the ends closed with a 250-w soldering gun quickly so as not to fry the innards.

Then I run a signal generator through the mechanical filter into an oscilloscope to see if the filter works and displays the nearly rectangular bandpass that makes the mechanical filter so valuable. ANY QUESTIONS, PLEASE?

Date: Thu, 08 Nov 2007 20:18:36 -0500
From: Charles A Taylor <WD4INP@isp.com>
Subject: [R-390] mechanical filter solvent
To: r-390@mailman.qth.net

Has anyone discovered the magic juice that dissolves the potting fluid on the bobbins?

Date: Thu, 8 Nov 2007 18:35:06 -0800
From: "Craig C. Heaton" <wd8kdg@worldnet.att.net>
Subject: RE: [R-390] mechanical filter solvent

Haven't found the magic juice, yet! I can tell you that rubbing alcohol, acetone (finger nail polish remover), gasoline, MEK (methyl ethyl ketone), paint thinner, did not touch the potting stuff (black in color) on the bobbin/filter I've played with.

Didn't faze the bobbin either! I have the feeling this potting fluid is really the same material as the bobbin. Food for thought; if the bobbin and potting stuff is delrin, the stuff that is used for the gears in the HP 8640B sig-gen, it shrinks with age. So the bobbin & potting fluid shrink, crushing and breaking the #42 wire wound on it.

Date: Thu, 8 Nov 2007 21:42:38 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] mechanical filter solvent

Epoxy has exactly the same "crush forever" characteristic.
It's also real hard to dissolve.

Date: Mon, 17 Dec 2007 23:09:13 -0500
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: [R-390] Mechanical Filter Failure?

I'm working on bringing up an R-390A and have no response through the 2 kHz mechanical filter. It's my understanding that the usual failure mode for these is an open coil on the input or output yet I measure 40 - 50 ohms DC on both input and output of the 2 kHz filter. Checked the rest of the signal path around the filter especially the rotary switch and all checks ok. Is there anything else I should look at before thinking about finding a replacement?

Date: Mon, 17 Dec 2007 23:15:41 -0600
From: Robert Nickels <w9ran@oneradio.net>
Subject: [R-390] Mechanical filter failures ?

Well it would be the greatest coincidence, but just today I found one of the FA type filters in a Collins 354A-1 mechanical filter adapter in a 51J-3 had developed a hard short from on of the input coil terminals to ground (case). I measured it at 4 ohms and it was enough to pull the plate voltage down to nothing. Figuring I had little to lose, I put 10 volts from a current-limited power supply on it and next I knew, the short was gone. I was measuring around 22 ohms through each coil, along with the unwanted short to the case.

I understand the typical failure mode is when the foam rubber protective material inside the filter degrades and messes up the mechanical characteristics, but it's worth checking for shorts to the case.

Date: Tue, 18 Dec 2007 10:14:54 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Mechanical Filter Failure?

Before you go to crazy - sling a 10K ohm resistor between input and output directly on the filter. That should give you a quick verification that the signal path does not have any "gremlins" in it.

Date: Tue, 18 Dec 2007 09:23:42 -0600
From: Robert Nickels <w9ran@oneradio.net>
Subject: [R-390] Mechanical filter substitute

Good tip, Bob. And it reminded me - at the Belevidere IL hamfest I saw a Collins 75A series receiver that had a homebrew "filter replacement" in it. This was a small perf-board with a couple of chokes and capacitors which would obviously be for wideband AM but I thought it would be neat to give it a try. Of course I forgot to go back and sketch the circuit! Wonder if anyone knows about this and has the design details?

Date: Tue, 18 Dec 2007 12:09:58 -0500
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] Mechanical filter substitute

Thanks for all the info guys, Bob C - I'll cobb in the 10k to see what happens. BTW, Maybe Bob N. should try using one of the Motorola Permakay filters. Think I still got a few around here somewhere... Also what are the in/out Zs of the mechanical filters. If I want to measure one what source/load should it be looking into?

Date: Tue, 18 Dec 2007 12:18:07 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Mechanical filter substitute

The R-390A filters are high impedance. I don't remember the exact numbers, but > 100K ohms would not surprise me at all.

Date: Tue, 18 Dec 2007 22:11:19 -0800
From: John Kolb <jlkolb@jlkolb.cts.com>
Subject: Re: [R-390] Mechanical filter substitute

The test circuit shown on the F455N-20 data sheet calls for 100,000 ohm and 130 pF input and output. 25 db max insertion loss.

Date: Wed, 19 Dec 2007 19:37:30 -0500
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] Mechanical Filter Failure?

Looks like it's case closed for the 2 kHz filter. Connected a 10k in to out like Bob suggested and got signal. Removed the filter from the chassis and ohmed the in/out coils and again got around 50 ohms DC for both. Checked for shorts to case and found none. For that matter, was able to resonate in and out coils to 455 kHz with 130 pF or so of shunt C so it looks like the coils are ok. It's fate was sealed though when I swept the filter and found virtually zippo transmission. Thanks Bob C and John K, for the termination info on the filter. Is the filter possibly fixable or should I be looking for a replacement?

Date: Wed, 19 Dec 2007 19:53:10 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Mechanical Filter Failure?

he filter is basically a "ladder" of very small hockey pucks connected by stiff wires

welded to the edges. From your description I would guess you broke a wire at a weld. The filter can just unsolders. Since the filter is dead at this point, pulling it apart won't hurt anything. It might be something you can fix.

Date: Wed, 19 Dec 2007 20:25:28 EST
From: ToddRoberts2001@aol.com
Subject: Re: [R-390] Mechanical Filter Failure?

Sounds like something mechanical has failed in the discs or the couplers in the filter. The dead filter would be well worth keeping for the good input and output coils. Those coils could repair 2 other filters if each had one bad coil. Definitely good parts worth keeping!

Date: Wed, 19 Dec 2007 22:14:39 -0500
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] Mechanical Filter Failure?

So how much of what kind of heat do I need to open the filter? I've got implements of destruction all the way up to oxyacetylene.

Date: Wed, 19 Dec 2007 22:35:22 EST
From: ToddRoberts2001@aol.com
Subject: Re: [R-390] Mechanical Filter Failure?

Go to the R-390A Frequently Asked Questions References Page: <http://www.r-390a.net/faq-refs.htm>

Scroll down the list of files until you get to the Tutorials List and download Graham Baxter's R-390A Mechanical Filter Repair Tutorial. Lots of good closeup pictures and shows how he opened up the filter. I believe a common propane hand torch like is used to solder and sweat copper water pipes is fine for this purpose.

Date: Wed, 19 Dec 2007 23:07:56 -0500
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] Mechanical Filter Failure?

Thanks everyone for the reference to Graham Baxter's page. Looks like he's the resident expert. He said he uses a butane torch that's used to flambe tomatoes.

Date: Thu, 20 Dec 2007 21:51:42 -0800
From: John Kolb <jlkolb@jlkolb.cts.com>
Subject: Re: [R-390] Mechanical Filter Failure?

It's possible it's a broken motion coupling wire or the magnostriuctive wire on the coil axis, but from what I've read about R-390A filter problems, the high probability failure is that the mounting foam degraded creating a gummy substance which dampens vibrations causing very high insertion loss. Graham and Buzz have web sites showing disassembly of the type of filter where each terminal end of the filter is a separate piece. <http://www.delphelectronics.co.uk/filter390a/>

<http://webs.lanset.com/buzz/misc/filter/390Afilter.html>

This site shows disassembly of the type where there's an entire metal cartridge inside the outer case. <http://collinsfilter.tripod.com/navigation.htm>

Date: Fri, 21 Dec 2007 10:26:21 -0600
From: Robert Nickels <w9ran@oneradio.net>
Subject: Re: [R-390] Mechanical Filter Failure?

Thanks for posting all those great links John. I recently found a coil-to-case short in a FA type filter, but was able to clear it and the filter works again. Still puzzled as to the cause, but these post mortems give a renewed appreciation for the engineering that went into the design of these filters. All before the age of CAD, FEA, and Spice!

Date: Wed, 02 Jan 2008 16:39:45 -0500
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: [R-390] Mechanical Filter - Cracked Glass Seal

I discovered that one of my mechanical filter input terminals on has a cracked glass seal. It's very subtle and exhibits only the slightest of motion. The post is bent and no doubt is the cause of the damage. I need to do a complete check but believe the filter to be electrically ok.

My thought for repair is simply to build up around the post with some generic two part epoxy and then designate that terminal as "ground", not really knowing what hi Z properties epoxy from the hardware store might have. Any thoughts on what might make a better repair than glopping on some hardware store epoxy?

Date: Wed, 2 Jan 2008 18:46:59 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Mechanical Filter - Cracked Glass Seal

Hardware store five minute epoxy sounds fine to me. Been there, done that, it works.

Date: Wed, 02 Jan 2008 18:17:34 -0600 (CST)
From: "Jim Shorney" <jshorney@inebraska.com>
Subject: Re: [R-390] Mechanical Filter - Cracked Glass Seal

I tend to avoid the 5-minute stuff. Maybe it's improved, but back when I started using it for stuff years ago I noticed that it would start to degrade after a couple of years. Faster if subject to extreme conditions/temp variations. I use standard JB-Weld for pretty much everything these days.

Date: Wed, 2 Jan 2008 18:52:59 -0600
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] Mechanical Filter - Cracked Glass Seal

I think JB Weld has fine metal particles mixed in with it if I remember correctly... Might not mix with electronic stuff.

Date: Thu, 3 Jan 2008 13:03:40 EST
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Mechanical Filter - Cracked Glass Seal

Some Q dope or even just some finger nail polish may be a simpler solution. You are just looking for a humidity seal. You expect what is left of the glass bead to from the spacing function most of the mechanical support.

Date: Fri, 04 Jan 2008 09:48:43 -0500
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] Mechanical Filter - Cracked Glass Seal

Thanks everyone for all of your suggestions for glass bead repair. Not sure what I'll use yet but at least it will be fixed before the modules went through the big wash'em up procedure. Otherwise it would have been possible for water to get inside and I would have never known it. Thanks again.

Date: Tue, 22 Jan 2008 12:56:22 -0800
From: "Chris Kepus" <ckepus@comcast.net>
Subject: [R-390] Testing R-390 Mechanical Filters at a swap meet

What is the "least complicated method"* to test a mechanical filter that is out of the receiver to determine if it is "good"**. What is the "absolute simplest and fastest method"*** to test a mechanical filter that is out of the receiver to determine if there is a *high probability* it is "good"**. .

*Assumptions for "least complicated method": Test equipment available: Signal Generator or variable oscillator capable of generating a signal at 455 KHz.; VTVM; Frequency counter. Possibly a signal or dual trace scope. (no spectrum analyzer available) Reference procedure: <http://jlkolb.cts.com/site/MFtest.htm> by KK6IL

Assumptions for "absolute simplest and fastest method": You are at a swap meet. You have nothing to test with other than a cigarette lighter, a cell phone and a Swiss Army knife. (LOL) Keep going >>>> Seriously, what can you carry with you that will perform a high probability test that will show the filter is not damaged internally as not to be DOA? Is there a filter "continuity" test?? Nothing found on a Google search. Looking forward to your comments.

Date: Tue, 22 Jan 2008 16:07:07 -0500
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] Testing R-390 Mechanical Filters at a swap meet

Simplest is to ohm out the input and output coils and make sure they are not open circuit. Then make sure that neither input nor output coil is leaky to ground (again an ohmmeter... a Megger on a lowish voltage setting if you have one.) This does not test that the filter is a filter... it is simply checking that over the years, the coils haven't opened up or shorted to developed leaks to ground. But it will catch, in my experience, 100 percent of filter failures. Others have reported that the mechanics inside the filter can get gummed up by the foam, and while my tests won't find gummed up mechanicals, in at least some cases the gummy foam is

responsible for the leakage to ground.

Date: Fri, 1 Feb 2008 12:51:42 -0500
From: "FISCH, MICHAEL" <mfisch@kent.edu>
Subject: [R-390] Thanks and need a 4kHz filter

I finally got my R-390a up and running. It looks like I could spend a long time fixing more stuff (C551, AGC, better audio...), but I want to use it! I want to thank all of you for your help, comments and all the great stuff on the web. The 4kHz filter in my IF is bad, and I'm not a watch maker so I really don't want to start to fix it and never get around to it. Is there a good source for these filters? Does anybody have one for sale...? Also are the filters on American Trans-coil IFs generally good (i.e should I buy one for spare filters)?

Date: Fri, 1 Feb 2008 12:00:51 -0600
From: "Les Locklear" <leslocklear@cableone.net>
Subject: Re: [R-390] Thanks and need a 4kHz filter

The 4 kc filter is the one the Military and Government used the most, thus the one that fails soonest. I would get one of the Kiwa Filter Modules and replace it with that. It has been written up in the HSN archives onlines and works very well, and the audio is much better than the mechanical filters.

Date: Fri, 1 Feb 2008 15:08:25 -0500
From: roy.morgan@nist.gov
Subject: Re: [R-390] Thanks and need a 4kHz filter

Congratulations on getting your radio running. About the American Trans Coil IF decks:

- As I understand it, they sold or transferred their stock of R-390 parts to a fellow who's on the list. Maybe he will speak up and say whether he has any IF's left. It may be that they are all gone.

- I bought one way back when they were offering them. You got a stripped out IF deck with not very much left on it but the filters. I have not used any of the filters yet, so can't say if they are OK or not.

- The 4 kc filters seem to have failed more often than other bandwidths, possibly because they are used most.

- Dave Curry of Long Wave Filters, I think, sells new filters that fit the R-390A. These have gained a fine reputation in the 75A-4. See most any Electric Radio for the ad, or the ER website for more info. The most experienced Collins restorers I know heartily recommend them.

Date: Fri, 12 Sep 2008 12:45:09 -0700
From: "Mike Hardie" <mike46@shaw.ca>
Subject: [R-390] Extra Cap In Filter Compartment

After removing the filter cover from the IF deck a .005 disc ceramic was found

connected between one terminal on the output side of the filters and ground, basically in parallel with C512. Has anyone else seen this "mod"? I suspect it was inserted due to a faulty C512.

Date: Fri, 12 Sep 2008 16:44:48 -0400
From: "Miles B. Anderson, K2CBY" <k2cby@optonline.net>
Subject: [R-390] Estra Cap in Filter Compartment

I can't say I've ever seen this mod.

What I have seen is a mechanical filter with one pin shorted to the case. (Normally all 4 terminals -- and both the input & output windings are floating.) The filter is perfectly good and will work fine except that it drags the DC (in my case the AGC bus on the output side) to ground. This "mod" sounds like it might be an attempt to cure a problem like that.

Date: Mon, 15 Dec 2008 10:11:39 -0500
From: frankshughes@aim.com
Subject: [R-390] building up a spare IF deck - filters?

I'm starting to put together a spare IF deck to use for testing & troubleshooting my R-390A (1958 all Motorola). I'm new at this hobby and am trying to learn as I proceed. I bought a scavenged 390A IF deck, all it has remaining on it are the transformers, tube sockets, and electrical connectors. The filters & BFO plus some other small parts are gone. I found a BFO with no problem. (but no bracket or coupler). I have found some different mechanical filters? for sale in various places. Not sure if I should get the standard Collins filters, or are the Dittmore-Freimuth filters any better from a mechanical design? (is there any decomposing foam in the DF design?) I have also found references to Dave Curry - Longwave Products filters, but they seem to be even more obscure than the D-F, so I'm guessing these are a very low probability to find.? (I have not found any of these for sale anywhere) What is the actual operational effect, the functional performance difference between the different manufacturer's filter designs? Is it worth the effort to attempt to obtain non-Collins filters?

Date: Tue, 16 Dec 2008 08:02:38 -0600
From: "Tisha Hayes" <tisha.hayes@gmail.com>
Subject: [R-390] Clevite Filters

Clevite filters are an interesting footnote in the history of the R-390A. At the time of their conception they were more expensive than the Collins mechanical filter. The downsides; The input/output impedances and capacitances were completely different than the mechanical filters. Insertion losses were higher, all of this resulted in circuit changes to interconnect to the Clevite filter very differently than the mechanical filter. The shape factor was not as good as the Collins mechanical filter so IMD was worse. Because of the differences in electrical specifications the Clevite filter required a different impedance matching network. As a result, you cannot mix and match Clevite's with mechanical filters in the same radio. The upside; The Clevite filter did not have as much phase noise as a mechanical filter. This made it very useful for installations where direction finding was important as you could get a much better bearing on the transmitting site.

What that means now: The Clevite filter was a very early crystal filter. Over time, ceramic filters became much better with better shape factors approaching those of mechanical filters. Insertion losses decreased and the ceramic filter is now available in more appropriate circuit impedances. Today you can find multi-pole ceramic filters with better shape factors than the Collins mechanical filter. Their ultimate rejection is not as good because of crosstalk between the input and output connections. Notice how the R-390A mechanical filters have a mounting flange between the top and the bottom. This was to improve filter action by isolating the leads with a ground plane (the chassis and the mounting flange). If the R-390A was a new design today (with tubes), it would use 9 to 11 pole ceramic filters with the electro/mechanical separation between the inputs and outputs for better isolation. For DF applications, more advanced techniques like Doppler shift, interferometry and advanced phase analysis would make for a much better DF platform. That is my opinion,

Date: Sun, 16 Nov 2008 13:36:17 -0500
From: "John L. Ahrens Sr." <kc2fxe@gmail.com>
Subject: [R-390] 4kc filter

Hello All: I'm new to this mail list. So I'm looking for replacement 4kc filter or someone that can repair them.

Date: Sun, 16 Nov 2008 14:00:22 -0500
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] 4kc filter

Welcome aboard. An easy thing to check is the filter's transducer coils. The two isolated terminals at each end of the filter connect to what amounts to the coil of a small electromagnet. The DC resistance of each coil should be around 50 ohms for Collins filters.

DC resistance of other manufacturers can vary some. Furthermore, there should be NO continuity from either coil to the other coil or the case. Determine this first and it will point you in the right direction.

Date: Sun, 16 Nov 2008 16:19:05 -0500
From: <jrusgrove@comcast.net>
Subject: Re: [R-390] 4kc filter

Been following John KC2FXE's R-390A problem 'on the air'...don't think he'll mind if I jump in here. The filter works but develops sufficient leakage to drag down the AGC when the radio warms up. As it cools off the leakage problem goes away.

Date: Tue, 16 Dec 2008 20:39:33 -0800
From: John Kolb <jlkolb@jlkolb.cts.com>
Subject: Re: [R-390] Clevite Filters

Very good commentary on Clevite filters by Tisha. I think, though, you meant to say phase shift or group delay, rather than phase noise? I would add the nose of the ceramic filter bandpass is more rounded, compared to the square shape of a

mechanical filter.

Example <<http://www.jlkolb.cts.com/site/curves/LF-C2A.PDF>>

That can be corrected for with a little bit of treble boost in the audio chain.

Date: Tue, 16 Dec 2008 23:20:04 -0600
From: "Tisha Hayes" <tisha.hayes@gmail.com>
Subject: Re: [R-390] Clevite Filters

>meant to say phase shift or group delay, rather than phase noise?.....

Thanks for the correction. I did use the incorrect terminology.

Date: Tue, 18 Nov 2008 18:19:26 EST
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] 4kc filter

We know the filters when built had some foam insulation in them.
We also know that after all this time that foam has turned to gunk.

If your filter happens to have an air leak in the solder joints on either end, then it can attract moisture. The gunk can also move around, change size with temperature, change conductivity. Any and all of this can cause circuit problems.

We also know the filters can be unsoldered, cleaned, repacked and reassembled.

All good work worth doing if you have a filter giving you problems.
Any old filter not yet rebuilt will have the same gunk inside.
After shipping and handling, there is no assurance that it will work OK.
Cause that gunk may do any thing while in shipping.

If you have to pull and replace a filter you may as well install a filter that has had the extra effort applied to replace the packing foam. You can do the rebuild the filter your self, buy one and send it out for rebuild or buy one that is rebuilt. YMMV and thus your choice.

Date: Sun, 22 Mar 2009 16:50:51 -0700 (PDT)
From: wli <wli98122@yahoo.com>
Subject: Re: [R-390] a mechanical filter source

Ran across this URL of a source in Marletta GA
<http://www.mgs4u.com/RF-Microwave/filters.htm>

They advertise replacement R3980A Collins 455KC IF mechanical filters for around \$35. Does any one have any experience with them?

Date: Sun, 22 Mar 2009 20:24:49 -0500
From: "Barry" <n4buq@knology.net>
Subject: Re: [R-390] a mechanical filter source

I've ordered from them a couple of times and have been very pleased with what I've gotten. Fast, friendly service.

Date: Sun, 22 Mar 2009 20:40:29 -0500
From: Grant Youngman <nq5t@tx.rr.com>
Subject: Re: [R-390] a mechanical filter source

Max-Gain is a reasonable company to do business with. But I don't see anything at that link that looks remotely like filters for an R-390A or is advertised as such.

Date: Sun, 22 Mar 2009 22:04:52 -0400
From: Roy Morgan <k1lky@earthlink.net>
Subject: Re: [R-390] a mechanical filter source

Yes on the experience, but I bought Bristol Wrenches. Gen you lne Uhmurrican made by the Bristol Tool Company. Good prices, excellent product, shipped fast. Ham at the order phone number.

Date: Sun, 22 Mar 2009 21:15:01 -0700
From: Ren?e Deeter <k6fsb.1@gmail.com>
Subject: Re: [R-390] a mechanical filter source

I have ordered transmitting tubes for commercial use from Max-Gain Systems. Quality parts with wonderful, courteous and fast service. A great place to do business.

Date: Fri, 24 Apr 2009 11:12:17 -0400
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: [R-390] Physical Location of C568 - C571
To: r-390@mailman.qth.net

I'm assembling the topside mechanical filter compartment of a 390A IF module. The documentation I have (TN11-856A) is not clear as the exact physical location of the trimmer caps, C568, C569, C570 and C571 that tune the output transducers of the filters. The reference designators stenciled on the top of the filter shield box locate these trimmers at the top corners of the shield box when in fact the trimmers are mounted to a "plus" shaped bracket placing the trimmers "in-between" the filters. It would be just as easy to wire a given trimmer to either of two filters. What is the correct relationship of these trimmers and their filters?

Date: Fri, 24 Apr 2009 10:02:47 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] Physical Location of C568 - C571

There's no drawing or photo that I know of, but the correct connection can be deduced from some manuals. The trimmers should be paralleled by fixed mica caps. All of the fixed caps are 82pF except C507 and C516 on the 16kHz filter, which are 51pF. So find the 51's; the associated trimmer goes to the 16kHz filter. (Note: Some 8kHz and 16kHz filters are special and do not use the fixed output caps. In this case, the caps should be present but not connected.) This

information is not in the original TM 11-856A. In TM 11-5820-358-35, it's Figure 15 (Modified mechanical if. filters), on page 26. (Someone added this figure - without the page number - to my scan of TM 11-856A. I don't remember where I got this scan. It's dated October 4, 2001, and it's 44,335,104 bytes.) In Y2K-R2 and Y2K-R3, it's Figure 3-6, on page 3-16.

Date: Fri, 24 Apr 2009 15:03:33 -0500
From: Frank Donnelly <goober@centurytel.net>
Subject: [R-390] Testing Collins Mechanical filters:

I have an EAC R-390A that I am starting to restore. Before I did anything, I replaced a few Caps and turned it on. It worked, so I decided to do an alignment. all worked fine and it performed better after alignment. But the audio is not very loud. I then removed all the modules and then ordered some parts, Caps, Res, 10 turn Pot. My question is How do I test the Collins filters? When I was doing the alignment, I first Aligned the filter trimmers, and on the 16 KC filter I could get no response from either Trimmer Cap. When I turned it on I noticed a clicking sound when in the 16Kz position. I may have a bad filter or bad caps, don't know. Anyone have any ideas?

Date: Fri, 24 Apr 2009 16:47:21 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] Testing Collins Mechanical filters:

Ohmmeter tests: Across input and output coils of each filter, it should be 50 to 100 ohms. (Web says 50 to 60 ohms, my memory says closer to 100 ohms...). This is the DC resistance of the transducer coil. Between the signal pins and can should be very very high resistance, bigger than megohms. If it's leaky at the megohm level AGC action will reduce the gain. If there is leakage but only between one end and ground, it may be possible to isolate the filter can from ground. Standard reference on rebuilding filters: <http://www.delphelectronics.co.uk/filter390a/>

I kinda wish that I would get laid off of my job so that I could have time to fix my bad mechanical filters (and all the other old radios laying about the shack.) As it is others are getting laid off and I have to work extra hard to pick up the slack.

Date: Fri, 24 Apr 2009 18:18:58 -0400
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] Physical Location of C568 - C571

Thanks for the info on Figure 15. I saw that also but as you know it doesn't show exact locations. The schematics in the TM 11-856A download also refer to a table and figure (note 2, sheet 3) which appear to be part of some other manual. Dennis, WA6ACC sent me a pdf of one of Dallas Lankford's articles whose photos show which trimmer is wired to which filter. For reference, this article shows how Dallas replaced two of the mech filters with newer generation filters explicitly for upper and lower sideband.

Date: Fri, 24 Apr 2009 18:58:08 -0400
From: Jon Schlegel <ews265@rochester.rr.com>

Subject: Re: [R-390] Testing Collins Mechanical filters:

Another way to check the mechanical filters is to actually measure the RF signal going in and out to determine insertion loss. You will need a Hi-Z AC voltmeter like one of the HP410 model VTVMs or a scope with with a 10x probe to make this measurement. I think you should probably see an insertion loss of 20 dB or perhaps better. Assuming the input and output impedances of the filter are the same, this means you should see the ratio of filter input voltage to output voltage of no greater than about 10:1.

This is a dicey measurement because of the impedances involved. If the probe is not high enough impedance, it's loading effect on the circuits could make the measurements invalid. Also, the trimmer caps may need re-peaked due the extra shunt C that probe presents to the circuit.

For reference, I've measured filter impedances in the rather wide range of 10k to 50k. The standard Collins measurement setup requires a 100k source and load on the filter. In-circuit, the filter sees the plate resistance of V501 which as I recall is listed at around a 1 Megohm and the output sees only the grid input impedance of V502. It's clear Collins didn't want any more loading on these filters than absolutely necessary.

Date: Fri, 24 Apr 2009 18:47:15 -0500
From: Frank Donnelly <goober@centurytel.net>
Subject: Re: [R-390] Testing Collins Mechanical Filters:

Thanks for the advise Tim. I will try it. Also thanks to you Jon for your advice. I do have an HP-410C and a Tektronix 465B I may try it, but not sure I an smart enough to perform it properly. I will let you know. Thanks again to all. Frank

Date: Fri, 24 Apr 2009 19:57:09 -0400
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] Testing Collins Mechanical Filters:

The 410C is probably the instrument of choice. Just measure the in and the out and if it's better than 10:1 you are probably home free.

Date: Fri, 24 Apr 2009 17:12:14 -0700
From: Dennis Wade <sacramento.cyclist@gmail.com>
Subject: Re: [R-390] Testing Collins Mechanical filters:

Does anyone offer a filter rebuilding service? I have a 16, 8 and possibly a 4 kc filters in need of repair.

Date: Sat, 25 Apr 2009 01:49:31 +0000
From: kc2fxe@gmail.com
Subject: Re: [R-390] Testing Collins Mechanical filters:

Yea if someone offers a filter repair service, I have a 4kc filter with a inter. short to the case..

Date: Fri, 24 Apr 2009 22:20:32 -0700
From: John Kolb <jlkolb@jlkolb.cts.com>
Subject: Re: [R-390] Testing Collins Mechanical filters:

The Collins data sheet for the F455N-20 filter used in the R-390A lists the maximum insertion loss as 25 db.

Date: Sat, 25 Apr 2009 08:59:19 -0400
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] Testing Collins Mechanical filters:

Oops. Guess I should have checked the spec instead of relying on memory (thanks, John). 25 dB loss would then translate to about an 18:1 voltage factor maximum filter input to filter output instead of 10:1.

Date: Sat, 25 Apr 2009 23:42:22 -0400
From: "W2HX" <w2hx@w2hx.com>
Subject: [Collins] testing 51J4 mech filters

About a year and a half ago I put out a query on this list to find out how I might sweep/test a 51J4 filter to see if its ok or not. Well, I finally got around to trying it (boy does the time fly). I am using a sweep generator and a spectrum analyzer.

My question to the group is: When one of these mech filters are rated as BW=3.1 kHz is this the -3dB bandwidth or -6dB bandwidth? I ask because my measurements seem to be very close to the stated bandwidth using -6dB, but further off using -3dB. My set up is rather crude. I am not resonating the input or output of the filter, or attempting to match impedances, just in and out. 50 ohm sweeper in and 50 ohm SA out.

In case anyone is interested, here is a plot of a 1.4 kHz BW filter: <<http://www.hertzmail.com/51j4/collins%201.4%20kHz.gif>>

As you can see, this -6dB plot is still a little narrower than 1.4 kHz and the -3dB is narrower still. Perhaps if I used the proper input and output impedances, would my results differ?

Date: Sat, 25 Apr 2009 08:14:34 -0600
From: "Dr. Gerald N. Johnson" <geraldj@storm.weather.net>
Subject: Re: [Collins] testing 51J4 mech filters

Both impedance matching and resonating affect the pass band ripple, and likely the location of the band edge. In Collins bulletin 1031, a 1962 vintage mechanical filter catalog, the filter bandpass is rated at 6 and 60 dB down. For 50 ohm source and load, you'd series resonate the coils. Probably about 100 to 150 pf. Whatever parallel value +5 pf is in the 51J-4. 73, Jerry, K0CQ,
Technical Advisor to the CRA

Date: Sun, 26 Apr 2009 15:52:40 +0000
From: <kirklandb@sympatico.ca>
Subject: Re: [Collins] testing 51J4 mech filters

One of the 51j-4 manuals should have the selectivity curves that you need. Typically IF filters are spec for their 6/60 dB points to give a "shape factor". Ideally you want to terminate the filters with their "proper" impedances, i.e. that which they were designed for. When we designed SAW filters we traded off insertion loss, pass band ripple and rejection/selectivity. e.g. if we matched the filter for lowest insertion loss, we didn't get the best selectivity or pass band ripple.

How much effort you put into this depends on what you are trying to achieve, e.g.

- do you want to know if your filter is broken or usable
- do you want to know if your filter is out of spec or not

For the latter, I would suggest loading the filter as in the 51j-4 design, possibly even duplicating the pre and post amplifier circuits. For the former, sounds like you all ready have a circuit that works.

from the **Collins Digest, Vol 62, Issue 6**
Monday, June 8, 2009 9:00 AM

Date: Mon, 8 Jun 2009 10:18:57 +1000
From: "Pete Williams" <jupete@bigpond.net.au>
Subject: [Collins] Collins filters...

G'day.... I'm doing filter response curves of a selection of Collins stand alone mechanical filters ---- 250, 500 and 455kHz using my HP 8601/8601Asweeper combination. Display is on a oscilloscope via a diode detector. I would appreciate knowing how best to terminate and or resonate input and output to achieve a more realistic response.....a non terminated input/output shows ringing which doesn't appear to be function of too fast a scan rate. Collins must test them... question is how!

Date: Sun, 07 Jun 2009 20:37:38 -0600
From: "Dr. Gerald N. Johnson" <geraldj@storm.weather.net>
Subject: Re: [Collins] Collins filters...

Slow down the sweep rate. 60 Hz is plenty fast to lead to ringing. 10 Hz would be better, and may still show some artifacts of ringing on the departing frequency side of the sweep. Typically the standard mechanical filters are terminated with 100K in parallel with about 120 pf. The capacitor is often variable and when adjusted for maximum response, tends to reduce the passband ripple of the filter. That's a parallel connection, they can be series resonated with that same 120 pf and work decently in a 50 to 500 ohm circuit.

> Collins must test them... question is how !

SLOWLY! The vintage filters ring like a bell. They turn lightning clicks into long crashes. They turn power line noise into a continuous signal out of the receiver IF. Adjusting the termination probably won't affect the ringing at all. A ten second sweep time is not unreasonable to get it the same both sweeping direction. That's ten seconds in the passband.

Date: Tue, 09 Jun 2009 10:01:00 -0600
From: "Dr. Gerald N. Johnson" <geraldj@storm.weather.net>
Subject: Re: [Collins] Collins filters

That's a nonlinear load and not high impedance, so I'd run the output of the filter with it series resonated to probably 500 or so ohm resistor. But around here for the past 43 years, I'd just drive the 5 MHz or faster scope direct, forget the detector. Actually a half MHz scope would be plenty wide band for a 455 KHz mechanical filter. Just that I've had a 5 MHz or better that long. I only use diode detectors above 460 MHz where my most recent scope stops working. And that scope has been here more than 30 years.

Date: Tue, 08 Sep 2009 01:03:05 -0500
From: Steve Kent <steve.kent@att.net>
Subject: [R-390] Parts Needed, new R-390A owner & questions...

<snip>..... Now I hope that the mechanical filters aren't toast. What is the best way to test them? Take them out of circuit and measure the coil resistance and measure each terminal to ground? Any ideas what typical values would be?.....
<snip>

Date: Tue, 8 Sep 2009 09:54:32 EDT
From: DJED1@aol.com
Subject: Re: [R-390] Parts Needed, new R-390A owner & questions...

<snip>..... If I remember correctly, the mechanical filters should ohmmeter at about 40 ohms for each transducer coil. If C553 is intact, then probably the filters are OK..... <snip>

From: "Dr. Gerald N. Johnson" <geraldj@weather.net>
Subject: Re: [Collins] Testing Collins mechanical filters

>Picked up a batch of Collins mechanical filters and have a couple of questions
>To check activity, would a 50k ohm resistor and 130 pf across each set of end
>terminals allow the filter to properly respond to a signal generator and
>oscilloscope or spectrum analyzer?

More typically a 100K resistor. Series for the low impedance generator, and shunt for the high impedance scope, series for the low impedance spectrum analyzer. Alternatively the capacitor can be in series to series tune either or both transducer coils for low impedance. Probably not a perfect match to 50 ohms, but that will keep from loading down the filter. The capacitors can be variable to allow peaking at the pass band center which often improves the passband ripple.

>Also, I cannot seem to find data for all the various part numbers on the body of the filters.

> Such as: F 455 Z5 2V2 F 455 Z5 8T2 F 455 Z5 10T2

I think the 2V2, 8T2, and 10T2 are date codes of some sort. The filter model for these is F 455 Z5, I think a single sideband filter for 455 KHz carrier frequency. In other filters like a F 455 FA 21 used in later S-line, the FA is case and 21 is the

bandwidth in 100s of Hz. Z filters don't fit that mold, but any other letters in the middle designate the case. There is a mechanical filter catalog available on line dating from about 1964.-

Date: Mon, 18 Jan 2010 19:35:45 -0600
From: "Les Locklear" <leslocklear@cableone.net>
Subject: Re: [R-390] R390A alignment question

The only pertinent information I posted lately was the fact that the 8 kc mechanical filter was actually 11 kc that's why they sound good. The other was a response to your superb note on alignment. I have cut and pasted it below for you.

Aaaaaah Roger, you put it so nicely..... Your expertise far exceeds any of the techs I ran across in the Air Force while working for the DOD for over 30 years. All R-390's and R-390A's should have been so lucky as to pass through qualified hands such as yours. Unfortunately, such was not the case, witnessed by most of the jumbled, butchered nightmares left in DRMO facilities.

Date: Tue, 19 Jan 2010 20:18:19 -0800
From: John Kolb <jlkolb@jlkolb.cts.com>
Subject: Re: [R-390] R390A alignment question

Filters vary somewhat but the one I measured was only 9 kHz wide.
<http://www.jlkolb.cts.com/site/curves/F455N801.PDF>

Date: Sun, 2 May 2010 14:29:45 -1000
From: "Raymond Cote" <rjcote@hawaii.rr.com>
Subject: [Collins] help ID filters

I've noticed a few requests to ID filters. The answers were referenced to lists that had filter info but no link or source to copy. My filters are as follows:

F 500 Y 60 6551
526 9378-00

and

F 500 Y 60 6016
526 9378-00
FSN 5915 846 0451

Date: Sun, 02 May 2010 20:29:43 -0500
From: "Dr. Gerald N. Johnson" <geraldj@weather.net>
Subject: Re: [Collins] help ID filters

One filter list is at: <http://www.collinsmuseum.com/filters.html> I gave only the file name without the link because google can find the page from that name for you and I have it permanently downloaded to my computer without the link.

The other most authoritative file is the filter catalog at:

http://www.jptronics.org/radios/Collins/MECH_FILTERS/collins.filter_catalog.pdf

I also have this one downloaded a decade ago as well as an original on paper. This dates from the early 60s and I'd like to find something a decade or two later, but I haven't yet detected anything later.

These are the same filter. The number groups 6551 and 6016 are date codes meaning the 51st week of 1965 and the 16th week of 1960. From the part number, the center frequency is 500 KHz the bandwidth is 6.0 KHz and they are in the Y case which is a round case 7/16" diameter and less than three inches long. The Collins part number is 526-9378-00, FSN is the federal stock number as these were sold as components many times, not just parts used in Collins radios.

Date: Sun, 2 May 2010 21:40:32 -0600
From: "Fern" <crc@cyberlink.bc.ca>
Subject: Re: [Collins] help ID filters

Both of those mechanical filters are symmetrical and are 500 khz I F, 6 khz bandwidth @ 6db and 14 khz @ 60 db down. They can be used in the collins 51J4 in lieu of the original F500B60 bath tub style of mechanical filters.

Date: Sun, 2 May 2010 18:51:01 -0600
From: "Kurt" <tem14me@usa.net>
Subject: Re: [R-390] filter ID

These are AM filters used in a Collins 51S-1. 500 KHz IF frequency, a Y style case, 6.0 KHz bandwidth at 6 db with a date code 51st week of 1965 Collins fiscal year for the first filter and 16th week of 1960. Again Collins fiscal year. 526 9378 00 is the Collins part number. FSN: Federal Stock Number. I do not know of an online filter list but other may.

Date: Mon, 3 May 2010 01:54:46 -0500
From: Don Reaves <donreaves@gmail.com>
Subject: Re: [R-390] filter ID

>I do not know of an online filter list but others may.....

Here's one maintained by list member Norm.
<http://www.collinsmuseum.com/filters.html>

Date: Tue, 17 Aug 2010 10:41:07 -0500
From: "Bill Scurlock" <k5gcw@sbcglobal.net>
Subject: [R-390] R-390A Multiple Signal Peaks

I obtained my first R-390A a few months ago and have been slowly becoming familiar with it. There is one operational characteristic that I don't know whether it is normal or not. As the receiver is tuned across a carrier signal, there are multiple peaks observed on the Carrier Level Meter, and also changes in the audio frequency response resulting in some degree of audio distortion

regardless of which signal peak is selected by the tuning knob. The difference in signal level represented by these "peaks" and "dips" in the carrier level meter are somewhere around 100 microvolts or so where I did the testing (at carrier levels of about "40" on the meter). Visually, the needle on the carrier level meter would swing one or two "needle widths" between signal peaks. The AGC was on during these tests.

There are 6 identifiable signal peaks across the 16Kc. bandwidth position, spacing varies from 1.1 to 3.2 Kc., and the average spacing is 2.52 Kc. In the 8Kc. bandwidth position, there are also 6 peaks with spacing from 1.2 to 2.5 Kc., and the average spacing is 1.78 Kc. In the 4Kc. bandwidth position, there are 5 identifiable signal peaks, spacing varies from 0.3 to 1.0 Kc., and the average spacing is 750 cycles. At 2Kc. bandwidth, only 3 peaks can be seen, and they are about 600 cycles apart. Only one peak can be observed at the 1Kc. and 0.1Kc. bandwidth positions.

I checked the IF tuning, and it is stagger tuned as per instructions. Although I am suspicious that this may be a factor, I wanted to send this email to the group before I started making changes in the IF tuning arrangement.

I have other questions for the group, but wanted to address this one first.

Any assistance you can provide will be appreciated. Thanks.

Date: Tue, 17 Aug 2010 12:26:15 -0700
From: Dennis Wade <sacramento.cyclist@gmail.com>
Subject: Re: [R-390] R-390A Multiple Signal Peaks

It sounds to me like your seeing the passband ripple of the filter in use. I seem to recall a discussion of that feature of mechanical filters, especially the wider ones, on this list in years past. There is also, somewhere on the web some good plots of filter response taken by one of our own here. The more organized among us will probably post the link shortly. :)

Date: Tue, 17 Aug 2010 20:06:47 +0000
From: <kirklandb@sympatico.ca>
Subject: Re: [R-390] R-390A Multiple Signal Peaks

Passband ripple isn't strictly due to the use of mechanical filters, rather it is the filter choice such as Butterworth (maximally flat passband) versus Chebychev (equal ripple passband). If one allows "some" ripple in the passband, then a steeper filter skirt can be obtained for a given filter order. i.e. one can generate LC filters with ripple as well.

Of course, one is not restricted to Butterworth/Chebychev/Elliptic filter responses. It may be that the mechanical filter construction precludes a Butterworth response - don't know.

Date: Tue, 17 Aug 2010 13:11:18 -0700 (PDT)
From: John Kolb <jlkolb@jlkolb.cts.com>

Subject: Re: [R-390] R-390A Multiple Signal Peaks

That would be me ;) The R-390A filters can be found on the page
<http://jlkolb.cts.com/site/mfcurves.htm>

Click on the links for the Collins F455N-20, -40, -80, and -160 for the 4 filters. The 2 kHz and 16 kHz filters that I linked for these curves do exceed the ripple specification of 2 db max. Here's another 2 kHz filter that does meet spec for ripple <http://jlkolb.cts.com/site/curves/F455N202.PDF>

If testing the receiver with a signal generator, the filter ripple can be measured by increasing the generator output until the meter reads the same level as the high peaks, and see how many db stronger the generator output had to be.

Date: Wed, 18 Aug 2010 13:41:44 +1000
From: "bernie nicholson" <vk2abn@bigpond.net.au>
Subject: Re: [R-390] R-390 Digest, Vol 76, Issue 10

Bill what you are seeing are the actual frequencies of the individual discs in the mechanical filter , and it is quite normal ,

Date: Sun, 5 Sep 2010 20:19:13 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] the saga cont. part 3

>Anyone care to comment on similarities and differences between the HQ-129's
>single-crystal filter and the 390A's? I note the 390A has no "phasing" control on
>the front panel...

Are you trying to compare the HQ-129' to the mechanical filters of the R390/A or to the 455 Khz 0.1 KHz band pass filter? The 455 KHz 0.1 Khz crystal has C520 on top of Z501 can, and it does get adjusted. The trimmer caps on the mechanical filters do not shift the bandpass of the mechanical filters. These caps match impedance and thus signal level through the filters. We just trim them for all we can get. But the plan was to trim them so the signal would be equal through each of the filters. You were supposed to balance the levels as you changed bandwidth. Mechanical filters are in fact mechanical. Or more mechanical than crystals. The side skirts of the mechanical filters are much steeper than RC filters. Not better than a crystal. But the mechanical filter has a wider band pass than the crystal. Observe the single 455 KHz .1 KHz band pass of the R390 crystal and the 2 KHz bandpass of the mechanical filter. Consider the 16 Khz mechanical filter. How many crystals do you need to produce a 16 KHz band pass with a crystal filter. Try to sort out AM stations at night without the selective IF of either the R390 or R390/A. You do need some form of selectivity in a good DX receiver.

Date: Fri, 10 Sep 2010 15:33:10 -0500
From: <ka9egw@britewerkz.com>
Subject: [R-390] filter trimmer access holes

My IF deck has the filter trimmers; MOD2 I think this is. The chassis doesn't have access holes to get to the trimmers...the IF deck subchassis does but the main

frame sideplate covers them. Has anyone here ever generated a print of where the holes in the sideplate should be?

Date: Fri, 10 Sep 2010 18:05:10 -0400
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] filter trimmer access holes

I don't think the side plates originally had holes to adjust the trimmers. I think they are meant to be adjusted with the IF chassis lifted so that the trimmers are accessible.

Date: Fri, 10 Sep 2010 15:32:14 -0700
From: "Craig C Heaton" <wd8kdg@att.net>
Subject: Re: [R-390] filter trimmer access holes

Chuck Rippel has a great how to: IF Deck & Mechanical Filter Alignment.. Includes how to get to and adjust those trimmers on the side of the IF deck.
<http://www.r390a.com/html/technical.htm>

Date: Fri, 10 Sep 2010 18:41:23 -0500
From: <ka9egw@britewerkz.com>
Subject: Re: [R-390] filter trimmer access holes

Thank you! I note Chuck's statement "...the IF deck needs to be loose but still electrically connected..."

If I zap 4 holes in the sideplate in the right places then I'll be able to set those trimmers without juggling a loose, live subchassis. I wonder if later production units had the sideplate ventilated, or if the filter trimmer adjustments were done strictly at the depot level?

Date: Fri, 10 Sep 2010 20:03:08 -0700
From: "Craig C Heaton" <wd8kdg@att.net>
Subject: Re: [R-390] filter trimmer access holes

You ain't gonna need to play with the IF deck that often. If it were my radio, NO DRILLING or BLASTING.

Date: Sat, 11 Sep 2010 17:54:35 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] filter trimmer access holes

Some models had no caps. Late model chassis have the side holes. Some of the chassis were drilled after production in the field. Every six months you uncoupled the BFO and Band Width shafts and turned the IF deck up on to its back end. You then adjusted the four bottom caps and just griped the band switch shaft in your bare fingers to shift the switch. Put the deck back in and got on with it. you were doing it twice a day working 6 on and 2 off. Hated days because you were getting nothing done on the PM list. You spent all day with the chicken S of being in the military. On Swings and Mids you just cranked these receivers. Go do 10 monthly PM in 8 hours. That was skate time because it only takes about 10 minutes to do

a monthly. You did your share of SEMI (6 Month) and learned to get them done in 4 hours just to not be at it all week getting your quota.

Date: Sat, 12 Feb 2011 13:37:29 +0100
From: Heinz Breuer DH2FA <dh2fa@dar.c.de>
Subject: [R-390] Dittmore&Freimuth mechanical filter

A friend's jukebox revealed a R390A style mechanical filter with markings:

Dittmore&Freimuth
SM-D-243863
S/N:013
No: DF-455-BP-2-CB

I have not yet tested it but I guess it is a 2kc filter. Did Dittmore&Freimuth make their own mechanical filters or is it a Collins OEM product?

Date: Sat, 12 Feb 2011 07:27:59 -0600
From: "Les Locklear" <leslocklear@cableone.net>
Subject: Re: [R-390] Dittmore&Freimuth mechanical filter

Dittmore Freimuth Corp. Made their own mechanical filters. The Collins patent had expired. The Helena Rubenstein Filters would be marked Collins.

Date: Sun, 20 Mar 2011 11:35:58 -0500
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: [R-390] Q IF And Audio Module Tube Optimizing

With the bandwidth switch set to 2 KHz someone may want to explore how linear the frequency response is. It would be interesting to see a curve at 1000 Hz in addition to the 400 Hz test.

In fact, we may want to add a test step to go through and peak the trimmer capacitors on the mechanical filters (if they are there). I did not check all of the steps in the multiple postings but if we have not do a test of individual filter performance we should add steps for that as well.

It is disconcerting to me to be trying to dial into a signal and when I rotate the bandwidth switch I hit spots where the signal just completely disappears. I have some examples where it was not just related to the S/N ratio and a wider bandwidth resulting in an AGC action that drives the desired signal down through the floor.

I have seen this issue appear in some very high end receivers where there are no means of trimming a newly installed filter. Some of us know about the trimmer caps that were added as a later mod on the R-390A. Do you know that a receiver like the RF-590 from Harris does not have the ability for you to trim that capacitance if you add or move filters around?

Date: Sun, 20 Mar 2011 13:12:01 EDT
From: Flowertime01@wmconnect.com

Subject: Re: [R-390] Q IF And Audio Module Tube Optimizing

A real great point on trying to get a sense of the band pass shape of the filters in a (your) receiver. Back when we never worried, as a filter passed or did not pass a signal. But today we know about the insides reducing to gooey crud. This can cause all kinds of dead spots within a band pass. Yes, we should add a section on doing a simple (not sweep generator) test that results in a chart / graph of the band pass of each mechanical filter in the IF deck.

Yes as we change band width, other signal gets into the mix and into the AGC. This adds AGC reduction, this drops RF gain, this drops our wanted signal into the noise. I am thinking that at some signal levels we rattle gooey crud and thus loose the signal or have dead spots. We are lucky the crud is not hanging the filter in a completely dead inoperative state that passes no signal at all. I also think the crud can hang on a filter wafer and thus change its resonance. To our ears it is as if audio notches are being formed.

We just always peaked the trim caps on the IF for maximum gain on any filter. The real intent was to match the gains of the filters together. But the procedure is still to use a signal generator of clean single source signal. This is not the real world performance of what happens in the filters and AGC action. You are right. The trimmer caps can be used to better match and thus improve the apparent in your ear performance of the receiver. I just do not have a procedure to do a comparison of the filters. OK Fellows how do we do this with the AN/URM 25 and volt meter? How do we do this with a nice sweep generator and scope? What do we find as a base line?

Date: Wed, 16 May 2012 19:33:37 -0600
From: Anthony Casorso <canthony15@msn.com>
Subject: [R-390] R-390a mechanical filters at Fair

Roger (AI4NI) was kind enough to confirm for me that FairRadio has mechanical filters for R-390a even though they don't show up on their web site. He suggested that I email them and find out. Here is the reply from FairRadio:

"Yes we have mechanical filters for R390A
2 khz is \$85.00 plus shipping
4 khz is \$80.00
8 khz is \$65.00
16 khz is \$50.00"

Just in case anyone was wondering.

Date: Sun, 26 Aug 2012 21:19:29 -0400
From: Robert Newberry <N1XBM@amsat.org>
Subject: [R-390] R-392 bandwidth question

I was listening to the gang on 3.875 on my 392. Conditions were crowded with SSB above and below the QSO. I thought tightening up my bandwidth would help. I switched to 4kc and it was like engaging squelch I could see signal strength but I had barely detectable audio. I engaged the BFO and adjusted my tuning and was able to copy the QSO. I know this rig sounds great listening to AM shortwave. Question is did I do the correct thing for crowded band conditions?

Also is my bandwidth knob acting normal? Do you have to turn on the BFO to use 4kc?

Date: Sun, 26 Aug 2012 21:44:55 -0600
From: Anthony Casorso <canthony15@msn.com>
Subject: Re: [R-390] R-392 bandwidth question

I just tuned to 3.875 and also found SSB interference. I was able to switch down to 4 Kc and 2KC without the effect you describe.. Sounds like something is not right with your IF strip.

Date: Sun, 3 Feb 2013 10:55:21 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filters

Hi. New to this group. I have 2 R-390As. Filters in one module seem fine, but the gain drifts, I'm working on that. Other module has bad 2(weak) and 4(dead) but the 8 and 16 seem good, but different gain through them. Was wondering if anyone has come up with a good cheap way to replace the filters? Could it be possible to make an op-amp variable bandwidth 455 filter to replace the mechanical ones? Don't know the voltages involved in the filters, but maybe too much for op-amp filters? Is there any way to search the archives?

Date: Sun, 3 Feb 2013 10:55:21 -0500
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Subject: [R-390] Filters

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Date: Sun, 3 Feb 2013 11:16:25 -0600
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: [R-390] Filters

If your gain is drifting there is something else going on that is probably not directly related to the filters. That is the problem you really want to dig into.

I had been following your posts over on eHam (I also suggested you come here). I would start out by looking very closely at your voltage supply to make sure it is not wandering all over the place, that your tubes are in good shape (swap individual tubes from your known good IF deck into the deck in question, keep track of what ends up where or you will end up with two wonky decks). Make sure your AGC voltage is not doing strange things and whatever oscillators are involved in the IF deck are also stable.

It sounded like you had a radio that had a whole skew of problems (from the eHam posts over the past few weeks). There is some interdependence across the different decks. Like you found out, part of your B+ supply actually resides on the audio deck.. things like that.

You have one advantage in that at least one of your radios is a known-good quantity so it will make troubleshooting a bit easier.

Generally the IF filters are either going to work or they will not (due to the "killer cap" blowing out the input sides by letting B+ get into the filters). Sometimes the foamy insulation in a filter will deteriorate into a black sludge and the filter will be mechanically loose inside and rattle and may break off a lead. Sometimes it will get filled with goo and the filter curve will not look right if you swept it with a signal generator.

I think that deciding to pull out the IF filters and replace them with a different technology is a bit premature at this time. You may end up masking or minimizing the original problem but you will not really have fixed the issue. There "are" filter-like swaps (like going with Clevite ceramics, if you could even find them, heck, we would all love a set of original Clevite ceramic filters but they are rarer than hen's teeth). You could take some sort of DSP-like approach to an IF filter, an LC type approach (like the original R-390) or something else like crystal filters (with appropriate impedance matching).

Generally the mechanical filters should not be seeing any DC potential at all; they are isolated by capacitors. The IF signal levels involved are low millivolt range (maybe even high microvolt levels). In a properly aligned IF deck the filters should exhibit very sharp curves and good linearity.

If you really get stuck you could always send your IF deck out to someone who works on the radio all the time (there are probably a dozen people who are real magicians). It would be alot cheaper than sending in an entire radio for restoration. A properly set-up R-390A is going to be an eye-opening experience for you.

Date: Tue, 5 Feb 2013 17:18:43 +0000 (GMT)
From: chuck.rippel@cox.net
Subject: [R-390] Filters

>and 16 seem good, but different gain through them.....

At the age type of the filters, having varying gains through them is not all that unusual. I wish Dave Curry was still making his most excellent R390A filters. The .1 and 1 KC bandwidths are cascaded in concert with the 2kc filter. If it is defective, those will be affected. You can also have a defective crystal filter located in the can at the left-rear of the IF deck.

If the .1, 1 and 2 are defective, suspect a bad 2KC filter. I don't envy anyone having to change the filters. Several of them are challenging at best to access.

Date: Tue, 5 Feb 2013 12:51:39 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filters

Yes, the 2K filter does have some action through it, but gives -2V diode load where the 8 and 16 give -7V, but the 4 appears dead. I'll have to go through the . 1, 1 455 crystal to see if something in there is dragging down the 2 filter. The filters seem to check OK with the ohmmeter though. I don't think it's in the switch, everything looks to be original and undisturbed unless the guy was really good. The variable action I'm talking about is during a time period through the same filter so I think it's a cap or something changing value during warm up. And that's in another unit. The filters in it are good. BTW I took L601 apart and it appears to be made with #34 enameled wire and it smells really burned. Lots of wax in the thing and the round button popped off while I had the heat gun on it and I can't find it now. Not sure it's worth trying to re-wind if I can find a replacement at a reasonable price. 110 ohms for #34 is over 400'.

Date: Tue, 5 Feb 2013 11:00:07 -0800
From: "Craig Heaton" <hamfish@efn.org>
Subject: Re: [R-390] Filters

Another way to skin the cat:

After going thru the beast, replacing all of the offending BBOD's, electrolytic caps, mechanical/electrical alignment, getting all sections up to snuff, finding the best tubes in the correct places, etc: I pick the filter that has the least voltage at the diode load, crank up the IF gain till -7 volts is attained.

Then if one wants the same gain on the rest of the filters & the trimmer caps are in that IF section, adjust the other three down to -7 volts.

Been there, done that. At times I just peak each filter for the max and pick the filter I use the most and set the IF gain to -7 volts for that filter. With the RFI in the neighborhood, weak signals are never heard & IF gain adjustments are only an excuse for something to do on a rainy day in Springtucky, Orygun.

Date: Tue, 5 Feb 2013 14:05:13 -0500 (EST)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Filters

Is it safe to check the windings on those filters with an ohm meter (or, at least, with just any old ohm meter)?

Date: Tue, 05 Feb 2013 14:08:12 -0500
From: Al Parker <anchor@ec.rr.com>
Subject: Re: [R-390] Slightly OT

It is done often, negligible compromise to an "exact" match. Bear in mind that the impedance of both the antenna and the rcvr input will vary

with freq., so whatever an "exact" match might be is a "crap shoot".

Date: Tue, 05 Feb 2013 14:32:52 -0500
From: rbethman <rbethman@comcast.net>
Subject: [R-390] VOM use

Generally "yes", however I tend to reach for a VTVM. Simply habit. Remember that TS-352s were used. Those were issue. So if a Simpson 260 or similar is around, It would most likely bu just fine.

Date: Tue, 5 Feb 2013 20:57:09 -0800 (PST)
From: Norman Ryan <nnryann@yahoo.com>
Subject: Re: [R-390] Varying gain [WAS: Filters] and archives

Fifty ohms across the IF mechanical filter coils is nominal.? Resistances measured can vary up to five ohms either way, so you're good there.

Resistance to the shell (ground) should read infinity.? I'm not sure 34 megohms is inconsequential.? I forget how the IF deck performs when there is ohms leakage to ground.? Perhaps someone can chime in here.

Rotate the bandwidth switch so that contact is not made with the filter coils when you are testing so as to get a correct reading.? A basic digital VOM works for me, and I'm sure an older analog meter wouldn't draw damaging current across the coils.

You probably should avoid opening up a more or less working filter.? Do that on a failed unit instead! Here is a link to an excellent article on mechanical filter restoration: <http://www.delphelectronics.co.uk/filter390a/>
I think this article should be required reading and saved to the hard drive -- as well as bookmarked in the unlucky event that the link may not work some time in the future.

Date: Wed, 6 Feb 2013 10:07:40 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filters

Thanks for that link. I'd seen a few links to the filter repair but not that one. I'm thinking if I need to I could do that. I'm wondering about the donut that holds the assembly in the tube, seems it should be completely non-conductive, but stiff enough to hold the assembly tightly in the tube. I'm just trying to think of what would be really good there. Maybe a teflon or delrin donut with some silicone rubber to make a rather press fit into the tube? I'm not thrilled with A/C insulation tubing, it would probably do what the old stuff does eventually, turn to pucky.

I'm not sure I've seen what the in/out impedances are for the filters? I suppose I could find out by hitting them with 455 out of my service monitor and increasing a series resistance until I get 3db or half voltage across the resistor and the filter. The 50 ohm of the monitor would be irrelevant at that time. My monitor will only sweep down to 1MHz so it may be a bit difficult to check the response by sweeping. I could just do it 10Hz at a time. The monitor is High Stability, so it's

plenty accurate.

Date: Wed, 6 Feb 2013 21:31:54 -0500
From: John Wendler <wendlerjrv@gmail.com>
Subject: Re: [R-390] filters

Would any of the knowledgeable folk on the list care to comment about the donut material and whether the old material was chosen as an acoustic isolator to prevent microphonics?

Date: Thu, 7 Feb 2013 06:45:15 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] filters

The mechanical filters are made up of resonators. They work by acoustic resonance. You need to be very careful about how you mount them.

Date: Thu, 7 Feb 2013 11:21:29 -0600
From: Cecil <chacuff@cableone.net>
Subject: Re: [R-390] filters

We know there is some kind of foam material in them that turns to gum that impedes propagation through the filter that probably accounts for the filter loss seen in these aging filters. There have been those that have opened them up..cleaned them out and replaced the foam with some positive results.

I guess we had get good at this since that is where they all are heading unless we find a suitable replacement.

Date: Thu, 7 Feb 2013 10:01:35 -0800 (PST)
From: Norman Ryan <nnryann@yahoo.com>
Subject: Re: [R-390] filters

I imagine the learning curve for making these mechanical filters at the factory must have been steep.? Even so, the rejection rate must have been considerable, given the delicate construction.

Sadly, we poor slobs have only one shot at getting the repair right, and we're faced with the problem of finding a more durable replacement insulation material as well.? Anyone have thoughts on an alternative way to close up the filters, say, using two-part epoxy such as JB Weld?

It may turn out that foam pipe insulation as suggested by Graham Baxter will work just fine as it normally is exposed to heat from hot water pipes and thus ought to last a long time inside a working IF deck.? Heat from resoldering the end caps may be too much, thus my suggestion of epoxy as a possible workaround.

One of these days I want to undertake Graham Baxter's repair procedure and will share results here.? It likely will be some time down the line, though.

Date: Thu, 7 Feb 2013 14:22:30 -0500 (EST)

From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] filters

So some time in 2005 / 2006 one of the fellows at Fair Radio Sales in Ohio was rebuilding the filters.

I myself had opened a few failed filters in '73 '74 and even back then found the "packing" was goo. We can believe today that every filter is now in a goo condition yet these filters are still working well. Thus it may be logical to jump to the conclusion that the packing provides no part in the filtering activity.

You can use a hot hollow tube to melt a round core plug from a sheet of foam to make up new packing. Also use a hot knife to put in some slots to let the wires pass through the packing plugs.

If you wrap the barrel of the filter in a wet rag you can re solder the end caps with out melting the new plugs to goo right off the start. Invest in a spool of low temp solder. A few degrees could make the difference between success and failure.

Maybe a plug cut from great stuff could be used. The stuff does not hold up in sun light but we at least know what it looks like as it decomposes. I am thinking styrene would have a long life inside the filters. There are a number of ceramic filters about in the 455 range. We may need to re stuff the cans with a set of these items selected to provide a narrow band width. Much like building a crystal filter up from crystals.

Date: Thu, 7 Feb 2013 14:22:36 -0500 (EST)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] filters

Speaking of rejection rates, etc., I watched this video last night. Pretty fascinating stuff (even if it is solid-state). Interesting to see how some of the first silicon transistors were made, delivered, etc. The hand work they did for the first ICs was quite involved too.

<http://www.pbs.org/wgbh/americanexperience/films/silicon/player/>

Date: Thu, 7 Feb 2013 18:16:33 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] filters and wandering gain

I think I'm getting somewhere with the wandering IF gain. Injected 455 into grid of V504 and then V503. No wandering gain. When I injected it into V502 got the wandering gain. OK, set IF gain at max so I didn't confuse myself with the R519 gain control. Changed C517. No difference, still wandering gain. Moved injection to input of IF module, removed filter cover. Notice that as the gain changes, the tuning of the filters change with the variable caps. Also when I touch the adjustable cap on the 4K filter, I always get a 'snap'. Took a good look at the soldering around that area, and re-soldered the outputs of the 4K filter with a good hot iron. Also found a bad solder joint on the inside of the variable 4K cap. Soldered that better. Now I seem to have no wandering gain, but I do get a

large snap when I touch the 4K filter output connection with the tuning tool which only has a tiny metal piece at the end of a long plastic handle. I did get the gain dropping and when I touched the 4K filter output, it 'snapped' and gain went back up. It's holding for now. Wondering if the filters are changing or sometimes not letting the grid of V502 return to ground somehow? Still everytime I touch the 4K output connection with the tuning tip, I get a 'snap' and the noise level goes way up. None of the other filters do this.

Is there a direct connection from the input to the output on the filter connections? Exactly how is the grid of V502 returned through the filters and R507 to the AGC line, just the filter output winding? If connections are getting loose inside I could see the grid voltage on V502 getting strange. and changing the tube gain.

Ideas here? I'll have to let it cool off tonight and see if the gain still wanders around from cold, it's been on for a few hours now.

Date: Thu, 7 Feb 2013 17:26:32 -0600
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: Re: [R-390] filters and foam

I bet that the foam does have a mechanical isolating value for the filters from vibration. Probably it is as much about centering in the filter body. If you look at the more recent Collins mechanical filters they are a series of rods mounted on a substrate so they do not benefit from mechanical isolation yet they also exceeded the mil requirements.

One of the things I would of tried out would be to use that black conductive foam that you see integrated circuits stuck in for ESD control. One advantage I would see to that sort of foam is that if it was properly trimmed you "might" be able to improve filter blow-by as the ESD foam would provide RF shielding of the coils from one end to the other (like an RF gasket).

Date: Thu, 07 Feb 2013 18:51:18 -0500
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] filters and wandering gain

Surprised it is *only* 4KC width filter. Look carefully on top and on bottom of deck. Something is touching somewhere, or is leakage. [Spaghetti - original, can have deterioration issues.] Selector for B/W should be carefully checked. Wafer connections with old insulation on wires - 1) Touching something else? 2) somewhere crossed? 3) Wafer "rod" checked for voltage to chassis?

These are easy questions, but can be big difference. Can't see by message. Hence interrogatory methodology being used to cause thoughts or possible ideas and/or answers. I procured a second chassis over the insulation issues, and corrosion in general. You refer to "snap" when getting close to trimmer with plastic adjusting tool with small metal tip. With a plastic tool, you should not get a "snap". This seems as though the tool is completing a circuit.

From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filters

I have my 2K and 4K filters removed from the IF.

The 4K appears dead in the IF. Input and output windings show 51 ohms, to ground the output measures 34Meg, the input measures 370Meg.

2K in the IF appears to have high loss compared to 8 and 16K filters. Input and output windings show 53 ohms. To ground output measures infinity. Input measures 5.3Meg/1Meg depending on which way I use the leads.

82pf caps appear good.

Any recommendations for taking them apart? I've read the articles and the sites with pictures on removing the ends, but I'm still a bit confused about when heating them, how do I keep them from blowing apart with the build up of heat? I see a nubbin on one end of the filters, right in the center, output end, does that cover a hole? Or should I just drill a hole in one end before heating them? They appear to be the later filters, buff colored so there's no connection of the input and output ends.

http://i251.photobucket.com/albums/gg287/DogTi/R390A/filters_zpsb692cc43.jpg

Date: Fri, 15 Feb 2013 16:00:34 -0600
From: KA9EGW <ka9egw1@britewerkz.com>
Subject: [R-390] R-390A Filters

I am surprised nobody has tooled up an aftermarket crystal, ceramic or mechanical filter [especially 4K as that seems to be the most susceptible to end-of-life failure] as has been done for the power supply caps and some other unobtainium parts...if I had the time I would do it, but with a family member in termina decline I don't. And whatever happened to Tim Curry's replacement filters? Are the I/O Z's on current manufacture filters compatible?

Date: Fri, 15 Feb 2013 18:18:47 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filters

Yes, I'm suprised no one has come up with a viable replacement myself after all this time, but hey. I suggested an op amp filter, but it was poo-pooed at that freq, but with the new op amps we have these days, I wouldn't think 455 would be all that hard, but what do I know? DSP would be too much of a project.

I'm sure the switch is fine, but it's really hard to tell with the filters in the circuit. Now that they're out I'll check for sure, but everything except ohms to ground measures the same with a good IF module I have, and removing the 3 filters has raised the resistance to ground on the agc line on the IF with the bad filters.

I was measuring my filters with a Fluke 189.

Date: Fri, 15 Feb 2013 20:16:46 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filters

If you are going to do an op amp filter, you need to do the math first. Op amps are fine for something that's 40 KHz wide and stable to a few KHz. One percent at 455 KHz is 4.5 KHz. The individual resonators in the 4 KHz filter are set up to within < 400 Hz of their desired frequency.

Date: Fri, 15 Feb 2013 19:50:12 -0600
From: "mlmccauley@att.net" <mlmccauley@att.net>
Subject: [R-390] Filters

A DSP filter would be an ideal replacement for a mechanical. DSP chips that work at 455KHz are readily available for very reasonable \$. The problem is the software. To do a nice, flat topped, steep skirt filter would not be a trivial piece of work. The upside is that one relatively simple circuit could be made to do everything from super-narrow CW to full bandwidth AM SWL.

Date: Fri, 15 Feb 2013 21:05:15 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filters

Thus the variety of outboard dsp filter boxes that have shown up over the years. Once you get them into production, the cost is high enough that there is a very limited audience.

Date: Fri, 15 Feb 2013 20:18:23 -0600 (CST)
From: Jim Haynes <jhhaynes@earthlink.net>
Subject: [R-390] Filters

Rockwell-Collins still makes mechanical filters, but it's my understanding they use a different principle from the older ones, and also that the interface requirements are different.

I see by a web page that they make a low-cost series for use in 455 KHz IF circuits, with bandwidths of 300, 500, 2500, 5800, 7000 and 10000 Hz. Naturally they don't say what "low" means in cost.

Date: Fri, 15 Feb 2013 20:23:24 -0600
From: "mlmccauley@att.net" <mlmccauley@att.net>
Subject: Re: [R-390] Filters

Absolutely. I've seen those come and go. The concept is great, but the market is very limited, hence the cost. A savvy ham with the proper background could homebrew a very nice filter for a relatively cheap price. Soldering the hardware together would be a fairly easy weekend project, assuming you had a surface mount adapter board for the DSP chip. The software would take many weeks to write and even longer to debug.

Date: Fri, 15 Feb 2013 21:35:32 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filters

With the right hardware to target and good design software, the filters are a weekend project code. From scratch the design software stuff likely would run you < \$500.

Date: Fri, 15 Feb 2013 20:46:59 -0600
From: Cecil <chacuff@cableone.net>
Subject: Re: [R-390] Filters

Kiwa makes some nice filter modules that are less expensive than the Collins mechanicals...we should look at those a bit closer as a viable option. May be a bit of a challenge getting them packaged and mounted but it might be worth the trouble.

Date: Fri, 15 Feb 2013 19:12:27 -0800
From: "Scott Overstreet" <scott@becklawfirm.com>
Subject: Re: [R-390] Filters

Can you put it all in a box that would fit in place of the mechanical filters and run on available power within that sub assembly?

Date: Fri, 15 Feb 2013 22:19:06 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filters

One question worth asking: Is there still a supply of IF decks out there? If so parting one out is a much better solution than cobbling something strange into the IF chain.

Date: Fri, 15 Feb 2013 22:28:30 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filters

That gets you away from the whole "use a scrap demo board and wire it up" approach. To answer the question, yes you could come up with a module that drops in where the set of IF filters used to go. Grabbing power by one or another means is likely not to hard. Once you do all the custom design and boards, cost would be similar to an "attach to a PC" digital radio.

Date: Sat, 16 Feb 2013 00:03:12 -0500
From: "KR4HV" <kr4hv@numail.org>
Subject: Re: [R-390] [!! SPAM] Filters

Collins has an economy line of filters. I bought two last year for a Racal 455 if from Collins direct with my credit card at \$100each. They work great. Has anyone spoken with a Collins engineer about a product(s) or if they could reasonably retro and existing product line to work? They are available for phone calls. I spoke with one of their engineers about what I was doing at the time.

Just a thought. Walt

Rockwell Collins Filter Products

Rockwell Collins Filter Products specializes in designing mechanical filters to meet your unique and evolving requirements. We produce two different types of mechanical filters. For frequencies between 100 kHz and 700 kHz, we create filters made from rods resonating in a torsion mode. For frequencies below 100 kHz, we use flexure mode bar resonators. Our filters can achieve bandwidths from 0.05 to 5 percent. Whatever your filter needs are, Filter Products can customize designs to meet them.

Key Contacts

14192 Franklin Ave.
Tustin, CA 92780
Phone: (714) 929-3971
Fax: (714) 929-4011 Email

Application Notes

Torsional Mechanical Filters

A Low Cost Series of torsional mechanical filters has been designed for use in 455 kHz IF circuits. Excellent quality and reliability at a low cost.

Part # 3 dB BW (typ.)

526-8733-010 300 Hz
526-8693-010 500 Hz
526-8694-010 2.5 kHz
526-8695-010 5.8 kHz
526-8734-010 7.0 kHz
562-8735-010 10.0 kHz

Navtex Filters

Rockwell Collins builds Navtex filters at three frequencies:
424 kHz, 490 kHz and 518 kHz.

Part # Frequency Poles

526-8707-010 424 kHz 6
526-8708-030 518 kHz 6
526-8749-010 490 kHz 6
526-8771-010 490 kHz 4
526-8772-010 518 kHz 4

Date: Fri, 15 Feb 2013 23:12:15 -0600
From: KA9EGW <ka9egw1@britewerkz.com>
Subject: Re: [R-390] Filters

Then too, there is free DSP software for my PC, all I would need is any source of audio to feed into my sound card. As long as at least the 8 or 16K filter was still viable that would be a possibility. Sacrilege I know; I'm just trying to think ahead to when even used filters are complete unobtainium...or more to the [OT] point

what my options with my R-388 are, since 354A-1 upgrade-to-R388A/51J4 kits ARE unobtainium.

Date: Sat, 16 Feb 2013 00:51:52 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filters

There's also a perfectly good IF output jack on the back of the radio to attach a "gizmo" to. No need to chop up the radio at all. If you get to the point where there are no filters at all, jumper one position and use the IF output?

Date: Sat, 16 Feb 2013 04:17:08 -0500
From: "Charles P. Steinmetz" <charles_steinmetz@lavabit.com>
Subject: Re: [R-390] Filters

>If you are going to do an op amp filter, <snip>

Additionally, Q that high at 455 kHz would require op-amps with an insanely high gain-bandwidth product. A quick analysis of a 4th order Chebyshev design similar to the existing 4 kHz mechanical filter indicates that op-amps with a GBW > 4.5 GHz would be required. And it would have to work in the steaming confines of the 390A IF chassis, with 6 resistors and 4 capacitors that hold their values to within about 0.01% (a tempco of around 0.0001% -- or one part per million -- per degree C).

Then there is DSP. Mike wrote:

>A DSP filter would be an ideal replacement <snip>

For anyone who has done it a time or two, the filter code would be an evening's work. The problems would be (1) DSP horsepower and (2) feature bloat. Once you digitize, why would you want to implement just the IF filters and convert back to 455 kHz to feed it through the 390A IF/detector/audio chain? You'd be nuts not to provide lots of bandwidths from 10 Hz to 10 kHz or more, all-mode detectors, passband shift, several notch filters, noise blanker, synchronous AM, AGC, etc., etc.

With either of these solutions, once you have it designed and debugged, hams and SWLs might be willing to pay \$100 for a fully assembled unit, with warranty support (and perhaps installation) included. Maybe \$25 for a board and complete parts kit with a detailed, 55-page manual. It's probably easier (and much cheaper) to set the 390A to 16 kHz (jumper the filter position if the 16 kHz mechanical filter is dead) with slow AGC and feed the 390A's 455 kHz IF output through a suitable attenuator to your choice of commercial DSP radios tuned to 455 kHz.

Date: Sat, 16 Feb 2013 13:48:31 +0300
From: Edward <navydude1962@yahoo.com>
Subject: Re: [R-390] R-390 Digest, Vol 106, Issue 19

Maybe Dave Curry can supply the demand? Unless he's no longer with us.

Date: Sat, 16 Feb 2013 05:57:56 -0500
From: Robert Newberry <N1XBM@amsat.org>
Subject: Re: [R-390] Filters

What about the softrock lite? Cheap and easy to build.

Date: Sat, 16 Feb 2013 06:31:28 -0500
From: "Charles P. Steinmetz" <charles_steinmetz@lavabit.com>
Subject: Re: [R-390] filters

>donut material and whether the old material

I think the ultimate would be Teflon foam. See, for example:

<http://www2.dupont.com/Teflon_Industrial/en_US/products/product_by_name/Teflon_FFR/index.html>

<<http://www.blinexindia.com/ptfe-soft-flexible-foam-gasket-material.html>>

However, AFAIK it is not commonly available in sheets, rounds, or other structural engineering forms. One might be able to find Teflon foam-dielectric coax with a suitable size dielectric (ID/OD), but buying just a few inches could be a problem. If one wanted to explore the possibility of Teflon foam, this might be a good place to start:

<http://www2.dupont.com/Teflon_Industrial/en_US/contact/index.html>

If I were rebuilding a mechanical filter, I think I'd consider slices from an appropriately-sized (ID and OD) piece of the softest available (lowest durometer) silicone rubber tubing. Here is one source: <<http://www.acmerubber.com/siltube.htm>> Part No.: CATB-.375-.125-65957 (ID = 0.375", OD = 0.635"); CATB-.250-.125-65909 (ID = 0.250", OD = 0.500")

Failing that, I might try donuts punched from a sheet of silicone rubber of the appropriate thickness using circular leather or gasket punches. But I've never rebuilt a mechanical filter, so I cannot say from experience whether silicone rubber would be the best choice.

Date: Sat, 16 Feb 2013 09:00:47 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filters

I've got some 1/2" hardline. Wonder if I could cut out enough teflon foam or whatever that dielectric is to use for the filter spacer? Then how do you keep it from melting when soldering back together? Or like someone said, use JB Weld.

I've already sent the IF output (16KHz) to an SRA-3 mixer to mix the 455 down to 12KHz and fed it into my soundcard, used 'Dream' to demodulate it. I made up a 467KHz oscillator to drive the mixer. It seems to work, but is a pain to work with. I

couldn't seem to get the Radio Mondiale to demodulate, but then was not sure I had the signal.

BTW I put the Fluke ohmmeter on some of that foam used to put ICs into. It measures about 2Meg at 1/4" spacing, about 3Meg at 1". Don't think that's a good solution.

Date: Sat, 16 Feb 2013 08:08:35 -0600
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: Re: [R-390] Filters (Tisha, AA4HA)

I understand where this is all coming from; as the filters get older we will see an increasing rate of filter failures due to foam deterioration, killer cap "events" and contamination. There are a couple of directions to take this;

1. Retrofit in different mechanical, ceramic or LC filters into the same physical space where the original filters fit. Deal with the impedance matching and filter curve differences.
2. Design in a DSP based solution, ideally into the same dimensions of where the filters are today (square can). Deal with the software design, microcontroller code, etc...
3. Rebuild the existing filter. Take it apart, clean out the goo, wind new coils, make new foam, assemble it and solder it back together.

All three approaches have merit; traditionalists will opt for option #3. The more adventurous types would shoot for option #2.

Looking at the challenges involved in option #3 (filter rebuilds) the biggest obstacles are in unsoldering the tube, removing the guts, cleaning it all out, winding new voice coils, cutting new foam and reassembly. I think that most of us are pretty adept at taking things apart and putting them together again. As we all get older (more mature, yes, that sounds better) our eyesight is not as good, our fingers do not work quite the same for detail work or we do not have the patience to spend a day working on a single filter.

To me, I am intimidated by winding new coils. If I was able to buy pre-wound coils that fit the exact same dimension and had the same electrical specification life would be so much easier. If there was a rebuild kit where someone had already made new coils mounted on teflon tubing with new cheek pieces that could be reattached to the mechanical resonator and needle and soldered to the end-caps with new foam doughnuts then it turns into a clean-out job and soldering the end caps back in place.

It seems that if someone set up a little cottage production line to make nothing but coils they could sell rebuild kits for a reasonable price and still make a nice little profit. Doing something once is expensive when you look at the time investment. Doing it a few hundred times with a coil winder and selling a set of coils and foam spacers for \$20-\$40 might be a nice income supplement.

Date: Sat, 16 Feb 2013 06:14:54 -0800 (PST)
From: John Saxon <johnbsaxon@yahoo.com>
Subject: Re: [R-390] Filters

I am not as "savvy" as you folks when it comes to the electronics, but I am a "savvy" software guy who has done a lot of low-level, embedded stuff (including micro-coding on array processors for you old-timers out there). I have a couple of home projects using microcontrollers and I enjoy playing with them.

Anyhow, you folks have my curiosity up about the software requirements to do a DSP filter suitable for Collins mechanical filter replacement. Can some of you gurus point me to where the math algorithms are defined? Gotta be on the web someplace :-). FWIW I currently have a 390 and a 390A.

Date: Sat, 16 Feb 2013 09:32:37 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filters

Pretty much everything you get from a Softrock comes from the PC. It really doesn't have much in it.

Date: Sat, 16 Feb 2013 09:41:08 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filters

I could see someone making a DSP setup to replace the filter 'can'. Not me though. It would be nice to incorporate the front panel dial with an encoder so it could have variable bandwidth from .1 to 16KHz, just like original only continuous. I think that would sell if the price could be down around \$200. I'd buy one, especially if I can't get the old filters working.

I'm assuming my coil windings are good since I'm measuring 50 ohms in and out, it's just the resistance to ground that seems wrong, I'm hoping it's just a matter of cleaning them up and re-assembly. I may start pulling the 4K apart today.

Again, do I have to drill a hole in one of the end caps to keep from blowing the thing apart while heating the end? I'm going to wrap a wet towel around the label to see if I can save it and take off the input end (bottom) first.

Also, is the ground lug on the end cap just soldered on, or can I use that to pull with and what is this nubbin in the center of the bottom end?
http://i251.photobucket.com/albums/gg287/DogTi/R390A/filterbottom_zpse5ba0910.jpg

Date: Sat, 16 Feb 2013 09:47:41 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] IF Gain R519

One of my IFs has a 50K in place of the 10K R519. I put a 12K across the terminals temp. Anyone know of a source for the locking style pot? I checked Fair Radio and didn't see any. I'd like to keep it original looking if possible. I probably

have a standard 10K pot.

Date: Sat, 16 Feb 2013 09:51:01 -0500
From: "Charles P. Steinmetz" <charles_steinmetz@lavabit.com>
Subject: Re: [R-390] Filters

For the software, start with Hayward, et al., Experimental Methods in RF Design and then move to dedicated DSP texts. The software isn't the problem -- processing horsepower is. Digitizing and manipulating 455 kHz with sufficient bit depth is still close to cutting edge. Most DSP radios use a final IF in the 12-20 kHz range, and even that is taxing to process in real time. This is not a job you can do with microcontrollers.

But my previous question still stands -- once you have developed the DSP capacity to do the filtering, why in the world would you convert back to analog and put it through the 390A IF? It would be plain silly not to have the DSP also handle AGC, passband shift, notch filtering, noise blanking, all-mode detectors, and synchronous AM, at the least.

Date: Sat, 16 Feb 2013 10:26:07 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filters

When I do them at work, the typical target is an FPGA. There are a variety of approaches. In this case I'd probably do a CIC decimator down to something rational, do the filter(s) as a FIR, and then a CIC interpolator back up to 455 KHz. Run the A/D's and D/A's with a sample frequency around 2 MHz or so. I would go with fairly high order CIC's and a filter or (more likely) cascaded set of filters in the 1 to 2 K taps region. The internal clock on the FPGA would be in the 50 to 200 MHz region so it didn't nuke the radio to bad. Its probably a pretty solid day or two to work all that stuff out.

You want the digital filter to be "better than" the existing filters in terms of shape factor, and ultimate attenuation. That takes you out of the cheap / dirty approach to some of this. You want at least 120 db (more like 135). The parts you use will need to be pretty good. The filters themselves would not be simple in terms of horsepower. You actually need *less* DSP horsepower in the gizmo to run it into a PC than to put it back out at 455 KHz. If you have a PC, you do all the real filtering there. You also don't have the CIC interpolator and RF D/A. IF DSP done *right* has it's own bucket of worms, they each need to be taken care of. That adds complexity.

Lots of details to work out. How big a front end filter ahead of the A/D (probably a ceramic bandpass)? What sort of setup to use as a dithering source (it's an IF, you don't have enough noise to dither adequately) ? The board layout and enclosure would have to be *very* good to get the isolation. Same is true of the power supply. The clock source would need to be quite good to get the ultimate attenuation you are after. Since you don't have massive decimation going on, the A/D would be at least a 16 bit part (18 and 24 bit parts are out there). I'd bet on an 8 layer board, BGA construction on some of the parts, and three passes to get a final layout. Hopefully you can avoid 0.5 mm pitch BGA's.

Tooling the custom enclosure, doing the board runs would need to be funded somehow. By the time you are done, there's probably \$20K in the "tooling" bucket. That assumes somebody will do the pick and place for free on the prototypes. Doing a production run probably involves fronting another \$20 to 40K.

More or less you have the same stuff as in a QS1R or something like it, plus the front end filter, plus the RF D/A. Weather it is \$1,000 or \$2,000 when you were done depends on how many thousand a year you can sell and how many years you plan to do it. Last time I saw scrap IF decks they were below \$200. For that matter one can eBay a whole radio for \$500 and part it out.

As pointed out earlier by Charles, for the same money you can just tack a SDR + PC on the radio and have a *lot* more features. Features creep is a very real issue. The SDR + R-390 combo won't quite work right, since you don't have much dithering on the A/D, but it will work.

The whole point of "it won't quite work right" is the real issue. The R-390(A or not) is a pure analog radio. What ever issues it has are analog issues. Digital radios have their own set of issues, quite independent of anything analog. As soon as you drop DSP into the radio, you bring all the digital "stuff" along with it. You then have both the analog limitations plus the digital ones. If you want to deal with digital issues, just spend the same money on a full digital radio. That way you don't have to deal with the analog issues as well.

Date: Sat, 16 Feb 2013 10:57:19 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filters

That link to collinsfilter is for the old sytle. Mine has no connection from the top to bottom end caps. Anyhow, I've got it apart. Bottom came off not to hard with the small butane torch, but the wires broke off while removing the cap. It's really hard to work fast and get it hot enough to pull off easily. The top end was a real problem since I was trying to save the label and I wrapped a wet paper towel around the label. It just would not come off with the butane torch, I tried a heat gun and it wouldn't even melt the solder, so I broke out the propane torch which was much easier to work with since the butane torch I have to keep my thumb on it and it's really hard to keep down. Anyhow the top end came out with a swoosh and pulled out the whole filter assembly with it.

Don't know if I just have a mess right now? I'll clean it up and see what I have.

http://i251.photobucket.com/albums/gg287/DogTi/R390A/filterapart_zpseb3e20cf.jpg

Date: Sat, 16 Feb 2013 10:24:16 -0600
From: KA9EGW <ka9egw1@britewerkz.com>
Subject: Re: [R-390] Filters

If it is actually teflon, good luck trying to get it to melt. Years ago when I was a

Novice, WA9TIR told me [speaking in praise of Teflon-dielectric coax] "you can get that stuff glowing red and it won't melt". Whether he was exaggerating I know not. If it's polyethylene, good luck keeping it from melting.

Date: Sat, 16 Feb 2013 11:39:26 -0500
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] Filters

Why do you think Teflon sheeting is approved for lining the inside of aircraft?

It doesn't melt!

"Most" hardline, older, uses ceramic "beads" to allow it to bend within the specified bending radius. HMMW Poly would probably do a very good job, is cheaper than teflon, and machines quite well. The pic I just saw from "this" filter "destruction" is just that. It is destroyed. The wires holding the stack of disks are broken. Entirely too much force used. My \$0.02 - YMMV

Curry Longwave Products NOT available. Sir Rippel posted this awhile back. Perhaps putting out a LIST call for filters would have gotten a direct message from the small handful of folks that DO have excess R-390s and R-390As, AND modules.

Date: Sat, 16 Feb 2013 10:43:52 -0600
From: "mlmccauley@att.net" <mlmccauley@att.net>
Subject: Re: [R-390] Filters

Charles has a good point RE not going back into the radio. Even given its deficiencies, I think using an outboard SDR makes more sense. You wouldn't have to go with the expense of a Flex. As a couple of guys have already pointed out, there are simpler, less expensive options available in that sort of thing. It's at least worth checking out.

Date: Sat, 16 Feb 2013 11:44:17 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filters

"Multirate Signal Processing for Communications Systems" by Fredric Harris is a pretty good DSP text for the more advanced stuff in this case. It's about \$160 on Amazon. It gets pretty deep pretty fast.

If you want to stay Collins centric - "Digital Signal Processing in Communications Systems" by Marvin Frerking is more radio-centric and the author is an old time Collins Radio guy. Truth in lending - we've also bought each other a number of beers ?. The book is about \$152 on Amazon. It's a much better introductory text.

But yes, the connection between "can I do this" and "should I do this" is a bit weak. Of course if somebody has the cash to fund the project. I've spent more than a little time digging into using an R-390 as a front end for a DSP radio. No matter which way I try it, there are a number of limitations.

By far the most rational approach (= cheap) is to simply down convert the IF output and use a PC+sound card for the DSP. That lets you use pre-existing software for all the heavy lifting. Do an I/Q downconverter board for 455 KHz and match it up with a \$100 to \$200 USB "sound card". If you want to do it right, set up a D/A to drive the AGC input on the radio.

Date: Sat, 16 Feb 2013 09:17:08 -0800 (PST)
From: Gary Geissinger <geissingergary@yahoo.com>
Subject: Re: [R-390] Filters

I've taken a slightly different approach to DSP on the cheap with R-390A, WJs, and other gear. I also convert the IF tap down to a relatively low frequency, but then I use an Analog Devices SHARC DSP board to digitize the signal and do the DSP. When I taught EE I had my students do bandpass filtering (Z-transforms), FSK demods, CW adapters, and the like using these. My favorite final semester project was to assign the specs for the Dovetron MPC-1000 and have students do the dual superhet on the SHARC. Synchronous AM is easy on the SHARC boards with their Harvard architecture. The boards have the PC Win based development environment included (ASM and C) and have codecs on board. The free software library includes many useful signal processing functions and IQ processing is a natural. The tight coupling of the clock oscillator, codec, and SHARC means low phase noise and high performance. Some kits used to cost \$100. Some were more... A lot more. But the more reasonable SHARC boards bolted into TecTec enclosures are powerful peripheral devices. Don't get less than a 32 bit device for most applications and make sure it has hardware floating point unless you are an experienced binary fixed point coder. www.analog.com

Gary WA0SPM / AAR8GI
Chief Electrical Engineer, Digital Globe Inc.

Date: Sat, 16 Feb 2013 12:35:08 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filters

Well, I don't think I've destroyed it yet. The coils still measure around 52 ohms on the wires. I got one of the coils out, it just pulled out with the wires, the tape tab just came out when I pulled on it. There's a much better repair link here, but if you look at my pictures, it adds a bit of info. I wasn't sure where the magnet was. The filter repair link is <http://www.delphelectronics.co.uk/filter390a/> and you can see my pictures here <http://s251.beta.photobucket.com/user/DogTi/library/R390A>

I'm not sure what was wrong with this filter. The tiny wire in the center of the bobbin is indeed small, I have a hard time seeing it. All I've done at this point is clean things up. There was a bit of detrius in between the metal coils and there is a bit more in there I need to get out. I'm not messing with the center wires. I'm not sure if the center wire goes through all the discs, I don't think so, I think I can see it on the top end it attaches to the 2nd disk from the end. I can't see the center wire on the bottom end between the discs. I'm thinking I'll have to use a tiny bit of silicone glue to hold the bobbins in place in the copper cylinder since they seem to be loose and the tape is doing nothing. I see no reason to take the magnets off. I've cleaned up all the spongy stuff and loose glue around the magnets.

I still measure infinity with my fluke from the bobbin wires to the discs. I'm hoping just cleaning it up will do something for it. We'll see.

Date: Sat, 16 Feb 2013 12:55:08 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filters

The coils on each end of the filter act as either a microphone or a speaker depending on which end you are looking at. The disks are the filter resonators. They are **very** precisely dimensioned to make things work. The wires between the disks are the coupling between the resonators. They also are **very** precisely dimensioned to make it all work. About the only thing that can be repaired are the windings on each end. If the disks or their coupling wires are damaged - there is no rational way to repair them.

The goop / goo / stuff can act as mass loading on the resonators. With any mechanical resonator that can de-Q them or it can shift their frequency. Removing crud is good, damaging interconnect wires is bad.

Date: Sat, 16 Feb 2013 12:34:01 -0600
From: "mlmccauley@att.net" <mlmccauley@att.net>
Subject: Re: [R-390] Filters

This sounds like a very powerful solution. Do you have any schematics and code that you could post as a starting point? I understand that the demo board contains the core DSP circuitry. I'm referring to what was added to that, the downconverter and other ancillaries.

Date: Sat, 16 Feb 2013 14:00:07 -0500
From: "Charles P. Steinmetz" <charles_steinmetz@lavabit.com>
Subject: Re: [R-390] Filters

>That link to collinsfilter is for the old sytle.

Not sure what link you are referring to. Have you seen G8OAD Graham Baxter's article? It is the first link if you google <collins mechanical filter repair>. <http://www.delphoelectronics.co.uk/filter390a/>
<http://www.r-390a.net/FilterRepair/index.html>

Date: Sat, 16 Feb 2013 14:55:17 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filters

I get the feeling like no one is really reading my posts so I may quit dealing with it, too bad for someone that wants to rebuild filters. But I will post pictues on my photobucket account for anyone that is interested.

Here's a picture of what I think is the center wire attached to the second resonator disk on the top (output) end of the filter. On the bottom end (input), I don't see the wire like that, but I have not yet pulled out the coils on that end, the center wire

may be coming off the end disk there and that's why I don't see it in the resonator disks.

http://s251.beta.photobucket.com/user/DogTi/media/R390A/filtertopcenterwire_zps1e973e91.jpg.html?sort=3&o=0

Date: Sat, 16 Feb 2013 14:00:57 -0600 (CST)
From: ka9egw1@britewerkz.com
Subject: Re: [R-390] Filters

This is rather puzzling--if there are no busted wires, I mean if the windings are still good, not open, no shorted turns, and I assume the welds to the stack rods are good, it begs the question "well then why did it fail?"

Please keep us posted on what you find.

Date: Sat, 16 Feb 2013 20:09:04 +0000
From: Graham Baxter <graham@delphe.co.uk>
Subject: Re: [R-390] Filters

There does seem to be a lot of interest in the doughnuts at the expense of the intriguing physics of the filter! It is my recollection that the filter was completely symmetrical. If you can't see the wire, it is probably broken. That is sad news, but hopefully someone will be able to supply a filter with bad coils but intact mechanics.

Date: Sat, 16 Feb 2013 15:18:40 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filters

If you have continuity, the coils are still there. A coil is either open / shorted / or good. A single turn shorted *could* create an issue that is very hard to diagnose without a Q meter. Filters that die with good coils likely have trouble from mass loading (goop on the disks) or from coupling (broken wire between the disks).

Date: Sat, 16 Feb 2013 14:18:46 -0600
From: KA9EGW <ka9egw1@britewerkz.com>
Subject: Re: [R-390] Filters

Could one unravel a length of Litz wire to get the requisite wire, or is it something like phosphor bronze?

Date: Sat, 16 Feb 2013 15:22:50 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filters

One very common way to strip teflon wire or cable is a pair of "hot tweezers". They simply melt the dielectric or insulation. They aren't a whole lot hotter than a soldering iron.

Having just melted a teflon insulated sensor wire (like yesterday) - it's not all that

hard to do.

Conventional coax is rated to some very high power levels. The energy to get it "glowing red hot" is simply not anything you are going to run into in an amateur environment.

Date: Sat, 16 Feb 2013 20:25:16 +0000
From: Graham Baxter <graham@delphe.co.uk>
Subject: Re: [R-390] Filters

I think we are speaking of the magnetostrictive wire which from the picture looks to be absent at one end.

Date: Sat, 16 Feb 2013 15:30:13 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filters

If you re-wind the solenoid coils you would need the correct stranding *and* insulation Litz wire. The transducer coils resonate with the caps on the end of the transformer. Winding tension will also play a part in the value you get when you are done. On the same machine with the same source of wire, you can hit the same inductance within 1 or 2 percent. Q will be amazingly consistent, but probably not to better than 5%. Change pretty much anything and you will have to fiddle to get back there. Ben there done that on a lot of production coils.

Date: Sat, 16 Feb 2013 15:37:29 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filters

OK, big problem. When I pulled the bobbin out of the top side (output) there is no central wire. I did notice when I pulled the top cap off the filter, there was a small wire, and I mean small, floating around in with the crap. I'm sure that wire was the central wire that fell off the disk on the output side. I did put it aside, but now I've lost that wire, it was maybe 3/4" long and thinner than a hair. I'm sure that's why this filter has failed. It's probably what reacts with the output bobbin to make it work. My only option is to pull off the copper end that holds the bobbins and see if I can somehow attach another hair thin wire to that end. This may be problematical.

I'm not sure what the magnets do, but I do notice that the holes in the center of the plastic bobbin holders seem to want to be off center away from the output wires to make the center wire line up in the center of the bobbin hole. I guess that's what that piece of tape was for under the end of the bobbin where the wires come out. It gave a way to put in the bobbin and also spaced the bobbin to center the wire.

I'll look around on the desk for the wire, but it's probably stuck to something, it seemed to be magnetic. I should have been more careful, but that's what experience is all about.

Whoops, I just found the wire. Now how to attach it back to the end disk? <http://i251.photobucket.com/albums/gg287/DogTi/R390A/>

filteroutwire_zps63789a32.jpg

Date: Sat, 16 Feb 2013 15:38:58 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filters

It's hard to see the coupling wire on both sides in the pictures, so there's no way to tell if it's broken. The wire is likely not magnetic in any way. It's purpose is acoustic coupling between the resonator disks. The material is chosen for it's acoustic properties (low loss at 455 KHz) and stability (temperature / time). The other constrain on all the materials is weldability.

When these filters were designed, the process for making the disks was fairly similar to crystal manufacture. The disks are taken to diameter first and then lapped to thickness. Adjusting the time in the lapping process is what gets you to roughly the right frequency. After lapping the resonators are sorted into bins by frequency. Different frequencies go into different locations on the various filters.

Date: Sat, 16 Feb 2013 15:41:55 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filters

If it's magnetic, it's only because they used steel wire for strength. Just replace it with a pice of normal magnet wire.

Date: Sat, 16 Feb 2013 15:59:34 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filters

Did you break off the actuator wire? Is that the source of your magnetic wire?

If so you need to re-weld it to the disk. Glue won't do the trick.

Date: Sat, 16 Feb 2013 16:02:38 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filtersq

Here is a pic of the top end with the copper cylinder that holds the coil bobbins. It looks like it's soldered to the end disk. This too may be problematical. Not sure if I can unsolder this thing from the disk to attach the wire, and then how to attach the wire? MIG or TIG?

http://i251.photobucket.com/albums/gg287/DogTi/R390A/filtercoppercyl_zpsc59576c.jpg

Date: Sat, 16 Feb 2013 16:09:30 -0500
From: "Charles P. Steinmetz" <charles_steinmetz@lavabit.com>
Subject: Re: [R-390] Filters

I presume it was originally welded, probably with some sort of spot-welding process. If you get the cup and coil out of the way so you have a clear view of the disk, it should be easy to tell. If it was welded, I suspect that you'll need to re-weld

it to repair it. A tiny drop of really, really good epoxy might work, but I wouldn't hold out much hope that it would last. Note that the wire probably needs to be placed on the disk with reasonable precision to get the mechanical impedance right.

Date: Sat, 16 Feb 2013 16:58:21 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filters

There's not much to see in the picture. We are either talking about a wire that attaches to 1) the coil bobbin (which is visible), or 2) the center of the end disk (which is not visible at all), or 3) the edge of the disk (which is not obvious). It's slightly possible we could be talking about the ground strap (which is not the wire in the earlier picture).

The coupling wires are resistance welded between the disks. The actuator wire was either resistance welded or silver soldered onto the center of the end disk. If it's silver solder, any change in the amount of solder will change the mass of the disk and it's resonant frequency. To a lesser extent re-welding could have the same problem. Of course the whole description of the center wire as an actuator may be a bit off in the case of the filter you have. It is the terminology used in the article on rebuilding filters.

How does the "broken" end of the filter compare to the "correct" end of the same filter?

What ever the attachment method of the wire, it needs to have good acoustic properties at 455 KHz. That rules out most plastics, and many ceramics. Hard solder or welding are the obvious choices.

Date: Sat, 16 Feb 2013 17:02:18 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filters

I was just looking at the copper cylinder and it appears to be molded into the last disk, so I took my vernier calipers, measured the bottom of the copper cylinder and it turns out the copper cylinder is embedded into the last resonator disk. Hmm. Not looking good to unsolder it. It almost looks silver soldered.

Does anyone have a bad 4K filter they would be willing to sacrifice to the good of all? Bad coils are fine. I'm thinking about a better way to pull the end caps off too.

I notice there is a resistor in the bottom end, about 57K across the coils. Didn't notice it because of the goop before.

Date: Sat, 16 Feb 2013 16:14:19 -0600
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: Re: [R-390] Filters, the little wire

That tiny than a hair little wire that runs through the center of the coils is very

important. Think of the coils like speaker coils and then think of that little wire like the speaker cone that moves when the magnetic forces tug on it. That little wire is coupling the 455 KHz signal to the stack of disks that are mechanical resonators. At the other end of the filter there is another little wire that mechanically vibrates and those coils pick up the disturbance in the magnetic field and translate it back into an electrical signal.

If you break off that tiny little wire I do not know of a good way to mechanically reattach it to the filter. Think of it as being a critical dimension, size, space and attachment. A blob-o-glue or a tack weld or solder change some very important characteristics (resonances) of that magical little wire and how the mechanical motion gets transferred over to the stack-o-disks.

That entire stack of disks is moving around at 455 KHz so you can also see why mechanical isolation is so important to the filter guts. Also the foam goo/powder/whatnot ends up changing the mass of the disks and will shift the resonant frequency (just like a musical instrument would be detuned).

Whatever foamy suspension devices you put into the filter should be supporting the coils and not directly touching the mechanical resonator disks. That changes their mass, shifts their frequency and attenuates their motion.

Goo we can clean off, coils we can rewind, broken magical wires or mangled stacks of resonator disks; we are out of luck.

Date: Sat, 16 Feb 2013 14:20:25 -0800 (PST)
From: John Kolb <jlkolb@jlkolb.cts.com>
Subject: Re: [R-390] Filters

Ouch! The wire does need to be magnetic. The wire vibrates at a 455 kHz rate in the magnetic field created by the magnet. This causes the magnetic field to vary, so that a voltage is induced in the pickup coil. Not sure how to repair that problem - maybe some sort of arc welder with a car battery and some way to interrupt the current before the steel wire melts.

Date: Sat, 16 Feb 2013 17:32:14 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filters

I'm thinking about how to attach the nickel wire. There may be a way. BTW it certainly is magnetic. I'm about done for today though.

I'm thinking of coming up with a better way to pull off the end caps now that I know how they work. That would certainly help, not to be so destructive in removing things. Pulling on the attachment points is not good, I had a couple of them move.

I've still got a 2K filter that has high loss and lower resistance from the coil to ground, so it may just have bad dukey inside to clean out.

Date: Sat, 16 Feb 2013 17:38:57 -0500

From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filters

All the previous efforts to repair filters have focused on re-connecting the wires to the RF coils or on cleaning out goop. I have never seen the repair process taken any further than that.

Date: Sat, 16 Feb 2013 17:48:03 -0500
From: k2cby <k2cby@optonline.net>
Subject: [R-390] Filters

I took a hard look at the photos, and it seems to me that all of the magnetic coupling wires are in place. While there are fine wires in the coils, the coupling wires that everyone seems to be referring to are on the perimeter of the filter discs and appear to be at least 0.5 mm (the lead in a mechanical pencil) or about #20 awg. Whatever is described as a "hair thin wire" has to have come from the coils, not the resonators, unless it is just an artifact that crept in from the bench during manufacture.

Date: Sat, 16 Feb 2013 18:09:12 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filters

Just to be clear: the wires that are welded to the edges of the disks are acoustic coupling wires rather than magnetic coupling wires. The only magnetic coupling is between the driver coils on the end and the driver that connects to the end disk. The basic operating mode of the filters is acoustic rather than magnetic.

Date: Sat, 16 Feb 2013 18:19:38 -0500
From: "MICHAEL TALLENT" <mwtallent@comcast.net>
Subject: Re: [R-390] Filters

There is a small magnetic wire probably spot welded to the center on each end disk and goes through the center of the coil to convert the magnetic field produced by the coil into mechanical movement to form an acoustical wave that travels through the disks and causes the small wire at the other end to vibrate and then generate a small signal into the coil at the "output" end of the filter.

<http://en.wikipedia.org/wiki/>

File:Mechanical_filter_with_disk_flexural_resonators.svg

Date: Sat, 16 Feb 2013 15:25:01 -0800 (PST)
From: Perry Sandeen <sandeenpa@yahoo.com>
Subject: [R-390] More Filter Options

It appears from Cuck Felton's ad in ER that he has obtained crystal filters as well as new meters for the R-390A's that he re-mans. I don't have any details.

On page 113 of Chapter 9 of the R2KR3 there is an article by Dallas Lankford on how to install a 6 KHz Collins low cost filter in the R-390A IF strip. It includes the details for winding the matching toroid coils that are needed.

If the Collins filter is too much for your wallet \$\$\$ of Nebraska has ceramic filters in the \$16 range but one would still have to have matching toroids. I don't know if the values Dallas used for the Collins filter would apply.

Shameless Plug: Many questions asked on the reflector list have been answered in the Y2KR3 chapters 9 thru 13. Roger's tutorials can take ANYONE with the willingness, who has basic mechanical skills, a minimal amount of test equipment and patience through all the steps to have a first rate "A". There are a plethora of other articles for making your "A" better than when it came new from the factory. Best of all it's a free download.

Date: Sat, 16 Feb 2013 18:28:10 -0500
From: "Charles P. Steinmetz" <charles_steinmetz@lavabit.com>
Subject: Re: [R-390] Filters

>Not sure how to repair that problem - maybe some sort of arc welder with
>a car battery and some way to interrupt the current before the steelwire melts.

I think you'd grasp the wire firmly very near the end with hemostats or similar, then attach one lead of your spot welder to the disk and the other to the hemostats. Touch the short end of the wire to the correct spot on the disk, and trigger the spot welder (making sure the hemostats are not touching the disk, and that you are holding the hemostats with a good insulator). Do you know any orthodontists who might collect old orthodontic equipment (or at least not throw it away)? The sort of welder I'm talking about was used to weld stainless steel strips into orthodontic bands in the bad old days. You could try jury-rigging a capacitor discharge in lieu of the welder, but you'd have to be lucky to get it right. For those who haven't seen it, John has a lot of good information about mechanical filters on his web site: <http://jkolb.cts.com/>

Date: Sat, 16 Feb 2013 17:35:20 -0600
From: KA9EGW <ka9egw1@britewerkz.com>
Subject: Re: [R-390] Filters

So if I understand this right, if the coupling wire needs to go to the center of the end disk, would not the technology used for attaching .002" nickel "drive rod" wires to the center of the diaphragm in a hearing-aid speaker have some applicability? Sounds a lot like a hearing aid--one end of the wire goes to the center of the diaphragm and the other end just floats in the middle of a coil.

It's "plunge welding"--put the wire at one potential, the end disk at the opposite potential, time/current-limit so it makes like a newbie stick welder on his first practice piece [i.e. me 2 weeks ago :-)]. Rather than a welding machine or even a small power supply, I would maybe use a low-series-resistance capacitor of the right size, charge it up to not-much voltage, and approach the disk with the wire. Which polarity on which side of the weld, I leave to those who can strike an arc without welding the stick to the workpiece HI [i.e. those who know anything about welding].

The technology exists; I troubleshot and kept running a bunch of drive rod

welders when I worked for a hearing-aid manufacturer some years ago...but the time/current/etc parameters we never touched.

Date: Sat, 16 Feb 2013 18:40:24 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] More Filter Options

With the exception of watch crystals, the whole industry of sub 1 MHz crystals is pretty much a thing of the past. Yes, there are a couple of people who will make you this or that. You better have deep pockets to get them interested in what ever you need done. Yes, one of them is a buddy, but that only goes just so far. The main technology still in existence is ceramic. There it's not so much can or can't, it's weather anybody wants to make complicated ceramics anymore. It's a market size sort of thing. People just don't make analog filter based radios anymore ?

Date: Sat, 16 Feb 2013 19:18:30 -0800 (PST)
From: John Kolb <jlkolb@jlkolb.cts.com>
Subject: Re: [R-390] Filters

I've placed the Collins factory specification for the F455N-20 filter on my web site.
http://www.jlkolb.cts.com/site/curves/F455N-20_DataSheet.pdf

Please ignore the filters for sale list - no filters for sale at the moment.

Date: Sat, 16 Feb 2013 23:01:33 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filters

So the driver coil as loaded into the filter has a Q of about 33. If the coil is mainly limited by it's resistance, that would give an unloaded Q of 60 for the coil alone. That's a pretty reasonable number for a simple multilayer solenoid coil.

Date: Sun, 17 Feb 2013 01:57:49 -0500
From: Lizeth Norman <normanlizeth@gmail.com>
Subject: Re: [R-390] Filtersq

Have been following this thread with great interest. What about battery places? Most of them here (Central FL) have welding machines that attach tabs to batteries. The weld footprint of the welding machine is actually pretty small. Too big probably, but might be worth a try.

Date: Sun, 17 Feb 2013 05:26:40 -0600
From: Raymond Cote <bluegrassdakine@hotmail.com>
Subject: Re: [R-390] Filters

You most likely have more than 50 Collins owners reading your posts and like me saving them as gold for later use. Many do. Of have the experience to comment so don't think your sharing is falling on deaf ears. That goes for all y'all Who share your experiences. Most likely ss of the data is not accessed until much later and source is not listed to thank. So I thank you and all that take the time to post even short experiences. Someone will benefit. Ray, longtime Collins 51J4,

388, 389, 390, 391 owner

Date: Sun, 17 Feb 2013 09:22:33 -0500
From: "Bruce Ussery" <twc9198764412@earthlink.net>
Subject: Re: [R-390] Filters

I appreciate the excellent discussions of theory of operation, as well as the photos. My understanding of the filters was minimal; now it's better. One description reminded me of the spring reverb units in guitar amps.

Date: Sun, 17 Feb 2013 09:30:41 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filters

Another thing the filters share a background with are the Vibrasponder / Vibrasender PL tone reeds used in FM two way gear. The most direct link is with crystal filters. A crystal is an electrostatically excited mechanical resonator (as is a ceramic). You rarely see crystals acoustically coupled. You do see old GTE gear with crystal filter banks made with the same weld and stack arrangement as the Collins mechanicals.

Date: Sun, 17 Feb 2013 09:41:06 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filtersq

What you need is a butt weld rather than a tab weld. Often these are done with headed wire to increase the weld area. Back in the era the filters were in production, California Fine Wire (CFW) was one of the places you got the stuff from. They have long since moved into other lines of business. The wire isn't quite taken to a nail head, but it's bulked up quite a bit at the end.

It's the sort of weld that you probably get right after the 10th or 20th try at the settings and a half dozen trials on many of them. Generally you only get one "shot" at the right location. The alloy on the filter disks may be marginally weldable, which would narrow down the useful setting range.

Date: Sun, 17 Feb 2013 09:45:10 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filters

I'm going to attempt to spot weld the wire on the center of the disk with a capacitive discharge. I need to practice first, so I've got some resistance wire that's lots thicker, but may do for some trials. If I can manage to get it welded, I'm going to make a form with a piece of teflon wire sheathing inside the form to hold the wire centered in the copper cup and then attempt to weld the wire back on. I'm not even going to try glue and since the copper cup is soldered or welded into the end resonator disk, it would be impossible to solder it back on.

I still need to come up with a holder donut. The hardline I have is Andrew 84147 FSJ4-50B Superflex and the dielectric is foam PE. I'll put the torch to the stuff and see how it holds up. Otherwise, I can't think of anything I have laying around

except some small teflon sheets and I don't think that would work. The paper insulating materials in the unit seems to be in good condition, it reminds me of speaker coil form material. Actually the teflon sheets may be good to replace the stiff paper insulation materials if it's thin enough. Like the pieces on the end caps. The small sheets I have aren't big enough for the large piece. It actually feels sort of like thin gasket material.

Are there any pictures that someone would especially like to see that I haven't supplied? G8OAD's web page has good ones. I'm just filling in with what I didn't understand from his article.

Here's where I stand right now and I haven't burned the label. http://s251.beta.photobucket.com/user/DogTi/media/R390A/filterparts_zpsc1292284.jpg.html?sort=3&o=0 The nubbin I was asking about on the bottom end appears to be a hole in the center of the bottom end cap that looks to have been a short tube that is cut off and sealed after soldering I'm guessing

Date: Sun, 17 Feb 2013 10:24:28 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filters

The fancy term for a pinch off used during seal is a "tubeulation". On a big vacuum tube, you cook the thing in an oven for hours / days before you melt the thing with a hydrogen torch. If the nubbin was once a tube, that's the term for it.

In this case the nubbin may or may not be used as part of the seal. You would need to pull the solder off of it first and see. The radio is rated to run at some *very* cold temperatures. If there is any moisture inside the filter can, you will get frost on the disks as the temperature drops. That would shift the frequency out of spec.

Unless you plan on running the radio outdoors in Alaska at night in the winter, I would not worry about moisture. If you do want to go through the whole process with what you have, it involves things like vacuum bakes and dry nitrogen filled glove boxes.

The dividing line is (no big surprise) freezing. The water capacity of air drops quickly as you go below the freezing point. Since we rarely run these radios below freezing, I'd say it's not a big deal.

If you don't go with the glove box / tube stuff, sealing is still pretty easy. You do one end and let it cool. A very big iron and reasonable speed is the right approach. On the other end, seal as quickly as you can over about 90% of the perimeter. The last 10% gets done in a single swipe (say 10 seconds). If it vents, repeat the swipe. The only real trick is how to hold the giant iron so you get heat into both the header and the can. Oddly enough you can do more damage to the header with heat than to the can.

Date: Sun, 17 Feb 2013 11:23:49 -0500
From: "quartz55" <quartz55@hughes.net>

Subject: [R-390] Filters

Well, this may be the time of year to do filters. Humidity is around 35% inside right now. I'm not even going to try to evacuate it. It's going to be used inside and if anyone wants to use it in the frigid weather, they will have to deal with it. I suppose getting it warmed up before sealing it would drive out most of the moisture, but not like evacuating and sealing it. All I have anyhow is one of those wine bottle pumps. I can see why these things are expensive, there's a lot more to it than putting a bunch of wires together.

Date: Sun, 17 Feb 2013 10:37:37 -0600
From: KA9EGW <ka9egw1@britewerkz.com>
Subject: Re: [R-390] Filters

I suppose the question of what alloys are involved and whether some sort of inert-gas shielding is desirable... When I serviced drive rod welders at Knowles Electronics I don't recall there being any inert-gas shielding.

Date: Sun, 17 Feb 2013 11:41:46 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filters

About the furthest I would go is to put it in a warm (but not hot) oven overnight after you seal one end. You need an oven you can *trust* to control to ~ 85 C / 185 F. That will drive out most of the residual moisture. What ever you use for support is likely to have a bit of moisture in it ?.

A couple of minor things that are worth doing.

- 1) Clean off *all* of the flux from any solder joints. Flux and fine gauge wire - not a good thing long term.
- 2) A dot of electronic grade RTV on any fine gauge junctions will increase their life expectancy quite a bit. It must be electronic grade since the normal stuff has acetic acid in it.
- 3) Check all the pins to ground with a good ohm meter *before* sealing things up.

Date: Sun, 17 Feb 2013 11:45:53 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filters

It's likely that the welding was done in a fairly conventional fashion (XXX pressure, YYY blast of current). The issue would be that rather than a 2:1 range on the pressure and current, you might have quite a bit less range.

Date: Sun, 17 Feb 2013 11:06:15 -0600
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: Re: [R-390] Filters (purge gas, foam replacement, paper/tape liner)

What I have been using for a purge gas is a mixture of argon, carbon dioxide and nitrogen. You can buy cans of the stuff on Amazon, it is called "Oenohilia Private Preserve Wine Preserve". It is about \$7 US a can and comes with a spray nozzle. For a while I was using something known as "zero air" that is used to calibrate MSHA gas detectors as it had no moisture in it. My source dried up (I no longer work for a company where gas detector calibration was one of the catch-all duties I had picked up). The wine preservative gas does that even better as the argon and carbon dioxide are heavy inert gases. For PTO's I do a couple of shots down inside of the plug before sealing them off. For a filter, if the seal is open then a shot or two ought to pretty much outgas most of the oxygen. Thinking about the foamy thing last night and I contemplated using 1/4" silicon tubing, cut in a length to make a slightly snug fit around the filter body and then super-gluing the ends together to make what looks like a hollow "O ring". Given the size of the filter and the size of the bore the hollow silicon O ring would hold the filter perfectly centered in the filter body with a snug fit but not with crushing force. I have some high temperature silicon tubing that is good up to 300C.

In lieu of the paper liner I thought about kapton tape on the inside of the bore. You could make a reverse roll of tape (sticky side out) on the end of a philips screwdriver and unwind it inside of the tube. I have some 30 mm wide stuff that I could try out. It should only take two pieces (one from either end) to fill most of the bore (except for the ends where the caps need to solder back on and maybe a small gap in the middle where there is nothing except for the resonator disks that should be nowhere near the sidewalls anyway).

Date: Sun, 17 Feb 2013 13:37:11 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filters

The Oenohilia Private Preserve Wine Preserve sounds like it may work about as good as anything I can do, and since I've got another filter to do yet, I may buy a bottle. \$9 including shipping now.

I've made up a form with a piece of teflon wire insulation wrapped in painters tape to fit and center the wire in the cup. Now to figure out how to weld the wire on the resonator. I did try some pieces of fine wire, strands cut out of some #24 stranded wire. I have a 61000uF 55V cap I charged up to 10 volts and welded them onto a bolt I had about. 10V seems to be about the max, if I go higher, the wire starts turning red for about 1/4" from the weld and comes apart. I was just using a variable PS to charge the cap, and clip leads with a small flat grip clip for the wire. Now to figure out how to do this procedure on the unit and the form with the wire in it. Seems best results were to hit the wire on the end and immediately let go with the clip so as not to keep heating the wire, but the voltage has dropped way down pretty quick. It may not matter. I had welds good enough to pick up the 3/8x2" bolt and nut with the strand.

Here's what I'm dealing with. http://i251.photobucket.com/albums/gg287/DogTi/R390A/filterwireform_zps94a11e37.jpg The length of the caliper end is the depth of the cup to the resonator. It looks like if the wire gets welded on the resonator right, it should just come to the end of the bobbins, and that is what the other end does. I'm not in a big rush.

I'm still thinking about the donuts. I don't quite understand your method Tisha. I don't have any Teflon tubing, but I do have small pieces I can cut 1x1" squares out of, it's about 0.025" thick. The paper in the filter is about .006" thick. Since I don't seem to have any problems with resistance from the bobbins to ground I could just re-use the paper. I've cleaned everything up with alcohol but there are still a few pieces of junk between a few of the resonators, I can get that out with canned air.

Date: Sun, 17 Feb 2013 14:00:58 -0800 (PST)
From: Perry Sandeen <sandeenpa@yahoo.com>
Subject: [R-390] Filter Options II

Wrote: With the exception of watch crystals, the whole industry of sub 1 MHz crystals is pretty much a thing of the past. Yes, there are a couple of people who will make you this or that. You better have deep pockets to get them interested in whatever you need done. Yes, one of them is a buddy, but that only goes just so far.

Yea verily.

My take of the group's replies is that:

1. Crystal filters are out of the question unless one does and up converter/down converter to use some of the commercial filters used in the rice box radios. Probably a real PITA.
2. While ceramic filters can be used, the supply is probably extremely limited, even worse that getting a original Collins replacement filter for the ?A?.
3. Use the Lankford roofing filter mod and stick to a 6 KHz or less bandwidth. For a \$100 or so it is probably the most cost/time effective solution.
4. Convert your ?A? to a R-725 and selling your remaining good filters on epy to help offset the conversion cost. Takes a lot of time and patience to convert the I.F. to 6 volt filaments. (Yes Tisha, I have 3 to do when I get a-round-to-it.)
5. Something microprocessor based would be too complex for the vast majority of us.

Date: Sun, 17 Feb 2013 20:07:58 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filters

Ugh. I've spent the last hour trying to put the wire into the hole in the Teflon sleeve and I can hardly see the wire with +2.25 glasses and a magnifier lamp, much less hold it steady enough to get it welded without touching something else in the meantime. I'm thinking I'm going to have to automate it somehow. My sight is just not good enough and my steadiness is not there either. I think it can be done, it just needs a jig to do it somehow. The wire is so fine any time it touches something it bends and it's magnetic too, so if I drop it, it immediately goes to the

magnet. That's probably why it was outside the copper cup when I took the end cap off. It's almost like I need to put the whole form into the cup with the wire in place while it gets welded. And that means everything needs to be dimensioned correctly while it's inserted.

http://i251.photobucket.com/albums/gg287/DogTi/R390A/filtterwireinsert_zps320e9dba.jpg

Date: Sun, 17 Feb 2013 20:32:56 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filters

Feed it down a hypodermic needle or a glass tube.

Date: Sun, 17 Feb 2013 22:13:47 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filter Options II

I keep coming back to another option:

How many IF modules are there still out there? The world was awash in them a while back. I have a suspicion there are many more out there than one might think.

Date: Sun, 17 Feb 2013 21:39:02 -0600
From: KA9EGW <ka9egw1@britewerkz.com>
Subject: Re: [R-390] Filters

The hearing-aid welding process I spoke of earlier, feeds the wire through a .003" ID glass tube. A hypo needle sounds like it has possibilities...except for that it is conductive; dunno how much of an issue that is...

You're quite right, re-threading one of those drive-rod welders was a PITA job, and type 51S tweezers [like for example Techni-Tool p/n 758TW164] and a 10X eye loupe [Techni-Tool 298IN008] are almost a necessity...

Sorry [and slightly frustrated] I'm not coming up off the top of my head with anything else that comes right to mind...waitasec...how about those glass capillary tubes they let a little blood climb into then stick one end in a clay block to do a spun hematocrit? Would one of those be small enough?

Date: Sun, 17 Feb 2013 22:49:05 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filters

I suspect that the hypodermic approach only woks if you insulate the end of the needle with something. Since the voltage is low, it doesn't have to be anything fancy (paint, wax,?)

Date: Sun, 17 Feb 2013 23:25:15 -0500
From: "quartz55" <quartz55@hughes.net>

Subject: [R-390] Filters

The needle thing would probably work if the wire didn't weld itself to the needle. I am thinking about making a sled arrangement for the Teflon wire shield/painters tape assembly to slide the whole assembly including the wire into the copper cup while the + clip is attached to the tiny wire. I just don't have any access to tiny glass tubes and I still would have to put the wire through it and get it centered. It needs a jig to assemble and weld at the same time. It's impossible to do by hand, at least for me.

In the meantime, I've cut out some foam PE from the hardline and was not impressed with it's temperature resistance. I put the butane flame on it and it melted and caught fire. However 2 layers of the stuff seem to make a good spacer. This is just a rough attempt. I doubt if it would disintegrate like the original stuff. http://i251.photobucket.com/albums/gg287/DogTi/R390A/filterfoamPE_zps38cb6c27.jpg

It's a bit stiff, but it certainly has high resistance. I may try putting it in a tube and soldering next to it to see what it does. Actually where it sits in the outer tube is about a half inch away from the ends. Some judicious use of water soaked towels may do the trick, not unlike the label. Maybe I could also make a ring of Teflon around the perimeter to help keep the heat away from the foam and forget about the card material. But the card would sure make it easy to slide into the outer tube. Actually my pieces of Teflon may work like the card material, I'd just have to make strips instead of a solid tube.

I re-read Graham, G8OAD's article and once I've taken a filter apart, it makes a lot more sense. He answers a lot of questions if you read it carefully. I'm thinking about forgetting the tape around the magnets, mostly because I don't have any. The magnets are attached plenty good, I can't imagine tape is going to help. I do have some mylar tape I could put over it.

Date: Sun, 17 Feb 2013 22:09:01 -0800 (PST)
From: "Drew P." <drewraille807@yahoo.com>
Subject: Re: [R-390] Filters

> Another thing the filters share a background with are the Vibrasponder /
Vibrasender PL tone reeds used in FM two way gear. [snipped]

Another IF filter solution similar to that used in some old FM two way gear could be used - a big bunch of cascaded LC tuned circuits like the old "Permakay" filters. These would occupy much space and hence would limit you to perhaps 2 bandwidth choices within the space inside the filter cover. Bandwidth curve shape would not be as good as the mechanical filters, but would be much better than a flat zero non-functional filter. I am following this thread with interest as I have a Stewart-Warner with a defunct 4 kc "mechanism a philharmonic".

Date: Mon, 18 Feb 2013 06:48:01 -0600
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: Re: [R-390] Filters

That is what is great about this group. Coming here to learn things.

Date: Mon, 18 Feb 2013 13:38:29 +0000
From: William A Kulze <wak9@cornell.edu>
Subject: Re: [R-390] Filters

>There's also a perfectly good IF output jack on the back of the radio to attach a
>"gizmo" to. No need to chop up the radio at all. If you get to the point where there
>are no filters at all, jumper one position and use the IF output...

I've been using that IF output to feed a winradio. I never use the 4kHz filter, I use either 8 or 16. With this new DVB-T dongle, an up-converter and a PAL-F adapter, you could have the whole setup for well under \$100. Legendary R-390 (a) front end, full DSP capability.

Date: Mon, 18 Feb 2013 08:58:59 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filters

Ok, that gets us off into another rabbit hole.

The FM filters were indeed amazing things. To me the most amazing part of it was watching the line girls (in that era, yes indeed the entire line was staffed by "female associates") align one. 16 - 24 stagger tuned poles, very simple tools. No automation, just manual tune up. They went from nothing to a perfect filter in under a minute. Truly amazing. When one mentioned aligning an R-390 to the same people, the reply was - "bring it in, we all worked on them to?" (the rest of the concerning the relative skills of a certain junior engineer compared to the line assembly team is not suitable for a family oriented list).

Sorry for the digression ?

The Q of the resonators in a big pot core filter is much lower than the Q of the resonator disks in a mechanical filter. That makes the LC filter very good for a nice broadband FM IF filter. Another minor issue is the coupling between resonators. The mechanical's have a very tough time doing the sort of linear phase that an FM IF wants. Simple answer - there's a reason you don't see mechanical filters in FM radios. The flip side is that the high Q / low coupling of the mechanical makes them just the right thing for more narrow filters. SSB is more tolerant of phase / delay ripple than FM. Mechanical filters are fine for an R-390A. A narrow mechanical will have less insertion loss than a narrow LC filter (higher Q counts). With a gain stage or two you could fix that. It would make straight drop in a bit more complex. Lots of rabbits to chase?.

Date: Mon, 18 Feb 2013 09:17:59 -0500 (EST)
From: djed1@aol.com
Subject: Re: [R-390] Filter Options II

Probably a lot of filters out there- I have a set of spare filters stashed away. What I don't know is whether they are deteriorating as they sit in the box. My R-390A has been in my possession for 30 years and has seen light use all that time. I

hope that the deterioration of the foam in the filters is somewhat related to the operating temperature.

Date: Mon, 18 Feb 2013 08:31:47 -0600
From: Les Locklear <leslocklear@hotmail.com>
Subject: Re: [R-390] Filter Options II

Here are a couple of articles on using the Kiwa filter modules on various types (tube and solid state) receivers.

<http://kiwa.com/errvw.html>
<http://kiwa.com/goodwin.htm>

Date: Mon, 18 Feb 2013 09:38:01 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Stagger Tuning and IF craziness

The loaded Q of the driver coils is indeed in the vicinity of 33 (input resistance 100K ohms, resonating cap 120 pf, $120 \text{ pf} = 2916 \text{ j ohms at } 455 \text{ KHz}$). Since the 3 db bandwidth is F_c / Q you get $455 / 33 = 13.8 \text{ KHz}$. That's just for the driver coil on one end. The Q of the coil it's self, unloaded by the filter is significantly higher. In order to be "much wider" than 16 KHz, you might want 160 KHz on both ends. $455/160$ gives you a Q of 2.8. For an input resistance of 100K ohms, that would be a resonating capacitance of ~ 10 pf. In order to hit something like that you would need to tune the input to each filter. That's not something the Collins guys wanted to do. Eight more trimmers cost money, and take up space.

Bottom line - yes the coils do get into the bandwidth of the IF filters to a greater or lesser degree. The response is a composite of the driver coils and the disks. You don't want to do anything dramatic to those coils. You will certainly mess up the passband of the wider filters if you do. The whole filter was calculated / designed with the impact of the driver coil Q's taken into account.

Date: Mon, 18 Feb 2013 09:47:59 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filter Options II

They sold a *lot* of those IF decks with filters on them. A lot of people bought "more than one" for spares. I certainly did. I have absolutely no idea what shape the filters are in. I'll dig into them when I loose a filter?.

Date: Mon, 18 Feb 2013 08:57:32 -0600
From: Cecil <chacuff@cableone.net>
Subject: Re: [R-390] Filter Options II

I would expect NOS filters to be about like NOS paper and electrolytic caps....to have aged just the same as an in service part...and possibly worse. Just my thoughts though...

Date: Mon, 18 Feb 2013 10:15:30 -0500
From: Bob Camp <ham@kb8tq.com>

Subject: Re: [R-390] Filter Options II

One very real question is - do some batches of filters hold up better than others?

The "stuff" turning into goo should be just as detrimental to a 16 KHz filter as to a 4 KHz filter. Neither one will last long hanging from the support wires. We have a lot of data that 4 KHz seems to fail much more often than the rest. I'm wondering if either they had a bad batch of 4 KHz filters or if they had to open them for re-tune more often than the rest.

There may be a population of filters out there that will last a very long time.

Date: Mon, 18 Feb 2013 09:45:27 -0600
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: Re: [R-390] Filter foolishness

Quote; Bob Wrote:

"The loaded Q of the driver coils is indeed in the vicinity of 33 (input resistance 100K ohms, resonating cap 120 pf, $120 \text{ pf} = 2916 \text{ j ohms}$ at 455 KHz). Since the 3 db bandwidth is F_c / Q you get $455 / 33 = 13.8 \text{ KHz}$. That's just for the driver coil on one end. The Q of the coil it's self, unloaded by the filter is significantly higher.

In order to be "much wider" than 16 KHz, you might want 160 KHz on both ends. $455/160$ gives you a Q of 2.8. For an input resistance of 100K ohms, that would be a resonating capacitance of ~ 10 pf. In order to hit something like that you would need to tune the input to each filter. That's not something the Collins guys wanted to do. Eight more trimmers cost money, and take up space.

Bottom line - yes the coils do get into the bandwidth of the IF filters to a greater or lesser degree. The response is a composite of the driver coils and the disks. You don't want to do anything dramatic to those coils. You will certainly mess up the passband of the wider filters if you do. The whole filter was calculated / designed with the impact of the driver coil Q's taken into account."

Yes, that is pretty close to what I was seeing as well, it was a fun exercise to work through. If you played around with significant coil variations for the different filters you are also messing with the insertion loss and might be blasting the headphones off of your head whenever you turned the bandwidth switch. That would be if you were looking at a different set of specifications for each individual filter but would make no sense for a family of filters that should be more or less matched to each other.

I did not believe the Q values at first and had not considered that when first looking at things. The software tool I was using gave me the value but I decided to not emphasize that in what I wrote. Also my values for "k" on calculating mutually opposed impedance of the coils was extrapolated (wing and a prayer) and I was unsure how to consider the magneto-mechanical impact upon the magic wire for the center cheekpiece spacing and coil length (the coils could be compressed into a smaller dimension for a greater flux density).

I was intrigued by their choice of wire gauge, turns ratio and coil spacing. With modern computing methods we could run through in an afternoon what would of taken a room full of people several weeks to calculate by hand. It just increased my admiration of what they did on what is such a small device inside of the receiver. I had to go crack open a few books on acoustics and speaker design to get a better understanding of the magic wire and the dancing disks.

Date: Mon, 18 Feb 2013 12:46:31 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filter foolishness

The loaded Q of the driver coils themselves is far from the whole story. The Q on each end of the test circuit in the filter spec is 1/2 of the Q of the drivers alone. It's still significant if you want to hit your filter passband numbers. Adobe is going a bit nuts at the moment so I can't open my copy of the Y2K manual. Wonderfully buggy software? off to paper copy land.

There's no obvious loading on either end of the filters. The in circuit Q's of the drivers could be anywhere between 33 and 16. Vacuum tube grids rarely are low impedance, so I 'd bet that at least one end is lightly loaded.

The K/Q values for fancy IF transformer sets were a design variable. They generally did a pretty good job with graphical tools to get the design done. Of course most IF strips are pretty simple.

Mechanical or crystal filers were a very different thing. There big rooms full of mechanical four function calculators were the norm. Parallel rooms doing the calc's and cross checks every few hours to catch the inevitable errors. Needless to say they spent a lot of time on any one design.

The best way to look at most IF strips is as a "synchronously tuned filter". "Handbook of Filter Synthesis" by Anatol I Zverev (\$93 on Amazon) is the classic reference on a lot of this good old stuff. Zverev was working for Westinghouse at the same time Collins was designing some of this stuff. One way to look at a synchronous filter is as a K/Q filter where none of the sections are over coupled. In some over coupled filters, you de-q the sections to it into a synchronous filter for alignment.

If you want to do a full computer simulation of the IF strip, Linear Tech's LT-SPICE program is free. It's quite capable of doing a full run up of the 455 KHz strip. You can indeed do the tubes. I'd probably keep it simpler than that.

Date: Mon, 18 Feb 2013 12:25:27 -0600
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: Re: [R-390] Filter Options II

I am guilty of keeping a pristine condition IF deck as a spare module. The same with every other module in the receiver to keep my two active receivers up and running. Squirreled away is a engraved faceplate with handles, a bag of connectors that had been cut-off of some eBay special by a salvager, maybe a half dozen loose filters of unknown vintage and enough tubes, knobs, clamps

and pieces and parts to practically build another receiver (minus the chassis).

I hope the folks who do keep living receivers going have a tiny preserve of spare parts to keep them glowing. If we keep a sense of community then we can help each other out without giving away the bank. Some people have massive parts collections (remember me in your will, LOL) and build or rebuild receivers for a hobby. If Perry ever wants to sell one of his "specials" I would love to have one. In fact Perry has an impressive collection of test equipment too that I have an envious eye for (lol). Ms. Tisha Hayes/ AA4HA

Date: Mon, 18 Feb 2013 14:20:04 -0500

From: Bob Camp <ham@kb8tq.com>

Subject: Re: [R-390] Filter Options II

For a while tubes were the "panic item" on these radios. Eventually we found that the DOD had a panic attack over them as well. Net result is a stack of tubes big enough to keep the radios going in occasional use pretty much forever. That of course assumes there is no nasty fungus that eats tubes or something like that.

Power transformers are another common lose it and you're dead item. Short of a lightning strike, they seem to be pretty durable. Like other modules there are spares running around. We seem to panic over the every time lighting strikes?

We do indeed have or ballast tube issues. Long ago the assembled multitude figured out how to get around that issue. Can I buy one - sure. Would I pay the price - nope. At least I have a choice.

Radios like the R-390(A or not) likely will out live much of what came after them. Integrated circuits have a number of issues that limit their life. Not all of them will die, but the ones that do will be impossible to replace. Lose one and you lose the radio. Might you cobble something up? You might for one or two failures. The most likely to fail parts (CPU's / ROM's / RAM) are also the ones that went obsolete the quickest. We have fun looking for the last stock of filters that was built for 20+ years, they have to look for the last stock of CPU's that were made for 2 or 3 years.

We may not like it, but the market does work in all of these situations. There is indeed a price that you can pay for the last CPU in the universe. As with the ballast tube, it's not one I would likely pay. Just as Fair Radio wants \$1,200 for an R-390A (up from \$125), things don't seem to get cheaper as time goes by. I seem to recall spending \$125 just for partial IF deck long after the \$125 radios were all gone.

Not getting any cheaper, but I believe it's still worth it.

Date: Mon, 18 Feb 2013 19:16:34 -0500

From: "quartz55" <quartz55@hughes.net>

Subject: [R-390] Filters

Here's my plan. I've made this jig.

<http://i251.photobucket.com/albums/gg287/DogTi/R390A/>

filterwirejig_zpsd6465c1c.jpg

All I need to do is put the wire in the shuttle (piece of teflon wire insulation rolled up in painters tape) and attach the capacitor to the filter body and the wire which will be in the shuttle and press it into the copper cup. Of course I'll make a few test runs with just the ohmmeter to see that I just get the wire in just enough to hit the resonator without bending the wire. Dimensions will be very critical. I'll have to glue the rulers to the aluminum track so it's pretty stable so it probably won't be until tomorrow.

If anyone has a better idea, let me know. I'll make some drawings of the dimensions of the cup, wire and shuttle so everyone can have them. You can't believe how small this stuff is, the pictures are deceptive, like 2x. Like I say it's about all I can do to see the wire. I have to keep it stuck to a piece of tape.

Date: Mon, 18 Feb 2013 20:13:46 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter fishpaper/ Foam PE

I really don't want to put the old decomposing fishpaper back in the assembly. It's pretty brittle at this point. What else can I use that may be more stable? I can get some teflon film, but it's hard to find stuff at .006" thick and nothing would stick to it and it won't stick to anything either. It looks like G8OAD didn't use anything. The more I play with the foam PE for the donuts, the more I like it, except for the melting quality, but I'm going to test that. If I can find some thermal paper to replace the fishpaper the foam PE may be just fine.

Date: Mon, 18 Feb 2013 20:22:08 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filter fishpaper/ Foam PE

Archival grade paper does exist. The stuff should be stable enough to outlast the cockroaches.

Date: Mon, 18 Feb 2013 21:01:56 -0800 (PST)
From: "Drew P." <drewrailleu807@yahoo.com>
Subject: Re: [R-390] Filters

Bob Camp wrote: [snipped] "A narrow mechanical will have less insertion loss than a narrow LC filter (higher Q counts). With a gain stage or two you could fix that. It would make straight drop in a bit more complex."

IIRC, the Collins mechanical filters used in the R-390A have a very high insertion loss, even when working as designed. This would be a reason why they were placed AFTER the first 455KHz IF stage. If these filters indeed have high loss, then perhaps no additional gain stage would be required when substituting a many pole LC filter for mechanical. Lossy original filter, lossy replacement.

Date: Tue, 19 Feb 2013 01:59:50 -0800 (PST)
From: John Kolb <jlkolb@jlkolb.cts.com>
Subject: Re: [R-390] Filters

Yes, newer design mechanical filters have low insertion loss, but R390A filters are spec'ed at 25 db max, typical of older designs. I put the data sheet for the F455N-20 filter on my web site, but then for the first time ever, my 300 MB/month bandwidth was exceeded, so I guess a bunch of you found it of interest. Perhaps someone who grabbed it can make it available elsewhere.

"Filters" has been one of the most active threads I've ever seen on any of the groups I watch, and is very interesting. Good luck to you, Quartz, as you attempt this difficult repair - I've never attempted anything more difficult than opening filters, cleaning or repairing coil wires. Hats off to you all who rewind coils.

Date: Tue, 19 Feb 2013 09:04:56 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filters

As I usually do, I was thinking about my project welding the center wire last night in bed. I'm going to revisit the welding process using my jig and the bolt. It would be much easier if I can have the wire in position on the end resonator and then give it the jolt instead of trying to bring it up to the resonator while the voltage is on the wire. It may change the spark energy at the wire because now I'd be getting 2 sparks, one on the wire/resonator and another with the switch or clip contact to the capacitor, which may effect things. Anyhow, bottom line is I'm going to do some more experiments with a fine wire and the bolt before I try the final solution.

Date: Tue, 19 Feb 2013 06:12:36 -0800
From: Robert Fish <rwfish@comcast.net>
Subject: Re: [R-390] Filters

Never weld in bed, it just isn't safe. Sorry I couldn't resist,

Date: Tue, 19 Feb 2013 08:53:38 -0600
From: Tom Frobase <tfrobase@gmail.com>
Subject: Re: [R-390] Filters

Another lesson I have learned in South Texas is not to weld in flip-flops!!

Date: Tue, 19 Feb 2013 10:52:48 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filters

Well, my idea didn't work out so good. It appears the best way to weld the wire is to approach the bolt/resonator with the wire at full voltage. That produces a spark at the point of contact and I've gotten some real good welds that way. Letting the wire touch the bolt/resonator and using a switch or similar just produces a spark at the point of contact with the capacitor/switch and nothing much happens where I want the weld. Now the big problem is holding the end of the wire with something, so I can turn loose of the wire easily after welding. Things are so small it's really hard to manage. Hmmm, maybe hemostats, but I don't want to bend up the wire. After it's welded, I don't want to mess with the wire. I've noticed after one weld, the wire is pretty much shot. Not sure what this nickel wire will do,

but I figure I've probably only got one chance.

As far as the fishpaper, I'm thinking about getting some 1/32" gasket material. Thought about Kapton tape, but that would produce the same non-sticking problem Teflon would. Plus 5 mil Kapton is real expensive. 1 mil is not bad.

Date: Tue, 19 Feb 2013 18:14:20 +0000
From: "Webb, Gary" <glwebb@gundluth.org>
Subject: [R-390] Filters/SDR and the R390A

I have an email folder R390/R390A. Actually several for various topics (read hobbies). Amateur radio, antennas, canoes, fly fishing, fly tying, recipes, etc..

Anyway I dug this one out in case anyone was interested in going the SDR route for their filter solutions. Or just for fun.

<http://www.w1vd.com/R-390ASoftRockdetails.html>

Date: Tue, 19 Feb 2013 15:38:55 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filters

"So what if you cobbled up a 2N-whatever pass device in the line?"

I thought about that, and the first article I found on capacitive discharge welding was an article on welding tabs on batteries. It included an SCR with a foot switch to discharge the cap onto the welding tip through the SCR. I'm thinking I only have one chance at this and I do get good welds from single strands of #24 stranded wire onto a bolt with approaching the bolt with the wire, much like striking an arc weld, but not removing it since it's just a one hit type thing. I'm sure any device in line with the wire/resonator would just pull energy from the weld to the switch and that's pretty much what I found by messing with it.

My biggest problem now is mechanical, how do I attach the wire to something that when it gets welded, I can un-attach the wire without disturbing anything. Right now, I'm working on using some tweezers, but until I get some reproducible methods, I'm not going to try it.

Date: Tue, 19 Feb 2013 15:47:46 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] SDR

I've already mixed the 455 from the R390A IF down to 12KHz, with a 467KHz oscillator (+7dbm) and an SRA-3 mixer to feed my Soundblaster and running 'Dream' on the computer. Seems to work pretty much like the SoftRock, without the SoftRock radio. On my 3GHZ Athalon, I do get a bit of delay, and it was nice to see the numbers with the MGC levels in the article. I haven't done any extensive testing with the setup, but it decoded CW, AM, SSB (both), FM, however I haven't gotten the RDM to work yet. If anyone else has tried 'Dream', I'd like to compare notes.

Date: Tue, 19 Feb 2013 18:08:40 -0500
From: Curt Nixon <cptcurt@flash.net>
Subject: Re: [R-390] SDR

The only real problem is how much bandwidth do you "see" in the IF out. A Softrock set-up right after the first mixer, before any IF filtering lets and you see 100Khz or more of the band at once. It sure is nice tho...even to see what is a few Khz up or down from your set.

I use a SR on my Drake A and B line as a panadapter--works well and is really useful. Comes out right after the first mixer. The technology is amazing. There are guys using those 100 dollar Fun Cube Dongles for 2M EME!! It doesn't get much more demanding on a receiver than that--at least noise and sensitivity-wise.

Date: Tue, 19 Feb 2013 18:45:15 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filters

Thanks for the ideas, yes, I've got the filter innards set in a trough, and the wire I've put into a 'sled' composed of a Teflon center with rolled up tape as the outer cover, I've thought about hemostats, but they crinkle the wire and are too large, I have a small spring clip that has flat 'teeth' so it doesn't crinkle the wire, but it's so small it's hard to deal with, it's too small to keep my fingers on it reliably, alligator clips are just too clumsy and the teeth don't meet that good, the tweezers are also clumsy and too hard to hold together. I'm trying to come up with some sort of clamp/clip that I can slide in the trough while holding the wire on the end of the 'sled'. I thought I could use the end handle of a voltmeter lead, but that has the pointed end and nothing good to attach the wire with, plus it's not exactly centered either.

The other problem is that all this has to go into the copper cup about 1/8" which doesn't seem like much, but we're dealing with 1/10ths of inches here.

Here's the end of the flat clip, the voltmeter probe and the 'sled' with a test wire in it. I've found my close up lens for the camera. That sled is about 1/4" dia.
http://i251.photobucket.com/albums/gg287/DogTi/R390A/filterwiresled_zpsb2481c56.jpg

That clip with the flat ends seems to be the thing, but it's unmanageable it's so small, maybe I can solder some handles on it and make it so it slides in the trough along with the sled.

In the meantime, I may test the 2K filter, $20\log V_1/V_2 = -25(\text{db})$ That's 17.7 (or .0564) for V_1/V_2 if I calculate right. Now I need to know roughly what voltage is going into the filter. It's probably in the order of 100-200uV. My old Motorola RF milivoltmeter will read down there. Hmm, maybe not smallest scale is 1mV. That means if I put 200uV in I should be getting 11uV out. Hmm. Where's that 20db gain amp.

Date: Tue, 19 Feb 2013 19:03:33 -0500

From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filters

We're not dealing with silly 50 ohm systems here. With zero power gain, 1 uV in 50 ohms becomes 44.7 uV in a 100K ohm system. One volt RMS is only 10 micro watts in a 100K ohm system (E^2/R). Hitting the filters with milliwatts is not a good idea, micro watts had better be ok?. If you put a couple of volts RMS into the filter you should get a couple hundred millivolts out of the filter. If you use a scope, that's quite possibly 10 volts p-p in and a bit under a volt p-p out. Scopes with lots of tubes in them can handle those sort of levels at 455 KHz.

Date: Tue, 19 Feb 2013 20:16:52 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filters

Yes, didn't think about the 100K vs. 50 ohms. So, 10VP-P @ 100K would be about 122uW. That's do-able. But since db are db, $20\log_{10}(1/\text{volts})=20\text{db}$, so yes that would be about right if the filter has a 25db loss. Actually I should probably see about .6VP-P from 10VP-P. That's easily seen on my 545A or B.

I'm not sure what my R2005 will put out in volts though. Probably not 10P-P. Maybe.

Date: Tue, 19 Feb 2013 20:33:27 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filters

If you have the RF power, all you need is a transformer / transformation to get the voltage. You could try for a straight transformer. I'd go with some sort of tuned circuit to do the multiplication. A pi network would also be a possible way to go. Cascaded L networks are the classic solution. What ever it is, low Q is the way to go. You can easily get to high a Q and make it to twitchy to be useful. The problem with any single section approach is that the Q limits the maximum transform you can get.

Date: Tue, 19 Feb 2013 20:57:51 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filters

Here's a simple lowpass L network cascade that should do the trick:

- 1) 50 ohm source, one side grounded
- 2) Series L = 53 uH
- 3) Shunt C to ground = 2122 pf
- 4) Series L = 530 uH
- 5) Shunt C to ground = 212 pf
- 6) Series L = 5.3 mH
- 7) Shunt C to ground = 21.2 pf
- 8) 50 K load resistor shunt to ground

output is from the junction of the final R,L, and C.

Each section does a 10:1 impedance transform and ~ 3:1 voltage transform. Which ever section you stop with gets loaded with 500 or 5,000, or 50,000 ohms to ground (depending on how far you go). My guess is that two sections giving you a 10:1 voltage step up should be adequate. The loaded Q's of all the sections are about 3, so you should try for coils with a Q of at least 30.

That all assumes that I didn't slip a digit somewhere punching this all in.

Date: Wed, 20 Feb 2013 07:35:38 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filters

You have multiple filters in the radio. You can indeed loose all of them at once. From what I've seen that's relatively rare. The most likely replacement situation would be swapping out one or two and leaving the rest in the radio. That puts some limits on the insertion loss and bandwidth of the filters. If I already have a working 8 KHz wide filter in the radio, there's no need to replace the 4 KHz filter with a 8 KHz L/C filter.

I still believe that we are a long way from radios that have lost all their filters from wear out. There are still some questions to be answered about why the 4 KHz filter fails. Figuring that out is the real key to all this.

Date: Wed, 20 Feb 2013 13:50:56 +0000
From: William A Kulze <wak9@cornell.edu>
Subject: Re: [R-390] SDR

The way I'm doing it with a winradio isn't something I'd say go out and get one of these for this purpose, but already having it, hey... the idea is the same.

The radio has a bandwidth of 20kHz, but the R-390 won't do more than 16kHz, works out OK. You just need the right amount of attenuation between the IF out and the Rx input. At this bandwidth it's a limited panadapter, but I get AM, AMS, USB, LSB, DSB, ISB, FM, and CW. Plus, I can run 3rd party demodulator software, including DReaM, Power SDR, HD-SDR or SDR-Radio, which is one that Simon Brown is developing. A couple of issues back in QST there was the article regarding the DVB-t dongle, which tunes from around 64MHz up to about 1.7 GHz. The go for \$25 or \$30. The author built his own up-converter with a 125MHz osc chip and a 555 timer, or you can buy one online for about \$50. Software is free, or the adventurous can write their own. Basically DC to 2GHz, all mode, for under \$100.

One nice thing about this approach is that it's not a dedicated setup, you still get the full functionality of the SDR hardware, demodulating a boatanchor's IF out is just one of the things you can do with it.

Date: Wed, 20 Feb 2013 07:01:35 -0800
From: Dan Merz <mdmerz@frontier.com>
Subject: Re: [R-390] Filters

Bob, maybe it's as simple as heat. The location of fl-503 is most interior and only filter with tubes on 2 sides, next to the corners of the cover. Dan

Date: Wed, 20 Feb 2013 10:22:09 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filters

Ok, I've got a good weld on the end of a 1/4-20 SS bolt. I can't pull it off with finger pressure pulling on the end. I'm going to try a few more. This may work.

http://i251.photobucket.com/albums/gg287/DogTi/R390A/filtercenterwirewelded_zps9b214dfe.jpg

Date: Wed, 20 Feb 2013 10:23:53 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Fw: Filters

I think I've figured out the sled arrangement. Now I need a little practice with it. This is much easier to control and it gives me a place to put the clip lead without it interfering also.

http://i251.photobucket.com/albums/gg287/DogTi/R390A/filtercenterwirejig_zps8791c01d.jpg

Date: Wed, 20 Feb 2013 11:49:42 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter wire

I think the wire is getting shorter and shorter. I've tried 2 times, I get a snap, but not full discharge. I'm wondering if once the wire has been welded, it just doesn't want to weld any more. I'm sure it's been stressed on the end and even burned a bit. I've noticed the trial wires I used didn't like welding more than once. I may try once more, but then I think it's going to be just too short. Now where could I find a new piece of wire like this?

http://i251.photobucket.com/albums/gg287/DogTi/R390A/wire_zpsa08cce0d.jpg

Date: Wed, 20 Feb 2013 12:16:20 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter wire

I think it's a lost cause. Everytime I try it, it gets shorter and more brittle. This last time it even crinkled up. It was a valiant effort though and I think the method is about as good as one could come up with, given what I have to work with.

http://i251.photobucket.com/albums/gg287/DogTi/R390A/wire1_zps44b1aaf8.jpg

Anyone have a bad 4K filter I could try re-building with my good coils?

I did get some 1/64" gasket material. It's about .015 thick which is more than the

original fishpaper which was 5 mils, but it seems to have about the same consistency, it burns from the torch the same. It was \$1 for a piece 18x12" at the auto store. Karropak is the name printed on it.

I guess I'll have to move on to the 2K filter, but I need to check it's loss first.

Date: Wed, 20 Feb 2013 17:28:54 +0000
From: Graham Baxter <graham@delphe.co.uk>
Subject: Re: [R-390] Filter wire

Is it worth buying a length of Nickel wire? What is its diameter?

http://wires.co.uk/acatalog/ni_bare.html

Date: Wed, 20 Feb 2013 16:15:07 -0500
From: "Charles P. Steinmetz" <charles_steinmetz@lavabit.com>
Subject: Re: [R-390] Filter wire

That is why I originally recommended grabbing it with the current clamp very close to the end to be welded, to avoid drawing the welding current through the length of the wire. Of course, that would have required removing the copper cup from the end disk to provide access to the disk end of the wire, which would have entailed

its own perils. No free lunch. An exciting and educational journey, in any case.

Date: Wed, 20 Feb 2013 17:37:32 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filter wire

The gotcha is probably that you need to do your practice welds on the real materials. Copper and steel melt at a bit lower temperatures than things like nickel and chrome.

Looking at my junk parts pile, a crud IF deck with filters is a more likely score than a loose 4 KHz filter.

Date: Wed, 20 Feb 2013 18:30:05 -0500
From: Lizeth Norman <normanlizeth@gmail.com>
Subject: Re: [R-390] Filter wire

Have two loose filters one is 4kc the other IIRC is 16kc. To whom do I send them?? They're broken, though. Have three (more) Collins mech filters for the 390a if deck. one 4kc and two 8kc Email me if you'd like one.

Date: Thu, 21 Feb 2013 11:12:48 -0600
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: Re: [R-390] Filter Wire

We learn more from our failures than we do our successes. You put forth a good effort to make it work and it just did not. It tells us that the probability of success in reattaching that little wire is pretty low once it is broken off. Even if you

had managed to make an attachment I would be wondering how much the temper of that wire would of been affected by heat and its ability to transfer mechanical force to the resonator disks. Thanks for giving it a try,

Date: Thu, 21 Feb 2013 09:17:20 -0800
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] Filter Wire

Since you now have nothing to lose, you might as well try other, less-likely repairs. Squeeze as much learning out of it as you can.

Date: Thu, 21 Feb 2013 13:41:47 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filters

Here's what I'm thinking about the magnetostrictive wire. Needs to be welded on close to the contact point. Maybe with less uF and more voltage, need to experiment in this department. I'm not sure what the wire size is, probably something less than #40, which means it's going to be real hard to deal with. I think I could come up with another sled/flea clip arrangement that would reach into the copper cup and weld it on (capacitive discharge) close or even right on the resonator. I don't think it's worth trying to unsolder the copper cup off the last resonator. I'm willing to play with it, but the only wire I find (US) is #34 nickel for about \$8. It might be worth playing with unless I can come up with a 4K filter with only bad bobbins.

Date: Thu, 21 Feb 2013 17:48:53 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filters

It might not hurt to try and figure out what the wire is made out of. It may not be anything very crazy to buy more of. Practicing with the right type of wire is probably the only way to get the weld process right. The ideal weld is one that breaks at roughly the same pull as the wire.

Date: Fri, 22 Feb 2013 13:02:10 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filters

Someone indicated they would send me a few broken filters. I'm going to see what I have on hand before destroying the 4K one I have any more. If I can get it working with parts from another, so much the better. If I find broken magnetostrictive wires on others, I may continue on with trying to see if I can repair the wires.

I'm still looking for more broken filters to play with. What the heck if they're broken and we can learn repair methods?

I'll need to come up with a method of testing them, I have one of those function generator chips I've put in a box, don't know if it goes to 455, but it may, and I think I have some audio amps that may go up there to produce about 10V into

100K.

Date: Fri, 22 Feb 2013 16:13:47 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter inside dimensions

I've posted a pic of the dimensions I measure of the copper cup, wire, bobbin, etc. on photobucket if anyone is interested. Just to keep track. It agrees with G8OAD's dimensions within 1/4". Drawing is not to scale. Wire dimension was taken from when it came out of the filter.

http://i251.photobucket.com/albums/gg287/DogTi/R390A/filterdimensions_zpsad5b2227.jpg

Date: Fri, 22 Feb 2013 19:23:29 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filters

I'd suggest that a signal generator of some sort that will run at 455 KHz is a really good idea. The phase noise of many function generators is a bit nasty.

Date: Fri, 22 Feb 2013 22:33:15 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter testing

Yes, and the function gen only goes to about 120K anyhow. However, the R2005 service monitor I have does put out at least 4VP-P (it really only reads to 1V rms or 3.3VP-P out but cranks up a bit past that), so that may be good enough to work with. I'll just have to put a 100K resistor in series. Plus it tunes in 10 Hz increments and is High Stab, so it's pretty accurate. I'll give it a try tomorrow. If I can get anywhere around .24VP-P out, the filter should be good, but I don't think it will be, because the resistance from the windings to ground is somewhere around 25Meg, much less than any of the others I have. The foam has probably turned to sticky puckity and hopefully that will be an easy fix.

Date: Sat, 23 Feb 2013 10:15:05 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filter testing

Even a simple 4:1 transformer will help you on the p-p voltage. You are close enough with the generator to your target 10V p-p for it to work. Of course 10V p-p is a very arbitrary goal. A lot depends on what your "detector" looks like. If your detector is a scope with a 5 mv / division sensitivity, two divisions would be 10 mv p-p. That would let you test things with 200 mv p-p input.

The resistance to ground is what's going to kill you. The way the AGC is set up you are in trouble with just about any measurable resistance to ground. There are various threads in the archives about rewiring this or that to get around similar resistance to ground issues.

Of course the old school approach to all this also still works. AM modulate the

signal generator at 400 Hz. Use an AM radio with the AGC turned off as the detector. Measure the 400 Hz out of the radio with an AC voltmeter. Since you happen to have a 455 KHz AM radio sitting there?.

Date: Sat, 23 Feb 2013 13:33:00 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter test

Here's my exotic test rig.

http://i251.photobucket.com/albums/gg287/DogTi/R390A/filterjig_zps784c4ade.jpg

Date: Sat, 23 Feb 2013 13:26:18 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter testing

Well, my first attempt at measuring the 2K filter, 4VP-P input (something more than 1V rms) gives me about .008VP-P out. That's over -50db loss.

I do have the 82pf caps in and out, 100K in series in and 100K load. I'm assuming the caps resonate the coils in the filter, but I'm not sure what the values of the var caps I have on them are, they may be a bit small.

I can feed the filter with the service monitor at 455 and at the same time measure the output on the service monitor's scope. It has a resolution of .01/.1/1/10V/div vertical. So it should easily measure the required roughly .25VP-P out with 4VP-P input. My Tec 545 only has .05V/cm resolution min.

I can even sweep the SM output from 450-460, but that gives me a funky output on the scope, it may be sweeping too fast, I can't regulate that.

Given that the resistance of one side of the coils to ground is around 25-30Meg on the Fluke, it registers high loss in the R390A and the test fixture shows 50db, I'm going to pull it apart. I need the practice anyhow.

Date: Sat, 23 Feb 2013 16:08:33 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filter test

If you are running into a 50 ohm input on the "detector" and have a 100K ohm resistor in series, you will see a *lot* of attenuation from that combo. You very much want to run into a 1 meg ohm input on something like a scope.

The caps plus the stray capacitance plus the detector input cap should total to roughly 120 pf. Tuning is a bit critical since the Q is above 10.

Date: Sat, 23 Feb 2013 16:18:47 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter testing

I used the test schematic from the F455N data sheet someone posted here a few days ago.

http://i251.photobucket.com/albums/gg287/DogTi/R390A/filterjigschematic_zps43bdbbebb.jpg

All I did was put a .01uf and a 100K in series with a connector on a Pomona box, installed a Teflon feedthrough and made some leads to solder to the filter. As you can see I put the 82pf caps and the vari cap on the filter and a 100K load on the output. The input is from my Motorola R2005/HS, 4VP-P out and the test leads go to the scope on the same SM.

The 2K filter has the magnetostrictive wires intact. It looks like the foam has just spread around in the unit to make lower resistance, I'm hoping I can just clean it up, re-install the bobbins, put some new foam and gasket material in the unit and solder it back together. The fishpaper in the 2K filter was very brittle and came apart with removal. There was no tape around the copper cups and the bias magnets. The bobbins were held in the copper cups with some hard black glue which I broke loose to remove them. The lugs on the end caps that have the hole in them seem to be welded to the caps because I used them to pull on and they never got loose. I didn't like pulling on the terminals. The butane torch gave up, so I used the propane torch very low and it actually worked better. The foam in the 2K filter was more intact so I could see it covered the whole copper cup and went all the way up to the terminals on the inside, so the 'donut' needs to be about 3/4" long, but when I touch the stuff it turns to sticky black glue. It cleans up nicely with alcohol.

If someone has some 3/4" or more hardline with removable dielectric in it, I'd appreciate some. The 1/2" hardline I have gives me only tiny pieces to work with.

Date: Sat, 23 Feb 2013 18:08:27 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter test

The input should be good, just a 50 ohm line to the N connector feeding the .01uF and the 100K ohm in series to the input of the filter and the associated caps. I'm thinking that should be good.

The output of the filter is loaded with a 100K resistor, per the testing instructions. The output clips are attached to about 2' of RG58 to the input of the SM scope which has a 1Meg input. I'm not sure I have the right vari caps though. When I get the filter back together, I'll be more careful to see if I can get it to resonance. So there's really no 'detector', the SM scope is just looking at the 455KHz out across 100K ohms as far as I can tell. Now there may be some capacitance in the RG58 that could mess with it. I could use a scope probe if that would make any difference?

I could also ground one side of the output to the case which I really have only done on the input side.

Date: Sat, 23 Feb 2013 18:18:41 -0500

From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter repair

I cut some 3/4" pieces out the dielectric in the 1/2" hardline I have, massaged the shape and circularity to fit on the handle of an exacto knife which is about the exact diameter of the copper cup. Used some non-acidic RTV to glue them together in the shape you can see in the picture. Stuffed them in the filter case to let it dry overnight, set on each end of the case. These are going to be my first test 'donuts'. Hope the don't melt when I solder things together.

http://i251.photobucket.com/albums/gg287/DogTi/R390A/filterdonuts_zps9909e246.jpg

Date: Sat, 23 Feb 2013 21:25:07 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filter test

The capacitance of the input amp plus the capacitance of the cable is the issue here. Scope probes get around this by putting a bit of capacitance in parallel with the series resistor. Two feet of RG58 should be about 50 pf. If the scope input is about 25 pf you have a net of 75 pf.

That will give you about 4666 j ohms at 455 KHz. Your 100 K ohm resistor will give you about 27 db of loss into the "detector". That plus the 25 db of the filter comes out to right around 50 db.

Date: Sat, 23 Feb 2013 22:20:59 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Detector

What do you mean 'detector'? I've worked on filters/isolation switches before and granted I'm not using good 'bypass' circuitry, but I guess we'll see when I get the thing back together. I'm no expert here. The thing did exhibit very high loss in the R390A RX.

Could you give me a good example of what the test circuit should look like, in 'real components' with 'real test equipment'? Not j factors. Dave

Date: Sun, 24 Feb 2013 10:34:07 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Detector

What ever you are using to measure the output of the filter is a detector.

A fairly good approach to filter testing:

Input side (option 1):

- 1) Coax (any length) from the signal generator over to the test setup.
- 2) Mini Circuits AD4-6T transformer on the end of the coax
- 3) Terminate the transformer in 200 ohms

- 4) 2 x 50 K (one from each side of the transformer) to filter input
- 5) ~120 pf between the ends of the 50K's
- 6) filter input to the same junction

Input side (option 2):

- 1) Coax (any length) from generator to the test setup.
- 2) Terminate coax in 50 ohms
- 3) 100K to from coax to filter input
- 4) ~ 120 pf cap to ground on filter input

Output side (option 1):

- 1) 100K across the filter output
- 2) ~ 100 pf across the filter output
- 3) High impedance scope probe across output
- 4) Scope probe to scope input. A TEK 2465B would do nicely.

Output side (option 2):

- 1) coax (any length) to 50 ohm scope input
- 2) AD4-6T
- 3) terminate transformer in 200 ohms
- 4) 2x50K (one from each side of transformer) to filter output
- 5) ~ 120 pf between ends of the 50K's
- 6) Filter output to same junction

Output side (option 3):

- 1) Boonton 92 RF Milivoltmeter, probe to filter output
- 2) Cap ~ 120 pf across filter output
- 3) Run on lowest two scales on meter, adjust generator to stay in range

Output side (option 4):

- 1) BC-453 on filter output
- 2) Cap ~ 100 pf across filter output
- 3) AM modulate the signal generator, measure audio out of the radio

In all cases the approach is the same:

- 1) Remove filter and caps
- 2) Replace filter with shorts
- 3) Measure level, that's your zero db point
- 4) Put the filter and caps back in
- 5) peak the caps
- 6) Measure the level

Any input option can be used with any output option.

The key point is to keep any high impedance leads very short. Stray capacitance

is a problem. 1/8W carbon comp resistors are the best thing to use for the resistors. Ceramic or silver mica caps are about the only way to go for the caps. You want a solid ground plans under the filter. PCB material is the normal way to take care of that. Short leads on all the caps and resistors are a really good idea.

Date: Sun, 24 Feb 2013 11:40:43 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter testing

Thanks Bob, I'll try one of those methods when I get this thing back together. I was thinking too, I could eliminate that 2' of RG58 and just connect the clips directly onto the input of the scope. Only scope I have is the SM, Tec545A and B; milivoltmeters, Motorola RF and an old HP410B. Boat anchor stuff you know. I've got an old 'Marka-Sweep' too, I may see if that's still working.

I cut circles out of the gasket material to replace the old end cap fishpaper. A penny seems to be about right and then I cut slices to push the circles over the terminals. Then I trimmed it to fit with a razor knife. The strap from the resonator appears to be trapped under the cap and the filter body. There appears to be a bend in the end of the strap that fits nicely in the groove of the end cap. I'm probably going to drill out the nubbin to install a #4 screw with locktite to seal it after I fill it with the wine stuff I'm getting.

This 2K filter seems to have the magnetostrictive wire welded to the second from the end resonator. That is the wire goes through a hole in the end resonator. I think if the wires in this filter got damaged or fell off, it would be impossible to repair them.

The foam donuts I made were real tight, so I shaved them down a bit, and the RTV doesn't hold real good on the PE so they're setting up again.

http://i251.photobucket.com/albums/gg287/DogTi/R390A/filterendcaps_zpsf160e0d3.jpg

http://i251.photobucket.com/albums/gg287/DogTi/R390A/filterendcapstrap_zps604cd179.jpg

Date: Sun, 24 Feb 2013 12:16:41 -0600
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: Re: [R-390] Filter Testing

Make sure you do not exceed 3.7 Volts or 95 mA through the filters. Those are the maximum rated values for #41 wire in that application (maximum bundled current). (351 mW) Any sort of DC current will mess up your biasing too. I would suggest attaching the case of the filters to chassis ground so you do not have an unintentional re-radiator.

All of this is good stuff, I like your foamy spacers, I like the testing procedures that are shaping up and the results of that testing.

If you could get your generator down below 0 dBm then you could also use an

SDR as a spectrum analyzer/power meter to look at the insertion loss and filter curve if you took care of impedance matching.

Date: Tue, 26 Feb 2013 15:15:19 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter repair

Couple days of hard times.

I was trying to put the 2K innards into the foam donut I had made and snapped a couple of the rods that connect the resonators. I tried soldering the miniscule things back on but was not very successful as you can imagine. So now the copper cup is off, turns out the copper cup goes through the whole last ring that looks like the resonator ring. Here's a pic of the stuff.

http://i251.photobucket.com/albums/gg287/DogTi/R390A/filter2kwire_zps6bc7012d.jpg

At this point all I can do is try to solder the rods/resonators back together, but I'm not holding out for the lottery.

Lesson learned here is not to handle the resonator disks any more than necessary and DON'T PUT ANY FORCE ON THEM. So now I seem to be in the market for a 2K filter or parts too.

Other side issue, the wife's irrigation installers for her gardens pulled their plow through my underground 1 1/2" conduit with my 9086 coax and control cables in it that go to the antenna about 100' away. Needless to say I'm steamed. I did tell them where it was, but I happened to be gone at the exact time they did it. And then they didn't tell me. Not my job!!.

Date: Tue, 26 Feb 2013 18:06:00 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filter repair

The connections between the resonators provide a precise amount of acoustic coupling between the disks. Any messing with them likely will nuke the filter characteristics.

Date: Tue, 26 Feb 2013 18:35:11 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter repair

"The connections between the resonators provide a precise amount of acoustic coupling between the disks. Any messing with them likely will nuke the filter characteristics."

I'm sure, but what have I got to lose except time? I've done lot stranger and idiotic things and sometimes they work (to some degree). About all I have to lose is wasted time at this point. At least I still have another semi-good IF module with all the filters and the 8 and 16 in this one, however both do have

some leakage which I'm sure affects the AGC.

Now how do I re-install those standoffs that are screwed to the bottom of the filter mounting screws without taking off the wires? It was easy taking the screws out. When I replaced Z501, I removed all the wires from the standoffs and re-installed. I actually did a good job, you can hardly tell but there's a bit more room there.

Date: Tue, 26 Feb 2013 18:56:17 -0500
From: "Charles P. Steinmetz" <charles_steinmetz@lavabit.com>
Subject: Re: [R-390] Filter repair

>.....out the copper cup goes through the whole last ring that looks like
>the resonator ring.

Look on the bright side. (1) now you know the outer "disk" is really just a band around the copper cup, and (2) you have a nice clear view of the attachment of the actuator wire.

One take-home point might be, don't make the donut such a snug fit.

Date: Wed, 27 Feb 2013 11:51:00 -0800 (PST)
From: Garry Stoklas <jergar@sbcglobal.net>
Subject: [R-390] Filter Repair

Even before this latest round of discussion on filter repair, I had thought about doing what Dave Curry had done; take a new, modern Rockwell Collins filter, and an impedance matching network and put the whole thing in the case of a bad, unrepairable R-390A filter. Their "low cost" product line has filters of .3, .5, 2.5, 5.8, 7.0 and 10.0 kHz @ 3 db bw. While these bandwidths don't match up with the R-390A 2,4,8,16, they might well be better than the aging filters that are failing. Their "low cost" filters are in a plastic case that is about 1.25" long x .5" wide x .5" high including the pins so they and the matching network would fit nicely inside a R-390A filter case. They have lots of other bandwidths that are closer or equal to the existing filters but they are not "low cost". This discussion got me thinking so I called Rockwell Collins this morning to find out how much the filters are and where to get them. First, you can buy them directly from Collins, they'll even accept a credit/debit card over the phone, and they have no distributors. Second, the "low cost" line is still pretty expensive - \$105.34 in 1 to 4 quantity, \$86.69 5 - 9, \$70.85 10 - 24, and \$60.16 25 - 49. These "low cost" ones are normally a stock item. The closest non-low cost on their filter list they have to a 4 kHz is 3.8 kHz that is also in the same plastic package as the low cost line. Out of curiosity I asked the price of this filter and was flabbergasted by the 1 to 4 price of \$329.05 each. No wonder the Dave Curry filters were expensive and he has stopped making them. Also, many of the other filters are in a metal package that "are too big to" fit inside a R-390A filter.

I have a Kenwood R-1000 that has the tiny Murata filters that I have found to not be all that good. I may buy one of the 2.5 or 5.8 filters to try in that radio to see what they can do. Will let the board know the results if I do.

Date: Wed, 27 Feb 2013 14:59:45 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter repair

Interesting. The resonators in the filter are magnetic, but the ring that's on the copper cup is not magnetic. The magnetostrictive wire is, however. I was trying to think of a way to keep the rings lined up and spaced while soldering stuff together.

I'm thinking if there is nothing more wrong with a filter than leakage, I think I'd not pull the bobbins out of the copper cup, maybe just re-glue it in place with some modern epoxy and clean it up as good as possible. One of the bias magnets came off the 2K filter too, so that will have to be re-glued.

The saga continues. I used to see these R390As when I worked at USM620K, on top of Teufelsberg (American name) in the Gruenewald in Berlin. I was a Monterey Mary, German variety, MOS 058? 63-65. 78th USASASOU, Graduated Army Language School in Oct 63. Went straight to Berlin.

<http://i251.photobucket.com/albums/gg287/DogTi/ocup.jpg>

Date: Wed, 27 Feb 2013 18:20:31 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filter Repair

The skirt selectivity of the "low cost" filters isn't quite as good as it might be. Normally cascading filters is a problem. They interact in odd ways. In this case you need more loss than the filters have. That would let you separate a couple filters with an attenuator.

One cheap / practical approach might be to combine a low cost mechanical with a bit wider ceramic filter. If the ceramic adds 40 db to the skirts, it's well worth it.

More or less:

Ceramic filter	9 db loss
Collins filter	9 db loss
matching	2 X 1 db loss

That would let you run about a 6 db pad. I suspect that it would need to be fiddled a bit to work.

Date: Mon, 4 Mar 2013 18:30:48 +0000 (GMT)
From: chuck.rippel@cox.net
Subject: [R-390] Interested in R390A Filters? PLEASE READ !!

There has been a lot of discussion about surrounding R390A filters. It seems there are a variety of reasons; the 4KC's are falling at the highest rate, when a 2KC fails, that causes the loss of 3 bandwidth positions, the .1, 100 and 2KC. The 8's (really 11KC) fail and I expect that 16's are failing but that is almost a "who cares" unless the owner has a need to receive MUX.

So, there is a need for filters. Here is a possible solution:

Some of you may remember the R390A filters Longwave Products made available a few years ago. I remember they were offered in 3 bandwidths, .5KC, 2.5KC and 6KC; they were priced at \$199.00 each. The Longwave Product filters were not some slopped in after thought. Each was a new design, Collins Mechanical filter which was mounted on a circuit board with that assy enclosed in a machined brass tube complete with a mounting flange and were exact replacements for the stock filter. Longwave built the filters such that the physical isolation between the input of a filter and its output provided by the aluminum top of the IF deck was maintained. This was good stuff !

Unfortunately, Longwave stopped building R390A filters due to lack of interest however, they still sell 75A-4 filters. I've had a sidebar conversation with Dave Curry, owner of Longwave Products. He is considering a 1 time run of R390A filters if enough people roger up and make a commitment in the form of a deposit ahead of time. Let me stress that at this time, Dave is only CONSIDERING building filters ! Its not time to make any sort of commitment to Longwave. Dave has travel scheduled and won't be back for about 3 weeks. We also don't know what bandwidths are available from Collins although I'm sure Dave will try and source 2-3 bandwidths that best accommodate the requests.

Dave is going to have to source the filters and price the machining of the brass enclosure. He did not share what the actual selling price might be but suffice to say, it will probably exceed the \$195 each cost of the last offering. My involvement is solely to engage Dave and suggest he build the filters again and share his initial thoughts with you. How the commitment deposits and filter purchasing will take place will be solely up to him. Here is some information on the filters. I used to have a picture of one but can't locate it just now. <http://www.r-390a.net/Collins-Curry-Study.pdf>

FWIW, I have one of his 6 kc filters that was installed in place of the, (IMHO) "useless" 16 kc. It works wonderfully !! There have been several people who have picked up completed radios from me and I make it a point to demonstrate the filter.

Until we hear back from Dave, each of us needs to decide if we are serious about making a firm commitment. Of course, its ultimately depends on price, the bandwidth(s) available, how many each individual might need, etc..

Date: Mon, 04 Mar 2013 13:46:47 -0500
From: Ron Hunsicker <ronhunsi@ptd.net>
Subject: [R-390] Interested in R390A filters?

Chuck put one of the Curry 6 KHz filters in my R390a many years ago, right after Curry released them. It is a great filter!

Date: Mon, 04 Mar 2013 17:48:13 -0500
From: "Charles P. Steinmetz" <charles_steinmetz@lavabit.com>
Subject: Re: [R-390] Interested in R390A Filters?

I agree regarding the 16 kHz filter.

In today's band conditions, 6 - 6.5 kHz is (IMO) the optimum AM filter. For very noisy conditions, 4 kHz is about optimum. If you live down the street from a strong AM station you like, 8 - 9 kHz with a relaxed shape factor (better group delay) than a mechanical filter is about the best you can do.

If I were choosing four *mechanical* filters with a clean slate, they would be 2 - 2.3 kHz (for SSB and desperate-measures AM reception), 4 kHz, 6 kHz, and 9 - 10 kHz. If I didn't care about SSB but wanted to copy CW, I'd install a filter in the 250 - 500 Hz range instead of the 2 - 2.4 kHz filter. If I didn't live down the street from a strong AM station I loved, I'd omit the 9-10 kHz filter and install both the 250-500 Hz and the 2 - 2.3 kHz filters. If I were making OEM-format replacement filters, I think I'd look hard at ceramic filters instead of the Collins "low-cost" mechanical filters.

From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter repair

OK, I've got my #34 nickel wire today and it's very magnetic, I couldn't find any #40 and I'm not sure I could handle it anyhow. I thought about building up a higher voltage circuit to try welding with higher voltage and much lower cap value, but after trying a few 20uF 700V caps at 150V, the voltage just doesn't stay on them for any time at all, so I went back and used a 13,500uF at 10 volts and it seems to weld the wire on a resonator disk I took out of another filter pretty good. I can't pull it off the resonator with my finger pressure. I also held the wire close to the end of the wire with the clip, like 1/16" or less. That keeps it from bending too while pressing it on the disk. So now I've got to build up a sled arrangement to try to weld the wire on my old 4K filter by pushing the wire and clip way into the copper cup and not shorting anything. Here's my latest attempt, I didn't even try to center it.

http://i251.photobucket.com/albums/gg287/DogTi/R390A/filterwireweld34_zps5c0125c5.jpg

A couple of nice guys also sent me some old broken filters to play with, and a couple of them were the R390A 4K filters. One of the old shiny ones and one of the newer buff type. One has an open winding and the other measures good with the ohmeter, but I'll try it in my new filter test circuit. Maybe I can get one or 2 good 4K filters out of the 3 bad ones I have.

I also got a headband magnifier, my lighted desk magnifier was just not strong enough. I'm set to play with them again, but if it warms up and the weather is good, I have a lot of yard work to do.

Date: Sat, 9 Mar 2013 14:21:25 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter repair

I've got the lost magneto wire welded back in the 4K filter, but as I say, it's a #34, not 40, and the bobbins installed and glued. But what the heck. Anyhow, I'm pretty tired of it today, I've need to cut some more foam PE from the hardline. I find it's easier just to take the soldering iron to fasten together the pieces of PE, RTV doesn't stick, but then I'm using 5 minute epoxy to attach the PE to the filter bodies and the bobbins in the copper cups. I've got all the dimensions for all this stuff and I'll list it later. But here's where it stands now. I notice the bobbin wires seem to have lost some of their covering, so I'm going to mask them and spray them with some enamel so they don't short out when I install everything. It's just a matter if getting it back together now and see if it even works. I'm sure soldering those #40 wires on the end caps is going to be challenging.

I haven't been looking foreword to winding any of those bobbins, but hopefully between all the old filters I have and the broken ones, they can be re-used. They don't seem to be different at least between the 455 models.

http://i251.photobucket.com/albums/gg287/DogTi/R390A/filterassembly_zps90ed7d6f.jpg

Date: Sat, 9 Mar 2013 16:07:47 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filter repair

There is a problem when soldering small diameter copper wire known as "neck down". It's an issue once you go past about number 36 wire. If you cross section the solder joint you can see it fairly well. The diameter of the wire is smaller inside the solder than it is normally. The reason is fairly simple - some of the copper dissolves in the solder.

Here's where the problem comes in - the dissolved area extends *above* the surface of the solder. The diameter of the wire shrinks before it hits the joint. The why gets into how flux and solder do their thing. The net result is that the wire is both weaker and less stiff right at the joint. Motion in the wire (think vibration) will break the wire at the joint.

The solution is fairly simple - dot the joint with something that will stiffen things up. Epoxy works, so do various other fairly rigid plastics. You don't need very much at all, anything that runs up a dozen or so wire diameters is more than enough.

The other solution is to not use copper wire, go to something like steel. Not much of an answer in this case.

Date: Sat, 9 Mar 2013 17:42:41 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Soldering Wire

I'm not soldering the #34 wire. I spark welded it to the resonator. 13V out of a 13,500MFD cap and a short as a lead as I could make. No way to get back inside the copper cup to do anything. It was my only option that I could figure to replace the magnetostrictive wire. What the heck, the filter doesn't work anyhow.

Date: Sat, 9 Mar 2013 20:43:24 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Soldering Wire

I suspect you soon will be soldering the bobbin wire to the headers?.

Date: Sat, 9 Mar 2013 18:19:34 -0800 (PST)
From: Norman Ryan <nnryann@yahoo.com>
Subject: Re: [R-390] Filter repair

I suspect Bob is referring to soldering the bobbin wires to the end cover terminals. This link might be helpful for better understanding the challenge of soldering hair-fine magnet wire:

http://www.microjoining.com/articles/FlashSoldering_Extending_Applications.pdf

(If clicking the link doesn't work, copy and paste to your browser.)

This mechanical filter repair thread is of great interest to me. Sometime down the line I want to try my hand at mechanical filter restoration and hope eventually to have results worth sharing with the group.

Date: Sat, 9 Mar 2013 21:48:14 -0500
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filter repair

Yup, the proper term for a coined block of metal with glass to metal seals in it is a header. End cover = header.

Date: Thu, 14 Mar 2013 17:08:41 -0400
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter repair

I've gotten back to working on the filters today. Got the 4K filter ready to install back in the tube. I ended up gluing the foam on the copper cups, I think I will also glue it to the gasket material, but it looks if the dimensions are right, things should be tight in the tube. I shaved the outer parts of the foam to conform to the size of the gasket material in the tube, so the gasket with the filter assembly in it is a light press fit into the metal tube. I've lost the 57K resistor, it was here a minute ago. Funny how things can disappear off a tablet. The ground strap also fell off the resonator, I can only solder it back on and see what happens. I drilled and tapped a 6-32 hole in the bottom end and cut off a screw. I think I'm going to seal it with RTV instead of Loctite. You can see in the pic, a 6-32 is about as small as you can go to get the inert air bottle straw into it and have space around so the old air can escape. I'm thinking since this stuff is lighter than air, I should hold the hole down and insert the tube from the bottom to let the air escape down and out although it may not matter.

Now if I can solder those tiny wires on the header pins, I'll wrap them so they don't just fall off when I solder the end caps on, although I may just tack the end caps

until I test the thing. As Bob says, I'll put a little glue on the wires where I solder them to hopefully keep them from stressing off. May help with the heat too.

http://i251.photobucket.com/albums/gg287/DogTi/R390A/filter4k_zps7bf4c9ec.jpg

Date: Thu, 21 Mar 2013 14:33:43 -0400
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter repair

I had to take a break and do some yard work, but I'm back on it today. Broke the wires trying to install one side, so back to the drawing board. Too hard to solder #40 end to end, and also too hard to solder pieces together, so I soldered a couple of #34 to the header pins, and then to the #40 wires from the coil. Added glue to all 4 joints and now waiting for glue to dry and see if I can stuff it back in the tube without breaking wires. Then comes the other side. This stuff is about the limit of my seeing, even with the headband magnifiers and also about the limit of what I can hold and maneuver.

Then I need to see if my test setup is working. Maybe I can get this one finished if I don't break any more wires today.

http://i251.photobucket.com/albums/gg287/DogTi/R390A/filterwirends_zpsdab6c395.jpg

Do image codes work in email? That way people don't have to click on the link, maybe the pic will just show up in the email? Can't hurt to try.

[IMG]http://i251.photobucket.com/albums/gg287/DogTi/R390A/filterwirends_zpsdab6c395.jpg[/IMG]

Date: Thu, 21 Mar 2013 22:39:20 -0400
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter repair

Hmm, I may be on to something here. I 'repaired' a FA type filter, and just to test it in my test setup, I shoot 1vrms (2.8vp-p) into the 'repaired' filter and measure out of the thing .12vp-p (.042rms) doing the math, that turns out to be 27db. I haven't checked the BW, but it sure starts to cut off at about 1K high. I've got one of the 4K 390A filters about to be ready to test, I need to tack the end caps in the tube so they don't fall out.

How does this test setup look? I've got the 50 ohm monitor output going to the Pamona box with a .1uf and a 100K ohm in series, a 70pf variable across the filter and on the output the same 70pf variable and a 100K resistor feeding right into the scope input with the clip leads. It seems to peak up fine. I haven't got the grounds set up right yet, but that will come. I'm not sure how many db I can measure for loss anyhow. The proof will be in the pudding.

http://i251.photobucket.com/albums/gg287/DogTi/R390A/FILTERTESTSET_zps3d02da99.jpg

Date: Fri, 22 Mar 2013 07:05:05 -0400
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filter repair

Just be sure to start by replacing the filter with a short, that's your zero db point. You'll have to pop off the caps since they won't have anything to resonate with.

Date: Sat, 23 Mar 2013 11:55:22 -0400
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter test setup

It was not very effective using the service monitor as both the scope (detector) and generator, so I incorporated the RF milivoltmeter as the detector. So, to establish a base line, feeding the 50 ohms out of the SM to a .1uF for DC block, 100K ohms for series impedance matching for the filter, and loading the output of the filter with 100Kohms as in the picture.

First, I tested the output of the SM into the VM with a 50ohm adapter and the VM agrees with the SM within 2db, in 10 db steps also all the way to the bottom VM scale.

Removed the 50 ohm adapter, VM clip lead to the output side of the 100K ohm series resistor, and stepping through 10 db out on the SM, I get only a few db difference on the VM, it takes about 20 db of SM output attenuation to reach a point of 10db steps agreement from the SM to the VM. I attribute this to impedance variations at the high levels??? >From there on the SM and VM agree within 1db until I get to the lowest scale on the VM where probably blowby or extraneous rf is being read by the VM. This gives me about a 50db range I can use to test the filters, which may be good enough to start.

Can someone help me with increasing the range I can measure or is there a better way to set up this arrangement? I do have another RF voltmeter, an HP410D but it reads much higher voltages than the mvolt meter. I also have some various amplifiers I could use on the output of the filter, but they are all 50 ohm input devices.

This FA filter I am testing seems to be working, it was one sent to me and the bobbins were loose and a wire broken. I only replaced the bobbins and repaired the broken wire and it seems to be working as a real 2k filter, but I haven't made detailed measurements on it until I feel confident with the test set.

I have another FA filter that measures good with the ohmmeter, 50 ohms in and out, and good ground with no perceptible feedthrough to ground, but that filter is just not working. These filters would work fine in a R390A filter tube if the mounting stud is cut off and the unit mounted in the tube. If this filter works satisfactorily, I'll try that since my 2K filter seems a lost cause at the moment.

http://i251.photobucket.com/albums/gg287/DogTi/R390A/testset_zps70751df1.jpg

Date: Sat, 23 Mar 2013 13:14:32 -0400
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter test response

Well, I got a response, I only checked it every 0.2 KHz, it appears to be skewed to the high side, but the BW is about right. The IL I measure around 23db, but it may be more than that given my setup. Here's a chart. I only get about 40 db of range on my setup before things start feeding through.

http://i251.photobucket.com/albums/gg287/DogTi/R390A/filterresponse_zps6dc20bb8.jpg

Date: Fri, 29 Mar 2013 11:39:22 -0400
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter repair

Good news. I tested the repaired 4K filter and here is the response on my test set. It measures right at 4KHz at 6db down, if a bit shifted up in freq (50Hz). The 2K is the shifted down about the same. I think that's pretty irrelevant.

http://i251.photobucket.com/albums/gg287/DogTi/R390A/4Krepairedfilter_zps3cae2037.jpg

My generator (SM) only has 100Hz steps, so right now or until I build a VFO, I'm kind of locked into using it. I've been using my test setup with a 2K FA type I repaired and it appears to be very consistent as far as the nose response. I can only get about 30db range with my test set. I'm working on extending the range, and that will come. Given the sharp drop of the skirts, I don't expect the filters not to have enough ultimate rejection or be out of spec. The repaired 2K FA filter appears to have about 16 db loss, the spec on it is 9 db. I don't understand that unless I'm mistaken. The repaired R390A 4K filter has a loss of 0.3V to .022V or 22.6db, well within reason as far as I'm concerned. Now we'll see if it lasts.

Just amazing, I really didn't expect this to work. I'm going to cut off the studs of the FA filters and put it in the R390A 2K tube.

I suppose I should build up a high voltage isolation tester while I'm at it.

Date: Fri, 29 Mar 2013 20:31:38 -0400
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter repair

Here's a picture I never put in my list of how I attached the #34 wire to the resonator. I grabbed the wire (shown is a #26 copper, not the nickel wire) with the flea clip as close as I could to the welding end and pushed it into the copper cup against the resonator after centering everything and a couple of test runs so nothing shorted while I was doing it. Like I said, I used a 33000MFD 50V cap with about 12 volts on it. I used a clip lead on that thick wire soldered to the sled and clamped the copper cup end on the V trough so it was good and stable. I can't believe this worked.

If anyone else wants to try this, I have a hundred feet of #34 nickel wire I would be glad to share. Or you can find it on ebay for about \$6 delivered.

http://i251.photobucket.com/albums/gg287/DogTi/R390A/filtermagnetowiresled_zps60d161be.jpg

Date: Thu, 4 Apr 2013 16:42:10 -0400
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter testing

So it was too cold to work outside today and the Dr. gave me a good report on my yearly physical this morning despite being 70 later this year, so back to the filter test set to try to get more range on my setup. I made an LC impedance matching circuit from the ARRL Handbook, 150pf in series and 780uH to ground should match 50 to 100K ohms, and I put that in a box with the filter matching capacitors. Fed that straight to the filter being careful not to exceed 1V rms. It gave me a bit more range, 50db max with the current setup with things attached to an aluminum ground plane and things grounded to the plane as in the picture. I still get the same measurements on the nose but now I'm down to 50db on the skirts. Only way I can figure to get more range now is to amplify the output of the filter, trying not to introduce more blowby. I may have to go to a piece of copper clad with ground points soldered to the plane and attached to the filter input, the filter body, and shorten up the output leads considerably going into some sort of FET amp. Since I've only got 1V going in, 22 db filter loss gets me to the -10 db scale and the bottom scale is -50, that really only gives me a 50db range accounting for the 10db on the scale.

Maybe I should just not worry about the ultimate filter rejection if I'm getting 50db now? I'm not sure the circuitry in the R390A is any better?

http://i251.photobucket.com/albums/gg287/DogTi/filtertestset1_zps45ebf3c3.jpg

http://i251.photobucket.com/albums/gg287/DogTi/filtertestset1pic_zps12505b88.jpg

Comments welcome. That's the 4K filter I repaired with the new magnetorestrictive wire. I've got an FA filter I'm going to install in the 2K R390A filter tube that reads good at 2.1KHz. I'll get some pictures of that when I get to that one.

Date: Thu, 4 Apr 2013 17:38:42 -0400
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filter testing

If the skirts have a problem, there's nothing you can do about it. Testing the insertion loss and then the first 20 db or so of the roll off will tell you everything you need to know.

Date: Fri, 5 Apr 2013 10:15:21 -0400
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter repair

I moved the pics in my last post to here, in the correct library.

http://i251.photobucket.com/albums/gg287/DogTi/R390A/filtertestset1_zps45ebf3c3.jpg

http://i251.photobucket.com/albums/gg287/DogTi/R390A/filtertestset1pic_zps12505b88.jpg

Date: Sun, 7 Apr 2013 18:26:47 -0400
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter repair

I've been working on the 2K filter today and have some pictures, although I'm not done with it yet. It takes forever to work on a side and glue wires together and repeat the other side. Plus working with the headband magnifier that I have to get up to about 3" to what I'm working on. I'm thinking about getting a pair of the 3.5 diopter surgical loupe so I can get back from the work a bit. Anyhow here's some pics. I cut the mounting studs off, plus the mounting wires to make it fit in the tube. Removed the plastic cover, but that was a given since I had to repair the filter anyhow. On the end view you can see where I glued the bobbin in the copper cup, glued the #40 wires to the soldered side of the connecting wires and the header connectors, added a ground wire from the outside end of the ground and put a small piece of shrink tubing so nothing touched, glued that in place, glued the new fishpaper in place along with the filter body to the tube. Hopefully this thing will still work when I get done with it.

The 4K filter seems fine, I just need to solder up the ends. I did get the skirt measurements down to about -40db. If I can get an amp on the output side of the filter, I may be able to get to 60 or 70 db if I'm lucky. I'm thinking about a LM384 or an fet op amp.

http://i251.photobucket.com/albums/gg287/DogTi/R390A/2kfilterassy2_zps00662ee6.jpg

http://i251.photobucket.com/albums/gg287/DogTi/R390A/2kfilterbot_zps67ec03c8.jpg

http://i251.photobucket.com/albums/gg287/DogTi/R390A/2kfilterassy_zpsf8c9fb21.jpg

http://i251.photobucket.com/albums/gg287/DogTi/R390A/2kfilterassy3_zps57ea1649.jpg

Date: Sun, 7 Apr 2013 21:53:45 -0400 (EDT)
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: [R-390] Quartz55

Do you have a name?
Awesome work you are doing on the filters.

Good luck and stay with it.

I think getting 50 db on the open bench is about as good as you can go in open free space like you are doing. It is likely a good enough test for what we need to know about doing the repair / replacements /re stuffing. Thank you for all the work you are putting into this venture. Roger Ruskowski AI4NI

Date: Fri, 19 Apr 2013 11:21:22 -0400
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter Repair

I found a nice Ungar 47.5 watt 1000 deg. iron on ebay, got it for about \$15. It sure makes soldering the ends of the filters a breeze. I do one side at a time, that is so the whole disk does not get loose while soldering. The filter does get quite warm, but don't know what else can be done. Everything still measures fine with the ohmeter, haven't put them on the test rig yet. I'm thinking this iron will also be good enough to unsolder the end caps without being so destructive with the heat and a flame. I have the iron powered through a standard light controller, so I can crank down the heat, otherwise it gets really hot.

I'm thinking about pulling out the 8 and 16 filters to get the goo out of them although they seem to work, but they do have some resistance to ground from the coils which I'm sure screws up the AGC. Might as well wire them up all together, it looks like a lot of things have to come out anyhow to re-do the filters. There's some parts I just can't get to without pulling things apart, I already have the switch rod pulled off.

http://i251.photobucket.com/albums/gg287/DogTi/R390A/solderiron_zps914e0186.jpg

Date: Sun, 21 Apr 2013 19:32:01 -0400
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter repair
Message-ID: <5329FA31240140F1BAE2480322EFBDEB@DAVE>
Content-Type: text/plain; charset="Windows-1252"

I took apart another 4K filter someone sent me today, mostly for practice. I used that big Ungar iron and just put the thing against the disk on the end with a bit of solder, let it heat up and just pulled the disk off like nothing. The bottom end was a bit sticky because of the ground strap that comes from the disks, but it was much better than heating up the thing with a flame. I've got the thing cleaned up, I could hear the filter assembly shaking around inside the can when I got it, so of course the ground strap was broken off at the filter. One of the coils visually looks good, I haven't checked the resistance, and the other one has broken wires near the coil, I'm still hoping I don't have to rewind it, just add wires to the ones that are broken.

I'm thinking I could repair these things in about 2-3 hours if there is no big issues inside. It took me about 45 min. to remove everything and clean it up, including taking out the coils and cleaning them up. I haven't messed with the tape on the outside nor the bias magnets since they seem stable. All I did was clean the

goop out and make sure none was in the copper disks. Hopefully this thing will go back together easily (I'm worried about soldering on the ground strap) and work satisfactorily. The Ungar didn't bother the label on the filter at all, so that's nice.

If there were a source of foam PE that would easily be worked for the inside, these things would be easy to repair. I'm thinking about getting one of those surgeons loupes that focus out at arms length instead of the close up headband.

Date: Mon, 22 Apr 2013 11:26:11 -0400
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter Repair

Ugh, I had it, the wires on this coil were both broken short to the coil, but I managed to solder 2 #40 wires on the short ends, and I measured 52 ohms and then moving things around the one that goes down inside the coil snapped off right at the notch it comes out of. I tried digging it out, but of course all that did was break it off even shorter. So it looks like I'm going to get a lesson in coil winding, unless I can find one out of the other ones that are junk. The top wire was broken at the notch too, but I managed to pull it up, solder a wire on it and glue it back in the notch, so it worked, but.....

http://i251.photobucket.com/albums/gg287/DogTi/R390A/coilbrokenwire_zps7a702c9c.jpg

Date: Tue, 23 Apr 2013 14:24:45 -0400
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter Repair

I need help with connecting #40 wire together. When I do it, I loop each end, try to crush them on each other, solder them and then glue them with epoxy for insulation and stability. However, these wires are almost impossible to see, even with the headband 3.5x magnifier. It doesn't look anything like the picture, I wish it did, it's looks about half that size through the magnifier and the depth perception is poor, so it's hard to get the pliers to crush the wires together.

Has anyone got a better way to connect these tiny wires, it takes me about a half an hour to do 2 connections? I'm getting a pair of the surgeons loupes so at least that will get it so I don't have to look at them from 3".

Also notice that the glue seems to want to ball up, surface tension I reckon. Is there any way I can get the glue to spread out more evenly on the wires?

http://i251.photobucket.com/albums/gg287/DogTi/R390A/coilbrokenwire_zps7a702c9c.jpg

Date: Tue, 23 Apr 2013 13:38:03 -0500
From: Mike A <mikea@mikea.ath.cx>
Subject: Re: [R-390] Filter Repair

I can't help much on the glue balling up, but think that the visual assist you might

find most helpful for this would come from 5x to 40x magnification through a stereomicroscope. There are several available on the watery auction place, for prices from quite decent through shockingly high. A good stereo microscope lets you see in, well, `_stereo_`. The illusion (or presentation) of depth is usually quite good. No, I'm not selling a stereomicroscope; I've been buying higher-powered scopes.

Date: Tue, 23 Apr 2013 15:58:33 -0400
From: "Charles P. Steinmetz" <charles_steinmetz@lavabit.com>
Subject: Re: [R-390] Filter Repair

All you can do by trying to "crush them on each other" is deform the wire and create weak spots that will be prone to future breakage. Ideally, you would hold the two uninsulated ends precisely parallel and touching, overlapping by the length the ends have been stripped, and solder them. Like this:

```
=====
-----
```

Use a monospaced font to view the ASCII graphic. "====" represents wire with the insulation still on, "----" represents the wire ends that have been stripped. You would move the upper wire down until its bare end is touching the bare end of the lower wire, then solder them. Use enamel (fingernail polish works) or glue to insulate the joint. If you are stripping the enamel by scraping, be extremely careful not to nick the wires. Better to use a solder pot to remove the insulation and tin the ends of the wires.

Date: Tue, 23 Apr 2013 17:25:13 -0400
From: Roy Morgan <k1lky@earthlink.net>
Subject: Re: [R-390] Filter Repair

A trick I have not tried is to press the tiny wire against an aspirin tablet with the solder iron, this gets the insulation off it without any teensy knife work. Then solder as others have suggested: Fastening a larger wire (stranded perhaps) firmly nearby can take the wiggle off the teensy one and prevent more breakage. If you can find the right size wire, it might work well to strip out the old wire (count the turns if possible!) and rewind the coils. Modern insulation/coatings are better than they used back then.

Date: Tue, 23 Apr 2013 18:56:53 -0400
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter repair

Yeah, I like the idea of just stripping them and holding them next to each other and soldering. I'll try the finger nail polish too, it's an acetone base as I remember, I wonder if I would put a drop of acetone in the epoxy? Worth a try to get rid of the surface tension. I was concerned about making weak spots by bending the wires on themselves. I'll try the aspirin too, I've been scraping them with the exacto knife and it's a harrowing experience, especially on the wires from the coils, the extension wires can easily be replaced. I've only been scraping enough to get a good solder flow, not to make it totally clean. I remember in the

70's we used to just clean them with a hot iron, but the new stuff doesn't seem to want to melt off.

Stereo microscope sounds interesting but working under a microscope is about like looking through the headband magnifier at 3". Like I say, I've got some surgeon loupes coming, maybe they will help.

Now the idea is how to hold the wires end to end so I can solder them. These wires are so small and delicate. I'll work up something. The alligator clips on the holder device is not precise enough.

One thing I've been thinking about is when pulling the coils out, put them immediately on a piece of blue painters tape and stabilize the wires coming off the coil. You don't need to be bending these wires any more than necessary. I broke one off as you can see in my previous post, and it was working fine.

Date: Tue, 23 Apr 2013 19:02:44 -0400
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter repair

Oh, by the way, here is the picture I meant to send. It shows my connections.

http://i251.photobucket.com/albums/gg287/DogTi/R390A/wireconnection_zps5b7268ba.jpg

Date: Wed, 24 Apr 2013 09:58:26 -0400
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter Repair

Yes, much better, took me all of a few minutes after I got it set up. The aspirin works good too. It kind of melts and makes a goo that with heat takes the insulation right off. Now to find that other flea clip, the alligators don't hold #40 very good at all.

http://i251.photobucket.com/albums/gg287/DogTi/R390A/wireconnecting_zps2fca99bc.jpg

Date: Wed, 8 May 2013 11:56:17 -0400
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter Repair

Rainy wx so back on the filters. Well, what I was worrying about finally happened. While installing the coils in the copper disk, first one went in fine, 2nd one didn't go all the way in, pulled it out and I'd mashed the magneto wire and broke it off. Tried welding it back on, but like before all I succeeded in doing was making the original #40 wire shorter, so I cut off another piece of #34 and welded that back on. Left it long, installed the coil and then cut the wire off at the end of the coil. I'm hoping this one will work too, but it will be an extra 4K filter for me. All I need to do now is put the foam PE on it and install it back in the tube, solder the wires and solder it shut.

<http://i251.photobucket.com/albums/gg287/DogTi/R390A/>

4krepaiemag_zps407439e6.jpg

http://i251.photobucket.com/albums/gg287/DogTi/R390A/4kreparepair_zps00fbd102.jpg

Date: Wed, 8 May 2013 17:37:44 -0400
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter Repair

I've been breaking too many wires off the coils right at the point where it goes into the notch and it's always the one I can't dig out, so here's what I'm doing to try to forstall breaking more of these little wires. Add some epoxy right on the outside of the coil where the wires come out, there's a bout 1/8 inch before it comes out of the copper cup anyhow.

http://i251.photobucket.com/albums/gg287/DogTi/R390A/coilglue_zps34e89cff.jpg

Date: Wed, 8 May 2013 17:51:47 -0400
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Filter Repair

If you just use epoxy, it will fatigue and fail right where it hits the epoxy. What you want is epoxy first and then RTV over that. You don't need a lot, spreading the bend out over 10 diameters isn't very hard. I spent several hundred hours with a vibe machine figuring that out.

From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter repair

RTV is a good idea. Thanks, it is much easier to remove than the epoxy too. But a #40 wire will most likely be destroyed in either case.

Date: Fri, 10 May 2013 14:08:59 -0400
From: Glenn Little WB4UIV <glennmaillist@bellsouth.net>
Subject: Re: [R-390] Filter repair

Be careful in your selection of RTV. Use only the RTV that cures with Alcohol; and NOT the RTV that cures with acetic acid. The acetic acid curing RTV will eat copper.

Date: Tue, 14 May 2013 11:10:41 -0400
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter repair

I've been looking around for some foam PE that I can use in the filter repairs. Cutting the foam out of hardline is a real pain and it doesn't really fit all that well. It's pretty stiff and I have to glue several pieces together to make it fit correctly. I was looking at the wrapping foam on ebay, but not sure it would be acceptable. There is some pink anti static foam at 'the foam factory' that looks promising, but again I'm concerned about it's suitability. Anyone got a good idea where I can

find some foam that would be good and easier to work with. I was thinking the thinner the better, then I could just cut it in strips and wrap it around the copper cup until it was the proper thickness. Don't need much of it. Other ideas accepted.

Date: Fri, 24 May 2013 10:46:37 -0700
From: Gordon <gordon@n6wk.com>
Subject: [R-390] Mechanical filter Alignment

In this article <http://r-390a.us/R-390A%20Alignment%20v2.htm> , it talks about aligning the *Mechanical Filters*, yet I can't find any of the caps mentioned to adjust! C-564 thru C-571 ? Is this article wrong or am I just missing all of them somehow?

Date: Fri, 24 May 2013 13:59:21 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Mechanical filter Alignment

Have you looked inside the filter cover? If your radio has them, that's where they'll be. Not all units had them, though.

Date: Fri, 24 May 2013 17:59:33 +0000
From: <chacuff@cableone.net>
Subject: Re: [R-390] Mechanical filter Alignment

Not all IF decks had the trimmer caps installed. You probably have an early one. Not much you can do.

Date: Fri, 24 May 2013 11:05:18 -0700
From: Gordon <gordon@n6wk.com>
Subject: Re: [R-390] Mechanical filter Alignment

Yep, cover is off and there is nothing to adjust in there :-(

Date: Fri, 24 May 2013 11:06:37 -0700
From: Gordon <gordon@n6wk.com>
Subject: Re: [R-390] Mechanical filter Alignment

I don't even see them listed in the manual either

Date: Fri, 24 May 2013 11:27:08 -0700
From: Gordon <gordon@n6wk.com>
Subject: Re: [R-390] Mechanical filter Alignment

Does anyone have the schematic showing these caps ?
Maybe I could wire some into my filters ?

Date: Fri, 24 May 2013 14:41:03 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Mechanical filter Alignment

Do you have a copy of the Y2K manual? It doesn't show those on the schematic (at least not in the version I just looked at); however, Table 1-9 does describe those as a production mod.

That manual also has information about the endpoint adjustment (and a LOT of other stuff as well!)

Date: Fri, 24 May 2013 14:44:12 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Mechanical filter Alignment

They are shown in Figure 3-6 in the Y2K manual (just not on the main schematic).

Date: Fri, 24 May 2013 12:43:44 -0700
From: Gordon <gordon@n6wk.com>
Subject: Re: [R-390] Mechanical filter Alignment

I just found them there as well.

Date: Sun, 26 May 2013 17:47:03 -0400 (EDT)
From: Roger Ruzkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] Mechanical filter Alignment

In the beginning there was no adjustment.
Some nice values were engineered and the best cap values were installed.

Some one though service people did not have enough to do and decided that caps to diddle were needed. So trim caps were added. If your IF deck does not have them, then be blessed and leave it alone. It is good as it gets.

You just can not add them in.
They are not needed.

Besides the caps do not align the filters at all. They just get a bit better or not better impedance match in and out of the filter for more or less signal level passed through the filter.

The idea was not to align the filter.

The idea was to adjust the four filters for the same relative power level. And this was not necessarily the maximum power through any of the filters.

Date: Sun, 26 May 2013 17:57:22 -0400 (EDT)
From: Roger Ruzkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] Mechanical filter Alignment

In the beginning there was no adjustment. Some nice values were engineered and the best cap values were installed. The first production runs from Collins did not have trim caps. A fixed value was used. If you have one of these early decks be happy. You have one of the original early IF deck modules.

Look on the IF deck side of your receiver frame. Do you have a set of 4 holes in the side that lets you look at the IF deck where the trim caps under the IF deck could be adjusted? You hope not. So you also know if you have an old early frame (not holes) or a later production frame with holes.

A lot of adjustable IF decks went into frames with no side holes. You tilted the deck out to do the trim cap adjustment. Then late model frames had holes added. Look out for hand drilled frames. Not a problem but you know its a post production change.

Someone though service people did not have enough to do and decided that caps to diddle were needed. So trim caps were added.

If your IF deck does not have them, then be blessed and leave it alone. It is good as it gets. You just can not add them in. They are not needed.

Besides the caps do not align the filters at all. They just get a bit better or not better impedance match in and out of the filter for more or less signal level passed through the filter. The idea was not to align the filter. The idea was to adjust the four filters for the same relative power level. And this was not necessarily the maximum power through any of the filters.

Date: Sun, 26 May 2013 15:26:43 -0700
From: Gordon <gordon@n6wk.com>
Subject: Re: [R-390] Mechanical filter Alignment

I appreciate the tips. I am trying to track down why it distorts on very strong signals. It's as if the AGC isn't fast enough on the attack time. Perhaps my C551 is bad. I seem to have read some where that the AGC is/can be a problem on the 390A receivers.

Date: Sun, 26 May 2013 18:38:04 -0400 (EDT)
From: Roger Ruskowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] Mechanical filter Alignment

In my 25 words or less, the AGC has always been wanting.
Your problem sounds normal.
The Operator solution was to back off the RF gain as needed.
We need to pass this back to Les, and Tisha.

There have been a number of recommended resistor cap changes in the AGC circuit to change the action on specific stages in terms of stage gain for a given AGC voltage. There is another set of changes to adjust the attack and decay times. These are all subjective values to get a sound you like.

Date: Sun, 26 May 2013 19:30:32 -0400
From: k2cby <k2cby@optonline.net>
Subject: [R-390] Mechanical filter alignment

You may be barking up the wrong tree so far as AGC problems are concerned. The most likely failure mode for the AGC bus is a leaky bypass capacitor, not the

AGC delay capacitor C551, which is a very solid unit.

Open the jumper between terminals 3 and 4 of TB-102. Measure the resistance from Terminal 4 to ground. It should be infinity. If it isn't your problem is one of the .005 uF bypass capacitors on the AGC bus.

If the resistance from Terminal 4 to ground shows open, check C543, C547 and C548, all of which are "black beauties" and should be replaced in any case.

Date: Sun, 26 May 2013 21:10:04 -0400
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] AGC

Gordon asked about the AGC problems he is having. It's been my understanding that people think the AGC in the R390A was always not very good and reduction of the RF gain could compensate. I think there may be another problem going on. As the filters age, they have less resistance to ground through the deteriorating foam. Look at the AGC line in the schematic where it's connected to R507 and that resistor is connected to the mechanical filters on the output side which is RF grounded by C512. If you have low resistance in that circuit due to the filters, it certainly will affect the AGC action by dragging the voltage down. All it takes is one of the filters to be non-compliant.

Date: Sun, 26 May 2013 18:19:11 -0700
From: Gordon <gordon@n6wk.com>
Subject: Re: [R-390] Mechanical filter alignment

All of the black beauties have been replaced. I checked from terminal 4 to ground of TB-102 and it is 1.6 MΩ. Does that indicate a leaky bypass cap?

Date: Sun, 26 May 2013 20:37:17 -0700
From: Gordon <gordon@n6wk.com>
Subject: Re: [R-390] Mechanical filter alignment

I find that if I unplug J-208 going to the RF module, the reading from terminal 4 to ground goes to infinity! Seems the slight resistance (1.6 megohm) is coming from one of the caps, C-226, C-284, C-273, C-319 or C-297 in the RF module from looking at the schematic.

Date: Mon, 27 May 2013 03:55:22 -0400
From: "Charles P. Steinmetz" <charles_steinmetz@lavabit.com>
Subject: Re: [R-390] Mechanical filter alignment

>Does that indicate a leaky by-pass cap ?.....

Most likely, yes. That is definitely much lower than it should be.

Date: Mon, 27 May 2013 04:13:02 -0400
From: "Charles P. Steinmetz" <charles_steinmetz@lavabit.com>
Subject: Re: [R-390] AGC

>.....AGC in the R390Awas always not very good <snip>

In a properly-working 390A, the AGC works fine for signals with full carrier (as it was intended to). If there is a general issue with the AGC in a properly-working 390A, it is that, like pretty much all radios of the era, the AGC does not work very effectively on signals without full carrier (e.g., common SSB).

>.....I think there may be another problem going on. <snip>

If the AGC is not working properly, the prime suspect is leakage to ground on the AGC buss. This can be from leaky capacitors, spilled coffee, or, as Dave says, deteriorating filters. The point is, find the leak and fix it. So far, I have not seen an epidemic of leaky filters. However, it is possible that the examples we have seen are a harbinger of things to come as the radios continue to age. (Now don't you wish you'd bought a 390 instead of a 390A....)

Date: Mon, 27 May 2013 08:41:36 -0400
From: Bob Camp <ham@kb8tq.com>
Subject: Re: [R-390] Mechanical filter alignment

The reading you get will depend a lot on the ohmmeter you are using. Ideally it should read above 100 meg with -10V on the line. You will have significant trouble below 10 meg.

Date: Tue, 28 May 2013 00:14:10 -0700 (PDT)
From: "Drew P." <drewraille807@yahoo.com>
Subject: Re: [R-390] Mechanical filter alignment

>.....Does that indicate a leaky by-pass cap ?"

A reading of 1.6 megohm is not far off from what it should be. There is a voltage divider of 270k then 1.5 meg to ground in the RF deck.

Date: Wed, 12 Jun 2013 07:59:34 -0400
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter Repair

I'm still looking for a good replacement for the deteriorated foam in the filters. The foam PE from the hardline is adequate, but it's really hard to work with. If I could find thin strips of the stuff that would be great, I could just wrap it around the copper cups until it's the right diameter. I've been procrastinating because it's such a pain working with the hardline foam. I've found some PE at McMasters, but there's all sorts of PE and I'm not sure what their stuff is, it could be as hard as a chopping block.

If anyone has a good idea of stuff to use, let me know.

Date: Wed, 12 Jun 2013 09:41:18 -0400 (EDT)
From: Gordon Hayward <ghayward@uoguelph.ca>
Subject: Re: [R-390] Filter Repair

I forget the name of the company (might be Gore, the makers of Goretex), but there is a teflon foam (fairly dense but easily pliable) that's used to seal valve stems and flanges. It comes as a rope about 1/2 inch thick. You'll only need a promotional sample to do several filters. I don't think that stuff will ever deteriorate. Good luck doing a web search

Date: Wed, 12 Jun 2013 13:02:18 -0400
From: Roy Morgan <k1lky@earthlink.net>
Subject: Re: [R-390] Filter Repair

Arrange two blocks of wood bolted together with two (or more) holes drilled through the place the blocks come together, differing in the amount they overlap the joint. The holes are the same size as the hardline or coax insulating foam (after the outer jacket and/or braid have been removed). Sandwich a razor blade or utility knife blade across the hole and draw the wire through the hole to shave off a layer of the foam. You'll have a more or less thin strip of insulation foam that may well be easier to work with.

(It might be easier to use a woodworkers plane set for a coarse cut to shave off the strips while laying the coax center foam/conductor on a flat surface.)

A similar tool can be made to score the outer jacket of flexible coax for easily stripping as part of recovering the outer braid for use in grounding your radios or towers, or in making RF connections in a band crusher linear amplifier. The tip of the razor blade or knife blade pokes into the hole just enough to score the outer jacket and not cut the underlying braid.

A flattened piece of medium or large coax braid would do a much better job of conducting RF than the largest wire you may have on hand. Form a hole for mounting hardware at the ends of the braid, then solder-soak the tips to form a good connection. Silver plated coax braid as found in mil-spec coax would be the best.

One company that advertises on the QRZ site makes solid copper strapping that is good for such jobs, also. (<http://www.gacopper.com/>)

Date: Wed, 12 Jun 2013 23:19:18 -0400
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter Repair

OK, I tried stripping a long piece of 1/2" hardline and razored off a long piece of foam to the center conductor. It's a bit narrow and somewhat stiff and cracks when I bend it tight enough to go around the copper cup. It may have to do. I'll try a couple pieces if I can get it to wrap and glue on the cup. I wish I could find a piece of 1/2" tape of the stuff. I found the Gortex stuff, but couldn't find anyplace to get some samples and real buying of the stuff looks like \$\$\$\$. Plus PTFE does not glue very good. I have strips of PTFE, but it's not expanded, just hard strips, but it's flexible enough, but again glue doesn't work on the stuff.

I did try some packing foam PE but it melted immediately upon giving it the heat gun. That wouldn't work. <snip>

Date: Mon, 22 Jul 2013 17:22:11 -0400
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter Repair

Finally got back to finishing some repairs after my back surgery. Finished the extra 4K filter, I broke one of the magneto wires and had to repair that, fixed the coils and replaced everything and got this response. http://i251.photobucket.com/albums/gg287/DogTi/R390A/4K2filter_zpsd0ca77b6.jpg

It looks a bit narrow on the high side and may be out of spec as far as the min/max variation. I don't know how to read the info in the filter data sheet. I'm looking at 'Filter Response' part, it lists freqs as F6H-F6L, and F60H-F60L as well as 20 and 40. I only have the data sheet for the 2K filter. Bottom line is I'm wondering what the variation within the bandpass portion is supposed to be. This filter appears to have about 7 db variation in the bandpass. I have no clue what it originally did since it was not working when I got it. Insertion Loss with this filter is 25.5db.

I'm thinking I'll sell this filter to fund some items for the test setup. I still can only get to about 36db before I run into feed through. It's probably the setup, not the filter, but I need to make sure. I'm going to try a FET input amp to see if I can boost the output of the filter into the Moto (Boonton) meter. I'm already pumping about a volt into the input.

Next project is to remove and 'fix' the 8 and 16K filters although they are still working, but I bet they have leakage and will affect the AGC. I might as well since I already have 2 of the filters and the switch assembly apart.

Date: Thu, 2 Jan 2014 16:10:43 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] AGC/filters

Just to add to the confusion. The module I was repairing the filters in, I installed the repaired 2K and 4K filters and the agc line in that IF was measuring around 50Meg (pin 6 J512) with my Fluke 189. The good module measures in the hundreds of Megs. I'm getting some confidence that this 189 will measure good Meg resistance without the need for high voltages. So something's amiss. Started removing resistors and no results, it appears that when I installed the FA filter in the 2K tube, one of the tabs hit the plastic base inside the filter, discovered after removing the end cap, hope I can get it back together I don't have another 2K filter, I'm going to take the dremel and see if I can grind off the plastic so I can install the cap without the wire tab hitting anything, that brought the resistance from that coil to ground to about 50 Meg. The 8K filter is also around 60Meg, so it's apart now being repaired, just lots of goopy stuff from the old foam. Hopefully this will bring the agc R back up to the hundreds. We'll see.

I'll also do an expos? on repairing filters that only have isolation problems, I didn't do much to the 8K filter other than take it apart, remove the goop and I've got some hardline foam glued to the thing and ready to install back in the tube when the glue dries. This only took me about 3 hours but I had a bunch of stuff ready.

The proof of the pudding is going to be soldering the #40 wires back on the end tabs. The 16K filter coils are still measuring over 300Meg to ground. You can only do this after removing any wires to the coils. When it's in the circuit, you really can't tell anything.

Date: Thu, 2 Jan 2014 18:00:32 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] AGC/filters

Ugh. The 8 K filter has a 'short' in the coil winding to the center insulator/spacer, so it measures only 20 Meg from the coil to the insulator. The enameled wire must have a break in it to the spacer. Unless I can find a small piece of real thin mylar tape to insulate it, I can't get the isolation needed for that filter. So it's kind of on hold for now. Otherwise everything was easy. I wonder if the clear shipping tape would be thin enough, can't hurt to try.

Date: Sat, 4 Jan 2014 22:45:57 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter Repair

Hopefully some good news tonight. I mentioned I removed an 8K filter to try to get rid of it's high loss to ground resistance (about 20Meg). It was about a 2 day project. I thought I could get done in a day, but things cropped up. Mainly one of the bobbins had resistance from the wires to the insulators of about 10 Meg which meant I had to insulate the whole bobbin from the copper cup, which involved removing the bobbin, wrapping it in mylar tape (clear shipping tape) and re-installing it hoping I didn't crush the magnetostrictive wire, which was successful. However, I found that grease or contaminants on the glass feed throughs in the end caps would produce resistance readings from ground to the coils too, so I had to be careful to clean everything which meant I had to remove the end caps and clean them thoroughly. After all that I now have an 8K filter that I can't measure the resistance from the coils to ground (I've discovered the Fluke 189 will read to 500 Meg) and the coils still measure ~50 ohms after soldering the caps back on the tubes. Tomorrow I'll check the filter on the test set to make sure it's in spec and then hopefully re-install the filters back in the IF module and the AGC will work right. The 2K filter had other issues which I hope to resolve quickly. It would have been a 1 day project if the one coil hadn't had resistance to ground. I'm assuming there must have been a crack or open in the magnet wire enamel that produced the 'short'. Like I said previously, I'll do a photo explanation of the process when I get done. I've got some good pics and I've figured out how to get the filters apart easily and solder them back together without destroying them. If it hadn't been for the problem with one coil, I could have fixed it in about 5 hours, which is still a project, but worth it if you want filters/AGC that work.

Date: Sun, 5 Jan 2014 14:48:51 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter Repair

Great. The 8K filter is working, however, it turns out to be more like a 9K filter. No biggie. Only other thing is it only appears to have 8dB loss in the passband range. All the other filters I've worked on (only 2 and 4 K filters) have had losses

in the 25dB range. Is this typical? I know the spec is no more than 26 dB I think. Here's a plot of the thing with my test setup. http://i251.photobucket.com/albums/gg287/DogTi/R390A/8K6723_zps80cfb0b2.jpg I put a line in at -14 dB (6dB down). My setup is still limited to about 45-50 dB range. I've learned a lot fixing this one, kind of getting the patter down. I don't know whether to go ahead and fix the 16K while I have things apart, which appears to have about 350 Meg to ground resistance. I'm sure the foam has turned to glue like the rest. I can't even measure the resistance to ground on the 8K one now, so it must be beyond 500 Meg. That's quite an improvement from 20 Meg or so.

Date: Mon, 6 Jan 2014 11:07:31 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Collins Filters

Does anyone have any direct information on the insertion loss of the mechanical filters. I have 2 pdf files from Collins, F455FA21 (Plastic type I think), and F455N-20, the standard R390A metal tube type. Both list insertion loss at 25dB MAX. Does anyone know what typical values are? The 8K one I fixed has only 8 dB IL. The 2K and 4K I repaired both are in the 25 dB area. Both R390A's I have seem to produce more 'volume' when switching to 8/16K. I'm going to pull the 16K today and see what it's like and then replace the foam in it.

I have some text with links to pics for the repairs I've done, as soon as I clean it up, I'll be posting it. The pictures are already posted at PhotoBucket if anyone wants to look through them. <http://s251.photobucket.com/user/DogTi/library/R390A/R390A%20Filter%20Repair?sort=2&page=1>

Date: Wed, 8 Jan 2014 13:30:15 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Hook up wire/filters

The #22 solid wire, I've found some silver plated copper wire, actually Silver Plated Copper German Bead Wire. I wonder if that will be satisfactory or should I just get plain old #22 tinned soft copper wire. The price is about the same, nominal, I'm only concerned that the bead wire may be brittle. I also ordered some new clear teflon spaghetti.

I'm getting ready to re-install the filters in my IF module. They're all cleaned up, and I can't measure any resistance from the coils to ground on any of them. I've re-measured all the filters and it appears that the 2K has ~18 dB loss, the 4K ~23, the 8K ~9 dB, and the 16K ~9 dB which puts them all in spec as far as IL goes. Some of them do not meet the variance spec, but I can't do anything about that. The 2K is a replacement with a plastic FA type and has about 6 dB variance and the 4K had the magnetostrictive wire replaced with 4.5 dB variance, and they were both bad/didn't work, so there was no way to know how they originally worked. The 8 and 16K filters were the best with variance, at 3 and 1.8. Cleaning up the foam in the 8 and 16 only made a difference with the resistance from the coils to ground.

I wonder if I can balance the filters by detuning some with the caps, or will that affect the curve? I haven't tried that on my test setup although I still have one

hooked up.

No one has responded to my question about filter IL. Is this because it's been covered somewhere before, or there just isn't much information there?

Date: Wed, 8 Jan 2014 16:33:49 -0500 (EST)
From: Roger Ruskowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] Hook up wire/filters

If the wire will fit and bend it should be good enough. The original function of the trim caps was to match / set the insertion loss of each filter so that as you switched from filter to filter the output of the signal would be the same. We always just adjusted the caps for max on any filter to get all we could get. You maxed the weak filter and trimmed the others back to match. Then set the IF gain adjust as needed.

Peak them all.

Set the IF gain adjust in the bandwidth you use most. AM 8 or 16, SSB 4, CW 2.

Date: Wed, 8 Jan 2014 20:49:43 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter Repair, etc.

OK, I've been playing with these filters for about a week now. I took the 8K filter and tried to run it down in gain but I could only reduce it about 3 dB or so. I've got the 82pf and a 6-120 variable on the output side. The input I'm feeding with a 50 to 100K ohm filter I made up in a Pamona box. It appears that reducing the gain of the output filter with the var cap does change the response somewhat, but I cannot get a 20 dB difference in gain. As far as terminology, I'm using what the Collins filter people are using, "response variation", yes I know the word ripple. Here's a trace of the 8K filter with various settings of the var cap. http://i251.photobucket.com/albums/gg287/DogTi/R390A/R390A%20Filter%20Repair/filter8Kchanges_zpsc3c04b2b.jpg I'm learning a lot about making charts in Excel.

I didn't do the whole response because I have to step through 100 hertz at a time, write it down and transfer it to Excel and make a chart with the numbers. No automation here. But I seem to be getting consistent results, even over time so I'm pretty confident my measurements are fair to good. I've even discovered I can get the isolation of the in/out to almost 60 dB without an amp, so that helps. It just took a bit of playing with the setup. Of course the filters that are already 20 dB down, I don't get that large isolation in to out with those filters.

I'll plug away here and put these 4 filters back in the module that I've already put orange drops in, but I didn't change the 5000pf bypass which I should have done to start with, but the only thing this IF module was having problems with was the AGC and I'm pretty sure it's the low resistance (relatively, like 15-30 Meg ohms) from the coils to ground. But when you add a few 15 Meg in parallel, it starts adding up to real resistance. Plus the 2 and 4K filters were shot.

I have another IF module I may play with when a few other things get done, at

least I've got the filter process down. I've got ceramic caps for that module, those orange drops are just too big to put in the IF module in general, and the filters all work in that module. The ceramics are very small compared; they look like large surface mounts with wires attached. Plus they're a nice blue color. Check it out with the red arrow here next to the OD, that's a .1uf, 630V http://i251.photobucket.com/albums/gg287/DogTi/R390A/ceramic_zpseae5d080.jpg

Date: Fri, 10 Jan 2014 11:26:22 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter Repair

I've pulled apart an early shiny 4K filter. I heated the label with the heat gun and was able to pull it off without messing it up except the glue stayed on the tube, but at least the label is intact. I thought from other articles that the end caps were strapped together, but unfortunately that is not the case, at least for this filter. I hung the filter by the top end cap lugs and tied a 10 lb. weight to the flanges, hoping to pull the tube off, but all it did was pull the top end cap off, breaking the coil wires in the process. One broke at the terminal and the other broke at the bobbin. However, I've repaired that, there was enough still on the bobbin to repair. The innards of the filter seem much better made than the later ones. See the pics, no foam goop. The assembly is held in a metal circular bracket by 2 rubber grommets that are still in good shape. The other problem is the magnet fell out of the top side, that can be glued back in place, not sure about the orientation N/S or if it's even important. The biggest problem is the magnetostrictive wire fell out of the bottom side, but I still have it, if you look carefully at the pic, you can see it. So it looks like I'll be trying to weld the wire back in place. If I can accomplish that the filter may work again. I'm going to try much lower voltage because the last one I tried, I melted it and had to go to a #34 nickel wire.

http://i251.photobucket.com/albums/gg287/DogTi/R390A/R390A%20Filter%20Repair/4Kshiny_zps42290a34.jpg
http://i251.photobucket.com/albums/gg287/DogTi/R390A/R390A%20Filter%20Repair/4kbottommagnetowie_zps3839bed4.jpg
http://i251.photobucket.com/albums/gg287/DogTi/R390A/R390A%20Filter%20Repair/4kshinytopmissingmagnet_zpsc3cd0bf.jpg

Other thing I've discovered is the Fluke will measure conductance in nS. >From 0.1 to 50 nS, 0.1 nS = 1,000,000 MO, 50 nS = 20 MO. Trying to measure conductance from ground to the coils in the repaired filters, I still can't measure anything.

Date: Fri, 10 Jan 2014 19:13:06 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter Repair

I got the early shiny 4K filter repaired. I had to use a coil from the broken 2K filter I had since one of the coils went bad. I dropped the magnetostrictive wire and couldn't find it so I used the #34 nickel wire I have and it didn't take long to fix. The older style filters are actually easier to work on, they are in a metal structure with clips attached to the end caps so I can put the thing together in it's structure

and push the whole thing in the tube as an assembly without messing with the end caps and wires. The response is not great, 8 dB ripple but it certainly is a 4K filter.

This makes the second 4K filter I have fixed that's extra. If anyone needs one let me know. I can't guarantee these things, but I won't hurt you too much. It does take a day to fix them, it was raining all day today anyhow.

Here's the response. Interesting all the 4K I have show a rise at the high end. This one is very sharp on the skirts, but I'm not sure it's the way I measure now with 20 dB more in/out isolation.

http://i251.photobucket.com/albums/gg287/DogTi/R390A/R390A%20Filter%20Repair/4Kshinyresponse_zpsf882abe8.jpg

Date: Sun, 19 Jan 2014 18:48:47 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter Repair

Well, I've installed the repaired filters in the IF module that had the 2 and 4 K ones dead, and rebuilt the other 2 while I was at it. It's now working just like the other IF that appears to have good filters. Measuring the R at S503 rear pin 8 which should be the AGC line at the filters, I measure ~300 Meg ohms on both IF's now (out of the RX). That's a pretty good trick, pulling out those filters and replacing them and it works first time, if I do say so myself. Of course I did a bunch of measurements compared to the other IF before I put it in. I guess I'm anal enough. I notice the 14MHz band is dead though, must be a loose crystal.

The carrier meter drops off with the 4 and 2 K filters, much expected as they have almost 15 dB more loss than the 8 and 16. Now I need to tune it up. Anyhow, I've gotten most of my write up done for 'filter repair' and since I don't have a web page, I'll post it here as text and links to my photobucket account for the pictures. If it can be added to the 'Pearls', I don't mind. It was a project; I'm not sure how many hours I had in it, maybe a week or 2. Was it worth it? No, but so what, maybe it will benefit someone else.

Date: Mon, 20 Jan 2014 07:32:53 -0800 (PST)
From: Norman Ryan <nnryann@yahoo.com>
Subject: Re: [R-390] Filter Repair

Thanks for sharing your work.? I'm looking forward to reading your report and viewing the pictures.? I want to try my hand at filter repair one of these days and will get inspiration from your work.

Date: Mon, 20 Jan 2014 14:08:12 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter Repair

First I'd like to thank Graham Baxter, G8OAD, for getting me started on this and he has a good write up on the procedure here

<http://www.delphelectronics.co.uk/filter390a/>

I'd just like to add my take on the procedure.

What you need.

Fine needle nose pliers or tweezers, hemostats, the usual stuff. 1/32" gasket material from the auto store, couple of feet will do, FelPro or Kerropak is what I used.

Propane torch or similar to remove end caps

Large soldering iron to re-solder end caps, I used Ungar #4036 47 W I tried a 42 W #1239 and it wasn't enough to solder the end caps on.

Vise

Solder of course

Aspirin to remove coating from enameled wire

#40 enameled wire

Solid clip holder to hold things while soldering

Hardline foam PTFE, enough, like Swedish meatballs or Pralines or Jameson?s

Drill and tap for 6-32 machine screws to seal the bottom end cap, #6 will accommodate the straw for the gas.

Can of 'Private Reserve Wine preserver' to put inert gas in the finished filter, thanks Tisha.

Non-reactive RTV, I used Permatex Ultra Blue sensor safe RTV silicone gasket maker

5 minute epoxy

6-32 machine screws cut to about 1/8"

Teflon tubing for #22 wire

#22 solid tinned wire

If you need to replace the magnetostrictive wire, #40 nickel wire available on line or send me a note, I have plenty.

Variable power supply and large capacitor, I used a 13,500 MFD 60WVDC with 10 volts on it.

Small angle iron, piece of single or double sided copper board, flea clip

Time and Patience

You can see all my pictures either here <http://s251.photobucket.com/user/DogTi/library/R390A?sort=3&page=3> or here <http://s251.photobucket.com/user/DogTi/library/R390A/R390A%20Filter%20Repair?sort=2&page=1>

The pictures are self explanatory.

Notice there are two types of filters, the shiny ones and the matt ones. They will come apart the same, but the shiny ones have a split metal tube that holds the filter assembly in rubber donuts and is ultimately easier to work on. The shiny ones have holders for the end caps welded on the inside of the end caps. Most of the rest of the article will be for the matt ones since there seem to be more of them.

First thing is to remove the filters from the IF deck. Obvious what needs to be done there, make copious notes where wires go, I am fortunate and used a second IF module as a pattern but I do have drawings and pictures but the bottom/input notes are suspicious.

I have found it better just to cut the wires and remove components than stick a hot solder iron down in the bowels of these things. Of course the components like capacitors should be removed with all the wires intact, but long jumpers can be cut, there is usually enough to put back on or you can get the Teflon spaghetti and tined #20 wire or add Teflon wire with small shrink tubing if things get too short. You will burn the wire insulation taking them off anyhow, so just cut them. I mark and tag parts with blue painters tape.

The filters in my EAC radio, both the 2 and 4K filters were dead, so there was nothing to lose. The 8 and 16K worked, but the AGC action in this RX was bad or nonexistent. The filter connections have to be removed to measure any leakage from the coils to ground since one side of the input/bottom end of all the coils are at ground and there is only about 50 ohms of DC resistance in the coils. The output side has a common line for the AGC and the output is connected to S503. There again one side of the coils is connected to the AGC and it's impossible to measure out one filter. The 8 and 16 K filters I had measured about 20 Meg to ground at the coils out of the circuit. After repair, I could not measure the resistance, above 500Meg. I'm using a Fluke 189 and it seems capable of measuring these high resistances, you may need another method if you don't have a real good DVM. I ruined the 2K filter by breaking the rods so I replaced it with an FA 2.1K plastic type inserted in the can. The 4K filter had a broken magnetostrictive wire; it was laying in the goop when I took it apart. I couldn't measure it with my calipers. I managed to spot weld a # 40 nickel wire back in its place and the thing is working so far. That magnetostrictive wire must be about #50 because it's impossible to spot weld back on, it just melts. I'd like to know how they made these filters.

If you suspect your filters, I'd recommend removing them to test them; it's about the only way to make sure unless someone has a better idea. Once the filters are out, I'd suggest only doing one filter at a time unless you are real good at keeping parts separate. Each one you do will get easier.

The end caps are removed by clamping the filter at the mounting extrusions in a vice, maybe even with a right angle plate in the vice so you can catch things. The ground tab on the end cap appears to be solidly attached to the cap so I use some needle nose pliers to grab that to pull it off when the solder melts. I try to avoid messing with the terminals as much as possible, **DON'T PUT THE PROPANE FLAME RIGHT ON THE TERMINALS**. Wrap a piece of wet paper towel folded to the size of the label to protect it. It makes the top end cap hard to remove, but it's worth it. Heat the end cap more than the tube. Try not to jerk the cap out or you risk breaking the wires off the bobbins. Position your pliers and your hand so it will pull the cap out just a bit when the solder melts, you don't want to jerk it way out possibly breaking the wires at the bobbins. Perhaps rig up a lever arrangement by the vice. Twisting across the tube axis helps.

When you get one end cap loose, cut the wires right at the end cap terminals and set the cap aside, do the other end.

Now remove all the goop you can with a small screwdriver, or whatever you feel appropriate. You can get the goop out all the way to the fishpaper circle that is at the end of the copper cup, which is where the rods and disks start. Object is to get out as much goop so it doesn't get into the disks before or during removing the assembly.

Once most of the goop is out, pull the filter assembly out of the tube. Grab the assembly by the copper cup end to pull it out, make sure the ground strap is loose from the tube. Don't pull on the wires or the tape that's sticking out of the copper cup, you'll risk pulling the wires off.

Notice the ground strap is on the bottom end of the filter and is on the Collins name side of the label, as well as the ground lug, and the terminals on the end caps line up with the screw holes in the mounting tabs. You will need to know this when replacing things.

The thing you want to do **RIGHT NOW** is put some RTV (non-reactive type) on the wires where that little yellow tape is sticking out of the copper cups if the magnetostrictive wire is good and you can measure ~50 ohms across the coil. Clean around the wires as needed, but as little as possible. Don't get it in the center hole or around the bobbin in case you have to remove it. The object here is to keep the wires from breaking at the bobbin which will be impossible to repair if they do.

Apparently the bobbins can be re-wound, but I haven't done that yet. If any glue is loose, remove it and if needed use some new 5 minute epoxy to repair anything that needs it. I've had the magnets come off so if you want, add glue to hold them on. **DO NOT TOUCH THE RODS AND DISCS** if at all possible. Handle the module by the copper cups with the yellow tape over them. The rods and disks are quite fragile and if you break/bend anything, that's it, it's over. Hopefully you won't need to clean the rods and discs, but look for crap in between them and if necessary clean it out with maybe a #32 wire or some air.

Now is a good time to clean up the end caps, remove the resistor at the top/input end, try cleaning it without alcohol or it will take the color off, measure it and make

sure it's what it says it is, take a close up pic of it, the colors will be easier to see. I found the 8K had a 100K, and the 16K had a 57K, I forget what the 2 and 4 had. Consider replacing the resistors. Drill and tap a hole in the bottom cap for a screw of your desire but the straw for the inert gas needs at least #6. Pull the old fish paper off the end caps and from inside the tube, clean up all the residual solder so you can get the things back together easily. While the RTV is setting up, use a dime to outline with a pencil and cut it with some scissors inside the line. Gauge where the holes need to be for the terminals with calipers and make an X with an Exacto knife and push a knife through to make sure the terminals will go through. After installing the disks back on the end caps, make sure to drill a hole for the inert air. Clean out the fish paper from the tube and clean out the tube and remove all the solder you can, I knocked it out with the propane torch and a cut it out with a utility knife. Cut a rectangular piece of the gasket 2.5 long x 2.6 Circumference (nothing critical, but not too long) and wrap it in a circle so it will form inside the tube.

Now clean all the loose goop off the filter, I used an acid brush with the bristles cut short and alcohol. Don't soak the yellow Mylar tape on the copper cups on the ends, you don't want to remove that if possible, unless something else is fallen out or the magnet or magnetostrictive wire needs fixing. You should be able to get everything pretty clean and no sticky goop around. I left the circular fish paper spacers in place; it makes a gauge to fit the PTFE foam back on. You'll need some PTFE foam insulation. Only thing I had was some 1/2" hardline, I stripped the copper shielding off it, not easy, but with some side cutters and perseverance you can get the foam and center conductor out. Take an Exacto knife and strip off a piece cutting it against the center conductor like you're stripping electrical wire, you will have a long strip about 1/8" thick and 3/16" wide.

Now cut pieces off the rest of the foam from the center conductor, you will need to start cutting the foam against the conductor and just peel it away with your fingernails and keep cutting against the conductor, finally you will get a piece off, maybe 1/2 to 3/4" long depending on how long you scored it. I used the thicker pieces glued right on the copper cups/yellow tape, not against the magnets and the thin piece on top of that to bring the dimension up to the thickness of the inner diameter of the tube/gasket material. I used a couple of small clamps to hold the foam on the copper cups while it was curing. You should be able to put the whole assembly rolled up in the gasket material now and test fit it in the tube.

Some (all?) filters have resistors in the top/input side. When you remove them, make a note of what they are and replace or reuse them. At this point the end caps should be clean and the tube too so the end caps will easily slide onto the tube. Wrap the new fish paper around the assembly with the insulation and slide it into the tube, make sure the ground strap is on the bottom end and is at about a 45 degree to the mounting tabs with the outside ground lug on the Collins name side of the label, check the pictures, a test run is advisable here, but it wants to be tight, but it can also be glued in place with epoxy. To replace the wires, I clean the ends from the bobbin with the aspirin and solder for maybe 1/8" or so, install 2 new #40 wires on the end cap terminals wrapping at least 3 turns around the terminal in case the solder melts while finishing the caps. Make sure the fish paper is replaced, the resistor in place, the hole drilled in the bottom cap and then I make the wires from the terminals short enough to just reach the wires from

the assembly. Then holding the end cap with a clip, solder the wires back together. I use RTV again to insulate the soldered areas and also on the terminals to prevent too much flexing.

Let this set up for a while, have some Swedish meatballs or Pralines or Jameson's and put the end cap back in the tube and now measure the terminals to ground, it should be well above 500Meg and the terminals should be in the vicinity of 50 ohms. If all is good at this point, tack solder the end cap on and then do the other end same way. Measure again to make sure there are no shorts or breaks. I would test the filter at this point in a test fixture for bandwidth and IL. Then solder the end caps back in place with a hot iron and the wet paper around the label again. Clean it up with alcohol and make sure all the measurements are still good. It should be good to go at this point. I found that grease and junk will contaminate the glass insulated terminals, so they need to be real clean before and after assembly or you will be measuring low resistance to ground (20Meg or so).

I had one bobbin that measured about 20 Meg to ground no matter what I did. Apparently one of the #40 wires in the bobbin had some broken enamel and was showing low resistance. I had to remove the bobbin, wrap it in some Mylar tape (the clear shipping tape) and re-install it back in the copper cup. Not easy to do, but possible, the hardest thing to do is get the Mylar tape tight against the bobbin, try rolling it together on a hard surface and holding the first end with tweezers.

If you need to remove the bobbin, you will need to break it free from the copper cup, use something like an Exacto knife and go around the edge inside the copper cup, break away any glue, pry against the bobbin and the copper cup and finally it will break free, then you need to hope you can pull the bobbin out with that little yellow tape. But I've done it several times. Then you need to hope when you put the bobbin back in you don't crush the magnetostrictive wire, and I've done that too.

At this point it would be suggested the filters be tested in some arrangement before replacement into the R390A. I have a R2005D Moto service monitor that puts out +10 dBm or so, steps in 100 Hz, I made an LC matching circuit from 50 to 100K ohms to match the filter input and use a Motorola RF meter (Boonton) to measure the output with a 150pf variable capacitor and a 100K resistor. I have the plans for that circuit if anyone needs it, it's good to about 60 dB, but I'd rather have more.

Now finish those Swedish meatballs, Pralines or Jamesons.

Magnetostrictive wire

If you have a broken magnetostrictive wire or you break one loose, I haven't had any luck welding the original back in; it seems to melt before it gets stuck on the end disk. So I use #40 nickel, it seems to work. Make up a sliding arrangement so you can grab the #40 wire with a small flea clip as close to the end as possible, make a bunch of test runs sliding the wire into the copper cup so nothing but the end of the wire touches the end disk. Notice the copper cup has a hole in the back end of it and the last cone is attached to the copper cup, so you

are trying to weld that wire onto the last cone. After making sure nothing shorted and things were centered as best as I could arrange, I charged up the 13,000 MFD capacitor to 10V, attached clip leads to the assembly and the sled, slid the flea clip into the copper cup and you will get a spark. Open the flea clip and pull the clip out and hopefully the wire will be welded to the end disk. I've done 2 that have worked, so it's not impossible.

Bobbins

I haven't tried re-winding bobbins yet. G8OAD has, so see his article. I figure that 48' of #40 wire is 50 ohms, but Graham says it's two 610 turns, alternately in the bobbin. Graham states that there are 2 paths for leakage, one across the glass feed through insulators, cleaning is apparent here, and the other is leakage from the wires to the bobbins/copper cups. I found on one bobbin I had luck by wrapping the bobbin in Mylar tape and re-installing. Re-winding is another option. Of course if the coil is open it needs to be replaced if you have spare filters or re-winding.

Date: Mon, 20 Jan 2014 19:08:38 -0500
From: Steve Hobensack <stevehobensack@hotmail.com>
Subject: Re: [R-390] Filter Repair

Tuning a new mechanical filter or a replacement filter can be a little tedious. There is usually a parallel silver mica capacitor in parallel with the ceramic trimmer. I use a very small variable cap in parallel with the ceramic trimmer cap. I adjust the variable until there are two peaks on the perimeter of the ceramic trimmer cap. I remove the midget variable, measure it with my cap meter, then install a fixed mica cap of near the measured value.

Date: Mon, 20 Jan 2014 22:08:54 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Filter Repair

I haven't found that there's any real "tuning" to the filters. The response doesn't change that much by adjusting the caps on top or bottom, however the IL does change, but only a few dB by measurements I've made. I was surprised a bit by the difference in the IL of the 2 and 4 K filters compared to the 8 and 16, about 15 dB more IL for the 2 and 4.

Date: Fri, 08 Aug 2014 17:31:14 -0400
From: rbethman <rbethman@comcast.net>
Subject: [R-390] Filter testing

With an IF deck with no power applied, what would be a test set up, filters in place and wired, that would indicate that they can/will pass a signal? I have multiple signal generators, and a TEK 5440 scope.

Would setting to 455Kc on the sig gen, first looked at and synced with the scope, then applied to each filter input, and look at the output do this? I'd also ask if it really matters which direction the signal is applied?

Date: Fri, 8 Aug 2014 18:55:37 -0700
From: Norman Ryan via R-390 <r-390@mailman.qth.net>
Subject: Re: [R-390] Filter testing

Hmmm, test with no power applied?? Okkkkay... In that case the quickest way, IMO, would be a simple continuity test with an ohmmeter. If you read roughly 50 ohms on each coil and close to infinity from the terminals to ground, chances are good that the filter under test is OK. Bear in mind you have to switch around the bandwidth control to get true readings.

As far as I can tell, the next test is to put the IF deck in the receiver, power it up and check alignment per the manual. Alignment often isn't needed unless you suspect the slugs and trimmer caps have been messed with.

Replace C553 with a high quality film foil cap such as has been suggested recently by Charles.

Date: Fri, 8 Aug 2014 21:06:04 -0700
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] Filter testing

Bob, As long as you're sure c553 is good and the resistance checks out as suggested, there's not much other testing you can do. So, when installed, the output level of all four filters should be some what the same. If not, there is a problem. I had one that was low and it was a bad cap in the filter can. I copied the following in part from the 'pearls' of wisdom at:

http://www.r-390a.net/Pearls/IF_deck_filters.pdf

>Date: Thu, 5 Apr 2001
>From: "Barry L. Ornitz" <ornitz@tricon.net>
>Subject: [R-390] Testing Mechanical Filters

>Thomas Warren, W4PG, asked about testing mechanical filters, specifically if
>there is a way to do this without rebuilding the stages before and after the >filter.
Short answer - yes and no. <snip>

Date: Sat, 09 Aug 2014 13:35:16 -0400
From: Al Parker <anchor@ec.rr.com>
Subject: Re: [R-390] Filter testing

(Norman, where've you been, haven't seen you in ages, still have the boat?).
Bob, I've tested them out of ckt, and if the in-ckt switches do isolate and not ground them, it should be possible to at least do a comparative test. I set up a jig to give the recommended in and out capacitances and resistances, and fed a sig gen in (I think they are bi-directional), and used a freq. selective voltmeter to monitor the output. Could just use a scope.73,Al, W8UT

Date: Mon, 17 Aug 2015 18:29:43 -0400
From: John Wendler <>wendlerjrv@gmail.com>
Subject: [R-390] Rockwell-Collins ending production of mechanical filters

<http://www.arrl.org/news/rockwell-collins-to-end-mechanical-filter-production>

https://www.rockwellcollins.com/Capabilities_and_Markets/More/Rockwell_Collins_Filters.aspx

Date: Tue, 18 Aug 2015 00:16:51 +0000 (UTC)
From: Bill Guyger via R-390 <r-390@mailman.qth.net>
Subject: Re: [R-390] Rockwell-Collins ending production of mechanical filters

Yep one more thing to make you feel old. I think I'll find a rocking chair, and sit there remembering them things that glowed in the dark and radios that took a man to lift them and, that didn't have a screen and a mouse attached.....
DSP and Software Defined Radios are making Collins feel the pinch and they're one of the leaders in those fields.

Date: Fri, 12 Aug 2016 08:26:08 -0500
From: Les Locklear <leslocklear@hotmail.com>
Subject: Re: [R-390] Mint condition R-390A

This is what was said about the 1960 EAC early run contract by the former Director of Radio for the Signal Corps at Fort Monmouth. " Also about this time we got a bad run of R-390A's from Electronic Assistance in Red Bank that nobody wanted to get stuck with. These turned out to be receivers that they had rebuilt from surplus. Tom Howard of Alltronics Howard in Boston put us on to this when he wanted to get a contract like EAC to rebuild receivers. He had supplied over 300 junkers to EAC ". " All of the Clevite ceramic filters were to have been replaced with mechanical filters when they were scheduled for depot maintenance ".

Date: Fri, 12 Aug 2016 10:30:39 -0400
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] Mint condition R-390A

> The ceramic filters were from the 1960 EAC contract. They
> didn't meet specifications, production was stopped * * *
> and they went back to the mechanical filters. Clevite was
> the filter manufacturer.

Oh, how right you are. I've worked on 4 of these over the years, and the ceramic filters were just the pits. All of the nasty, harsh-sounding ringing at the cutoff frequency like the Collins mechanical filters (more, actually, as I recall), and horrible stop band performance, as well. These radios had the poorest IF and audio performance of all 390As (which already fell far behind the original R390/URR with its LC IF filters). Truly awful.

The owners of the 4 receivers I worked on upgraded to standard filters and were astounded at how much of an improvement it made. Rare?
Yup. For very, very good reason.

Date: Fri, 17 Mar 2017 21:25:42 -0400
From: Frank Hughes <fsh396ss@gmail.com>

Subject: [R-390] 4kc filter position silent

Trying to locate the trouble w/ my R-390A 4kc filter. Works fine in all other filter selections, but 4kc is now silent. Looking at the schematic, seems like either the filter might be open or possibly a trimmer is dirty?

Also noted C509, C514 need to be checked. I had retired this particular R-390A a few years ago, after finding a pristine R-390/URR to use for AM nets. (My ears like the R-390/URR audio a little better, don't know why) But now I need to use this R-390A for SSB (CV-591A attached), having a 4kc filter would be handy. Other than just swapping in another 4kc filter to isolate the issue, and checking the capacitors associated with this filter, is there anything else I should be looking for while I have it apart?

I have a hoard of mechanical filters of various KC values around here somewhere, but as the foam inside them seems to decay with each passing day, might have a pile of junk spare filters by now.

Date: Sat, 18 Mar 2017 03:01:20 +0000 (UTC)
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] 4kc filter position silent

Hi Frank, Don't forget to check the switch contacts. Maybe a little deoxit.

Date: Tue, 21 Mar 2017 20:16:13 -0400
From: Frank Hughes <fsh396ss@gmail.com>
Subject: [R-390] R390A 4kc filter status

Thanks for all the helpful advice and comments.
Had time today to set up a test.
Results indicate I am old and deaf.

The 4kc filter is working, just down a few db from years past, as is my Hearing. A suggested, I'll just turn up the gain to compensate for the losses, electrical and anatomical!

http://i180.photobucket.com/albums/x257/fish1_07/R-390/r390a%204kc%20filter%20test_zpsdxj9czjz.jpg

Date: Wed, 22 Mar 2017 04:21:32 +0000 (UTC)
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] R390A 4kc filter status

Hi Frank, I know what you mean. But, all the filters should provide about the same level of output. If your 4kc is more that a couple db down, it might need tuning or replacing.

Date: Thu, 23 Mar 2017 02:41:10 -0700
From: John <jlkolb@jlkolb.cts.com>
Subject: Re: [R-390] 4kc filter position silent

There's a writeup on mechanical filter testing on my web page.
<http://jlkolb.cts.com/site/MFtest.htm>

Needs a stable RF generator and wide dynamic range voltmeter for the filter frequency. Of course, a spectrum analyzer with tracking generator works well also. Receiver S meter and switchable attenuator could be used for measurement.

The trick is to know the input and output impedance of the filter, and properly match it to the test equipment. For R-390A filters, it's 100 Kohms and around 120 pF.

Date: Wed, 14 Jun 2017 20:57:01 -0400
From: "Al S." <racalral7@gmail.com>
Subject: [R-390] A 6kc. mechanical filter for a R-390a?

I have one of the more modern blue cased Collins mechanical filters here. It was apparently used in the Racal 6790 receiver BW is 6.0 kc. 526 9957 040. This filter is designed to be used in that SS receiver and for lower impedance, than the higher impedance the stock 390a filters see. I would like to experiment with this filter in a 390a. Any ideas on toroidal matching to the IF deck in the 390a.

Date: Wed, 14 Jun 2017 22:04:24 -0400
From: Bob kb8tq <kb8tq@n1k.org>
Subject: Re: [R-390] A 6kc. mechanical filter for a R-390a?

You will have to use some sort of transformer match. Doing really wide range impedance matching with networks is a pain. You probably are going from megohms to hundreds of ohms ?

Date: Wed, 14 Jun 2017 22:41:41 -0400
From: "Al S." <racalral7@gmail.com>
Subject: Re: [R-390] A 6kc. mechanical filter for a R-390a?

I seem to recall an article somewhere?, maybe the Y2k manual or notes by Mr. Dallas Lankford on using the modern Collins torsional filters as roofing filters in the receiver. Using toroidal matching transformers.

Date: Wed, 14 Jun 2017 20:24:42 -0700
From: Alan Victor <amvictor@ncsu.edu>
Subject: Re: [R-390] A 6kc. mechanical filter for a R-390a?

First you need to establish the current terminating Z for the mechanical filters in the 390A. Then you need to know the required termination Z for the ones you wish to install. Designing a matching system to handle this problem is pretty straight forward. I do not believe the current 390A mechanical filters are that high a Z. At least the ones I have worked with at 455 kHz and built some receivers around were only about 3k/?? Cpf. I would have to look them up in my notes.

Date: Fri, 16 Jun 2017 01:09:04 -0400
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] A 6kc. mechanical filter for a R-390a?

The original Collins filters (the type used in the 390A) are self-terminated and are designed to be fed from a Hi-Z source and terminated by a Hi-Z load (50k ohms or greater in parallel with 130pF). Here is what a contemporary Collins applications note said:

> THE DESIGN OF CIRCUITS employing Mechanical Filters is relatively simple, since no special matching networks are normally required. Being internally terminated, the filters need only a high-resistance termination (50,000 ohms or greater) at either end together with the capacity (approximately 130 pf) required to resonate filter input and output at the center frequency.

>

> THIS HIGH RESISTANCE is readily obtained by driving the Filter with a pentode tube (effectively a constant current generator) and terminating it into a vacuum tube grid. It was this usage that led to the use of the term "transfer impedance" in specifying the effect of a Mechanical Filter on the gain of a given circuit. The transfer impedance is the ratio of the input current to the output voltage, so the over-all gain of an amplifier stage with a Mechanical Filter following the amplifier tube is simply equal to the transconductance of the tube times the transfer impedance.

Many of the newer rectangular filters are designed to be terminated at both ends with 2k ohms in parallel with 30pF. I am attaching a schematic of the Collins test circuit below. Your filter is most likely of this type.

Date: Fri, 16 Jun 2017 08:26:00 -0400
From: "Al S." <racalral7@gmail.com>
Subject: Re: [R-390] A 6kc. mechanical filter for a R-390a?

Thanks for that information on the 390a mechanical filters. I'll have to have a look at how this 6kc filter is terminated etc in the Racal 6790 receiver. Its not one of the physically tiny torsional filters. The only info that I have with the filter is that it needs a 750 pf. Cap for resonating on the input and output of the filter in the circuit. Also some good reading on mechanical filters from the March 1993 issue of Rf Design magazine. Bill Sabins article is very informative.

Date: Fri, 16 Jun 2017 08:13:29 -0500
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: Re: [R-390] Mechanical filter, Collins notes

Thanks for posting that extract of the Collins notes on impedance matching the filters. It is nice to read some of the concepts that were used when the radio was initially designed.

Date: Fri, 16 Jun 2017 09:14:09 -0400
From: Bob kb8tq <kb8tq@n1k.org>
Subject: Re: [R-390] A 6kc. mechanical filter for a R-390a?

To measure something like the input to the old style filters, you need to dig out the ever popular "admittance bridge". It's sort of the forerunner to the modern S parameter test sets. One in good shape will give you the data. You *can* do the measurement with more modern stuff, it is a bear of a measurement to calibrate properly (unless you cheat).

Date: Fri, 16 Jun 2017 11:08:14 -0400
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] A 6kc. mechanical filter for a R-390a?

The 6790 terminates the filter inputs with 4.7k ohms and the filter outputs with 5k ohms (2x 10k in parallel). The different filters use different resonating capacitors, from 82pF to 750pF (see table attached below).

The manual does not provide sufficient information to say what the correct resonating capacitors are for the 6kHz filter (at least, not in the schematic and parts list -- I didn't read any of the text). One of the filters does use 750pF + 750pF, but I can't say which one from the information at hand. (Note that some of the filters use different value capacitors on the input and output.)

Date: Fri, 16 Jun 2017 12:01:55 -0400
From: "Al S." <racalral7@gmail.com>
Subject: Re: [R-390] A 6kc. mechanical filter for a R-390a?

Thanks for passing along all the information on the 6790 mechanical filters. I purchased these from Gary Harmon if I recall correctly. He refurbished those receivers in the past and sold parts. He did provide a table with the 7883-4 or 526 9957 040. 6kc filter, showing the resonating caps for all six mechanical filters. 7883-1 to 7883-6. The table indicates the 750 pf caps used for the 6kc filter.

Date: Sat, 17 Jun 2017 20:08:35 +0000 (UTC)
From: Perry Sandeen <sandeenpa@yahoo.com>
Subject: Re: [R-390] A 6kc. mechanical filter for a R-390a

There are several ways to get a 6KHz filter into the R390A. In the Y2KR3 manual (what! You don't even have a digital copy) Dallas Langford shows how to do it with a new style Collins filter, which is being phased out. About \$125.

Mouser sells Murata filters for about \$5 or so, but they, too, are not suggested for new design. The same matching data from the Y2KR3 should work OK. Dallas said his wasn't exact but worked well.

Kiwa sells both ceramic filters that will use the Dallas data as well as active Hi Z modules for \$125 IIRC.

Last is our favorite high priced source: Surplus Sales of Neb.? He has ceramic filters that will need matching as well.? Price is new-born child, or in our case,

grand-child.

There was a Ham who published a note in ER magazine how he used the Murata files in a SP 600. I wrote him twice for the matching coil data but he never responded. Maybe someone else might have better luck. <snip>

Date: Sat, 17 Jun 2017 18:07:48 -0400
From: "Al S." <racalra17@gmail.com>
Subject: Re: [R-390] A 6kc. mechanical filter for a R-390a?

Thanks to Charles we have the information on suitable matching of the filters I already have here. Gotta wind some toroids etc. This filter will replace the 16kc. filter.

Date: Mon, 6 May 2019 19:09:11 -0400
From: <jgedde@optonline.net>
Subject: [R-390] Spectrum Analyzer Fun: IF filter responses

Playing with the spectrum analyzer tonight. I decided to use it to measure the response of my IF filters. Using the spectrum analyzer's tracking generator, I injected a signal into E211 (third mixer input) to drive the IF filters with the balanced signal it sees in normal operation. The RF input to the spectrum analyzer was taken from the IF output. Attached are the plots from the filters. One file contains the responses of the four mechanical filters, the other file contains response from the 0.1 kHz crystal filter and the 1 kHz network.

Date: Tue, 7 May 2019 06:31:36 +0000 (UTC)
From: Roger Ruzzkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] Spectrum Analyzer Fun: IF filter responses

John, Thank you for those two images. A real deck with current equipment. An observed output with a classic match to what the engineers said was going on. Please read the little numbers on the images John has posted. Mechanical filters with long length skirts. A crystal notch reaching for infinity, just like it says in the books. Amazing Roger AI4NI
