RF DECK ELECTRICAL NOTES

RF Deck Test- by Chuck Rippel

I also encourage you to do a quick test that will verify the condition of your RF deck and state of alignment. The procedure is as follows:

1- Disconnect the antenna

2- Set the "Line Gain" and "Line Meter" controls for a relative -5 db indication on the "Line Level" meter.Adjust the antenna trimer for a relative peak on the "Line Level" meter and note the position of the control.

Discussion:
An R390A with a properly operating RF deck is capable of peaking on its own internal noise as indicated by the "Line Level" meter. Further, that peak with no antenna connected should be coincident with the "Ant Trim" control indicating "0." Having the peak not occur at all indicates an RF deck failure or poor/improper alignment. Additionally, improper alignment can also be the case when the noise peak as indicated by the "Line Level" meter not coincident with the "0" (+- .5) position on the "Antenna Trim" control. - Chuck

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Measuring Receiver Sensitivity by Chuck Rippel

There may be an occasion when its appropriate to measure and record receiver sensitivity in real terms using an accepted standard. For radio receivers, real term sensitivity is expressed as the value of a modulated RF voltage applied to the antenna input necessary to provide a 10db S/N + N figure. This means, what input voltage is required to raise audio output 10 db over the receiver noise floor.

Measuring the receiver sensitivity in the R390A is an easy, straight forward procedure. The receiver Line Level meter can even be used to help with the measurement. Here is the procedure:

1- Turn the receiver and signal generator on and allow them to warm up for 1 hour.

2- Put the receiver and generator on 4.8 mHz (or any other frequency of choice)

3- Set the initial generator output to 1uv and modulation level 1kc, 30% but do not connect the antenna input yet

4- Set the R390A Function switch to "MGC," Bandwidth to 4kc, RF gain full CW, BFO off.

5- Set the Line Meter range switch to -10 and carefully adjust the Line Gain control for a -10db indication on the Line Level meter.

6- Watch the Line Level meter and peak the Ant Trim on receiver noise alone; readjust the Line Gain control for a -10db indication on the Line Leve lmeter. This level is now indicating a relative level of the receiver noise floor.

7- Connect the generator to the receiver antenna input (I use the "Balanced" input) and adjust the Kilocycle Change control to center the output of the generator in the receiver passband.

8- Adjust the RF output level of the generator to cause the Line Level meter on the R390A to read "0."

9- Note the output of the generator in microvolts. This value is the 10db S/N + N receiver sensitivity. It should be less than 0.5uv although the official specifications of the receiver call for 3 microvolts.

Testing the RF Deck Noise Power Contribution by Joe Buch, N2JB

Here is an interesting test you can run to prove to yourself what the IF gain setting procedure is all about.

• Before running the above procedure, set the IF gain to maximum, ie. fully CCW looking from the top. Set up as above except:

• Set IF bandwidth to 8 kHz

• Set the Line Gain for 0VU on the Line Level meter. Then, tune the antenna trimmer for a minimum reading

When I did this with my receiver the noise dropped by only 3 dB in IF Gain Setting Procedure, step 9. That means the noise from the receiver first RF amplifier, the place where the receiver noise floor should be established, is only 3 dB above the noise generated in the following stages. With the maximum IF gain setting, half of the noise power heard in the output is coming from stages later than the first RF amplifier. Then I performed the adjustment as above and measured the difference between the antenna trimmer peak and minimum settings. When I did this, I found the difference to now be 5 dB. Now only about 1/3 of the noise power heard in the output comes from the later stages. Your results may vary depending

on how much gain your receiver has ahead of the stages controlled by the IF Gain pot. If you can't hear the noise peak as the trimmer is rotated through resonance, there is something wrong with your RF deck. I would be interested to hear your experiences running this procedure. Is my receiver typical, or do I need to give it a tune-up?

Once the receiver sensitivity has been established, you can then "massage" the IF Gain (usually by dropping in nearly all the way) and tube lineup for the best recovered audio. The technique to "massage" the If gain is covered in the Technical, IF Gain section of this site.

Optimizing the vacuum tube lineup in the signal part is another technique to maximize performace. Because changing them does not require re-alignment, an easy start is to work with the tubes in the signal path of the IF strip. These are the 5749W's IF amps, V-501, V-502 and V-503. The 6AK6 4th IF amp V-504 and the detector, V-506, a 5814A. With your generator set up and the receiver at step 8 above, install a replacement tube at V-501, allow it to warm up about 5 minutes and note the indication of the Line Level Meter. If it climbs above 0db, the new tube has improved gain, if not, reinstall the old tube. Repeat the same steps for V502, V503, V-504 and V-506. You may "find" a few extra db in your spare tube stores.

Date: Sat, 21 Mar 1998 07:59:50 +0000
From: "Chuck Rippel" <crippel@exis.net>
Subject: R390A Alignment Note

The following is probably the **single most important alignment component** in the R390A receiver. It's relevence is not really spelled out in any of the technical manuals I have seen but it is the real key to getting the receiver properly aligned. PTO tracking on the R390A is very important. Due to the tracking nature of the RF and IF circuitry, the PTO end points must be very carefully adjusted. If the PTO is "long" or "short," it will not tune in the designed 1 mHz segments that match the mechanical cam profiles which drive the slugs in the various coils. In as much as I restore R390A's, I find that PTO mis-tracking by a little as 10 kHz can noticably degrade overall performance. Don't believe it? Loosen the PTO coupler then tune the radio on simple band noise. At this point, changing frequency with the KILOCYCLE CHANGE knob will only tracking the cam stacks and not the PTO. Observe that the band noise drops away at about (+-) 7 kc or so from your original frequency. That's is how tight the mechnical tracking on the '390A is. Here is a quick check for proper PTO tracking:

Let the radio warm up for about an hour.

Tune the radio down to (-) 000 and zero beat the calibrator. Next,tune the radio up and note the frequency where it zero beats. The dial should read close, say to plus or minus 3 kc's of (+) 000. If that is not the result, both the PTO end points AND the dial over run need to be reset. This is followed by setting (timing, actually) the various cams which now need to be mechanically realigned. Follow this by an an electrical alignment as outlined on top of the "Utah shaped" plate on top of the RF deck.

Successful completion will result in the mechanics of the receiver tracking with the electronics.

Variable IF Reference & Stage Gain by Chuck Rippel

Part of the secret behind the R390A's incredible selectivity and its immunity to near RF fields is found in the two tracking IF sections. The First Variable IF operates while receiving frequencies below 8 Mhz and is tuned to pass IF signals from 17 to 25 mhz. This represents the sum of the actual received frequency that is amplified by V-201 and then applied to the grid of the First Mixer, V-202. The 17.0 Mhz output from the 1st Crystal Oscillator, V-207 is also applied to the cathode of the same tube. The signal represented by that sum is directed to the tracking coils Z-213-1, 213-2 and 213-3 which are kept tuned to the correct frequency within the 17 - 25 mhz IF frequency range by the cam system. This signal is then known as the First Variable IF Frequency.

During reception of frequencies 8 Mhz and below, the composite output of the First Variable IF is routed through S-208 (front), then C-286 and is applied to the grid of the 2nd Mixer, V-203. For reception of frequencies 8 Mhz and above, the amplified recived signal signal from V-201 is routed around the First Mixer by S-206 and applied to the grid of the 2nd Mixer through S-208 and C-286. The output of the 2nd Crystal Oscillator, V-401 is also applied to the cathode of V-203. The resultant output is the 2nd Variable IF Frequency which is always between 2 and 3 Mhz. That difference is applied to the tracking coils Z-216-1, 216-2 and 216-3 which are also kept tuned to the correct frequency within the 2-3 Mhz IF frequency range by the cam system.

The 2nd Variable IF frequency is applied to the grid of the 3rd mixer, V-204 where it is mixed with the output of the PTO (V-701) applied to pin 7. The PTO tunes from 3.455 to 2.455 Mhz . The difference frequency between the 2nd Variable IF Frequency and the output of the PTO is always 455kc. This difference frequency is applied to T-208 which is tuned to 455kc. The result is the 3rd IF Frequency which is then routed from the RF deck to the IF sub-chassis through

P-213 and P-218. In analyzing a failure in the variable IF system, it can be seen that a signal related failure in the First Variable IF will result in low gain during reception of only the frequencies below 8 Mhz. A like failure in the 2nd Variable IF or 3rd IF would affect all frequencies. Here is a quick test to see if the Variable IF stages are generally working.

Initial checks:

1) First Crystal Oscillator output as measured at pin 7 of V-202:
   Normal is approx 4V p-p
2) Second Crystal Oscillator output as measured at pin 7 of V-203:
   Normal is approx 3.2V p-p
3) PTO output measured at pin 7 of V-204:
   Normal is approx 6V p-p

First Variable IF Gain Test:

Tune the receiver to 00 500, AGC OFF, VTVM connected to read voltage at the rear Diode Load point.

Inject a 17.5 Mhz signal at approximately 15uv through an RF coupled probe to E-210. This should result in a reading of approximately -5V at measured at the diode load point. This bypasses the coils Z-216-1, 216-2 & 216-3 and can be used as a reference.

Inject a 17.5 Mhz signal at approximately 40uv through an RF coupled probe to pin 1 of V-202. This should yield approx -3.5V at the diode load point.

Discussion: An indication at the diode load point of approximately 1.5V of loss is nominal. If there is loss which cannot be corrected by proper alignment of coils Z-216-1, 216-2 and 216-3 or no signal at all, change the injection point coil to coil to moving "away" from the 2nd mixer to find the failure.

Second Variable IF Gain Test

Tune the receiver to 01 000+, AGC OFF, VTVM connected to read voltage at the rear Diode Load point.

Inject a 2.0 Mhz signal at approximately 15uv through an RF coupled probe to pin 1 of V203. This should result in a reading of approximately -2.2V at measured at the diode load point. Again, this bypasses the coils Z213-1, 213-2 & 213-3 and can be used as a reference.

Inject the 2.0 Mhz signal at approximately 15uv through an RF coupled

probe to pin 6 of V-204. This should yield approx -4.2V at the diode load point.

Discussion: An indication at the diode load point of an increase of approximately 2V is nominal. Again, If there is loss which cannot be corrected by proper alignment of coils Z-213-1, 213-2 and 213-3 or no signal at all, change the injection point coil to coil to moving "away" from the 2nd mixer to find the failure.
To align the variable IF stages, I use a different method from that found in the various military manuals. My technique yields better results by taking a systems approach and also not loading down the stage to be aligned. It is a bit lengthy to explain here but that procedure, along with many other techniques are demonstrated in the 7 hour long, R390A video tape series available from Hi-Res Communications. Don't forget to ask about the new 4 hour addendum to the 7 hour series..

Date: Wed, 5 Nov 1997 11:08:49 +0000
From: crippel@...
Subject: Re: HR-202

See that one all the time as it kills wht low bands when it fails. The fix is; its an easy. Remove the HR-202 xtal assy and: (A): Replace it (Fair Radio has replacements) (B): Take it a part and put a new 17mhz crystal in it. May as well replace the calibrator crystal while you're at it. It fails also. I favor "B" as the HR-202 assy's are getting hard to find. '390A xtals, 1st and 2nd oscillators) are dying right and left due to age. International crystal has the JAN cross reference. Take the number off the crystal case, (I know that the the R390A 2nd oscillator crystals are HC6/U) and give it to them.

From: crippel@...
Date: Tue Dec 2, 1997 4:03 am
Subject: Re: [R-390] audio, nothing but hash from my A !

> Hello, name here is Scott and I have a problem, hope a small one, with my
> Motorola mfg R-390A. It was working fine then without warning all I get
> from the speaker is white noise/hash. Meters seems to show a signal present
> on most any band but there is nothing there. Anyone run into this before ?
> Might I ask what the fix is? or rather what your fix was as I'm sure there

> are probably several ! Thanks for the help and happy listening. 73 Scott
>
The RF deck is running away. You have a failed or loose in its socket C-227 located on the cathode of V-201. It screws into the chassis and can be seen from the top looking down between V-201 and V-202.

From: dave metz <metzd@...>
Date: Thu Dec 25, 1997 10:24 am
Subject: Removing HR-202

A recently post by our resident master Chuck Rippel, seemed to come back to haunt me last month. I have a great R390A that he worked over in the last year and has unbelievable sensitivity and looks after he got done with his renovation. . Anyway, this wonderful unit was stone cold on the lower bands when I turned it on after maybe being off for several months. Hmmmmm me says, I wonder if Chuck's comments about HR202 and the 17 Meg Xtal going bad would have anything to do with the problem as the tube check gave no indication of problems. . So I called JAN xtals and ordered a couple of these $20 xtals. They came in yesterday and quickly one went into the assembly. Hot dog, its running like a champ today! I would caution anyone who does this surgery to take a spring hook to the center X of the holdown device to pull it out of the way and remove the plug in assembly with your other hand. Then put in a socket or something about the same height in its place to constantly keep tension on the springs while you are working on the assembly. To rehook those springs is a PAIN! If one slips and the spring goes down into the hole, you might be looking at removing the RF Deck to recover the spring. Such a deal!

From: "Chuck Rippel" <crippel@...>
Date: Thu Dec 25, 1997 8:41 pm
Subject: [R-390] HR-202 Mysteries & Details

Dave Metz posted the failure conditions and cure for a very common R390A problem, failure of HR-202. HR-202 is an approx 1-1/4" diameter, cylindrical oven containing crystals Y-203 and Y-202. It plugs in an octal socket located at the far right hand corner of the R390A RF deck. There is a removeable spring clip affair across the top to assure that HR-202 stays in place. Having any of the two crystals within HR-202 fail can cause a lot of head scratching. Finding complete HR-202 assys becoming more difficult so rebuilding a defective one is the preferred option. The first crystal within the HR-202 assy is Y-203, the 200KC crystal for the calibrator. This crystal can fail completely causing the calibrator to not operate. More commonly, it will have drifted with age and be out of range of the calibrator adjustment, C-310. Zero beat will not be achieveable against the alignment standard being used. The calibrator zero adjustment, C-310 is acessable through the back panel.

The cure is to replace Y-203, the 200KC crystal within HR-202.

The second crystal in HR-202 is Y-201, the 17 mHz 1st xtal oscillator. It drives V-207 whose plate is transformer coupled VIA T-207 to cathode of the first mixer, V-202. Part of the alignment procedure involves peaking T-207 during the IF alignment.

A Y-201 or associated circuit failure will cause all bands below 8 mHz to be "dead." It is THE most common cause of that symptom. Signals from .5 to 7.999 mHz go through the first mixer, V-202 and its tracking IF network consisting of Z213-1 through Z213-3. The oscillator, V-207 is turned on by the application of screen voltage, 150V B+ through S-208 (rear) which is sourced from V-605, the 0A2 voltage regulator.

The cure, as Dave correctly noted, is to replace Y-201, the 17mHz crystal. Note: The T-207 peak is very broad and its alignment will NOT cure a "dead" receiver.

It has occured to me that part of a very complete R390A restoration might include replacement of ALL the crystals. This not only includes the calibrator and 1st crystal oscillator as above but also the dozen or so crystals in the 2nd crystal oscillator associated with V-401.

In nearly every R390A, these xtals have drifted in frequency. A quick test is to simply zero beat the calibrator on one band then start changing bands and note the zero beat error from band to band.

However, the cost of the crystals alone would be impressive to say the least. However, they are available as Dave pointed out.

From: "Chuck Rippel" <crippel@...>
Date: Sat Jan 24, 1998 2:04 am
Subject: Re: [R-390] No Cal. Signal on 16MC

> I have a R-390A that doesn't have a calibration signal
> in the 16MC band position. All other bands have a signal,
> some stronger than others. Even after peaking the Ant. Trimmer.
> Also, the frequencies vary from band to band. Hopefully some
> of theses problems can be corrected through alignment.

The band is dead because Y-413, the 9.5 mHz crystal is not oscillating. Put a scope on P-415 the output of the crystal deck and see. Should be about 2V p-p.

From: Bill McFadden <bill.mcfadden@...>

Date: Fri Jan 30, 1998 9:35 am
Subject: Re: [R-390] HR-202 oven

> Just one question. Is the crystal oven HR202 supposed to be on all the
>time or is it controlled by the crystal oven switch? One of my R390As
>has a hot HR202 but the switch is off.

I believe it's on all the time. BTW, I bought an R-390A from Fair Radio Sales a few years ago, and it had a 25.2 volt oven installed in HR202 instead of the original 6.3 volt version. The radio still supplies it with 6.3 volts, so it's barely warm.

From: "Chuck Rippel" <crippel@...>
Date: Sat Jan 31, 1998 12:12 am
Subject: Re: [R-390] HR202

HR-202 is not on the "ovens" switch but it does stay warm all the time.

From: RON SIZER <rssizer@...>
Date: Mon Feb 2, 1998 6:29 pm
Subject: [R-390] R-390a Repaired

Hello all, Thanks to those with suggestions for repair of my R-390A, Stewart Warner S/N1831. It had very week reception below 8Mhz, signals were 20+ DB down. It turns out the mixer, V202s 17Mhz oscillator input level I measured early on, was way too low for proper operation. The reading was less than a volt P-P instead of the later 16 volts P-P after the repair. C327 in the 1st oscillator circuit was bad. T207 would peak but with the very low output. I have found many other mica caps in B+ circuits of 74A4, and 51J4 receivers to be the problem also. With this trouble shooting I got to know this receiver. It is a fine machine and a joy working with the MILL SPEC parts. I hope my experience will help others in repair of their R-390A.

From: laffitte@... (laffitte)
Date: Mon Feb 2, 1998 6:42 pm
Subject: [R-390] HR-202 overheating

I want to thank all who responded to my question on overheating in HR202. Apparently there is a thermostat here and it seems to have gone bad. Can it be disconnected from the circuit? I don't think that in our average 85 degrees there is any need for a crystal oven but I leave this to the experts of the group. Also, can overheating damage the crystals inside?

Date: Tue, 27 Jan 1998 16:21:19 -0800

From: gerald <k6qy@mindspring.com
Subject: [R-390] R 390A Hot HR202 xtal

Help needed. My 390A is dead. White noise, no indication of off the air or calibrate signal. Noise does not peak with ant trim but RF gain affects it. Xtal housing HR202 gets too hot to touch, much hotter than a rectifier tube!! Oven switch is off. Previous problem of cutting out and popping noise cured by replacing V202. Could this have been a symptom of the same problem? Any help would be appreciated.

Date: Wed, 28 Jan 1998 07:03:39 +0000
From: Chuck Rippel <crippel@exis.net>
Subject: Re: [R-390] R 390A Hot HR202 xtal

HR-202 is a crystal oven.
Check the 2 rear panel 1/8 AMP B+ fuses

Date: Wed, 28 Jan 1998 19:38:55 -0800
From: gerald <k6qy@mindspring.com>
Subject: [R-390] R390A Problem Solved

I want to thank all who answered my question about hot HR202 xtal. The problem was solved by following the tips in Chuck Rippel's video. Removed the RF deck, wouldn't have had the nerve to try without the video, and cleaned the ground connections and resoldered most of the connections. Put it back togather and it works FB. HR202 still seems darn hot but guess that is the way it should be.

Date: Sat, 11 Apr 1998 19:53:51 -0700
From: David Medley <davemed@worldnet.att.net>
Subject: [R-390] Problem Solved

A few days ago I reported an annoying problem with an R-390A radio. This involved the non operation of the antenna trim control on bands above 17 MHz although the radio appeared to have good sensitivity. Much to my surprise I received only one response from someone who had had this problem but his fix was inconclusive. So this morning I got up determined to get to the bottom of this thing and the results were to me surprising and pretty significant I believe.

First I spent some time studying the schematic and observed the following. The ant trim cap is a dual stator with a common rotor. One section has less capacity than the other. By means of a fairly complex switching scheme and some different circuitry in the various antenna coils these two sections are used either in series or in parallel with a cap inside the antenna coil. Both sections are used on most bands in various

combinations. As the trim cap operated in a fashion on all bands except the last I ruled out any fault in the trim cap itself. This was a relief as getting this out and inspecting it would be a really nasty job. So the problem had to be either in the switch or in the antenna coil assembly. The latter I quickly eliminated by substituting a known good coil. Results negative. Therefore it had to be in the switch.

So I pulled the RF assembly and after some time trying to figure out all this complicated circuitry I found that the relevant switch sections were right against the coil shield and extremely difficult to see. The culprit was **S20-3** which has both front and rear sections. The rear section which was more or less visible looked fine and checked out with an ohmmeter. Using a magnifying glass and lots of light I eventually found the relevant contacts and sure enough the one that was supposed to connect terminal 3 on the antenna coil to the ant trim was open. I could also see that the other contacts were dirty. I very carefully managed to close the contacts that were open with a delicate operation and then I gave that whole section a VERY liberal bath with TV contact cleaner and some hot air from a hair dryer. Everything looked clean and shiny now.

So I replaced the RF assembly and was happy to observe that the Ant trim control worked really well on the high bands. I then hooked up the sig gen and was rather amazed to observe the dramatic improvement in the sensitivity of the radio on all bands. At least 10db . When you think about this, this is probably one of keys to ultimate sensitivity. This switch section is right in the front of everything where signal levels are lowest. Any problem in this area is going to have a dramatic effect on performance. This particular radio, which came from St Julian's Creek, is now as sensitive as any I have worked on. With my old equipment I have no way of measuring noise floor accurately but on the air it beats anything else I have here. I hope I haven't bored the list with this long message but I feel happy after a productive days work.

Date: Tue, 26 May 1998 09:14:26 +0000
From: "Chuck Rippel" <crippel@exis.net>
Subject: [R-390] R390A Tech Tip

I was finishing up a Collins RF deck yesterday and upon beginning the alignment, found why the radio was sold. The bottom bands, those below 8 mHz were down in sensitivity about 20 db.

A quick analysis showed the output of the first xtal oscillator as measured at P-221 to be approximately 3/4 volt P-P instead of the usual 5.2V P-P or so. Additionally, when performing the variable IF alignment, T-207 would only show a peak at the very bottom of the slug travel.

The problem turned out to be C-327, located across the primary of T-207 had changed value. Once replaced, the proper injection levels to the mixer were restored.

Date: Tue, 18 Aug 1998 18:09:34 -0400
From: "Bruce J. Howes" <bhowes@buffnet.net>
Subject: [R-390] antenna trimmer fix

I wanted to pass along a problem, and more important a fix, that I had with my Imperial R-390A. I hope this helps someone else. Since I first acquired the unit it has suffered from a overload problem on strong signals. When looking at the diode load output on a scope the negative peaks would become chopped off. If the RF gain was backed down to the "7" position the problem disappeared. Despite my best efforts I could isolate and fault trace the problem, so I lived with it for several months by turning down the RF gain as described above on strong signals. This weekend I decided to take one more crack at the problem. After switching out IF and AF decks I still had no success. Remembering posting sometime ago about the bakelite disc on top of the antenna trimmer that can become contaminated with lubricant I thought to remove it and replace it with one from a spare unit. When I had the antenna trimmer shaft out I noted that the antenna trimmer gear-the vertical part of the worm gear system, seemed quite loose. I assumed that perhaps the nut securing the antenna trimmer had worked it's way loose. I attempted to tighten the nut when I noticed that the bakelite insulator was damaged, the ridge had cracked off. If you carefully examine the bakelite insulator pair used on the antenna trimmer capacitor you will note that a 'collar" serves to prevent the antenna trimmer cap from touching ground. My collar had broken, and the trimmer cap was touching ground. Since the bakelite collar is a two piece affair I wanted to inspect both the upper and lower collar. Darn, the two nuts securing the antenna trimmer housing can to the RF deck can only be accessed with the RF deck removed. So I removed the RF deck, removed the two nuts and washers so I could remove the antenna trimmer can. And what did I find? I found no lower bakelite insulator at all, the cap was actually touching ground! Over to my spare R-390A to rob the needed part, and after installation the radio plays fine!The long suffering AGC problem has been cured. Sometime, at some point of the radios life, some well meaning tech must have serviced the antenna trimmer and left the lower bakelite part out. The upper bakelite ring must have worked as a insulator for while, but the strain of the missing lower ring may have lead to its demise. The moral of this story, if you have an AGC issue, check the antenna trimmer, not just the bakelite disc, but the mounting as well, to confirm that is not shorted to ground. Anyway, after this long winded diatribe, I certainly hope that this helps someone get one of these wonderful receivers back on the air.

Date: Tue, 22 Sep 1998 16:42:06 -0600
From: "Eustaquio, Cal J" <cal.j.eustaquio@lmco.com>
Subject: [R-390] "Russian woodpecker"

Several years ago, I use to encounter on the bands (in the late 70's and throughout the 80's) a phenomenon known as the "Russian Woodpecker". Apparently a pulse type radar in the deep winter expanses of Russia, it use to blanket many an HF communication. The EW's couldn't answer what it was when I queried them on my ship. It didn't matter if you had an R-390 or so. Whenever the "pecker pecked", you got hit. Any answers? Cal, N6KYR.

Date: Sun, 01 Nov 1998 07:49:03 -0600
From: Bill Wilson <billo@internettport.net>
Subject: [R-390] Gain problem solved on R-390(non-A)

Still not satisfied with the performance of the R-390 I decided to investigate further. Yes, the radio "seemed" to working fine but something seemed wrong, a lack of performance on the bottom bands, lack of a audible 100Kc crystal calibrator signal (very weak) on the bottom bands. The radio worked OK; Radio Ancash (which has been quite strong lately) has been coming in fine, compared to the other R-390A's the radio would appear to be "in the ballpark".

Checking all the voltage and resistances on the five tubes on the RF deck revealed nothing; all were well within specs. The DC resistances of the IF coils was OK too. A routine check of the crystal osc tubes was next. The 2nd osc tube was fine but the 1st osc tube (6AJ5) specs started to raise some red flags. Pin six should read 51 volts and 94K...well it was pretty high; 170 volts and 441K. The problem was traced to **R 409, a 82 K resistor, it had drifted up to 404K!** I replaced the resistor and checked all the caps for obvious shorts. It's a little tight working in the crystal osc chassis I might add. Anyways the radio now works much better on the bottom seven bands, the voltages are now all within spec. Where Radio Ancash was audible the sig meter never moved, now it's about a 15-20 (like the other R-390A's). Other known stations are also much higher in strength.

What fooled me was that fact that the radio "seemed OK", these sets have so much reserve gain that a problem like this can sometimes go unnoticed. The 100K Calibrator is working better (went ahead and replaced its coupling cap) on the lower bands too. I still have some other work to do in the RF deck and other questions remain.

Date: Fri, 06 Nov 1998 09:54:19 -0400
From: laffitte@prtc.net (laffitte)

Subject: [R-390] SW RF Deck is out

Well, it is out. The Stewart Warner RF deck has been removed and is now in my work bench. The brownies have already been replaced and today all the 2.2K resistors are coming out. All are higher.There is also a 56K resistor that must be replaced and a 39K 1watt too. A good Deoxit should do the rest. Should I check anything else? Any of the mica caps that may require special attention?

The AF deck is also out and one of the sections of the 30uF electrolytic has a lot of leakage. Another one for replacement. Will report on any findings as they come.

Date: Mon, 09 Nov 1998 09:39:38 -0400
From: laffitte@prtc.net (laffitte)
Subject: [R-390] Stewart Warner RF Deck Report

The following are the results of the RF deck work done on my SW R390A. The RF deck was removed following the instructions in the manual which are fairly straight forward. All the resistors were checked as well as the 3 Brown Beauties (two .1 and one .033).

All of the 2.2K resistors were found out of tolerances. Some as high as 3K. Most of the others at 2.65K. One 56K resistor was found at 65K. They were all replaced. All other resistors were within tolerances. The three brown caps were leaking badly and were replaced by metalized polyester ones rated at 630V.

All the connections in the signal path were resoldered with silver solder. One connection near Z206-1 was found suspicious and also resoldered. The switches were given a good Deoxit 5 bath. C292-1,2 and 3 were checked for leakage (these caps are inside the Z216 coil enclosures).

The gear train was checked for broken clamps and none were found. It was lubed in specific places. The whole RF deck was cleaned. The RF deck was replaced and tested. NO AUDIO OR ANYTHING AND THAT SMELL OF A B+ SHORT!!

The RF deck was tested for B+ short according to the manual. Pin K on J 208 was found shorted. This is related to the circuit of V207. Careful checking revealed an RF choke lead touching a B+ terminal. Moving the lead out solved the problem. DO A B+ SHORT CHECK ON THE RF DECK BEFORE PLACING IT BACK!!! The RF deck was replaced and the radio turned on. Now everyrthing was OK.After a 3 hour warmup an IF/RF alignment was done according to the manual and using an URM-25D signal generator. The IF gain was adjusted following Chuck's instructions.

The PTO end points were checked also following Chuck Rippel's instructions and found to be within reasonable limits.The crystal oscillator was also adjusted according to the manual. The results are a more than 20 db increase in signal level and the capability of peaking the RF noise without the antenna connected. All the bands respond to this peaking although not equally. I did the IF gain adjust at 4.5MC. I have seen 15.2MC as another frequency in which to do this adjustment. Is there any difference? I think that the inequalities in the responses to the ant trimmer adjust may be due to crystals in the oscillator that are deteriorating. Nonetheless I could still peak the noise in all bands. The Stewart Warner is now as good as it has ever been in the last years. Its a pleasure to operate with such a low noise figure.

One extra detail is that after 6 hours I rechecked all the adjustments and found that in some bands these had changed a bit. I would recommend a period of at least 5 hours before alignment just to make sure that everything is stabilized. The lube job on the gears did wonders with the KC control movements.

Overall this was a good experience with great results. It requires some patience and care but it is sure worth it. I am now hunting for Chuck's test DX stations to see how good it is doing. Radio Ancash is my target tonight. Now I am thinking of redoing my EAC too. I hope that some of this information helps. Originally it was Nolan's posting that got a lot of us RF decking so thanks to Nolan and also to Chuck for his shared expertise with the group.

Date: Mon, 9 Nov 1998 09:48:04 -0500 (Eastern Standard Time)
From: Norman Ryan <nryan@acpub.duke.edu>
Subject: Re: [R-390] L402 and R536

> I am not able to find these components in the schematic and consequently their correct values. Could anyone of you help me with this.

> 1. L402 - located in the XTAL Osc. subchassis.
> 2. R536 - located in the IF subchassis. Looks like a 5 watt resistor.

In the R-390A schematic:
L402 is 10 microHenry.
R536 is 4 Ohm.

On the schematic they are located in little dotted squares above the voltage regulator tube V605.

Date: Mon, 16 Nov 1998 07:49:57 -0400
From: laffitte@prtc.net (laffitte)

Subject: [R-390] EAC RF Deck

I worked this weekend on my EAC's R390A RF deck and have some notes that may be of interest to the group. As with the SW deck, all 2.2K resistors had drifted higher by as much as 3.15K. I replaced them all. The 56K resistor in V207 circuit had also drifted to 61K and an 82K resistor in V202 circuit was 96K. Both replaced. The 120K resistor in V207 circuit was ok in this one. I also replaced all .1 and the .033 cap. Now, before finishing up I did an experiment. I replaced the RF deck back without any other changes, checked for shorts, reconnected, turned on for a couple of hours, realigned the whole thing by the book and although I could peak the noise with the ant trimmer it was not the same as the SW. I took the RF deck out and replaced C286 and C327 right out. After getting it back in place and realigning again the result was dramatically better. I think that C286 and C327 should be replaced right out in each RF deck overhaul. They are critical and may have changed in value significantly over the years. The EAC and SW have RF decks that are very sensitive now. I still must work on the VFO end points on the EAC but will have to get a frequency counter for that. After the EAC I will go for the R390s non As.

Date: Wed, 18 Nov 1998 11:37:28 -0400
From: "Chuck Rippel" <crippel@exis.net>
Subject: [R-390] Tech Tip

Just when I thought I was going to run out of these.....

One of my radios started an intermittent snapping and popping. My standard troubleshooting method to localize the source is to disconnect modules beginning with the IF unit and see if the noise goes away.

Once I determined the source of the failure did not lie in the IF unit, I started with V-201, the first RF amp and pulled each tube until the noise stopped. In this case, pulling V204, the 3rd mixed stopped the noise. I replaced V-204 but no joy. V-204 mixes the PTO signal with the 2-3 Mhz IF and T-208 is tuned to 455KC and couples the difference frequency.

This radio always had a funny problem with tuning that was a bit unstable. The bottom line was that V-701, the PTO tube was bad. Before replacing the tube, I compressed the individual tube pin sockets and gave the tube pins a shot of De-Oxit just prior to installing it.

The receiver is back to the specs I recorded after restoring it, a fantastic 0.07uv for 10db S/N + N with AM and the 4KC filter.

Date: Wed, 21 Apr 1999 08:51:26 -0400

From: "Chuck Rippel" <crippel@erols.com>
Subject: [R-390] One for the Books !

For those of us masochists that enjoy being punished by BA radios, here's a case history for the books. Am finishing up the R390A factory SSB rig. When I get done, I plan to put pictures of the extra module, its wiring and some of the best BA SSB audio I've yet to hear in RealAudio files on the www site. Of course, I'll post it here when its available.

I digress..... Got everything done and went to take the first pass at alignment last Saturday afternoon. Usually, I take 2 alignment passes, one coarse optimizing tube positions then a final, needle splitting precision alignment to "ice the cake." This radio aligned and performed better-than-par save for the bands below 8 Mhz. They were in the 2-3uv for 10db region. In factory specs, but not anywhere close to my expectations. This indicates a failure in the 1st xtal oscillator or 2nd conversion. At various times Sunday, instead of troubleshooting, I simply replaced all the parts that are usually suspect. C-286, C-326, R-212. I swapped out the 2nd variable IF transformers, Z-213-1, 2, and 3. Finally, although they tested good, swapped out V-202, V-207, V203. Turned it back on and no change. Hmm, this was to turn out to be a head scratcher.....

I decided to check the levels at J-221 which are typically > 4V p-p. It was .75V p-p. The problem was low levels from the 2nd xtal oscillator. Verified the problem and solution by substituting a 17mhz signal into P-221 from my HP-606 @ 4V p-p and the radio worked fine.

Perhaps this failure might be easy to correct..... Usually, C-327, a 100pf mica which tunes T-207 fails. Out came the RF deck. It was confirmed that someone had been unsuccessfully working in that area as a capacitor was grounded at a unconventional spot. After correcting that, I walked over to my parts bin and pulled out a brand new silver-mica cap in a bag marked "100pf" I got from Surplus Sales of Nebraska. The cap said "100V3." Put the cap in, re-installed and recabled everything and lit it off. T-207 peaked right about in the middle of its range so I knew I had it. However, a quick test revealed the exact same problem, still deaf at 3uv. Checked the levels at J-221 and found the required 5V p-p. Substituted the signal again from the HP-606 and the radio worked wonderfully. This was truly black magic so I ended Sundays session about midnight considering an exorcism or packing the RF deck in garlic....
Thought about it Monday just a bit and decided to check the output at J-221 again. This time, I hooked a counter to the vertical amp output of the Tek 1704A scope.

Whoa.... ! Yes, the signal was at 5V p-p but instead of the required 17mhz,

it was at 51 mhz, the 3rd overtone of the crystal. Easy, replace HR-202 with a known good one. Same problem, 51 Mhz... Replaced T-207 with a brand new American Trans-Coil unit. (thank goodness for those parts, eh?). No joy.

More thought on Tuesday and I had a hunch. Brought home 2 100pf 1KV ceramic disc caps from work. Replaced C-327 and C-286 Tuesday evening and >> bingo <<<, it worked great. There must've been just enough of the first overtone of the crystal being amplified to make the radio work.

Surplus Sales had mislabled the bag of caps and neither one of us caught the cryptic label on the component itself. Most likely, those are 1000pf caps which perfectly tuned T-207 to the 3rd overtone of Y-201, the 2nd xtal oscillator. Learned more new attributes about the RF deck than I ever wanted to know. However, purity and levels from both crystal oscillators is critical.

Date: Wed, 21 Apr 1999 09:28:53 -0500
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] One for the Books !

Something wrong with your math, Chuck... A 1000 pf in place of 100 pf would LOWER the resonant frequency by a factor SQRT(10)... More likely that 100V3 capacitor was 10 pf, 10 with multiplier of 1. I have never found labeled capacitors any more trustworthy than color coded capacitors and never trust a label until I've confirmed the value with my Q-meter. 10 pf, neglecting circuit strays would raise the resonant frequency by a factor of SQRT(10)... about 3 times higher.

I'd have noticed the different frequency with my scope by triggering at a controlled sweep speed, but then I cheat with a Tek 475 scope that triggers up to about 450 MHz. You will wish you had 100 pf mica cap for those because the 100 pf ceramic disks will drift excessively, as much as 20 or 30%.

Date: Sat, 21 Nov 1998 20:28:24 -0500
From: "Bruce J. Howes" <bhowes@buffnet.net>
Subject: [R-390] [R390] Problems with 1st IF Alignment, Bandswitch Clamp Replacement and some notes on the Antenna Trimmer

As I continue to work on my latest R390A, this one a combination of St. Julian's creek modules, a few problems have come up. I wanted to mention these in the hopes that they might save someone else time.

1) - Bandswitch gear clamp broken:

Lower bands below 8MC were dead, this was traced to a broken gear clamp on the bandswitch shaft. Seems to be a common fault as the Imperial model I did a few months back had the same issue. I did find a simple method to replace the clamp that does not require removal of the gear train. Remove the freq.. odometer, remove the KC gear and the "zero adjust" gear. Now using a small punch drive out the spring pin located on the first gear on the bandswitch shaft. Remove the front panel. The shaft can now be pushed forward, leaving the gear in place, so you exchange the gear clamp. The pin can be pushed back in with a pair of pliers.

2)-Alignment procedure on the 1st variable IF:

I have difficulty carrying out the alignment procedure for slugs on the 1st variable IF. In the ARMY manual (dated 1961) that I was using the signal generator frequency was specified as 18.75MC to test point E209, and the receiver was to be set at 1.250MC. I did not seem to be able to find the signal on the receiver. After much head scratching I checked the Navships manual (dated 1970) and found a signal generator **frequency of 18.25MC.** After changing the signal generator frequency to 18.25MC the signal was quite audible. I know that the RF deck that I was aligning was out of a unit that had a diode load connection on the front panel, so I assume it was a Navy unit. I would seem the Navy units use this different 1st IF alignment procedure. I have aligned at least 3 or 4 other RF decks and never encountered this before, I assume that they must have been ARMY units. Perhaps Chuck or someone could enlighten me on this one.

3)-Not able to peak T-201 - T-206:

After figuring out the IF issue mentioned above I continued on to the RF alignment procedure. I again ran into another issue. During the RF alignment the two rear transformers would peak and align as expected, but the front transformers, the antenna input units, did not. Not amount of tweaking of the slugs or the caps produced any effect. This seems to effect T-201 - T-203 the most. After some work I isolated the problem to another issue that I had run across before, defective insulator bushings on the antenna trimmer variable cap. Remove of the RF deck allowed me to access the nuts that retained the trimmer cover. Once the cover was removed the fault was easy to see. The insulator bushing has a small shoulder collar that keeps the cap from touching the can. The shoulder was missing, and the cap was touching the cover. After a trip though my parts box I was able to locate another set of insulators. I also had to straighten the top of the can, the upper mounting bracket had dented the rear of the can severely. I assume that this unit must have received a good whack on the antenna trimmer shaft at some point in it's life, destroying the bushings. After reassembly the transformers peaked as expected, and my work was done!

With those issues corrected the unit plays 100%, and R-390A #4 joins the lineup here at station KG2IC in sunny Buffalo, NY.

Date: Tue, 13 Apr 1999 15:02:28 -0400
From: "John F. Bunting" <w4net@alltel.net>
Subject: [R-390] Some Case Histories

I thought I'd put this together to document some of my experiences with tworeceivers in my collection. Maybe it may save some headscratching for some others. Please feel free to comment if you wish. 73 de John, W4NET

Some R-390A case histories at W4NET: <snip>

Tubes all checked OK and RT510 was a real TJ311M01. It was dead on 2-4 MHz, quite weak on 16-32 MHz, seemed to play OK on the remaining bands. I took the cover off the RF deck and looked at T203, Z203-1 & Z203-2. Funny thing, the slugs had come unglued fron the spring support rods and fallen down into the coils. I remove the rack and used tooth picks to fish the slugs out. Some Super Glue to the rescue. I put the slugs on the correct support rods just to make sure. While they were setting up, I spotted the 16-32 MHz problem. Slug in Z206-1 had also fallen off. Same repair technique. Loosened the little retaining screws on the two racks, reinstalled the racks and springs. Checked the up-down movement of the slugs and tightened the retaining screws where the slugs seemed to travel the best. It now played on all bands. <snip>

Date: Tue, 18 May 1999 11:20:36 -0400
From: "Chuck Rippel" <crippel@erols.com>
Subject: [R-390] R390A crystals 2nd Xtal Oscillator Xtals

2nd oscillator xtals are #2 or #3 high failure rate items. Add to that, their emission has got to be down after all these years (you'd be down too if you shook for 35 years <g>) A side benefit will be that the overall performance of the radio on each and every band. An additional payoff should be that the band to band calibration should be spot on.

I would install the new srystals and let them age for about a week. Be sure to change bands as defined by the fundemental frequencies of each crystal. Don't worry much about operating the radio on the bands driven by an overtone. Let the radio operate on that band for 4-5 hours per session.

If only we knew the real alignment procedure for T-401. I think I have an idea and will carry it out on the radio I am working on now when the time comes. Below is an overview of my working theory:

The highest fundamental crystal frequency is 17mc and the lowest is 9.5. The mid point is approximately Y-407 which drives the 6, 10 and 23 mhz bands. Set the trimmer for the 10 mhz band at 2/3 capacitance. (These are the same type trimmers used in Collins "S" Line and KWM-2(A's). and they have illustrations in both manuals on how to determine 1/3, 2/3 and full capacitance settings).

Once the set up is done (I am assuming the gear train has been correctly timed, PTO endpoints set and the RF and variable IF electrical alignments fully completed) set the T-401 slug for maximum sensitivity on the 10 mhz band. Use the coil slug, do not adjust the trimmer. Leave that at 2/3 full capacitance as above.

This procedure should result in being able to adjust all the other trimmers within their range when peaking the other bands. If you find that some bands cause you to "run out of trimmer" at either full or minimum capacitance before the band being adjusted peaks, go back to the 10 mhz band and try pre-setting that trimmer cap for 1/3 capacitance then re-adjusting T-401 for the peak on that band. Then, go back, re-peak the other bands and see what you get.

From working with other Collins designs, I sense that T-401 sets the inductance of the 2nd crystal oscillator such that the trimmers can all peak within their ranges for each individual band.

If you replaced the 17 mhz crystal, Y-201 (in HR-202) I'd also replace C-327 a 100pf across T-207 with a 100pf, 500V mica or maybe ceramic disc. Also, be sure to peak up T-207 on 1.9 mhz as part of your post-burn in alignment.

Hope this helps. Again, it is an un-tried, working theory... Chuck

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Date: Tue, 13 Apr 1999 15:02:28 -0400
From: "John F. Bunting" <w4net@alltel.net>
Subject: [R-390] Some Case Histories

I thought I'd put this together to document some of my experiences with two receivers in my collection. Maybe it may save some headscratching for some others. Please feel free to comment if you wish. 73 de John, W4NET

Some R-390A case histories at W4NET:

First receiver: R-1247/GRC-129, Serial No. 10, Contract No. AF30(635)30962, Manson Labs. Inc. , Stamford, Conn. This one was originally built by Collins to be part of an AN/GRC-26D. It was built

before they had to put contract numbers on the subassemblies and had many components with 1954 date codes. Manson modified the receiver, by adding 3 BNC connectors and a one
terminal barrier strip to the rear panel and adding wiring to add crystal can relays to three subassemblies, the first crystal oscillator, the VFO, and the second crystal oscillator. This is all described in T.O 31R2-2GRC129-2. Otherwise it's still a classic R-390A. It did include top and bottom covers.

When I received this receiver, it had a few obvious problems and and a few not so obvious ones. K101 was completely missing. FL502 (2KHz) had been replaced with a small diameter Collins filter that looked like it came from early S-line, but seemed to be a LSB filter. The dial lock had been reassembled wrong and it took a "Macho-Man" to tune the receiver.

I was fortunate to trade for a 67EAC carcas that had been fire damaged. It's owner also had a loose new K101 that he threw in with it. The Mechanical filters were smutty, but seemed to be electrically OK.

The 2KHz filter and new K101 were transplanted into the R-1247. The receiver acted as if it was working, but without AGC. Turning down the RF gain helped. Two problems found here, first was that FL505 (16KHz) had a resistive short from the output winding to the case, thereby putting a low resistance ground on the AGC line through R507. The second smutty filter was transplanted into the R-1247. The AGC still didn't work as it should have. The culprit was C551 2uf in the IF was very leaky, in the order of 8-10K. After scrounging up another cap that could be mounted and look decent, it was beginning to play pretty well.

After it had been on for a couple of hours, it would make a low pitched, high amplitude, sort of stacato sound for 30 seconds or so every once in a while. Most of my remaining hair went away with this one. Started checking tubes in the old reliable Hickock, found a few weak ones but none were noisy even after leaving them in the checker for a hour each. Did find one strange thing, though, RT510 was not a 3TF7 or a TJ311M01. It was a 3HTF4. H'mmm, checked the voltage going to the BFO and, a'hhh! it was 18VAC. Replaced it with a 3TF7 and never heard the noise again. That was in 1982 and I'm writing this in 1999, but I did replace the 5849s in the bfo and vfo as a precaution after a month or so.

Second receiver: R-390A/URR, Serial No. 2445, Contract 14-Phila-56, Motorola, Inc. This one came with Case CY-979/URR, a little scuffed, but OK. The front panel seemed almost new. The silk screening looked great. It had MWO-11-5820-202-3512 silk screened on the panel. It had 3 motorola units from the above contract (IF, Xtal OSC and RF), a collins VFO and Audio. The

power supply was from AMELCO, Ser #8, Contr. # 30564-PC-62, More about it later.

Tubes all checked OK and RT510 was a real TJ311M01. It was dead on 2-4 MHz, quite weak on 16-32 MHz, seemed to play OK on the remaining bands. I took the cover off the RF deck and looked at T203, Z203-1 & Z203-2. Funny thing, the slugs had come unglued fron the spring support rods and fallen down into the coils. I remove the rack and used tooth picks to fish the slugs out. Some Super Glue to the rescue. I put the slugs on the correct support rods just to make sure. While they were setting up, I spotted the 16-32 MHz problem. Slug in Z206-1 had also fallen off. Same repair technique. Loosened the little retaining screws on the two racks, reinstalled the racks and springs. Checked the up-down movement of the slugs and tightened the retaining screws where the slugs seemed to travel the best. It now played on all bands.

The antenna trim knob would barely turn. Used WD-40 and lubed the bearings. I also used TeleType gear lube on the gears. It took a few days of fooling around with it before the WD-40 got down whwere it was needed. It's OK now and has been since 1983.

Next was replacement of leaky C551 to help the AGC. I was beginning to enjoy the receiver now, and had set it up on a small table next to my recliner in the den.

I noticed that on occasions that the dial lamps flickered. Nothing else on that outlet flickered. Before taking it out of the case, I used a line splitter and a clamp ampmeter to watch for changes in line current. I sure got them, but they were from the thermostat in HR202. Until then, I had always figured that the Ovens Off switch really meant what it said. However as you know, it does not control HR202. I did see some flickering of the ampmeter when the lamps flickered. I traded power supplies between the R-1247 and the R390A. Still had the flickering lamps in the R390A. Using clip leads, I monitored various things in the primary power chain. I even changed F101 and later monitored across it with a voltmeter. I finally put the clip leads across the microswitch (They never fail, do they?) operated by S102. The rest is history. Replaced the microswitch and positioned it for more positive switching action.

One thing good about the power supply swapping, it drew my attention to how noisy the AMELCO power supply was in comparison to the Collins supply from the R1247. Since then, I was fortunate to find a Motorola power supply from the 14-Phila-56 contract at a hamfest for $10. It is as quiet as the Collins supply. The AMELCO is now a spare.

In 1994, I noticed that after the receiver had been on for over an hour

there was some mushy kind of static noise on strong SW signals. It only happened when tuned between 8-16 MHz and on a very strong signal. Monitoring the AGC line with a VTVM showed variations that followed the noise. The only thing that had any connection to the agc on that group of frequencies was T205. Took it out and checked C219. It was leaky and it got worse with heat. Transplanted the T205 from the 67EAC carcas and it played fine.

I then went through the IF chassis, changing paper caps, putting in NODMS's AGC mod and doing a complete "by the book alignment". Replaced a few tubes, reset the end points and now really enjoy the receiver.

Date: Thu, 03 Jun 1999 09:33:22 -0500
From: "A. B. Bonds" <ab@vuse.vanderbilt.edu>
Subject: Re: [R-390] Meter responsiveness

Not quite sure what is happening, but it don't sound right. Or maybe I misunderstand. The calibrator frequency and WWV frequency are both wholly independent of settings and BFO and all that. The calibrator is zeroed to WWV by a variable cap accessible from the rear panel. What you can do to get the calibrator right is

(1) Turn on, let settle for half hour or so.
(2) Tune WWV, whichever one comes in real good.
(3) Zero beat it with the BFO. Doesn't matter what the dial reads.
(4) Turn the function switch to cal and listen for the beat (leave the BFO on).
(5) Twiddle the cap accessible through the rear panel hole until it zero beats.
(6) Check for zero beat on WWV again.
(7) Repeat if necessary.

I have found that once set, the cal oscillator will be within 50-100 Hz of WWV under nearly all conditions, usually even better.

With respect to all the rest of the stuff (reading the numbers right, etc) you really have to do the Whole Thang to get it right, starting with checking the IF alignment. In my hands, the Whole Thang takes about 4 hours, unless the set is already close.

Date: Thu, 03 Jun 1999 10:05:38 -0500
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] Meter responsiveness

You only get a calibrator in the ball park (but likely out in LEFT FIELD)

with the BFO on. The only way to get the calibrator really close is with the BFO off and when WWV has no tone. You should then be able to get the calibrator within a few cycles per second and see that beat note on the S-meter. Under those conditions there should be a regular swishing sound which is the beat note modulating receiver gain.

Date: Thu, 03 Jun 1999 10:17:43 -0700
From: Ralph Parker <rparker@istar.ca>
Subject: [R-390] R-390 calibrator

My situation exactly on a recently acquired EAC. Turned out to be a bad 200kc xtal. The multi-vibrator was trying its best to lock on to something, and producing that raw-ac wobble that you heard. Luckily, I had another xtal, and all was OK. If not, I was going to try a 1mc xtal to see what happened.

Date: Wed, 20 Oct 1999 19:37:42 -0400
From: "Tetrode" <tetrode@sprynet.com>
Subject: Re: [R-390] Progress Report... + RF Deck Problem found

>So now its on to the RF deck. The first obstacle seems to be what to do about C227. It looks like to get at the stud nut to loosen it requires removing at least half a dozen components around the RF Amp. Any suggestions on how to deal with this one?

Yup, I had a problem with that cap going bad, so its worth checking out or replacing while the RF deck is out. My 67 EAC had a problem where the front end was going into oscillation on the higher bands, it would jump in and out of oscillation as the antenna trimmer control was rotated. Luckily, about the same time as I was recapping, Nolan Lee reposted one of his capacitor emails which warned about that stud-mounted cap near the 6DC6. I was like, what stud mounted cap? It was unmarked, and I had overlooked it, probably thinking it was a bolt or something. First time I ever saw one of those types.

So I clipped it loose from the circuit, and it was definitely bad, almost open, and its reading was actually jumping around between 100 and 200 pf. Because its reading was jumping around I decided not to simply put a new value in parallel with it; it might make for a noisy front end (C227, .047 uF, is the primary cathode bypass for the 1st RF amp). So I just left its body in place but left it clipped out of the circuit. I agree that it is in a difficult spot to get too.

I didn't have any suitable .047s kicking around at the time, so I made one up out of 5 .01 uf 100 volt ck05 ceramics in parallel that I had a bunch of. It just happened to measure out to .047 uf :^). I chose to install the new

cap pack right above the tube socket so it would have the shortest leads possible, but that may not have been necessary. Even though the lead from the original C227 is actually quite long, my RF deck had the mod which puts an additional 47 pf cathode bypass right at the tube socket in order to efficiently bypass the high frequencies.

At first I didn't think that a missing cathode bypass would cause instability, but without it, the cathode is free to pump RF (and receive RF) throughout the wiring harness, so who knows where the feedback path was. There was a other work I did in the RF deck too, but the bottom line was that after fixing that cap the front end is now uncondionally stable like its supposed to be.

Date: Mon, 29 Nov 1999 08:32:45 -0600
From: "John P. Watkins" <jwatkin9@idt.net>
Subject: [R-390] Missing C-252

Hi All, the work proceeds, and the missing C-252 under the RF deck has been replaced. An amazing difference. Makes you wonder who tested the radio in Cedar Rapids and why it was never discovered in its many years of service. Perhaps that band (2 to 4 Mhz) was never used. One of the many mysteries that these radios evoke. I have also gotten very experienced in taking down the front panel and getting the RF deck out. For those of you that haven't done this, it is no problem, can be done in less than 15 minutes. Repairs completed and everything back in place in less than an hour. The radio is now in spec as to sensitivity. Now to continue to get it totally aligned. While I had the unit on its side, I tested the PTO spare that I bought from Fair Radio a while back (Cosmos PTO rebuilt at Tobyhanna). The PTO turned very smoothly and seems to be in good shape. About 10 turns (measured crudely) from 2455 to 3455. The PTO in the radio is a Progesstron and needs the end point adjusted. My next project. By the way, I also noticed that the mod for reducing the noise from the HR 202 crystal heater wasn't completed. The resistor R-235 was there, but the cap C-256 (0.1 ufd) had never been installed. Another mystery. needless to say the cap is there now.

Date: Sun, 26 Dec 1999 23:18:36 -0500
From: dave metz <metzd@cfw.com>
Subject: [R-390] Lankford AGC mods, ST. Julians finally finished

<snip> Then, I tried the RF deck mods suggested in the ER article. For whatever reason, the bottom line here was that after I had good AGC with almost no distortion, modifiying the RF deck to 6HA5's for mixers and changing the RF amp, created unacceptable problems. First, I lost a significant amount of AGC. Secondly, I couldn't open the rf gain completely without putting it into oscillation or having almost no rf gain

control with another type tube. So, I reversed the entire rf deck mods and took it back to original. Perhaps there is something else wrong in the rf deck or I missed the obvious when changing the wiring for these mods but after reversal, it again ran beautifully. <snip>

Date: Wed, 29 Dec 1999 20:35:13 -0500
From: "Randall C. Stout" <rcs1@sprintmail.com>
Subject: [R-390] Crystal oscillator ?

I did an initial alignment on my R-390A today, and although pleased overall, I am confused by a few of my findings.

Specifically , with the 2nd crystal oscillator stage, V401.

I noticed when I was peaking the trimmers for that stage that several were quite insensitive, no change in the diode load readings.

I then went through and checked each bands output with the crystal calibrator on, 2KC filter in. In general I got readings of between 35-60 dB on the carrier meter.

The same bands that wouldn't peak had low or absent readings. Specifically, 30,and 8 were nil, while 19MHZ was low at approx 20. These three all share crystal Y403. As a cross check , I took VTVM readings off of E402 for all bands, which gave a wide range of meausrements on the various bands, from -.55 to -6.0. The lowest three corresponded with Y403 again. So, I thought I had a bad crystal. I removed it, cleaned the terminals, and the socket and reintsalled. Voila, now the E402 readings were much better,-3.5 to -4.0. Confident that I had cured the problem, I rechecked the dB readings on the appropriate bands(that Y403 covers) but despite the improved E402 readings, the dB reading on 8MHz was essentially zero, I could just barely hear the tone, while the reading on 19MHZ had jumped up from 20 to 50.

My questions are:

1)What accounts for the wide range of readings even on the 'good bands"

2)Why the poor correlation between E402 readings and carrier readings in some cases?

3)With a lower level going onto the grid of V401(2nd crystal oscillator) should there be a noticeable difference in receiver sensitivity?

In the case where there was no calibrator output showing up on the carrier meter, but the E402 reading shows a reasonable reading, what is

going on? Is it possible that the crystal isn't oscillating at the normal freq. ie 8MHZ , so I don't get any carrier reading when checking it, but its osciallating enough somewhere to provide the neg. bias to the grid? I know that the crystals don't oscillate at the freq. of the indicated band, but rather are mixed with the signal from the first 1st crystal oscillator as part of the conversion process, but I still am not certain about what is going on.

Can crystals that do multiple bands, such as Y403, work fine on some bands, and not others? I would have thought that if one was bad, the others would be too.

I will go down and check the calibrator again on 8MHZ, in case the crystal has really drifted off, but it was still pretty close to freq. on the other two bands it serves.

Thanks for your input. What a wonderful jigsaw puzzle it is. I am learning more radio theory tinkering with this, then on dozens of simplier radios. This one makes you think a bit.

Date: Wed, 29 Dec 1999 20:46:28 -0500
From: Bob Login <jlogin@mindspring.com>
Subject: Re: [R-390] Crystal oscillator ?

Randy..Do the cams line up with the index marks when the freq is on 7mhz band turned to the top so that its 8MHz(7.999 turned to 8)? If not that cud be
ur problem?

Date: Thu, 30 Dec 1999 01:36:14 -0500 (EST)
From: Norman Ryan <nryan@duke.edu>
Subject: Re: [R-390] Crystal oscillator ?

The other day I posted something on my RF deck overhaul and since then did an alignment. Discovered a similar problem with three deaf bands with no correlation among the crystals. This evening while checking out some 0A2WA regulator tubes in XV601 I noticed voltage at the test point E607 was off on the tube that was there for the alignment. I went ahead and selected a regulator tube to get good 150VDC.

But there was a puzzlement with the line voltage. It was too low according to my good VOM. Seems I had relied on the reading off the Variac's el cheapo voltmeter. After resetting the line voltage (and checking the 150 VDC again), I noticed that ALL the bands came to life and the set performs better. The R-390A is now running on 115 VAC during burn-in of the restored RF deck.

The heck of it is I have to do the alignment all over again because it was done on something like 105 VAC. TM sez do it at 115 VAC, + or - 1 percent. I'm convinced realignment at the correct voltage will yield better results and besides I had to skip a set of trimmer caps because I couldn't hear anything on the 30 MC band.

Talk about your "R-390 wrist!" It's compounded with the URM-25D since you also have to tune it back and forth, back and forth, to get max peaking between each set of slugs and trimmer caps. Not sure if any of this relates to your situation. You may have a weak tube somewhere. I believe the 6C4 mixer tubes like to be strong.

Another possibility is T401 being out of adjustment, but don't know the correct procedure. I tweaked mine a bit to get one of the upper bands to calibrate stronger. Didn't seem to affect the other bands adversely, but this is strictly flying blind. Comments, anyone?

Anyone want to start a thread on which sockets should get the stronger tubes? I have a hunch that marginal ones will work fine in certain sockets. I think it was Nolan who says a well aged but not necessarily strong 5749 is best in the PTO, but strongest 5749's should go in the earliest IF stages. How to allocate the seven 5814A's? Here is a way to help conserve our dwindling tube supplies.

Date: Thu, 30 Dec 1999 22:09:31 -0600
From: Nolan Lee <nlee@gs.verio.net>
Subject: Re: [R-390] RF deck 5000pf capactiors

>In everyone's experience do any/all the 5000pf 1KV ceramic disc
>capacitors in a 1967 EAC RF deck have a history of failure or deterioration?

I changed one that was physically cracked when I went thru my EAC last year. I did check all of the ceramic disc caps in the receiver and didn't find any that had any measurable leakage.

>What about R205? In my RF deck that is the only 2200 ohm resistor that was out of tolerance.

I changed all of the 2.2K resistors in mine. I think that all or almost all the ones of that value were way out of spec. Paul, while you have the RF deck out, don't forget to clean the bandswitch and make sure that the wafers themselves are perfectly clean. Any conductive residue there can lead to a B+ flashover and ruining the wafer.

Date: Thu, 20 Jan 2000 06:11:02 -0800 (PST)
From: Robert Meyer <meyer_rm@yahoo.com>
Subject: [R-390] Thanks for the assist

I few weeks ago, I wrote to the list asking about why 3/20MHz were not working on my '390A (actually I asked about 3/21 but the memory is the first to go :-). I got MANY replies, pointing to Y404 and it's trimmer cap (including corrections on the frequencies, I might add). I also received scanned schematics and much encouragement.

Well, I ordered a new crystal from Fair Radio over the web (my first web transaction) and got the order yesterday. I also ordered a manual for the beast, figuring that I will undoubtedly need it in the future. I installed the crystal last night and everything is back to normal. Spent the rest of the night until 12:30 cleaning up a station that has been idle for far too long (on the order of six years). Tonight I check out the Central Electronics 200V transmitter and if that's OK, N2DXN will be back on the air.

Again, thanks for all of the help, folks. I'm glad this list exists! I hope that I can contribute back a bit with my experiences as time goes on.

Date: Thu, 27 Jan 2000 11:43:51 -0600
From: Nolan Lee <nlee@gs.verio.net>
Subject: Re:[R-390] Z201,T201, MOD1

>T201 and one of the Z201 RF coils do not have the gold plated pins but some other metal.

All of the original plug in style coils on the RF deck of the '67 EAC's that I've seen used gold pins and were marked with ATC's name.

> Also the covers for these two coils are not labeled American Trans Coil and have a thicker block style lettering. Finally, Z201 also has a "MOD1" stamp on the cover that is lacquered over. Coils from another manufacturer, perhaps. or is this a modification?

Yes, probably from a much earlier RF deck. Mod 1 involved changing the value of the capacitors in a couple of the cans originally on the Collins and I think Motorola contract receivers. I don't have the manual handy and don't remember if it involved actually changing the original capacitor or adding another in parallel. I've got a spare set of the early Collins contract coils around here somewhere and can compare them to the spare set for the EAC if you're really interested and can tell you for sure. I'm curious as to the problem that the mod and production change was to correct.

>I suspect that this may be an old repair as the mica caps within the coils appear to be of an older style and do not match the style of caps in the other coils.

Probably so. Replaced RF cans are pretty common. I've checked and went thru a number of the plug in rf coils and have noticed that of the mica capacitors, the large value ones like 1500 or 2400 pf are the ones most likely to test leaky. I suspect that this was a real critical value capacitor. The original specs call for 2% tolerance. I used some replacement caps from NOS R390A spares that someone sent me last year to repair a couple of spare coil assemblies and
noticed that the value of each capacitor down to the pf was written in india ink from the factory on the side of the capacitor bodies in addition to the normal color code. I made a post sometime last year on checking and going thru the RF and variable IF coils last year that outlined the what to look for, problems, fixes, etc. You might want to search the archives using key words of "conductive film", "resistance", and "clean". If you can't find it I'll look and see if I still have a copy on this end.

Date: Sat, 12 Feb 2000 14:43:01 -0700
From: "jordana@nucleus.com" <jordana@nucleus.com>
Subject: [R-390] 390A 0-8Mhz Help...

Second question/problem... after running the rig for a couple of hours, I lose about 20db on the meter on all bands from 0-7.999 Mhz... I have found that pulling and replacing V-203 can restore the gain to normal, but only for an hour or less... a local BCB station will drop from 90db to 70 db and it will stay there until I let the rig cool down, or do the pull/replace of the tube... does this seem like the beginning of the end for the well known cap that can kill or weaken the first 8 mhz??? It has also been noticed that the Gain is quite strong for the first 2 minutes, and has a first drop of 10db after that time... it is then quite stable for an hour or two,then drops another 10-15 db... Example... when 1st powered on the Level meter is at 100 on a Local BCB station, after 2 minutes it drops to 90 db, it will stay there for about 1-2 hours, then it drops to ~ 75db... I can accerate the drop by rotating the MHZ Control so that it reads just below 0 Mhz... the station I use for the test is at 660 Khz so the Mhz indicator is already at 0... while the rig has full gain, tuning below about 275 khz results in a lot of scratchy noise, but when the gain has dropped this noise has dissapeared... Originally I though it might have been a dirty bandswitch contact, but rotating from 0 to 32 mhz will not force the gain back to the original power up condition...I will be in here(the RF deck) for most of today and tomorrow, while the temperature outside is -22C , so if anyone has suggestions it would be appreciated... P.S. the Mixer tube for the <8 Mhz bands has been replaced with several others also and the condition remains the same with all of them... 73 de Jordan...

Hi I am now into the RF deck, and find very little obvious reason for this to happen... aside from an incorrect value for C-327, which had been replaced with a 120pf cap, nearly all of the resistors measure well with 5%, and I am replacing all the 2.2K jobs regardless... I am also going to replace the majority of the Solar .005 bypass caps with new .0047 1Kv discs... there are no longer amy Black Beauty or other OLD tubulars...anything else I should look at to address the above problem???

Date: Thu, 17 Feb 2000 13:07:20 -0700
From: "jordana@nucleus.com" <jordana@nucleus.com>
Subject: Re: [R-390] 390A 0-8Mhz Help...

Well I am stumped...!!!! The RF deck has been re-comped,degreased lubed and re-installed, and the problem still persists... it has changed in that instead of losing gain after an hour or so, it loses gain right after warmup now, there is a definite 18db loss below 8 mhz, and it takes place within 20 seconds of the Meter reading 100db on the strong local BC StationI have done V and R checks according to the Blue Book, and all seems within normal limits, except that I can't get the 7-9V on pin 7 of either V-202 or V-203... it seems to sit around 3 V using a 10M input FET VOM... I have also replaced the Crystal oven containing the 17 Mcs Crystal to no avail...All bandswitch sections were checked and re-soldered, nearly all resistors have been replaced, as well as 95% of the caps, the only caps I did not replace were the small value tubular ceramics... Silver solder was used throughout and all solder joints were inspected with a 7x Loup... all tubes concerned were replaced with known good tubes and the loss remains... ANY IDEAS...??

Date: Thu, 17 Feb 2000 17:24:59 -0500
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [BoatAnchors] Re: [R-390] 390A 0-8Mhz Help...

The problem may be that you're going about this too intensely. I find that with troubleshooting gear and bug-shooting software. You may have to back off and dumb down a bit to find the problem. All the smart things you've done haven't worked and some seem to have made things worse -- now it loses gain right away, etc.

For example, on a simple level, that's a clue. To do what you did, what other things did you have to do? Well, one thing is remove the deck. When you removed the deck what was involved in that? A bunch of connectors for one. You might have jostled something for another. One place to check is the wiring harness and the connectors -- including inside the connector covers. Certainly the ones you had to disconnect and reconnect, but possibly all of them. I've found problems in those. A loupe

won't show a defective common ground soldered junction, or a solder joint that's gone bad inside, but you may have already hit all of these with the iron and fresh solder. A lot of us have some fancy test equipment. One of the best ones though is a stick. Yes, go back to the stone (stick?) age, picture that scene in 2001 where the ape-man throws a stick in the air. If you haven't tried the tap test, start tapping. You might not want to tap on the ballast tube, but try everywhere else. Anything you've looked at and said "nah, can't be", (because it would be too easy or obvious) look at again. Hit it with a stick. Could be something dumb and mechanical rather that esoteric and electronic, and that below 8 mHz deal makes me even more suspicous of the possibility. Of course, a replacement part could also be defective.

Date: Fri, 18 Feb 2000 01:02:51 -0500
From: km1h@juno.com
Subject: Re: [BoatAnchors] Re: [R-390] 390A 0-8Mhz Help...

Barry, you must have ESP!

I may be one of those with access to hordes of nice test equipment but the stick has always been my favorite tool. You can replace stick with foot, wrench, hammer, screwdriver, beer can or whatever. My 85 Dodge van has a sticking carb float. Since it is winter in NH and its a pain in the butt to remove the carb, I just use a hammer as needed. Over 300K miles and the carb has not been removed so it can wait till spring.

But what happened today is the ESP query!

I was getting totally frustrated with a 40 GHz transmit module that lost about 10dB every time I went below -25C. Warm it up and its perfect. No loose bond wires or the obvious problems. You dont get much time to trouble shoot at those temperatures since as soon as the cover is removed condensation occurs and quickly detunes the RF. I finally brought the module back to room temp for about the 6th time and started banging on the cover with the plastic end of a screwdriver. Ah HA!! Fflicker on the Network Analyzer display. Removed the cover and carefully tapped several extremely small SOT sized DC components and bang....it failed! Turned out to be a bad solder connection in the gate bias regulator of a driver stage MMIC. Completely invisible even under the microscope. Its not the first time Ive used the cave man method of troubleshooting and damn sure wont be the last. My boss just shakes his head and goes have a nicotine fit outside whenever I do things like that. He and most of the other tech types are 20-30 yrs younger than me and just never got taught the "right way". The engineers and upper management just leave me to my methods since I outproduce the youngsters by a mile.

I still think you have ESP Barry! Scary thought!

Date: Fri, 18 Feb 2000 19:20:29 -0500
From: "Tetrode" <tetrode@sprynet.com>
Subject: Re: [R-390] Variable IF alignment

Paul wrote: What is the principle behind the methodology for the R-390a variable IF alignment? Why not just peak for a signal at 1500kc, for example?

I wondered about the same thing, so here's what I think about it.... It's to keep the resonant frequency of the resonators tracking together as the slugs are moved with frequency change. By resonator I mean the LC section in each of the RF cans, some of which are also transformers. For any given resonant frequency there are limitless combinations of L and C which will work; high L-low C, low L-high C, etc.. and each resonator has its own L and C adjustments which offer considerable adjustment range. All the tracking resonators need to have the *exact* same ratio of L and C (for any given frequency) so that all the resonance's move together as they are tuned. In other words they need to have and retain the same L/C ratio with respect to each other as the tuning slugs are moved about.

So how to do this? Each tuning procedure has a Low and High frequency point to adjust. At the low frequency adjustment point, the slugs are at (or near) their lowest point of travel in the coil and thus at maximum inductance, which is why the procedure says to tune the slugs for max signal; it is attempting to set all the L's to the same value. Then you go to the high frequency adjustment point, where the slugs are at their highest point of travel in the coil and thus at minimum inductance. Here, the circuit C has the most effect, which is why the procedure has you tune the trimmer caps for max signal; it is attempting to set all the C's to the same value.

So now you just peaked up the upper frequency, but you just screwed the low frequency peak since you just changed the C values, so you have to go back to retune the L's at the low frequency, and then go back up and retune the C's and so on. These adjustments are totally interactive, BUT each time this operation is performed, the L/C *ratio* of each resonator is being "walked"
closer to each other and thus all the resonant frequencies are moving along with each other as the slugs move.

Each time you repeat this step, you are rewarded with higher and higher gain as all the resonator frequencies line up, until you reach a point of diminishing returns and cannot see any more improvement. In actual practice, the number of iterations required depends on how badly the

tuning was messed up to begin with, and how picky you want to be with your tuning.

When I tuned my RF deck, I started from ground zero, since I had moved all the trimmer caps during cleaning their innards, and all the slugs had been removed from the racks for cleaning as well. Prior to unscrewing the slugs I made a note of their position so I could set them back to their approximate value but made no attempt to reset the positions of the caps. Even so, I found that after about four, sometimes five tuning iterations for each slug rack that the RF deck was pretty well peaked up.

Date: Fri, 18 Feb 2000 06:02:03 -0500
From: "Walter Wilson" <wewilson@knology.net>
Subject: Re: [R-390] Variable IF alignment / Wet tantalums

I've tried several methods of alignment, and seem to have settled on aligning the IF without making any direct connection to the radio with the signal generator. I leave the real antenna hooked up, and I use the signal generator as a mini-broadcast station. My incoming station feed is with ladder line, so it makes it easy to impose a signal with a few wraps of wire around the ladder line and a 50 ohm terminating resistor to provide a load for the signal generator. No direct connections to the radio. Then I use an alignment procedure that is outlined by Chuck Rippel (WA5HHG) in his R-390A video. Chuck gives a method of alignment for the IF sections that inject frequencies into the antenna jack instead of injecting signals at test points within the radio. I also have some printed articles from other sources that give similar procedures. The one that first led me to not directly connect the signal generator to the radio is a National Radio Club reprint, #R-29, by Charles Taylor. While I prefer this approach to alignment, I still can't see why this method would eliminate your distortion problem, but I'm glad it did. Maybe others can give an explanation.

Date: Fri, 18 Feb 2000 09:40:35 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] 390A 0-8Mhz Help...

Isolate the IF deck from the RF deck by injecting 455 kc signals into the IF deck input. The manual tells the proper levels for specified diode load voltage. Set the IF deck gain properly. Determine if the loss is in the IF section or in the RF section. If the IF section it working well, then work backwards toward the front end. Use the test points in the RF deck. Inject signal voltages at the various points to determine what stage is causing the decrease in detected signal level.

Date: Fri, 18 Feb 2000 16:37:33 -0800

From: Robert.Herendeen@infineon.com
Subject: RE: [R-390] 390A 0-8Mhz Help...

This sounds like a problem I had with a 51J2. The gain dropped off after a relatively short period. When turning the radio on cold, it worked fine for 10-15 min then slowly dropped in sensitivity. Did all the same stuff..... changed tubes and that helped for a little while then the same problems. I resorted to poking around with a signal generator and scope, measuring the gain at each stage and monitoring for drop of with a fixed input. I uncovered a combination of problems. First, the gain did fall off more between 4-8 mhz bands. Second the gain was falling off overall and seemed to be affected by tapping the IF transformers. The real frustrating characteristic was that hitting certain caps with quick freeze would temporally have an affect of making it better or worse. When it was better, it would work until the next time you turned it on!. I tracked down the gain problems to two stages, the first being the first mixer input stage for those bands, and fixed that by replacing of one of those pink micas. The second problem was ugly because I was multiple problems. When tilted on its side the affect of tapping on the cans was worse. I took apart the first IF can and found that the varnish had broken on the cup cores allowing the core to move around. So after repositioning and revarnishing the core, the erratic gain problem stopped, but I STILL had the overall drop in IF gain. So after many cool downs, like 3-6 hrs, and turn ons with scope attached and fixed input to the IF chain I narrowed the problem down to the first IF stage. Some cap? Touching a probe almost anywhere in the chain would pop the radio back to performance, though usually not max, so all measurements had to be static....don't move anything, but tapping each component had no affect. I replace each cap in the can, one at a time and no affect. That left me with two more caps, and so I replaced both, resoldered all connections in the stage and put DeOxit on each of the tube pins. One of these items fixed the problem. Interesting to note that just replacing the 1st IF tube or tapping or wiggling it around did not fix the problem.

So I had multiple problems that could only be solved by going to each stage. Personally, I think it was an oxidized tube socket or stage ground which was a star washer type solder lug onto an aluminum chassis. (Those got disturbed every time I had to remove the IF can or solder lug.)

Date: Tue, 29 Feb 2000 03:26:44 -0000
From: "Phil Atchley" <ko6bb@elite.net>
Subject: [R-390] Low gain below 8MHz & Calibrator Re-visited....

Today I decided to check what I could on the above two problems from "above the chassis" as I don't want to pull this puppy out of the cabinet until I'm ready to re-cap it and do all the other "routine overhaul" things

to it, which won't be until I've got all the parts here. First, I tried tubes, one at a time. Replacing the 1st mixer netted me "maybe" 5 to 6 dB on the "S" meter (at 4.4MHZ), replacing one of the calibrator tubes didn't net any additional output on even harmonics but did make a noticable difference in the level of the "odd" harmonics. Left the tube in. Then I started cleaning connectors (above the chassis). EUREKA! **Cleaning P221 (a mini BNC plug) and it's socket netted me over a 30 dB improvement (at 4.4MHz) on the S meter. This is the connection from the 17MHz Oscillator to the first mixer.** Now, I did notice the Mini BNC plug directly behind it (can't see the number) from the Xtal Oscillator Assy is veeerrrrry scratchy and erratic. DeOxit doesn't seem to help much. Anybody know how much of a pain in the Keester it is to replace this plug and or socket? No, I don't know if it's the plug or the socket (or both) that is erratic. But at least now the low bands seem to be much closer to normal,my local AM broadcast stations even read 100 on the Carrier Meter, they never did before. .

Date: Tue, 29 Feb 2000 07:12:44 +0000
From: "B.L.Williams" <B.L.WILLIAMS@prodigy.net>
Subject: Re: [R-390] Low gain below 8MHz & Calibrator Re-visited....

I have needed a can of DeOxit for some time now and it arrived yesterday. I have some old stereo gear with noisy switches that really need cleaning. Also, I'm tired of rubbing the pins on tubes with an eraser to clean them. I had the R-390A on last night and decided to shoot the antenna leads and scrub out the balanced connector in the process. Wow. The jump in gain was hard to believe. So, after reading about your BNC plug for the xtal oscillator I'm going to clean all that I can reach with the radio in the rack. Thought this might help someone out there.

Date: Tue, 29 Feb 2000 09:55:59 -0500 (EST)
From: "Paul H. Anderson" <pha@pdq.com>
Subject: Re: [R-390] Low gain below 8MHz & Calibrator Re-visited....

My friend (Patrick) and I bought R-390A user repairable radios from Fair Radio a couple of weeks ago. Patrick's radio had P207 wrapped around the left rear RF deck cam.

He removed the front panel, the VFO coupler spring, the cables connecting the RF deck, then the RF deck itself. Other than frayed high frequency shielded cables, and the one torn cable, everything was basically in ok shape. There was evidence of the unit having sat in water, as there was a high water mark about 1/4 inch up from the bottom.

Patrick pulled the broken wire through the deck, and was able to route an exact replacement shielded wire (that we lucked into finding the previous

day at Purchase Radio here in Ann Arbor, MI). The replacement was relatively easy to thread through the deck, but near the place where it was supposed to connect (I think the first switch wafer on the band switch), was a bit tight, so we soldered it into the existing wire, pending a more complete rebuild if warranted.

I worked on the plug end, which is what you were asking about. The plug has four pieces. For lack of better terminology, I'll call them the body, a back cover, a pinch fitting, and a threaded cover for the pinch fitting.

The back cover is a press fit, and is soldered in. I removed this one by heating the back cover with a small butane torch, holding the body with vice grips, and using a L-shaped music wire (2 inch by ~1/8 inch) to pry the back cover off. In my case, the wire was broken out, so I could reach the inside of the cover that way. In your case, you may just find it easier to drill a small hole in the cover, insert a wire hook, and pull it out that way.

After that, I trimmed the new wire insulation, shielding, and wire core to fit. I've done that kind of thing before a lot, so I eyeballed it and got it right the first time. You may want to practice with junk wire if you're less confident. To assemble, first put the pinch fitting cover with threads towards the end of the wire. Spread the fingers of the pinch fitting so the shielding fits through. Insert with the rounded part facing out of the body (towards the pinch fitting cover). Solder the wire to the post. Screw the pinch fitting threaded cover onto the body. Solder the back cover on. Admire your work. Plug it in, and hopefully all will sound fine. When reading this, be aware that I've done this exactly once (two days ago), and I don't have knowledge or equipment to measure and dB gain or loss relating to before/after performance. Your milage may vary. Don't try this at home. No warranty express or implied. I just offer this to help out...

Date: Tue, 07 Mar 2000 08:53 -0800 (PST)
From: rlruszkowski@west.raytheon.com
Subject: [R-390] Crystal Oscillator Deck Adjustments

To Adjust the Caps in the crystal osc deck you can do the following. Hang an AC volt meter on the local out pins of the rear terminal board as an indicator. Or a DC volt meter on the diode load (-7 Volts) to ground. This is the easier reading and sharper indicator.

Use either the cal tones or a station on each MC hertz band as a signal.

For each band adjust the cap for max. indication. You will get a wide range of values. This is due to different signal level inputs.

Find the weakest band. Try several signals on that band to find the strongest signal. re adjust the cap for max..

Once you find your weak band, write that band down for reference.

On that band adjust the cap and the transformer for the best max. output.

Now go back and adjust every cap on every band for max.. Do not re adjust the transformer.

If you change tubes you can bring all the bands back to max. by adjusting just the transformer.

On 0- 8 you need to decide if you want the 1st or second 2nd conversion. 0 -8 being the second conversion. Pick the one you want and adjust the cap to max. on that band. The max. point may or may not be the same for the other band. There are two numbers for these caps. The osc is used on both bands. So pick the band of most interest.

Some of the caps may be stuck. Use a good screw driver and nudge them a bit harder. Once free spin them around a few time to loosen them up. You can pull the deck and disassemble them all and clean them if necessary. Not a fun job but some times necessary.

Date: Mon, 6 Mar 2000 22:41:22 EST
From: PABigelow@aol.com
Subject: Re: [R-390] First time here

The dead 9mc band may be due to either:
1) Bad crystal for the band
2) Misadjusted trimmer capacitor for the 9mc band
3) Bad trimmer capacitor for the 9mc band
4) Bad switch position for the 9mc band

Since the same crystal for the 9mc band is used for the 4mc and the 21mc band AND you report that 4mc is pretty hot. #1 might be eliminated (check 21mc for noise and signals). That leaves the likely candidates of 2 and (hopefully not) 3 and/or 4.

As a test:
1) Turn on the receiver / plug in headphones / speaker
2) Turn to 9mc
3) Locate the trimmer capacitor on the crystal oscillator deck with the number "9" beneath it.
4) Note the current position of the trimmer.

5) Using a nonconductive tool try adjusting the trimmer capacitor.
6) Tune for the loudest background noise, if possible.
7) If no change, then set the capacitor back to the position noted in step 4.

Consider obtaining a new 12,000 Mc crystal for Y 405.

Date: Fri, 10 Mar 2000 23:15:56 -0600
From: "Gary Harmon" <gharmon@idworld.net>
Subject: [R-390] Question

My R-390A works on all bands except 4/5/6/7 MHz. Sounds good on 3 MHz and again on 8 MHz. Before I tax my senior brain is there a common fix for this type problem??

Date: Sat, 11 Mar 2000 09:30:42 -0500
From: "Walter Wilson" <wewilson@knology.net>
Subject: Re: [R-390] Question

You have a whole lineup of RF coils and capacitors that are tuned for the 4, 5, 6, and 7 MHz range. The tunable part of this circuit is C239-1, C239.2 C213-B, L219, L227-1, and L227-2. First check to make sure the slugs are still attached to the slug rack (4th one from the right). After that, it could be that it needs alignment, that one of the above trimmer capacitors is bad, that some non-tunable component in this circuit is bad (not as likely), or that bandswitch S201-S207 is not making good contact. I'd start with a good inspection of the slug rack, which can be done from the top, I'd probably then try to align this portion of the RF circuit, if you can pick up any signals at all. If no signals are present, then you may need to consider the switches next. Cleaning or inspecting the switch will require removing the RF Deck.

Date: Sat, 11 Mar 2000 13:48:38 -0500
From: "Charles A. Taylor" <calltaylor@prodigy.net>
Subject: [R-390] aligning/zeroing 100-kHz calibrator

>.....calibrate the calibration marker on the R390A.

A quick and easy way to set the R-390(*) calibrator to zerobeat, is to set the RX to CALIBRATE and the function switch, then jam the antenna transfer switch (use something non-conductive) in the open position. That reconnects the antenna inputs to the RX WITH the calibrator energized. Zero-beat the calibrator with any RF signal of known stability on a 100-KHz
multiple. Examples:

WWV/WWVH on 2500, 5000, 10000, 15000 or 20000 kHz;

WTOP Washington, DC on 1500 kHz;
WMVP Chicago on 1000 kHz;
WLW Cincinnati on 700 kHz
WTAM Cleveland on 1100 kHz;
WOAI San Antonio 1200 kHz;
XEW Mexico City on 900 kHz.

Generally, the higher the frequency of the standard, the better. Most Canadian and U.S. MW BC stations on multiples of 100 kHz will do.....but don't bet on
it... KXXX or CKXX in Lower Schauff, Kansas or Upper Schnauf, Alberta have occasionally gotten to be 50-100 Hz off.

Anyone want more precise instructions?

-
Date: Sat, 11 Mar 2000 17:23:48 -0500
From: "Walter Wilson" <wewilson@knology.net>
Subject: Re: [R-390] Question

You can test the switches with the radio off and RF deck in place. On the first switches (S201&S202), you should be able to tell if you have good connections by pulling loose P207 and P206 and measuring the continuity between the two center conductors. Getting on just the center conductors may be tricky, unless you have four hands, so get some help.

You'll be measuring continuity across the RF transformer. If you switch from say the 3MHz to the 4 MHz band and loose continuity, then you know that switch has a problem. You may be able to run the check on this section through the balanced antenna input, but I don't think the antenna relay pulls in until you turn on the power. Measuring a P206/P207 bypasses the antenna relay.

For the second gang of switches(S203-S205), you can measure from test point E208 to ground. You will have a higher resistance here (maybe as large as 1.5 M), but it should not be open nor should it change drastically when you switch between 4MHz and 3MHz for instance.

On the third set (S206), you can measure by pulling the 6DC6 tube and measuring from pin 5 to ground. This again should not be open but you should measure some resistance (5K plus the transformer).

The final switch that affects the 4 thru 7 MHz coils can be tested for continuity by measuring from E209 to ground. Once again, check continuity as you rotate into the 4-7 MHz range and out again. If your ohmeter reading changes a lot thru the 4-7 MHz range as compared to

other ranges, that switch may be your problem.

Date: Sat, 11 Mar 2000 22:08:08 EST
From: DCrespy@aol.com
Subject: [R-390] New Fix for a "Below 8 Megacycle" Problem

I'd been fighting an intermittent "below 8 Mc" problem on my EAC for a long time. The only thing that I could find that was consistent was that it always gave up after a few hours of warm-up. Of course I suspected the usual bad cap (the 100 uuF), and others, and a few resistors. I'd changed a lot of parts but nothing seemed to work.

Finally, for some reason (I guess because I had my Motorola out of the cabinet), I noticed that the crystal oven for the 17 mc and 200 kc crystals (HR 202) ran a lot hotter than the one on my Motorola. This oven is always on and is not disabled with the rear panel switch. Apparently the thermostat in the oven on the EAC was stuck 'on'.

I just disabled the oven (cut and removed the heater wire, made sure the bare ends were insulated from the housing). It is a new radio! It's been on all day now and works great! It is as strong below 8 now as it is above (save the standard 5 or 10 dB problem on the 7.0 band). For normal amateur/SWL use, I don't think the oven does much. But it sure can screw up an otherwise perfectly good radio!

Another place to look. Hope this helps someone!

Date: Sun, 12 Mar 2000 11:16:22 EST
From: Llgpt@aol.com
Subject: Re: [R-390] New Fix for a "Below 8 Megacycle" Problem

The best thing one can do with " ovens " is disable them, both X-tal and PTO. These were needed in extreme temperature changes the military encountered in trailers etc. But, not in homes. If an oven goes on and stays on, such as when a stat fails, serious problems can and do occur, especially in pto's, I have seen baked innards, ruined bearings etc. Especially on the older Collins and Motorola units. probably due to age. In mine, I just clip and tape leads.

Date: Thu, 16 Mar 2000 17:38 -0800 (PST)
From: rlruszkowski@west.raytheon.com
Subject: [R-390] BFO Adjustment

<snipped> I also happened to find out my medium wave bands are dead.

R390/A R390 bands are.

0.5 – 1MC 1 – 2MC 2 – 4MC 4- 8MC 8 –16MC 16 – 32MC

Which set of these bands are dead. It may be more than one set. Mis-adjustment of the slugs or caps. Things may need cleaning from setting around. The caps in the top of the coil cans in the RF deck set up over time and may just need an exercise. (good alignment) Look for a slug rack that does not track the cam.

Set the receiver to 7.+000 and look at the cams. each cam has a hole in it. On the front panel will be a set of black lines. The holes should be over the lines. cams will slip in the clamps and may need resetting. This will cause a band to fail. Along with the cams and bands is a band switch. This may need alignment. Do the easy things first and post more mail if it all fails. Tell us what you have done in the mail so we can guide you into the next levels of maintenance.

If you are missing 9Mhz how about 1Mhz. These both use the same crystal in the 2nd mixer. 0 converts to 8, 1 converts to 9. If 1 works then the 9 problem is not the crystal. It is likely still a problem in the crystal osc deck. But your not shopping for a crystal. If you think it is a crystal do some more testing on the crystal to make sure. Low failure rate and time consuming to locate the replacement just to find it is not the problem.

I also happened to find out my 9MHz band is dead. Guess something got fried

Not very likely. single bands will drop out because of the same caps used in the crystal oscillator deck. Crystals plug in. Tuning coil cans plug in. Switches get out of alignment. Cams get out of alignment. You only smoke a part in an R390 if a tube goes to hell on you and then it gets every thing.

Have you replaced the DC blocking cap in the IF deck to protect the mechanical filters? Have you checked the two big plug in caps in the audio deck for leaks? Have you put diodes in the power supply yet? Have you installed a 12BA6 in the BFO and PTO with a jumper in the ballast tube socket? After that it is down hill and great receiving.

Date: Sun, 19 Mar 2000 10:32:48 -0600
From: "Dr. Gerald N. Johnson" <geraldj@ames.net>
Subject: Re: [R-390] VRC runout and PTO alignment question

I think the only downside to aligning with the calibrator instead of a signal generator is that its not by the book and the antenna coil may not be perfectly tracked. That's why there's an antenna trimmer on the front panel. Antennas drive the antenna coil away from the present resonance too.

The upside to using the calibrator is that its always available and doesn't drift nearly as much as the most common signal generators.

I've been aligning my 75S3B with its calibrator for decades, not likely to change either.

Date: Sun, 19 Mar 2000 08:46:44 -0800 (PST)
From: Tom Marcotte <courir26@yahoo.com>
Subject: Re: [R-390] VRC runout and PTO alignment question

This is important to the performance of your rig. You should run the RF deck out to it's stop (either side is OK) and give the VRC 35 kcs of overtravel (make sure your zero set gadget is about in the middle of its limited range). Then set the cams up at the prescribed frequency (7+000 or 7999 + 1 kcs I think the freq is). Then, set your PTO endpoints to 1000 kcs in ten turns. After all this is done, you can proceed with alignment. If you skip the above steps your alignment will be sub-optimal.

Date: Tue, 21 Mar 2000 07:24:41 -0800
From: "Constanten, Carl" <CONSTCA@mail.northgrum.com>
Subject: RE: [R-390] Xtal Calibrator Question

The R-391 (and -390 also, for that matter) uses a calibrator circuit incorporating a free-running multivibrator synchronized by a 1 mc crystal. On mine, the crystal went south and the multivibrator wasn't synchronized anymore; the trimmer cap on the cal chassis can be set to put it in the ballpark but it won't be stable. I suspect your crystal has stopped oscillating. Replacing it fixed mine.

Date: Tue, 21 Mar 2000 11:16:02 -0500
From: km1h@juno.com
Subject: Re: [R-390] Xtal Calibrator Question

Try pulling the crystal and see if it is still putting out signals. However that is not a 100% method. Possibly you have a bad xtal and the loading is enough for the circuit to oscillate on its own. At such a low frequency it would (should) be quite stable.

Date: Tue, 21 Mar 2000 18:57:39 -0500
From: eengineer <eengineer@erols.com>
Subject: Re: [R-390] Xtal Calibrator Question

One other way that I use to test a crystal involves a scope and my HP 3525A synthesized Sig gen. I pick a 1V square wave, AC coupled and feed into the scope (Sig and GND of the Generator tied to Input and ground of

the scope). Put the crystal across the Input and Ground of the same lines (Driving the crystal AND the scope) and watch the display. Here is where the 3425A shines. I can program it in .0001 Hz increments or larger. Pick the crystal freq on the sig gen, and when you finally sweep the frequency of a good crystal, you will force it to resonate, which will be quite obvious on the scope. I do this with 32KHz, 8MHz, and 16.384 MHz crystals at the office when I suspect they may have gone south. On the other hand, not too many crystals I ever see go bad. (And we hit them with up to 5000 G's sometimes) I might have seen 2 or 3 in the last 3 years.

Date: Tue, 21 Mar 2000 18:01 -0800 (PST)
From: rlruszkowski@west.raytheon.com
Subject: Re[2]: [R-390] Xtal Calibrator Question

You can use any signal generator for this test. If you do not have a scope you can use an RF volt meter. As frequency goes up this gets harder with a meter. Mostly you sweep the generator slowly across the frequency and watch for a jump on the meter or a blip on the scope. This tells you your crystal under test has a low resistance resonance point. Roger KC6TRU

Date: Tue, 11 Apr 2000 20:56:42 -0400
From: "Dale Hardin" <aiti@gate.net>
Subject: [R-390] Dead below 8 mc...yet another reason

Here is a new one for your notes. My Motorola R-390A was essentially dead below 8 mc. I enlisted the aid of Don Frazier a ham friend of mine who has a good selection of test equipment, and, more importantly, another R-390A.

First mixer tube checked ok. C-327 was replaced during recapping. Checked 17 mc crystal by substitution...ok. However, there was no oscillation when looking at the oscillator output on the scope. Inserted a tube test point adapter at V207, first crystal oscillator. Voltage on plate (pin 6) was around 200v rather than 165v. Checked pin 7 with ohm-meter and got open circuit. Looks like an open inductor (L201).

Nothing to do but to remove RF deck. Checking to find L201 reveals that, while L201 is connected between pin 7 and ground, **pins 2 and 7 were not connected as shown in the schematic.** Jumpering pins 2 and 7 and a realignment brought back all bands below 8 mc. As this radio was essentially untouched (ie, not a depot dog), it must have always been this way. If it had not been for Don's skills at troubleshooting, I would have never have found the problem. (Moral; find a good Elmer.) Learned a lot today. What a radio! Hope this helps someone.

Sent: Wednesday, April 12, 2000 9:53 AM
To: aiti@gate.net
Subject: Re: [R-390] Dead below 8 mc...yet another reason

I was very interested to read of your experience with the 17MHz oscillator in your R-390A. I have had a similar problem, but in my case, the oscillator was not dead. Since the RF deck is removed from my receiver at the moment, I took a look at V207. In my receiver (a Capehart), L201 is connected from pin 2 to ground, and the two feedback mica capacitors are connected to pin 7. The point you missed is that pins 2 and 7 are internally connected inside the 6AK5 vacuum tube. So it sounds to me like either 1) pin 2 or pin 7 is defective in your tube socket, or 2) for some reason the internal connection is open in your 6AK5 tube. In either event, your "fix" solved the problem. Congratulations. 73, Lew Collins

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Date: Thu, 13 Apr 2000 06:47:47 -0400
From: "Dale Hardin" <aiti@gate.net>
Subject: FW: [R-390] Dead below 8 mc...yet another reason

Well, I must plead a memory lapse on the pin connection. Always had trouble remembering pinout numbering direction. (That will be the subject of a later post.) Indeed, L201 is connected to pin 2 and pins 2 and 7 are connected internally to the tube. Here, I must plead fatigue after a long day of troubleshooting. It is so obvious, my hand immediately smacked my forehead. So, I went to the tube in question and found continuity between pins 2 and 7. Darn. Next, I will check the tube extender adapter and the tube socket. Hopefully, I will find the culprit. (I swear I saw the open circuit, I swear.) To confound things, it works now. I hate it when I can't find out how I fixed something. Who knows, maybe the solder joint at pin 2 was bad and my jumper corrected it. Yeah, that's it. Now, to get a decent antenna installed on the office building without the landlord getting upset. The R-390A will live in my office beside my desk to keep me company. Now, on to the AGC mod to improve the ssb. Thanks guys for the help so far. I will be back.

Date: Mon, 17 Apr 2000 09:09:24 -0500
From: "Dale LeStourgeon" <DLESTOURGEON@ci.tulsa.ok.us>
Subject: Re: [R-390] 16 to 32 not so good.

Thanks for your help. This R-390A came to me with 16-32 dead. I took your advice and pulled the 16-32 slug rack and no slugs were broken or colored. I started to swap racks and realign like you suggested, but I decided to try something simple first -which I should have done in the beginning. I turned on the radio and set the Cal on and with the cam

down, I lifted the rack manually. As I raised it, I began to hear the tone so I felt pretty stupid for even hollering for help in the first place.. All I needed to do was adjust the ceramic trimmers in the cans, which were totally off. Now the radio is fine on all bands. I suspect a thorough alignment may be in order, but I am happy there is nothing really wrong.

Date: Thu, 27 Apr 2000 16:13 -0700 (PDT)
From: rlruszkowski@west.raytheon.com
Subject: Re:[R-390] R-390 not "A" RF Deck Alignment

>GM gorup. I'm aligning an Rf Deck and have low sensitivity form 17mhz to
>32mhz. Coil Z218's slug peaks at the top of its adjustment - just barely.
>The trimmer will also peak. Sensitivity is 5-6 uv. I have gotten .5 to
>0.75uv in the past on another radio. I have checked the 6C4 mixer and it
>checks gud on a tv2. All other coils in the 17-32mhz line peak where they
>should in their slug adjustment. Question - can the caps in Z218 change
>value enough to hurt performace like what Im seeing or is this a red herring
>resulting from something else? I

Have you owned this receiver long?
Has the receiver always acted this way since you owned it?
Is this a new problem that just jumped up?

Test 1. Swap the slug in Z218 with one of the other slugs in the rack. All three slugs should be the same. The 16 to 32 slugs should also be the same as the 8 -16 slugs. (and other). You can remove the screws on top of the slug rack to do this test.

Test 2. Did both slugs look the same color?

Test 3. Did both slugs look complete?

Test 4. Did both slugs look like they had the same length of springy link in them?

Test 5. Tune the rack to mid band 24 Mhz. Run the slugs to mid range. Peak the caps. Go to the top alignment point and peak the slugs (yes slugs). Now peak the caps. Does this look like the slugs are going to line up in range?

Test 6. Tune to the bottom alignment point and trim the slugs. Go to the top end and trim the caps. Repeat this until it gets as good as it gets.

Test 7. does 16 - 32 work now? or are you where you started?

You swapped two slugs. Was the problem mechanical (wrong color slug, broke slug, long spring in slug)? (new slug time) Did the problem follow the slug to the new location?(new slug time) Did the problem stay with the can and leave the new slug there tuned very high in the rack? Did the swap provide enough change that you can live with it? (it can happen)

Have you adjusted the antenna trimmer caps across the front end yet?

Select an equal pair of resistors 47 - 100 ohm tie one lead of each to the signal gen. output. put one lead of each into a socket of the balanced input antenna jack. Use some signal (things are lossy here) pick a point in mid band 750, 1500, 3000, 6000, 12000, 24000. and adjust the receiver for max. tuning measure the diode load and adjust the signal level on the generator for 4 volts on the diode load.

Now adjust the front cap and antenna trim for a max. diode load value. Back the generator output down as needed.

Did this help? So you think the can is bad?

Off with the springs from the rack. (roll it to a low point) Out with the slug rack.

There is a small Philip head bolt in the bottom of the slug tube. Use a small dia. screw driver and remove the can from the deck. The can should come off the deck. Push the side clips in with a gentle pointy object and slide the guts out of the can.

Inspect.
You can ease the silver clip off the peg under the caps and the cap tops will come free. The caps may be cleaned.

The slug wants to come out to peak. Too much inductance. Too much iron. Too little C.

Loose screw. Cob webs.
Wrong core type. Something in the bottom of the slug tube.
The coils are good because it will align and work at 5UV.
The trimmer caps can be dirty.
A cold solder joint in the can. (We do see this often)

What ever is wrong with the can can be fixed.If you need a slug post it here and see if any are available. Some one may have one in a parts deck

and will deal with you.

Date: Wed, 3 May 2000 09:19:42 -0500
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: [R-390] Synchronizing bandswitch

After separating the RF deck and the gear train, I've discovered the need to get the bandswitch synchronized with the gear train. I thought I had it correct, but after tracing the signal path (the heavy lines on the schematic) last night, something isn't right about it. While I can get the "front end" (S201, S202, S203, ...) correct, the remaining banks of the switch aren't correct. I have not rotated any of the switch banks independently of the others so they are all in sync with each other, but I still have the problem of getting signals from the antenna to the IF. Supposedly there is procedure on one of the manuals that describe this. Can someone point me to it? I have the latest CD from Jeff.

Date: Wed, 03 May 2000 08:13 -0700 (PDT)
From: rlruszkowski@west.raytheon.com
Subject: Re:[R-390] Synchronizing bandswitch

.....bandswitch synchronized with the gear train. .....

Take a good look at the schematic. You can drop an Ohm meter into the test points E210, E211 and some of the tube pins and find the band switch make break. As you roll the MC through the 0-1, 1-2, 3-4, 7-8, 15-16 points. You can stick a screw driver in the rear of the receiver and turn the band switch shaft with the clamp loose on the gear. You can adjust a little test an lot until you get it well centered on all switch points rolling both up and down in frequency. If you pull the deck you can eyeball it a lot quicker on the wafer switch. There is some miss alignment down the switch bank. I have never had to adjust the wafers to get alignment. But finding the sweet spot where everything worked on each band has more than once been a real pain.

I split my deck Easter week end here and gave it a cleaning. My apologies to Norman for haranguing him on his brassoed gears. After cleaning my deck the my brass gears looked poor and I shined mine up a bit also. But I did not have a problem getting mine realigned. I did it with the deck out. But then again I have done this a few hundred times on as many receivers.

Date: Thu, 11 May 2000 10:18:06 -0500
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: [R-390] Low Crystal Oscillator output

I've been looking at a low p-p output voltage from the crystal deck and

checked the voltage at pin 1 (control grid). It should around -10V, but I'm only getting about -0.04V. Does this sound like the grid resistor (R404, 120K)?

It's been a while since I studied this, but isn't the -10V a result of the grid current which should be 10V/120K which is only 83uA. Can this be correct? I assume there is a current through the crystals that has to be taken into consideration, but I don't know for sure. Can someone correct me, please? If my assumption is incorrect, then for this much drop in the bias wouldn't
the resistor have to be many times its value? Sure, they go high, but this much? I *think* I checked this thing when I had it out and I don't remember anything checking THAT far out. Could it be the grid to cathod cap (C408) gone leaky (or shorted)?

The output is consistently low on all the bands, so I tend to discount the crystal caps. Is there anything else that would cause this? Anyone seen this behaviour before?

Date: Thu, 11 May 2000 10:50:02 -0500
From: "Dr. Gerald N. Johnson" <geraldj@ames.net>
Subject: Re: [R-390] Low Crystal Oscillator output

Check the resistor, but I lay the odds much higher on:

1. weak tube.
2. leaky screen bypass capacitor
2a fried screen resistor
3. leaky tuned circuit bypass capacitor
3a fried plate feed isolation resistor
4. Leaky grid to ground capacitors.
5. changed cathode circuit resistance

The grid voltage is the result of grid rectification of signal that can only come from feedback from the output of the tube (cathode or plate). There's NO DC current through the crystals.

If the resistor value was high, the grid voltage might be very high too.

The gain of the stage is directly proportional to plate current and plate current is directly proportional to the screen voltage. If those supply voltages aren't correct, then a good tube won't oscillate right. If the tube is weak, has grid emission, or low emission the stage won't oscillate strongly. In a vacuum tube situation, the tubes were made with sockets for one reason: The tube is always MOST suspect when there's a malfunction.

At the age of your radio, anything is possible but I put the priorities as above. Get them all correct and with good switch connections to all the crystals and it should work fine.

Date: Thu, 11 May 2000 10:42 -0700 (PDT)
From: rlruszkowski@west.raytheon.com
Subject: Re:[R-390] Low Crystal Oscillator output

The resistance in the circuit it that much. The resistor may be ok and your looking a crud under a ground lug. Or cold solder joints that look and measure ohm meter good but not RF good.

Measure deck to pin socket on the tube side of the socket and see what the total resistance is. Yes you could have a leaky cap. Not a bad cap but crud over surface that does a by pass on the RF. Crud at socket could also be leaking the signal.

With the power OFF. With signal generator probe in one hand and scope probe in the other go exploring. Inject on one side of the solder and measure the other side of the solder.

Pull the deck loose and set it on a bench pad. ground the scope to SIG gen but not to the chassis. You can even check loss this way to ground points.

Many times we had these problems. We tore every thing apart, cleaned it up, put it back together and reported no trouble found.

Date: Thu, 11 May 2000 13:10:04 -0500
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Low Crystal Oscillator output

I'm pretty sure the tube is good. I have two and, while one is a little weaker than the other on the tube tester, they both exhibit the same behavior. I'll look at these other things when I pull the deck. Since there is very little grid current/voltage present, I tend to think you're right. The other items are stressed more than these grid components. It doesn't rule them out, but I suppose I'll look elsewhere first. Thanks for the checklist!

Date: Thu, 11 May 2000 12:52:45 -0500
From: "Dr. Gerald N. Johnson" <geraldj@ames.net>
Subject: Re: [R-390] Low Crystal Oscillator output

Your tube tester did not test for grid emission. Grid current from grid emission cancels grid current from signal rectification, though should result in a large plate current. With the grid bypassed or the crystal pulled

or the bandswitch moved to a blank position the grid voltage should be close to zero, NEVER positive. If positive its leakage or grid emission. If leakage it will be there with the tube pulled. There should be NO voltage on the grid pin with the tube removed.

I still vote for a faulty tube, then screen bypass capacitor (and screen dropping resistor fried by the leaky bypass capacitor), though the screen capacitor could be open, that would kill the tube gain too, or the ground for it be corroded, then plate supply bypass and resistor, then cathode circuit...

Date: Thu, 11 May 2000 14:05:32 -0500
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Low Crystal Oscillator output

I can do the emmission check by pulling a crystal, but with the tube pulled, I don't see how there could ever be any voltage on the grid. Everything connected to it is from ground. Am I missing something?

Date: Thu, 11 May 2000 13:42:15 -0500
From: "Dr. Gerald N. Johnson" <geraldj@ames.net>
Subject: Re: [R-390] Low Crystal Oscillator output

Nope.

Date: Thu, 11 May 2000 18:13:27 -0700 (PDT)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] Low Crystal Oscillator output

Don't forget to do the capacitor stress test here. That is to put the capacitor on a power supply that will run it up to its rated voltage and then test for leakage. It will be important on this circuit. Joe

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Date: Mon, 22 May 2000 20:17:12 -0500
From: Nolan Lee <nlee@gs.verio.net>
Subject: Re: [R-390] Antenna trimmer question

>I finally got around to installing the worm gear assembly back onto the
>antenna trimmer bracket so I could adjust this from the front panel (I had
>been turning the gear with my fingers from the top). I now notice
>something: if the teeth of the gears are engaged, the signal increases about
>10 to 15dB. I noticed this when I rocked the knob back and forth. It goes
>from engaged to not touching to engaged in the other direction with the

>signal drop occurring during the disengaged portion.

Barry, there are a couple of things you need to watch out for on the antenna trimmer. One is that the insulating bushing and thrust washer for the shaft that goes to the front panel are intact and oil and residue free. The second is that the insulating washer for shaft that enters the can itself isn't cracked or mispositioned. It's got a tiny little step on it that is supposed to center it in the hole. It usually doesn't. I've seen number of RF decks where it was mispositioned and would allow a short when the gear was loaded in one direction or the other resulting in sensitivity going all to hell. Kill the power to the set and measure the resistance of the shaft and gear that goes into the can to ground. I don't have the manual in front of me but it should be very high, hundreds of K maybe. Keep the lead on the center of the shaft/gear and start rotating the trimmer knob. If the resistance reading drops, you've probably got a misaligned insulating washer or some debris in the can. Was this a St.J. RF deck?

Date: Tue, 23 May 2000 08:39:05 -0500
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Antenna trimmer question

Thanks to everyone for the answers. Yes, the worm gear on the shaft was touching the shaft, thereby grounding it. When I installed it, I left the gear too far forward allowing it to touch the shoulder on its shaft. Not only did this ground the gear, it left way too much axial play in the shaft. I loosened the locking screws and pushed the gear away from the shoulder (about 1/16" or more) to where there is almost no axial play in the shaft. This stopped the intermittent grounding and now the shaft stays in the same position along its axis.

No, this isn't a St. Julian's Creek refugee. I'm not sure I would have the patience to resurrect one of those. This one needed a lot of TLC, but at least it didn't have smashed, missing parts, etc. It had some pretty major cosmetic problems that I've fixed and a lot of brown beauties that were cracked, but at least its been pretty well limited to replacing defective electrical components. I think these problems are a bit easier than some of the horror stories that the other guys have reported with their St. Julien's projects.

Someone had better come up with a 12 step program pretty soon. I'm getting really addicted to this...

Date: Thu, 17 Aug 2000 00:58:25 -0400
From: "Barry Hauser" <barry@hausernet.com>
Subject: Re: [R-390] Dead Bands Talking

Often, a problem is posted, suggestions are made on and off the reflector, and then you never hear how it turned out. So, I thought I'd close the loop on this one, and not be one of those holdouts. T'was as I thought. Four bad crystals. Thanks for all the guidance, though, guys.

Still curious, however -- four out of 15 and they were all on the right side of the crystal deck - 9, 10, 12, and 12.5 MC -- however, the 13 is among them and that was OK. Maybe a bad run? Wear & tear -- one oscillation too many? Bad supplier, e.g., the El Cheapo Crystal and Rock Salt Co.?

So -- add it to your Crimestoppers Textbook: Yup, more that a couple of crystals can be bad. This pattern might be more prevalent as time goes on, so don't rule it out -- sub out some crystals before messing with other things. (I guess)

Again, thanks to all for the assistance.

Date: Thu, 17 Aug 2000 03:47:11 -0500
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] Dead Bands Talking

Crystal frequency is inversely proportional to thickness so the 9 to 12.5 MHz rocks are thinner, an so more easily broken by shock. Different maker's rocks are more fragile because they can use different sizes of slab for the same frequency. Connections inside are different by maker and withstand shock and humidity differently. If the base of the crystal is not metal with glass feed throughs for the pins, its not perfectly sealed and moisture can corrode the works, especially the connections. Quartz is generally a superb insulator so applied DC isn't a problem, though I suppose transients could cause a bit of crystal physical warping from the piezo effect that's being used to detect their resonance. Many oscillator circuits apply only grid bias to the crystal though that might 100 volts... The one circuit that hooks the crystal from plate to grid sometimes has a series capacitor, I've always figured to protect the crystal changing fingers and probably to adjust the crystal frequency because the shunt C on grid and plate made more C that the crystal needed to be on frequency. Crystals can be destroyed by too much RF energy applied, they are rated for an optimum applied power, generally in the milliwatt range. Too small a power causes poor phase noise in the oscillator, to much power causes poor stability from crystal heating and short life from crystal fracture.

73, Jerry, KOCQ

Date: Thu, 17 Aug 2000 08:35:00 -0400
From: Roy Morgan <roy.morgan@nist.gov>

Subject: Re: [R-390] Dead Bands Talking

Just a thought: Maybe a stuck oven thermostat and only one side got excessive heat. I don't know how the heater elements are located. Stuck thermostats have been reported in the plug-in crystal oven.

Date: Thu, 17 Aug 2000 10:12:40 -0400 (EDT)
From: Norman Ryan <nryan@duke.edu>
Subject: Re: [R-390] Dead Bands Talking

Thanks for letting us know how your receiver turned out. Odd that four crystals should go bad like that. Possibly the former owner swapped crystals from one set to another.

Date: Thu, 17 Aug 2000 11:43:53 -0400
From: tbigelow@pop.state.vt.us (Todd Bigelow - PS)
Subject: Re: [R-390] Dead Bands Talking

I have a little something to add to this all.... I have a similar problem with my clean, 'like new' Teledyne '390A. I've recently acquired a second rig to use as a testbed to track it down. My rig is dead on EVERY band except the broadcast band. I can get a fairly weak calibration signal, but that's all. I also seem to get an image of the BCB on the 11 mcs band. Other than that, silence.

I started by pulling the calibrator crystal pack(was easy to get to) and noticed the pins were greenish-blue and kinda fuzzy. Hmmmm.... So, I cleaned the pins and socket, tried the other pack, swapped them to and fro. As strange as this may sound, i now pick up the remainder of the brodcast band on the next band above it(1mc and up). I can't understand why, there shouldn't be any correlation between the two. I just started with the calibrator in my cleaning
process and that's as far as I've gotten.

This rig was stored for a time in an outdoor barn, as well as in the former owner's basement. I've had it inside since getting it. I haven't gotten to the crystal compartment yet(something took me from my work and I never got back to it), but I'm now curious to see if the crystal pins are as green as the calibrator was. I just can't imagine what would kill the rig on ever band except the BCB, where it works like gangbusters. Seems odd too, that even the possibility of corrosion would effect every single crystal.

Anyone else had a similar problem? I've seen many folks with a band or two (or several)out, but never all but one. I hope to dig into it more this weekend, I'll post whatever I find to the group.

Date: Fri, 18 Aug 2000 16:15:59 -0400
From: "Barry Hauser" <barry@hausernet.com>
Subject: Re: [R-390] Dead Bands Talking

There have been previous posts about where to get crystals -- International Crystals is still around and makes them up. Yes they can be costly, but you only need one or two usually.

However, speaking of "crystal kits", I neglected to mention in my post from whence the four replacement crystals came. Happy coincidence that ATC is offering crystal decks for $30 apiece. These are largely incomplete -- no switch, no trimmers, mostly gutted underneath. But they have crystals -- the one I got had them all and all four of the ones I immediately needed worked. Most also have the oven covers, but these vary in design and might not fit. The xtal deck I got was an EAC '67 and the cover didn't fit the one on this older depot doggy. I suppose you could transfer and rewire the heating element/thermostat, but we don't use these things anywho. There may be a couple of other parts on them of interest, but mostly it's for the crystals. You can use the shell as a containment device when reforming old electrolytics -- in case they explode. ;-)

Mark Masin of ATC posted about his expanded offerings a few days ago - didn't you see it??? They have a new online ordering system that works great. Just fill in what you want -- shipping's included in the price -- and pay by credit card. Or you can send a check, etc. Here's one of the URL's -- http://www.atc-us.com/r390a They have a bunch of other stuff up on the site also and will be adding more they say.

Date: Fri, 18 Aug 2000 15:43:55 -0500
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Dead Bands Talking

Thanks! I had gone to ATC's new page, but one look at the crystal deck made me shudder. I did not, however, consider that the crystals being with it make it a pretty good deal ($2 apiece - not bad at all). I guess I was looking for a source of new ones, but I figure they will be on the order of $5 to $10 each, so it wouldn't be worth it for a whole set. If these are from a recent run ('67 being *recent*), I suppose they stand a pretty good chance of being good.

Date: Fri, 18 Aug 2000 17:13:36 EDT
From: Llgpt@aol.com
Subject: Re: [R-390] Dead Bands Talking

Crystals aren't a high failure rate item, of the 34 R-390A's that have passed through my hands, only 1 bad crystal in that bunch.

However, That is a heck of a deal from ATC, and well worth the asking price. Fair Radio gets $ 10.00 per crystal (used).

Date: Fri, 18 Aug 2000 17:30:36 -0400
From: "Barry Hauser" <barry@hausernet.com>
Subject: Re: [R-390] Dead Bands Talking

The xtal deck I received was a '67 EAC, but I'd be more likely to assume ATC's inventory might be mixed. Just didn't want to leave you with a false impression. The sockets were of much better quality in the ATC/EAC unit -- individual ceramic sockets, and the cover is hard-wired, whereas the one in the rx has handy (but probably less reliable) plugin pins on the cover's corners.

They also bolt down differently. The one in the rx has a horizontal screw tab in the front and two vertical tabs in the back. The EAC has four screws on top. However, the EAC deck itself has the tapped holes for the older style top. This may have been a replacement cover.

Date: Wed, 23 Aug 2000 10:18:14 -0400
From: "Paul Bigelow/Austin/IBM" <pbigelow@us.ibm.com>
Subject: [R-390] Z-702

Does adjusting Z-702 on the VFO perform any practical benefit? On my receiver, adjusting the screw does not seem to change signal strength nor change the frequency nor change the linearity. The manuals seem to make no references to its adjustment.

Date: Wed, 23 Aug 2000 11:01:30 -0400 (EDT)
From: Norman Ryan <nryan@duke.edu>
Subject: Re: [R-390] Z-702

If I'm not mistaken, Z702's output is very broad and is adjusted for maximum output over its entire frequency range. How that's done isn't clear to me, but if the VFO is working OK, I doubt performance will improve any further as it doesn't affect sensitivity, say, like the RF alignment procedure does.

I'm all for optimizing every circuit so as to wring out the best in the receiver. It's a marvel how the RF deck trimmers and slugs continue to peak with each pass during alignment. An RF deck freshly assembled after restoration may require repeated alignment before the coils stop peaking. After sufficient burn-in time, I'd bet one more alignment would increase performance a notch. Getting those circuits tuned and peaked is all part of the fun and the R-390*'s performance is the reward.

Date: Wed, 23 Aug 2000 11:07:44 -0400
From: "Tetrode" <tetrode@sprynet.com>
Subject: Re: [R-390] Z-702

I believe it's adjusted to get the flatest output of the VFO across its entire tuning range. You'd want to plug it into a scope or RF volt meter to watch the output change as I think it's pretty minimal. Haven't tried adjusting it yet, maybe next time.

Date: Wed, 23 Aug 2000 08:46:19 -0700
From: "Roger L Ruszkowski" <rlruszkowski@west.raytheon.com>
Subject: Re: [R-390] Z-702

Only if you can measure the VFO as injected at the mixer (using a tube extender), the from end to end you can detect an output level change from the VFO. You just set Z-702 for best even output across the band. Mostly you just never worry about it.

Date: Fri, 25 Aug 2000 21:46:29 -0500
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] Small Frequency change

50 pf in parallel with a few MHz crystal will move it maybe 5 KHz. More than that may make it stop oscillating. An 8-50 pf trimmer on each crystal can allow all the bands to track without changing the calibration on each band.

Nolan selected crystals from all his receivers to accomplish that. Some receivers were made with trimmers on the crystals for that purpose.

Date: Mon, 28 Aug 2000 11:25:10 -0500
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: [R-390] R205

When I first put my R390A back together and began my initial attempts at trying to hear something (I hadn't aligned it yet), I found that if I placed the sig generator output near the top of Z201-1, I could faintly hear the signal. If I touched the probe of the signal generator to the metal tip of one of the caps on the top of one of the transformers (Z201-1 I think it was), I could hear a stronger signal. About 10 seconds into this little foray, I noticed that something inside the rig was releasing magic smoke and I halted the experiment immediately and removed the power from the radio. Removing the RF unit revealed that R205, the plate resistor to V201, had lost 99 and 44/100% of its smoke supply. I don't have a method to replace the smoke, so I decided to replace the resistor with a

new, 1/2 watt resistor from "the shack".

After putting the RF deck back in place, and attempting to align it (properly this time), I have not been able to get it to perform well at all. Pulling the RF deck again and checking all the resistors revealed that the replacement I got From "where they have answers" was nearly infinitely resistive (i.e. open). I looked at it closely and it appeared to be crystalline-looking on the outside. Is this a high-failure item? I realize I must have put the original one through torture with my stupid experiment, but the second one failing has me wondering.

Was my mistake:

A. Touching the probe tip to the cap? Obviously, but why did this cause the tube to draw excessive current?

B. Thinking I can repair this radio myself? I'm a software guy by trade. Perhaps the two don't mix. "Hmmm, I don't know why it failed. Let's run a fifth test and see what happens..."

C. Buying from "the shack". I figured a resistor would be a pretty hard item to mess up, but perhaps I was wrong.

D. ???

I'm getting some carbon comp resistors from Mouser and hopefully this will fix the problem (unless I do something else stupid...) - long sigh here. Anyone else had similar problems with R205?

Aug 2000 10:59:39 -0500
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] R205

Smoke from a resistor is an indication that there is excessive leakage to ground beyond the resistor, e.g. probably a short. You put it back together wrong or a capacitor has shorted. The new resistor was made to release less smoke and so you didn't see it go. Its time to check out everything with an ohmmeter to find the problem before you open the wire in a plate coil.

Date: Mon, 28 Aug 2000 13:28:33 -0500
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] R205

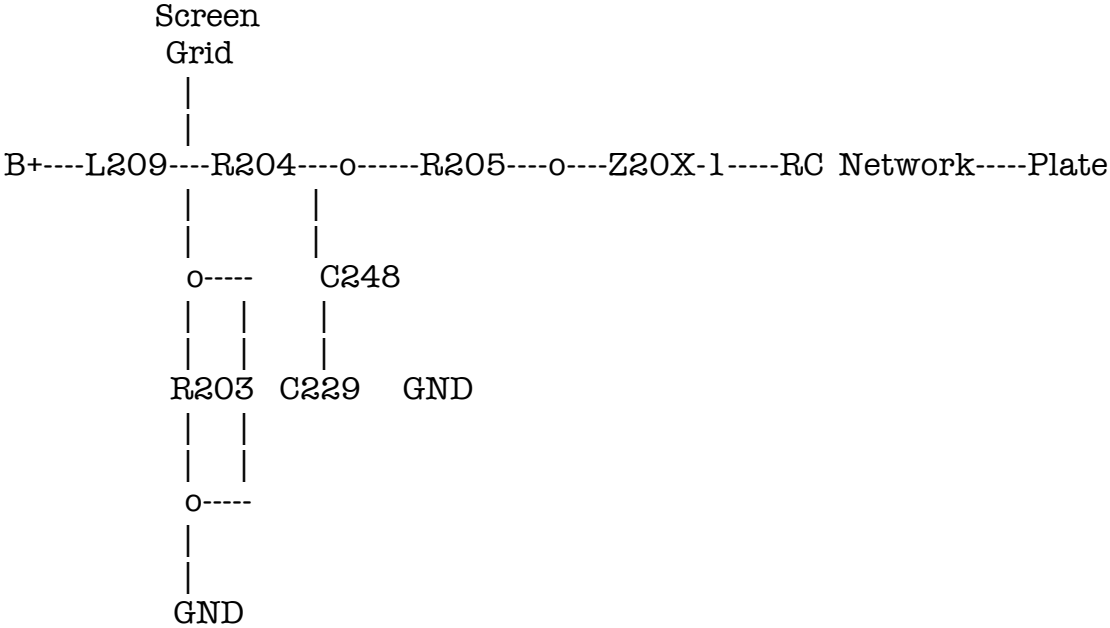
I checked all the resistors in the RF deck and found several to be out of tolerance (or on the edge) so I've ordered replacements for them as well.

Along with the resistors, I ordered a handfull of bypass caps. I suspect I have some problems with a few of them and this is one area I will definitely check for bypass problems. Dr. Jerry has suggested some methods to check for these and I plan to try them out. Thanks again to the great info and help from the members of this list! I certainly learn a LOT from it. Hopefully, my REAL radio won't kill me in the process. :)

Date: Fri, 1 Sep 2000 08:57:05 -0500
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: [R-390] R205 again

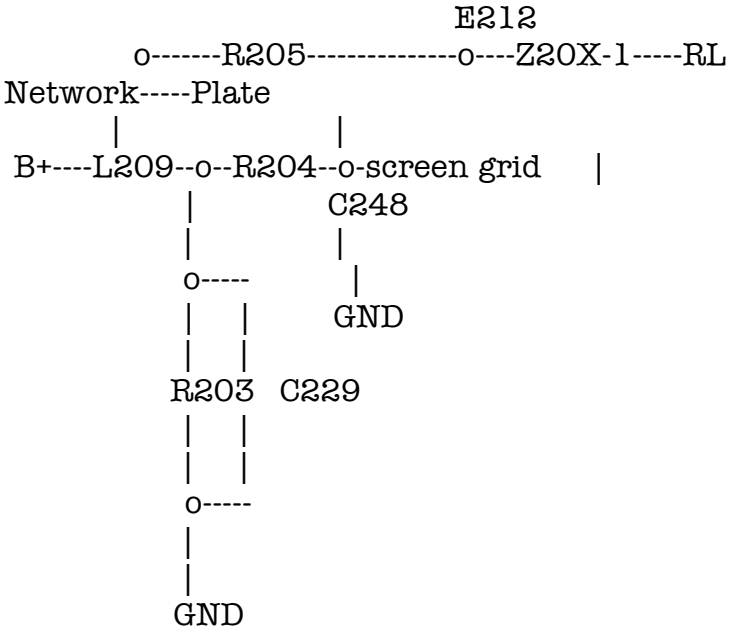
I'm still investigating the problem with my fried R205. I've rigged a cable to connect B+, 220V, (J208 pins A and H and nothing else) to the RF deck. When I apply voltage, at the junction of R203, R204, and R205, I get 220V. A the junction of R205, C248, Z20X-1, I get 45V.

The odd thing is, if I measure the resistance across R205, I get infinity and from the junction of R205,C248, Z20X-1, I get infinity as well. This has me scratching my head. How am I getting a voltage drop across R205 when it appears open? I figure C248 is leaking providing a path to ground, but with R205 checking open, I don't understand how I'm getting a voltage drop
across it. Is it possible that R205 checks open with my ohmmeter, but still conducts when high voltage is applied?
Furthermore, if C248 is leaking and R205 is conducting, why don't I see a voltage drop across R204? Note: You need to view the "ASCII-Draw" document below with a fixed-width font like Courier for things to line up correctly.



Date: Fri, 01 Sep 2000 10:27:18 -0500
From: Randy & Sherry Guttery <comcents@mississippi.net>
Subject: Re: [R-390] R205 again

First - I'm not sure where you got the above schematic - but it's not right, not according to my manual. Here is the circuit as in my TM11-856A:



The answer to your question above becomes obvious... with C248 taking the B+ basically to gnd, you'll have almost no screen current - hence no drop across R204. Fortunately - with C248 on the input side of the tanks, E212 and the switch contacts - little chance of damage to them... Still R205 could do some heat damage to nearby components - would be a good idea to get C248 changed out...

Date: Fri, 1 Sep 2000 10:36:37 -0500
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] R205 again

Thanks! You're correct. I did indeed have a mistake in the schematic. R204 is NOT in the plate circuit as I had it drawn.

Yes, I believe C248 is leaking and I have a replacements for it (as well as some others I suspect are doing the same). I'm just curious why I get infinite resistance across R205 (and C248 for that matter) with my meter, but I get a voltage at the junction of R205/C248. Is it simply a matter of the increased voltage causes the resistor to conduct (and the cap to leak) when my ohmmeter with its puny voltage says they are both

open?

I kind of hate to replace several components that I think are bad without knowing which ones are causing the problem. I did that with the paper caps, but I didn't want to take a chance with them; they were all cracked and I just didn't trust them. This is a great learning experience for me. Thanks so much!

Date: Fri, 01 Sep 2000 09:56:23 -0500
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] R205 again

There SHOULD be large voltage drop across a very high value resistor. Likely the infinity of your meter is only 10 or 20 megohms. Not at all infinity but large compared to most common values. With no heater voltage the only load on the circuit is your volt meter. ALL volt meters draw some current. You don't say what your meter is, so I'll guess its the preferred HP 410B. If I recall correctly the 410B has a DC input R of either 10 Mohms or 100 Mohms. If its 10 Mohms showing 45 volts then that says R205 has a value of 10M * (220-45)/45 = 38.9M. The meter current is too small to cause a voltage crop in R204. Most ordinary meters would call 38.9 Mohm as open. But my meggers would call that just a resistor.

There could be leakage in the bypass capacitor to add confusion to the computation. If its not orange drop, there IS more than a little leakage and the capacitor should have been replaced before you went to the bother of trouble shooting. Every black beauty or other vintage molded paper capacitor is now leaky (at least more than 99% of them) and not worth the bother of trouble shooting. Just replace them all and spend your trouble shooting time on real problems like fried resistors. When a resistor checks more than its tolerance from the rated value its time to replace it, providing the ohm meter accuracy is that good. Some aren't that good.

Before replacing a resistor that appears open, be sure to check the resistance between the resistor leads. The open circuit could be in a faulty solder connection that might be cured by nothing more than a good heating with a bit of fresh flux and solder.

Date: Fri, 01 Sep 2000 11:12:39 -0500
From: Randy & Sherry Guttery <comcents@mississippi.net>
Subject: Re: [R-390] R205 again

Yeah--- several things are probably going on here.... the ohm meter's "infinite" may be in fact too ambiguous and in reality - the resistor may be

many megs - but not quite open... and as you noted - it may be internally 'arcing' with full B+ on it... At any rate - there is probably just enough leakage through it to indicate on your voltmeter. Also - C248's leakage probably is also proportional to voltage applied (i.e. leakage resistance drops as voltage increases)... so as long as R204 is passing some small voltage - C248 is not too tight a "clamp"... but as the voltage starts getting serious... C248 is probably doing a "knee" curve- and dumps into gnd like a wire. Failure mode analysis can be an extremely fascinating area to explore -- I prefer such investigations when lightning is involved... because it's never the same twice. And since I have nearly 20 years experience of "close encounters" with lightning - I've seen some pretty impressive stuff. (Several insurance companies use me as an independent lightning investigator in this area).

I'm sure you are aware of the two "schools of thought" on replacements: those who prefer to "shotgun replace caps" in a radio in the beginning - then keep it up after that... and those who just replace the "necessary" parts (filters and caps that failure is known to cause serious collateral damage)- and later repair failures as they happen. This argument gets far more "discussion" in the antique (vintage) radio groups than here - as here - we're talking about serious radios - which are still worth serious bucks... in the "other" radio community - they may be talking about an AA5 worth $5.00 - which is a so-so performer - and butt ugly to boot! I still prefer to "shotgun" all caps, measure replace all resistor, etc. when I get a new (to me) radio - because I like to play them a lot. And I find it's easier to go through a chassis while it's apart and accessible. Obviously - when talking about an R-39x -- you're no longer talking about a small handful of parts. So the merits go both ways. You have to decide what's right for your situation - and go with that.

Here - I have (almost) unlimited test equipment for working on vintage radios --- so I have the luxury of testing components down to tight tolerances - and knowing exactly the condition, performance, etc. of each part. Not everyone has capacitor analyzers that test not only the value of a capacitor, but it's Power factor (series resistance as a vector against reactance); and it's leakage at working voltage. And as you've already noted - ohm meters aren't really up to the task. So --- to do capacitors RIGHT you either: replace them in mass - or get (beg, borrow, buy or steal) a capacitor analyzer. But even having one - I still shotgun caps... ESPECIALLY in something as hard as an R39x to work on. So as I noted earlier - YOU need to decide for yourself what makes you happy - and go with it... If you feel uncomfortable replacing (possibly) perfectly good caps - get an analyzer... I have a simple (cheap) EICO 950 --- it does a good job. There are, of course larger, better (and worse) ones - Pick one in your budget - and be satisfied --- ALL of them (working correctly, of course) will do an adequate job.

Date: Fri, 1 Sep 2000 11:11:51 -0500
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] R205 again

I didn't drag out the HP410B for this one. I was checking with the FlukeDVM. I don't know off the top of my head the DC input resistance, but I'll check.

The cap in question is a 5000pf, 1KV disk. I bought some 4700pf, 1KV disks and plan to replace this one with one of those. I've done the shotgun OD replacements, but now am apparently having problems with the ceramic disks.

Since I'm going to replace it, I'm going to clip it on one end and check this again. If I get a change, then I can know it was leaking. If not, I'm not sure what to check next. Just in case, I bought two replacements for R205 (carbon comps this time), but I don't want to fry another one. This is relatively simple circuit. I want to be able to find the problem before that happens again.

Date: Fri, 01 Sep 2000 10:46:57 -0500
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] R205 again

Replace the resistor after checking the solder connections. Then if it fries, replace the capacitor. Disk ceramics don't fail as often as resistors or solder connections. Especially the mechanically solid solder connections required by military and Collins practice that can work for years before corroding open when some lead didn't get soldered in the pile.

The resistor may be nearly open just because of its age or the humid environment its been in at some time. 73, Jerry, K0CQ

Date: Fri, 1 Sep 2000 13:24:53 -0500
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] R205 again

This is the resistor I replaced after the original one fried, so the solder connection is fresh - can't be 100% sure it's good, but it looks okay to me. I've checked the resistor "lead to lead" and still checks "infinity" ("infinity" being higher than the Fluke is capable of resolving), so I know the resistor is fried.

BTW, anyone know the internal resistance of a Fluke 25? The little user's manual doesn't appear to have that information. It will supposedly check

up to 32M, but I assume that doesn't tell me the internal resistance. Can I check it with the HP410B with both meters in "ohms" mode to check the internal resistance of the Fluke?

Date: Fri, 01 Sep 2000 13:05:09 -0500
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] R205 again

You might try checking the input R of the Fluke on DC. Its not likely to be a meaningful measurement on ohms because both meters will be supplying power to the circuit. Put the Fluke on DC, check different ranges, it should show the ohmmeter battery voltage in the 410B.

A better way to detect the internal resistance on volts for the Fluke is to feed it from a source through a large resistor. Large enough that the voltage at the Fluke is different from the voltage with that resistor shorted. (means the voltage source has to be stable for the length of the measurement).

Resistors can be wrecked by too much tension on the leads when wrapping them to the posts.

Two resistors bad hints at a problem downstream. My external supply is a good check Put it on the load side of R-205 and see what smokes. Look out for the coil.

Date: Mon, 4 Sep 2000 13:41:43 -0400
From: "Walter Wilson" <wewilson@knology.net>
Subject: [R-390] Low bands dead, but now resolved

I am in the process of reconditioning an R-390A. Cleanup and recapping went just fine, but I had neglected to replace one capacitor that Chuck Rippel recommends replacing in the RF deck. Barry Scott's recent thread reminded me of this little guy. It reared it's ugly head today.

I had just finished the first pass through the RF deck just to get things in the ballpark. I was getting ready to test tubes and then align the entire radio, but the sensitivity below 8MC was poor. I measured the sensitivity on 7600 KC at 30 uV, and at 8600 KC at 0.4 uV. Then I began to wonder if I had replaced **C327** (100pF), which is on the input of T207 feeding from the 1st Oscillator to the 1st Mixer. I couldn't remember, so off it all came again. Lo and behold, the original mica capacitor was still in place.

I grabbed a 100 pF capacitor out of the box and warmed up the soldering iron. After getting it all back together and reconnecting the signal generator, I was very pleased to measure 0.3 uV sensitivity on 7600 KC,

100 times lower than before the change. This just goes to confirm for me that this component probably deserves some attention on all future rebuilds.

This also goes to point out how valuable the experience of this group has been to my enjoyment of these wonderful radios. The wisdom that so many of you share so willingly sure goes a long way to help all of us enjoy this hobby. Keep up the good posts (you know, the ones that really talk about radios).

Date: Tue, 5 Sep 2000 17:14:56 -0400
From: "Paul Bigelow/Austin/IBM" <pbigelow@us.ibm.com>
Subject: [R-390] Achieving crystal deck linearity

In attempting to achieve "crystal deck linearity", something has been noticed.

For example: Y401 in the 2nd crystal oscillator. Although the 0 MC and 17 MC bands can be adjusted simultaneously by a trimmer in parallel with Y401, 17 MC will always read about 2kc higher than the 0 MC band. This behavior seems to be fairly consistent amongst crystals doing double or triple duty, that is, the higher frequency will read about 2kc higher than the lower frequency for any any given crystal. So, a trimmer on the CRYSTAL may not be the way to go but rather a trimmer for each SWITCH position? Yikes!

Date: Tue, 05 Sep 2000 16:09:34 -0500
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] Achieving crystal deck linearity

There will be a need for an additional switch wafer to allow for the trimmer per switch position... Could it be that the calibrator error is that much?

Date: Tue, 5 Sep 2000 18:25:08 -0400
From: "Paul Bigelow/Austin/IBM" <pbigelow@us.ibm.com>
Subject: Re: [R-390] Achieving crystal deck linearity

It has been suggested that the 17MC Y201 crystal may be in error. Kinda staring me in the face with the example and all! I forget about that little guy hidden off in the corner! I'll check it out.

Date: Tue, 05 Sep 2000 16:33:37 -0500
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] Achieving crystal deck linearity

That could do it. Don't leave any rocks unturned or untuned...

Date: Tue, 5 Sep 2000 21:14:37 EDT
From: PABigelow@aol.com
Subject: [R-390] Crystal Deck Linearity

In a quick test by swapping out Y201 with another 17MC crystal the difference between 0MC and 17MC was reduced somewhat -- a trimmer may be needed for Y201 but I think I'm on my way now! Thanks for the suggestions!

Date: Tue, 19 Sep 2000 13:48:46 -0500
From: Randy & Sherry Guttery <comcents@mississippi.net>
Subject: Re: [R-390] R-390A problem

Pull P108 from the RF deck and see if the fuse still blows... If it does - pull ALL of the multi-pin connectors from all modules and check again... if it still blows - it's in the chassis wiring... if not - reconnect the plugs one at a time and recheck... obviously - if connection one causes the fuse to blow - then the problem is isolated to that circuit. If the RF deck (P108) is the culprit... C308 would be a good place to start looking - as it has no resistor between it an B+ to act as a fuse - before the B+ fuse blows...

Date: Tue, 19 Sep 2000 23:05:10 -0400
From: Kim Mackey <mackeyka@muohio.edu>
Subject: Re: [R-390] R-390A problem

I'm assuming you are refering to F103 (the 1/8 amp fuse) when you say the B+ fuse is blowing and not F102 the (1/4 amp B+ fuse). I was looking at the schematic and notice that the B+ is applied to all of the following modules: IF Crystal Osc. VFO RF

The IF Chassis is the only one that does not have B+ applied with the function switch in the Off or Stand By position, so it's a strong possibility. The RF section also receives B+ to a portion of it only with the Function Switch in the AGC position. So I'm thinking the two strongest possiblities are in the IF or RF Sections or the wiring to those modules. I was thinking you might want to take an Ohm check from pin 2 of the rear wafer of the Function switch to ground with P108 connected and disconnected. If this line is at or near ground when P108 is connected and high when disconnected you'll want to look into the RF module. If it is at or near ground with P108 connected or disconnected then there may be a short in the wiring going to the RF deck. Do the same thing with the IF Deck. Check resistance from pin 2 rear wafer of the Function Switch to ground. If it is low with P112 connected or disconnected and high with it disconnected the problem could be in the IF Deck. If it is low with P112

connected or disconnected then the problem would appear to be in the wiring.
If indications are that it is in the RF Deck look around V201 (perhaps pins 5 and 6). If it appears to be in the IF Deck look around V501 (perhaps pins 5 and 6), and just maybe V505 (pins 5 and 6). Good luck. Keep us posted.

Date: Tue, 19 Sep 2000 23:14:45 -0400
From: Kim Mackey <mackeyka@muohio.edu>
Subject: [none]

I failed to mention in my previous email that you need to disconnect both of the plugs and then plug one in and make your measurement and then unplug that one and then plug in the other one. You don't want both in because that way you don't know which one is causing the short (if one exists).

Date: Tue, 19 Sep 2000 22:20:30 -0500
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] R-390A problem

Save fuses by supplying the radio through a 120 volt lamp. Better yet, insert a lamp or resistor in place of the fuse to limit the current. The trace the circuits with a sensitive digital voltmeter so you can work towards the offending circuit by finding where the voltage to ground is least. I've traced solder bridges on 12 volt radios that way by limiting the current to an amp or two, then could readily see the differences in voltage with the 200 mv scale on my digital voltmeter. It made for relatively easy circuit tracing and pointed me right to the solder bridge in the middle of the audio output IC. With the isolating resistors in the modules you can see which ones (especially without tubes) have a lot of drop and which ones don't. One other check that is harder to do at DC is to check the current in each wire attached to the supply or fuse holder. If you had a Bell clamp on DC ammeter with a sensitive enough range you should be able to isolate the shorted circuit easily. Failing that, you may have to separate the wires at a junction and see which one draws the most current from the supply or from the ohmmeter (with the supply disconnected. 73, Jerry, K0CQ

Date: Wed, 20 Sep 2000 15:08:56 -0700
From: David Medley <d.j.medley@att.net>
Subject: Re: [R-390] R-390A problem

I must thank you all for all the suggestions and help. One of you (Don Heywood) hit the nail right on the head. **The screw was indeed too long creating a short circuit.** I imagine I would have found it eventually but Don lead me straight to the seat of the problem. Changing the screw to

the proper size and repairing the damage removed that problem. I believe this is a typical application of Murphy's law. The one that says "If it is possible to put something on the wrong way somebody will eventually do it".

> You will probably get quite a few messages like this one relating to harness problems. I shorted out my B+ one time by putting in too long a screw into one of the holes behind the KC dial when mounting the RF unit. There are two green screws on the front of the RF deck kinda behind the KC knob..The harness passes behind these two holes. If you use one too long it will cut into the harness and short something out. Mine was B+, a friend did the same thing and he shorted out the filaments.

Date: Wed, 20 Sep 2000 09:02:49 -0500
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: [R-390] 2nd oscillator question

I'm still trying to determine why I have a low 2nd oscillator output. The radio works, but I still think I have a problem somewhere. The output should be in the 3V peak-to-peak range, but I'm only getting 50 to 100 mV instead (very small at the higher frequencies). I measured the voltages and resistances last night and here's what I got.

The DC voltages were made with a HP410B. The some of the resistances and AC voltages were made with a Fluke DVM (hence, the 2-decimal place accuracy).

The measurements were made with the tube in an extender with the controls set as par. 36.

Pin	Voltages		Ohms	
	Measured	Nominal	Measured	Nominal
1	-7.4	-10.3	117.5K	120.0K
2	0.05	0.2	7.6	8.0
3	5.97vac	6.3vac	0.4	0.1
4	0.0	0.0	0.0	0.0
5	180.0	166.0	25.8K	26.0K
6	110.0	97.0	60.1K	55.0K
7	0.06	0.2	7.8	8.0

The input voltage to the radio is 116.5V (running it through a CL80 inrush current limiter). Not sure why I'm getting the higher voltage at the plate. While I had the oscillator out, I checked the resistors and the were in tolerance. I applied voltage to the places where bypass caps are

located, measured the voltages across the resistors on each side of the caps and didn't have a noticeable voltage drop so I don't think they are leaking.

Anyone know anything else I can look for? The tube checks good and I've swapped it with other 5654s without improvement. The crystals don't seem to be bad as I get the same low output across all bands. I've swapped crystals from another deck without improvement either.

Guess I shouldn't complain too much. Heard Russian station last night on 20m SSB and Barcelona sounded like he was next door(of course a stacked set of 3 six-element monobander beams on his end might factor in here!). It just bugs me.

Date: Wed, 20 Sep 2000 10:04:05 -0500
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] 2nd oscillator question

Low grid (pin 1) voltage says its not oscillating as strongly as it should be. High plate and screen voltage says its not drawing as much plate and screen current as it should. Low cathode voltage says the same. Could be loss in the plate tank, either shorted turns in the coils or series resistance in the trimmer capacitor connections. Could be the feedback capacitors have changed value, (C408, 409, should be silver mica), could be shorted turns in the cathode choke. Could be resistance in the crystal circuit, or uniformly poor crystals. 73, Jerry, KOCQ

Date: Wed, 20 Sep 2000 11:15:42 -0500
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] 2nd oscillator question

I find it odd that the resistance I'm getting on pin 1 is lower than the nominal value. I would suspect that R404 would have increased over the years. If C408 is bad, I would be getting a parallel resistance across R404 with C408 and L401 (with possibly C409 contributing to this). Does this sound reasonable?

Date: Wed, 20 Sep 2000 10:41:38 -0500
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] 2nd oscillator question

If R404 was an IRC imitation carbon comp it would have gone down over the years just as easily as gone up. It would show a mould line lengthwise. The signal level in the stage is set by:

1. the ratio between C408 and C409.

2. the impedance seen at the plate.

3. the rectance and losses of the cathode choke.

4. the gain inherent in the tube.

5. the plate load impedance at resonance which is affected by losses in the coils and tuning capacitors and switch.

6. the losses in the crystals including resistance in the switch.

7. the value of the grid resistor. Yours isn't off but 2.08%, that's insignifcant compared to the original 5 or 10% tolerance of the original component.

8. leakage in C-408.

I'd try tacking 10 or 20 pf (or more if those helped) across C409 to increase the feedback. Or I'd go to my capacitor bin and install new (to the radio from my bin) silver mica capacitors for both C408 and C409 whose values I had confirmed independently of the marking. (probably by using my Q-meter). No disc ceramics except N080, have the quality needed for precision in the crystal oscillator circuit. 73, Jerry, KOCQ

Date: Fri, 29 Sep 2000 22:09:16 -0400
From: "Walter Wilson" <wewilson@knology.net>
Subject: Re: [R-390] R-390a Birdies

Ray Osterwald's article in ER lists these internally generated spurious responses:

910.13	1500.24	1635.0*	2368.0*	2727.75
3227.2	4000.6	4970.13	5357.0*	5637.8
6303.1	6999.76	7841.07	8376.0*	8591.2
9340.95	9568.3	10091.19	10318.7	10763.9
10945.96	11068.84	11564.04	11746.02	12364.01
12546.0	12627.0*	13712.51	13864.34	16122.0
17381.0*	18626.0*	19397.0*	25680.08*	27621.0*
28755.0*	30392.0*			

* = resulting from parasitic oscillation in the RF amp
others generated in the VFO via harmonic mixing

According to Ray, the best cure for these is to complete Field Change 7,which adds shielding and replaces R210 and R702 with 220K 1/2 W

resistors (56K originally).

Date: Fri, 06 Oct 2000 21:27:18 -0600
From: Jordan Arndt <jordana@nucleus.com>
Subject: Re: [R-390] 390A 0-8Mhz Help...

Well I am back at it... I have determined the problem is in the RF deck... this was done simply by replacing the IF deck and then the PTO with good working units and has also had the filter caps swapped out ... the main problem remains... the first part part of the problem is that someone (not me!!) has replaced R-275 with a .033 uF cap instead of a .0033 uF cap... that explains the lack of sensitivity below 8 mhz... the problem of loss of overall gain after a minute or so remains...the drop is roughly 20 db and occurs on all bands... it occurs after ~ 1 minute of on-time... and the receiver must be powered down for a minimum of 10 minutes and repowered for the problem to occur... if the rig has been on for some time, it takes much longer for it to 'reset' ... I think this is a voltage breakdown problem as I don't think that 45 seconds is long enough for heat to be a problem... I have the RF deck out right now and will go through the original work I did to replace some caps and resistors to see if I can find anything there... In the meantime can any of you guys (or gals if we have any out there) think of what to check next...??? I have vector sockets and have acquired an HP-411B to measure RF voltages , but given the speed at which the problem manifests itself, measurements have to be done one at a time... I will check to see if any of the adjustments on the 2-3 mhz IF section changes after the problem does show up... Any other ideas...??? the deck is a 1963 Teledyne with a 1960 Capehart Crystal deck.... I have a spare crystal deck if it comes to that..!

Date: Sat, 07 Oct 2000 02:24:29 -0500
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] 390A 0-8Mhz Help...

R-275 USUALLY designates a resistor, not a capacitor. C 275 in my book's schematic is 5000 pf. And is a B+ bypass. Being larger would not necessarily affect sensitivity below 8 MHz...

Thermal intermittents often respond to cooling with something like freeze mist.

The only things common to 0-8 and not the rest of the bands are the 1st crystal oscillator and 1st mixer. Drop in oscillator output will kill off mixer gain. An opening grid resistor on the mixer tube will kill gain as the tube will probably self bias to something more negative than the AGC voltage. Any open in the mixer cathode, resistor, capacitor, connector, cable, or oscillator coil secondary will cut the mixer gain. I'd be most

suspicious of a crystal fried by a faulty oven thermostat. And its easy to check by replacement.

My manual suggests checking the DC voltage on E209 (with VTVM having 1 meg ohm isolation resistor in the DC probe) of at least 4.5 volts. Suggests the RF voltage on the cathode should be at least 3 volts. Then suggests if these are low to check the oscillator tube by replacement, then they crystal, then the voltages around the oscillator then the mixer tube by replacement.

I don't find R-275 at all. C-275 is in a place that should not affect the oscillator operation because its isolated from the oscillator by R211 and C 326.

Low oscillator output can come from off value grid circuit capacitors or a faulty cathode choke if the obvious DC screen voltage, DC plate voltage, tube, or crystal aren't the culprit.

A drop in gain on all bands can be anywhere but the first oscillator and mixer. You have to identify the section of the receiver by injecting signal at various points from detector through to antenna connector. My TM gives details on that. ----------

Date: Sat, 07 Oct 2000 08:07:21 -0600
From: Jordan Arndt <jordana@nucleus.com>
Subject: Re: [R-390] 390A 0-8Mhz Help...

Hello Dr. J.... Yes it was a long day yesterday.... it should read C-275 and yes for some reason it makes a big difference in the gain from 0-8 mhz... You'll have to take my word for this unless you want to swap out the cap.... Probably why the 5000 pf cap was dropped to 3300 during production of the receiver according to the 1967 Navships manual as Mod level 1 or 2 depending on the contract...having a .033 instead of a .0033 makes a difference of about 15 db from 0 - 8 mhz....I have seen a difference even when replacing the .005 with a .0033 uF bypass...

I have tried to get meaningful measurements on several occasions, but the problem occurs so quickly and takes so long to recover from that it makes it very difficult... I have also replaced tubes one at a time to see if it recovers due to a tube, but with no luck in that department either...I would love to find a way to operate the RF deck outside of the rig and use freeze-it spray to cool down all the suspect components, but I haven't found a way to do that as of yet....I can run the IF deck upside down in the chassis, but I have eliminated the IF deck, the PTO, the power supply module, Antenna relays, and the audio deck as being the area causing the problem...More later.... 73 de Jordan.....

Date: Sat, 07 Oct 2000 12:55:30 -0500
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] 390A 0-8Mhz Help...

The C-275 I see is on the screen supply switching that enables the first crystal oscillator. Its isolated from the screen by a few K resistor and another 5000 pf bypass at the screen. I don't see how it should affect the oscillator power.

If you can't run the RF section out of the radio, then you need tube extenders to check the voltages at the tube pins. You can slip the pipe from a freeze mist container through small holes or cracks.

Check for LO injection, replace the crystal if its low.

Date: Sat, 07 Oct 2000 17:02:28 -0500
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] 390A 0-8Mhz Help...

The Z213 bypass is C280, C275 is a long ways away.

I don't know what its bypassing as a side effect. But the effect of the 0.033 compared to the .0033 (disk?) is the same as a month or two when someone complained about the low sensitivity of an older military receiver on its higher band (above 20 MHz). There I suggested paralleling the screen and cathode bypasses (that were paper capacitors) with 1000 or 5000 pf disk ceramics. The receiver improvement was significant. The output of the first mixer is at 17 to 25 MHz so I can see the same effect, though the modern orange drops have a far lower inductance than the classical paper capacitors and so should have less of an effect.

By silver solder, I presume you mean silver bearing lead tin solder? DC need not change when AC changes. My TM 11-856A dated 1956 doesn't have a parts list. The Y2K manual says 0.033 paper and the color picture clearly shows it. My 1956 manual shows 5000 pf in the diagrams.

Date: Sat, 07 Oct 2000 21:45:07 -0600
From: Jordan Arndt <jordana@nucleus.com>
Subject: Re: [R-390] 390A 0-8Mhz Help...

OK finally I have made some progress... I can recover the momentary gain increase by shorting the gear of the ant trim to ground... I think it might be a leaky C-226 ... can someone tell me where the top gear of the ant trim cap connects in the RF ckt...??? I know it should be insulated... I discovered this while trying to adjust the drive gear for smoother

rotation....

Date: Sat, 07 Oct 2000 23:00:54 -0500
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] 390A 0-8Mhz Help...

Sure you can cause the gain increase by grounding the antenna trim gear. That grounds the AGC just a surely as going to manual gain. The shaft of the capacitor connects to AGC according to the schematics in my TM. The gear is supposed to be insulated from the front panel shaft.

Now all you have to do is to find what else is causing that similar ground... broken AGC switch? pinched cable? tube with grid emission? leaky AGC bypass... You may be able to trace the AGC from the AGC rectifier through the isolation resistors along the AGC line to see where the voltage is lowest and identify the leaky part that way. You might connect a fixed supply, say -12 volts to the AGC terminals on the back to make for easier tracing.

Date: Sun, 8 Oct 2000 09:17:26 -0400
From: "Russ Schroeder" <w2dyy@rochester.rr.com>
Subject: Re: [R-390] 390A 0-8Mhz Help...

Had a similar problem in a National 173 many years ago. Check the control grid resistor. Could possibly be open. The effect would be to start operating normally, then as charge builds up on the grid (due to the open resistor) the tube gain decreases, eventually reaching cut-off. Turning the set off for a period of time allows the accumulated charge to bleed off (via stray leakage resistance) and allow the stage to start the process over again the next time power is applied. Momentally shorting the grid to ground would also restore the stage gain for a short period of time.

Date: Sun, 08 Oct 2000 11:23:14 -0600
From: Jordan Arndt <jordana@nucleus.com>
Subject: Re: [R-390] 390A 0-8Mhz Help...

Well I have finally found the problem... I traced the AGC line through the RF deck , especially the common ckts for all bands...I looked at various reasons the AGC line could become partially shunted to ground, and thought that before I start replacing parts again, I would recheck all the tubes in the RF deck... Gues what... the **6DC6 RF amp tube** showed up normal under all tests, but I found it to read gassy for the same period of time as the agc problem showed up...but ONLY during the first minute of gas testing....it would read normal for about 15 seconds, then jump up the scale for gas, and then about 45 seconds later it would return to normal...

The biggest difficulty is that the problem was being looked at the wrong way... it was not a case of the gain being too low and jumping up to normal, but that it was normal and jumped up to 20db above normal for a 40-50 second period before returning to normal sensitivity....

This one I will remember... the tubes had all been tested for Gm and gas, but only after a couple minutes of warmup...so all showed up fine....

I didn't recap the RF deck because of the problem, it was needed anyway...

Now if we could only find out the truth about C-275... even my 1977 repair parts list and diagram don't jive... the picture in the 1977 repair/parts manual shows a disc cap at C-275, and the parts list gives a part number and a description of it being a .033 paper cap....Why would 98% of the B+ bypass caps be in the .005 uf range and this one jump up to .033 uf..??? If you replace C-275 with a .0033 uf cap you will find an increase in sensitivity over all the <8 mhz bands bringing the sensitivity up to >8 mhz levels... granted noise doesn't really allow it to be used too often, but was it really meant to be this way or not..??? Looking through the R-390 not A manual, all the B+ bypass caps are the same value....

Date: Sun, 8 Oct 2000 14:21:30 -0400 (EDT)
From: Norman Ryan <nryan@duke.edu>
Subject: Re: [R-390] 390A 0-8Mhz Help...

Congratulations on solving the problem and thanks for keeping us informed of your progress. C275 is a longstanding and confusing issue. Every RF deck I've ever worked on has a paper .033 uF cap in there. I replace 'em with my favorite color cap-- Orange. :-)

On the TM 11-5820-35 schematic there is a note next to C275 that says "See Note 8." Note 8 says "See equipment modification chart." Equipment modification chart on page three says "C275 changed from 5,000 uuf to 3,300uuf."

The 3,300uuf value apparently is an error which is the source of all the confusion around C275. It also shows up in a note on figure 5, page 12 of the above TM.

Page 10 says "Capacitor C275 keeps the +150-volt regulated dc line at rf ground potential." What does that mean exactly? Does it bypass stray RF?

Date: Sun, 08 Oct 2000 12:46:29 -0600
From: Jordan Arndt <jordana@nucleus.com>
Subject: Re: [R-390] 390A 0-8Mhz Help...

Hi Norman... it has been my pleasure... sort of...!!! I have seen many decks with the.033 uF cap also, and all of these rigs have shown lowered sensitivity on the <8 mhz bands... I have replaced these with .0033 uf caps and the sensitivity on the lower bands comes back up to snuff, on par with the bands above 8 mhz...perhaps the reason for the cap change was that fact.... after working with EE's and ET's I can see how easy it would have been to find the wrong part number from a chart or over the phone and quote it while intending to use the correct part physically... If that had been done early enough, even production would have been requesting the .033 uf cap by part number and not the actual intended value... it would have become common accepted practice to install the .033 because it was the right part number and not necessarily the right value... Seeing as I have not encountered any improper functioning of RF decks using the .0033 uf cap at C-275 , and having found lowered sensitivity using the .033 uf cap , it really makes me wonder about the problem.... Given the ckt involved, I can see no reason to have gone from a .005 uf cap to a .033uf cap for bypassing the line, especially when the output of that stage is shorted to ground as soon as the 8 mhz and above positions are selected....

Date: Mon, 9 Oct 2000 02:12:28 -0400 (EDT)
From: Norman Ryan <nryan@duke.edu>
Subject: Re: [R-390] 390A 0-8Mhz Help...

Got a question or two about that darn C275 cap. You say you noticed an improvement in sensitivity at 0-8 Mhz when you used a .0033 instead of a .033. Did you do anything else to the RF module? Replace other caps? Replace out of spec resistors? Do any alignment? I'm curious about C275's function. From what I make out, it does something for the regulated 150 V B+. Is it just to make the VR output quieter? The 0A2 is basically an arcing device and could be putting out some RF noise, right?

Date: Mon, 09 Oct 2000 10:43:07 -0600
From: Jordan Arndt <jordana@nucleus.com>
Subject: Re: [R-390] 390A 0-8Mhz Help...

Hi Norman... actually it goes to terminal 7 on S-102 rear of the function switch and is connected to the Shorting R-619 line... at least on my schematic... I can't see the point of removing the hash after the Reg B+ has gone all over the rig and then bypassing it where it would do the least good... ... The manual states that C-611 bypasses noise generated by V-605 (0A2)....it is a .005 or 5,000 pf cap...I can see C-275 being a bypass to prevent the first oscillator RF getting into the Reg B+ line, but the output of the ckt is shunted to ground as soon as you move to 8 mhz.... the second crystal oscillator also has a pair of 5,000 pf caps (C-401 and C-410) with a ,33k resistor between them, for bypassing , and it states that "the

screen grid of V-401 is held at ground potential by feedback cap C-410 " and it is also a .005 uF cap....What say gang...?

Date: Tue, 10 Oct 2000 11:13:11 -0700 (PDT)
From: Joseph Gang <n6sf@yahoo.com>
Subject: [R-390] The Magic Green Gear is Missing

Well, I am almost ready to start restoration work on my R-390 (non-A). After careful inspection I have determined that the Green gear is missing (seems a common occurrence). Anyone know where I can obtain one? I checked with Fair Radio they don't have any more. Is the one for the R-390 and R-390A the same? If you get a whole RF section do they come with one?

Date: Tue, 10 Oct 2000 15:06:30 -0400
From: Bob Login <jlogin@mindspring.com>
Subject: Re: [R-390] The Magic Green Gear is Missing

Hi Mark..Don't take the rf section out of the 390 without the green gear in the proper place or else the whole alignment of the rf deck will go south! Tune to the alignment freq ...I think it is 02000 MHz (ck the manual) and take a small mirror and see if the cams are lined up correctly. If not you can do some alignment with the deck inplace especially if you take the xstal unit out. The 390A is a lot easier because the control shafts are part of the unit (KHz & MHz shafts) so it cann't spring loose like in the 390....the Government didn't like the 390 arrangement because I suspect it was a pain in the .... to get it back together... Let me also caution you not to turn the MHz or KHz shafts even with the green gear correctly in place as the cams will spring loose! The green gear holds the works at the alignment freq thats it!

Date: Tue, 10 Oct 2000 15:46:00 -0400
From: "Barry Hauser" <barry@hausernet.com>
Subject: Re: [R-390] The Magic Green Gear is Missing R390 non-A

Only the non-A has or needs a green gear. Both of mine, and the 391's came with it -- so I'm lucky I guess. However, you should double check whether it's truly missing. There are two mounting positions I've seen.

On one, the green gear is stored in at the top of the RF deck on the front of the slug rack -- just a bit to the left of the Veeder Root counter. On others, the gear is stored in it's "operating" position down below in the gear train, a bit to the left and well below the counter. In this position, it's turned green side out for storage and flipped over to unpainted side out for locking up the gears to keep things in synch when you lift the deck out. I did find one where the green gear was in the locking position with the

plain side out. It was engaged and turning with the gear train, adding some drag. Small chance, but worth a second look. (The gear is cupped with so the teeth are offset. Attached one way, it's engaged, green side out, it's free-wheeling.) Some non-A decks don't even have the threaded hole up top for storing the gear. Even if you have the threaded hole on your deck, it might have gotten stored down below. Without the gear it is possible to pull the RF deck, keeping things locked up with wire or something and perhaps make a few pencil marks. Worst comes to worse, you'd just have to resynch from the ground up -- not un-do-able.

Date: Mon, 16 Oct 2000 14:29:16 -0600
From: Jordan Arndt <jordana@nucleus.com>
Subject: [R-390] <8 Mhz Low sensitivity...

Has anyone tried this mod to improve the <8 mhz bands...???
http://www.koyote.com/users/gah/R-390%20Audio/page09.jpg

Date: Mon, 16 Oct 2000 15:30:42 -0700
From: "Roger L Ruszkowski" <rlruszkowski@west.raytheon.com>
Subject: Re: [R-390] <8 Mhz Low sensitivity...

I tried the V201 RF gain mod nailed wide open all the time. After a good run up and down the bands I opened the RF deck back up and removed the mod. On most signals the gain is just too much and over loads the receiver. The little extra gain was not worth the loss on high level signals.

Date: Tue, 31 Oct 2000 09:21:12 -0600
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] 390A 0-8Mhz Help...

Jordan, have you compared a .033 in a modern orange drop (extended foil hence far lower inductance) to the .0033 disk? It has the chance of meeting the mistaken specifications at the same time it bypasses the HF RF better. There must be some secondary effect because its not truly close to any active element in the circuit where bypassing should be critical. Well, checking the WD, I see it is directly across the 0A2. Too much C there can lead to the 0A2 oscillating. My RCA manual says 0.1µF is too much C. 0.033µF could be enough with an old tube to cause a noise generating oscillation to hurt receiver sensitivity. Another bypass in the second crystal oscillator adds .005 to the line. C-275 is in the circuit all the time, but the load is greater below 8 MHz which would make the 0A2 current less and more prone to oscillating. Working for minimal supply voltage could make the 0A2 more prone to oscillating also.

Date: Tue, 31 Oct 2000 15:22:33 -0600

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] 390A 0-8Mhz Help...

At approximately what frequency would this oscillation normally be?
10c? 100kc? 1mc? Barry - N4BUQ

Date: Tue, 31 Oct 2000 19:56:17 -0600
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] 390A 0-8Mhz Help...

The 0A2 oscillation probably would be near audio, depends on the C and the R since its a relaxation oscillator like one made with a neon bulb.It has a broad noise bandwidth because the rise time is determined by the RC while the fall is determined by the C and the fired R of the VR tube. So C about .05 mf and R of 1.2 or 2k. T = RC = 1 / 16.6 KHz.

Date: Thu, 04 Jan 2001 06:18:15 -0600
From: Nolan Lee <nlee@gs.verio.net>
Subject: [R-390] clone the horse so we can beat it...

>I'm restoring a SW R390A which had all original caps. It had a
>very low S-meter and AGC reading UNTIL I recapped the IF module
>(replaced all the molded caps with anything else I could find).

Cheap insurance. :-)

>Next will come all the other modules, whether they need it or not.

You've done the hard one, the rest are easy. Make sure when you pull the RF deck to replace the three caps in it that you clean the hell out of the band switch wafers with some electrical cleaner that doesn't leave any residue. Any accumulation of dirt. oil film, etc. on them can lead to flash over of the B+ ruining the wafer. It's a pain to change one, too. ;-(The most common arcing path that they seem to take is to the switch shaft so make sure that you clean the movable center sections of the switch too. Don't forget to check the little oil filled nut mount chassis capacitor near the 6DC6 for electrical leakage. If you're lucky, it will be fine. It's a pain to change one.

Date: Thu, 4 Jan 2001 08:10:03 -0500
From: rbussier@lexmark.com
Subject: RE: [R-390] R390A rf deck help needed

>Are there any other components in the RF, xtal cal, or xtal osc deck I should check or replace while it is out? Be prepared for a cramped operation if you plan to use ODs there. I did and

I think those two might have been the most difficult to replace in the entire radio due to the ground location as I recall. I recall thinking that if any of the components "under" the new caps ever needs replacing, these will have to come out first. I'm not sure if axial lead caps would make that job easier, but it might be worth investigating. I think I used 600V ODs and that may be overkill there -- don't know off hand. Perhaps 400V would suffice making the job a bit easier.

I recently acquired some very nice WIMA caps that were designed for PC board mounting. The leads are very short, but it's easy to mount new leads in a axial position. These are smaller, and flatter.

Date: Sat, 13 Jan 2001 20:54:10 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] BFO Neutralization

The RF deck has test points. They are on the top of the chassis.. If you hook an antenna to each one in turn you can sometimes discover which stage is not working. Or use a signal generator if you can figure out the right frequency to put in. Saves a lot of trouble.

Date: Sun, 14 Jan 2001 11:51:27 EST
From: Llgpt@aol.com
Subject: Re: [R-390] Crystal Query

JAN crystals has them for $12.00 each.

>The crystals for the SP-600 use a common case style, but I don't know about specific characteristics required.

It's in the SP-600 manual

>More on topic, perhaps -- I've recently come across three R-390A's with one or more bad rocks in the crystal deck which I've replaced grabbing them off from spare decks which probably cost me less than the price of one specially ordered new crystal. These are of the same case style of those used in the JX's. Look the same as the ones in the old CB's and scanners, etc. But are they the same type?

They (the crystals) will drift with age.

>Is there a "killer cap" or other component in the crystal deck or elsewhere that >can take 'em down if it fails?

In the case of the SP-600, yes, there are black tubulars in the frequency control box. It is a goofy scheme on the SP-600JX series. It was put in as

an afterthought by Hammarlund after government test proved they were too " drifty " to be used in point to point communications. To use the x-tals, you have to tune to that frequency with the receiver. If one were able to just click in the x-tal frequency one wanted it would have been great. Of course, it is probably neat to have all 6 slots filled. I had bunches oif them years ago, mostly 6mc and 8mc which were the older military frequencies. Filled up the various SP-600 I sold years ago.

Date: Fri, 26 Jan 2001 16:15:49 -0500
From: Jim Miller <jmille77@bellsouth.net>
Subject: [R-390] 2nd Xtal Osc Low Output on 7 & 24 Mhz Band

I've been chasing what appears to be a problem in my 2nd Xtal Osc. On all bands except 7 Mhz the output to the cathode of V203 is 3.5bVpp or greater and receive sensitivity is good. (These were measured with an HP410C using the RF probe.) However, on the 7 Mhz band (controlled by the 9 mhz oscillator crystal Y408) , the 2nd Osc output drops to 2.7 volts P-P, and there is a noticable drop in sensitivity, although signals are still readable. For example, the calibration signal level will show about 10 dB reduction on 7 Mhz compared to other bands. The 9 mhz crystal trimmer cap (C431F) does peak (the peaks are real...I get two peaks). I also see the same reduction in drive on the harmonic band (24) driven by this crystal.

I have changed the 9 mhz crystal with no improvement. The oscillator tube checks OK. I have changed essentially all of the fixed caps (inlcluding the 150 pf and 12 pf caps, and all of the ,005 bypass caps. I have changed all resistors (most had drifted), except the 120K grid resistor R404 which checks OK. I have not changed the cathode choke, which measures about 27 ohms resistance. Have checked the band switch and it appears good. Tightened all the hardware. I have not done any cleaning or changing of the trimmer caps, they appear to be functioning OK.

If I measure oscillator output versus band, it gradually rises as I go up in bands. If you plot output versus the crystal frequencies at each band, it almost
looks like the output of a bandpass filter. Here are my readings on a sampling of consecutive bands (these are the oscillaotr output levels after peaking of the appropriate trimmer cap):.

7 Mhz band (9 Mhz xtal)	2.7 vpp
8 Mhz band (10.5 Mhz xtal)	3.1 vpp
9 Mhz band (12 Mhz xtal)	3.5 vpp
10 Mhz band (13 Mhz xtal)	3.9 vpp
11 Mhz band (14 Mhz xtal)	4.1 vpp
12 Mhz band (15 Mhz xtal)	4.6 vpp

I would think that the 2nd oscillator design would attempt to keep the output level reasonably flat across all bands. But this does not appear to be the case, and my 7 Mhz sensitiviey seems to suffer as a result. It almost appears that perhaps the output transformer T401 is showing some rolloff at lower oscillator frequencies. I have examined the transformer and it looks OK.

So the question is: Does this appear to be a normal behavior? Do other R-390A's exhibit reduced sensitivity on the 7 Mhz band compared to other bands (if so this may be an unavoidable characteristic of the design).

Or is this a problem? The only thing I can think of replacing (other than the whole dang osc. module) is T401 or the trimmer cap, or perhaps the 0.5 mh cathode choke...in fact the choke's behavior in the cathode circuit could cause some gain-vs-frequency changes I suppose. Anyone have any ideas? Or should I just leave well enough alone? Thanks, Jim N4BE

Date: Fri, 26 Jan 2001 18:36:48 -0500
From: Al Solway <beral@videotron.ca>
Subject: [R-390] Re: 2nd Xtal Osc Low Output on 7 & 24 Mhz Band

OK on the MSG directed to me. If you have the Y2K Manual look at page 3-12. This is a simplified schematic of the 2nd Crystal Osc.

The band 7 crystal which is 9 MHz is shared with Bands 15 and 24. On Bands 7 and 24 the O/P freq. is the 3rd harmonic or 27Mgz. On Band 15 the O/P freq. is the 2nd harmonic or 18 Mhz. Check the O/P fof the 2nd Crystal Osc cand sensitivity on Band 15 and 24.

Also check all bands below 8. Have a close look at the Signal Flow diagrams Y2K pgs 5-40 through 5-42 and you will see what I mean.

The sensitivy on my R-390A is 0.316uv and 0.35uV at the band edges. Bands 00 to 06 is 0.177uV to 0.251uV. I have been told that Band 7 is always a bit less than the rest. BTW this my first R-390A. So Whatever I have just said is definitely not my creation but just echoing what the real experts have said before.

Date: Sat, 27 Jan 2001 08:35:00 -0500
From: Jim Miller <jmille77@bellsouth.net>
Subject: Re: [R-390] 2nd Xtal Osc Low Output on 7 & 24 Mhz Band

OK I'll keep looking, and pass on what I find, but the receiver does seem to be "receiving" well on 7 mhz, it just doesn't seem to match the other bands in sensitivity. So far I received only one response to the effect that it has

been said before that 390's exhibit slight reduction in sensitivity on 7 mhz, which would make sense if the 2nd osc. injection rolls off as lower frequency xtals are switched in. Now I am looking again at my test equipment operation. I may have been misreading my voltmeter (RMS vs peak) giving me an abnormally low measurement. After correcting my interpretation of the meter reading, multiplying by square root of 2, etc., double checking with a scope, I am indeed getting about 3 volts peak to peak 2nd osc. injection on 7 mhz, which is within specs I believe, but just a lot more on the other bands. I'll relay any other ideas I get, unless they are repeated to the reflector. But this may belong in the category of the old saying "Better is the worst enemy of good enough."

One issue I have is how I should preset the 2nd oscillator coil T401 before proceeding to alighn the caps. When I received my 390, the slug for T401 seemed to be tuned "out of the can" a lot. There was almost an inch spacing between the top of the can and the top of the slug tuning screw. I also did not seem able to get positive peaks on some trimmers (double peaks), so I experimented (trial and error) with other initial settings of T401 such that I was able to get a valid trimmer peak on all nads. This put the top of the screw at about a half inch out of the can. The manuals I have say nothing about how/where to preset this coil before going thru the trimmer alignment. Seems that would make a big difference somehow (for example my Collins KWM2 alignment instructions are very careful to say how to preset the slugs before starting.) Wonder if anyone has seen similar instructions for the 390.

Thanks, Jim N4BE

Foster wrote:

> Greetings Jim,
> I am having the same problem although I have not done near the trouble
> shooting that you have. I did replace the xtal and noticed a "little"
> improvement but not enough and thought I would dive in and change the cap or caps.... Since you put the question on the reflector, I think I will just
> wait a bit and see what developes.

Date: Mon, 29 Jan 2001 11:20:34 -0500
From: jmille77@bellsouth.net
Subject: [R-390] Accessing Antenna Trimmer Cap.

Is there an easy (or accepted) method of opening the antenna trimmer can to gain access to the trimmer capacitors for inspection and cleaning? The gear driving the trimmer shaft appears to be secured in place with a

pin, and it appears that this must be removed before the can can be removed. How should this be done?

Date: Mon, 29 Jan 2001 23:51:31 -0500
From: "Barry Hauser" <barry@hausernet.com>
Subject: Re: [R-390] [R390] RF deck problems

I took a peek The full URL is
http://home.att.net/~d.j.medley/RF_Deck_info.htm
for those readers who might have trouble finding the page.

I have a similar problem right now on an "A". Sometimes certain bands work, sometimes not. It seems to depend on how far I've cycled the MC knob. If the band, say 6 MC, is dead and I just switch back and forth from 6 to 7 or 6 to 5, no dice. But it seems that if I turn it over more detents, it will come in. Actually, I've had more non-A decks out than A's, but I think the mechanicals are similar enough that the exact positioning of the crystal deck and the bandswitch can affect this on those too.

Of course, you can get similar symptoms with a hanging slug rack and that's sometimes difficult to spot. You have to work the MC's through the whole range and eyeball each rack to see that the cam followers are, uh, following. What can happen is that one will follow down 2/3rds and then hang, after you've looked away. Also, the crystals in the A xtal deck may be intermittent in their sockets, which aren't all that snug. And, of course, the bandswitch might need a DeOxit job, too.

BTW - on this R-390A, a lot of the decal on the crystal deck indicator is gone.
Are you the guy who has replacements?

As for the shorted cap -- that's a general possibilty with all point to point wiring. True, many of the leads have sleeving, but not all, and some components are conductive on their bodies. A jolt in shipment can cause some components to shift -- or we may accidentally make contact with the underside of a module while handling or reinstalling it.

On top of that, there may have been a repair, and I've seen many where the tendency was to skip on tubing or heat shrink and leave excessive lead lengths.

> I would be interested to hear from any body who has seen the same or
> similar problems end

I'll let you know what I find on this R-390A. The crystal deck seemed to be correctly synched, but I didn't really look at the lineup in every MC

position and there are gaps in the decal. Only discovered the intermittent after I covered everything up and was too late to pursue further then.

Date: Sat, 7 Apr 2001 15:18:56 -0400 (EDT)
From: Norman Ryan <nryan@duke.edu>
Subject: Re: [R-390] HR-202 oven

Not all ovens are off when the ovens switch is in the "off" position. HR202 stays on all the time. It contains the 200 KHz. calibration crystal.
Oven works on 6.3 V @ 8 W.

Date: Mon, 9 Apr 2001 08:30:15 -0700 (PDT)
From: <jlap1939@yahoo.com>
Subject: [R-390] Freq.Accuracy

Had questions from several readers, who note no drift on their radios,as well as a few who do, regarding my experience w/my 390. Odd several were thinking the same... Just would like to comment on stabil. .TRUE: Can put my 390 on any lower freq., hot or cold, go back and turn on another time... DEAD ON.. It will do it time after time and doesn't drift AT ALL, EVER. May I point out that this is CODE and SSB, (and that my orig. degree was in music), (and I do have so-called "perfect pitch) and is with the BFO on, therefore, allowing you to detect the slightest change in pitch. Can you top it.....? I know a few have spoken of some drift, but on that radio, I simply don't have any... I believe it is "tighter" alignment, and care w/VFO-BFO and rf sections, as well as the best SOUNDING tubes in the circuit. Wish, (and hope) to get my 390a to that point... Comments?

Date: Wed, 18 Apr 2001 23:05:56 -0400 (EDT)
From: Norman Ryan <nryan@duke.edu>
Subject: Re: [R-390] Essential Tools

Ah yes, aspirin. I recently tried it for a headache. Not the normal type headache, but for repairing a Litz wire that had broken off the trimmer cap terminal in one of my RF deck's coils (T203, 2-4 MHz).

It makes a terrific solder flux. I held the iron's tip on a tablet until it liquified and turned a tan color, then deftly applied the thus fluxed iron and some rosin core solder to the end of the broken Litz wire. Got an instant and complete (I think) tinning. I next added a thin lead with a small strain loop between coil and terminal. A quick test in a working rig confirmed that the coil works. The trimmer cap peaked when I tweaked it. Since the coil had been relegated to the spares, I don't know if it is fully up to spec since I didn't do a slug adjustment on it because the set is in good alignment with its other coil. If I got all the Litz strands tinned correctly the repaired coil probably will come around fine during alignment. (Must

try that experimentally some day and report on it.) The hint came from a fellow list member a good while ago and I was really intrigued to try it. Thank you, kind sir, whoever you are-- and please stand up and take a bow!

Date: Tue, 22 May 2001 22:35:41 -0400
From: Bob Camp <bob@cq.nu>
Subject: [R-390] More Fire at the Camp's House

Well the Amelco caught fire again. Great new indoor sport - get the RF deck off a fully assembled R-390A before the smoke clears. Gotta find the part that's the problem. Based on my first pass run at it it's obviously something that requires more in depth work with a personal trainer ..... Turns out the calibrator problem was in the multivibrator. One of the coupling caps was pushed down on the plate of the 12AU7 and on ground. Took out the plate load resistor. Color code is now charcoal, black, charcoal, value is a tad high ... Also didn't do the tube much good either, one triode was pretty much dead on the TV-7. Replaced both the tube and the resistor and things seem a little bit better. Why is the resistor that fries always the one they put on the bottom of the pile ..... I have no idea how the cap got pushed down and until the DNA evidence proves otherwise that's my story and I'm sticking to it :) Tried a little more gentle persuasion on the stuck IF can core. It's not going anywhere without some major force involved. Then there's the cracked glass on the VU meter .... this could keep me busy all summer.

Date: Wed, 20 Jun 2001 19:04:31 -0400
From: Bob Camp <bob@cq.nu>
Subject: Re: [R-390] Non A restoration

Having spend a lot of time more or less in the crystal industry here's some basic info :

1) Other than aging (frequency change) there is no real wear out mechanism on crystals. If you drop them they break and if you get them to hot the solder melts. That's about it *if* they made them right.

2) The crystals that Collins and Motorola bought for the R-390 contracts had to go through the component groups at those companies. I worked for Motorola and sold to Collins, both places had *very* picky people in components.

3) Once the radio was bid out the crystals could be bought from any QPL source. We were QPL but never sold much that way. Always kind of wondered how you could make parts that cheap

I think that cost and corner cutting as the contracts went on has more to do with the crystal problems than anything else.

Date: Tue, 31 Jul 2001 13:28:31 -0700
From: David Wise <David_Wise@phoenix.com>
Subject: [R-390] Restoration Bulletin 4: Gear Train Breakthrough

(MOT, 363-PH-54) GEAR TRAIN: <snipped> (see RF_deck_mechanical)

RANDOM: C603 and C606 are forming up beautifully. Today they're ice-cold at 400V,
comfortably higher than the pre-warmup transient on this solid-stated power supply. I'm not going to bother with the time-delay relay. I will add both B+ fuses, however.

I applied the RF Deck part of FC7 (screen resistors 56k -> 220k). I just realized that "Mods" and "Field Changes" are not the same thing. My RF Deck contained Mods 1-4 but no FCs. Data Point: C275 is a .033 BB. I found that though there's no Mod mark, Z201 have the later 1500pF cap instead of the early 2400.

Can anybody explain what 14-PM-56-A1-51 means? It's an Order Number (not a Contract Number), and although I've seen a table of Order Numbers somewhere, this one's not in it. Most of my modules are thus. And where are the MWOs documented? Thanks.

Date: Fri, 3 Aug 2001 12:56:34 -0700
From: "Roger L Ruszkowski" <rlruszkowski@west.raytheon.com>
Subject: Re: [R-390] contact

>Is it normal/typical for the Cal. signal to get pretty weak on the high bands?

No this is not normal, you have an additional education opportunity.

- Is 17 to 31 just fading as you tune from 17 to 31?
  (Alignment of that RF section)
- or just on some MHZ bands? (Osc deck crystals)
- or kind of spoty on some bands (3rd Harmonic on Osc deck Crystals)
- Failure to operate receiver through all bands daily and keep oxide displaced on switch sections is a known historical problem.

We hear weekly about receivers that have been tuned to one station 24 X 365 and doing well. Yea like sure, Just wait until those knobs get moved by some grand-kid one day.

Collins, expected us to use those gears and use them often. Failure to use them results in these problems. You heard it before and hear it is again. Use it or lose it. <snip>

Date: Wed, 15 Aug 2001 10:36:52 -0500 (CDT)
From: Dave Merrill <r390a@enteract.com>
Subject: [R-390] Neon Antenna Overload

Last night I was flipping through the -10 manual and took a good look at the running spares table. A NE-45 neon lamp was listed, part I103. It's part of the antenna relay assembly and protects the front end from RF or static overload.

I don't recall changing a neon lamp in anything I've got - do these lamps ever go bad? Can they become noisy? Anybody ever have a problem that could be traced to I103? I103 doesn't show up in the TM 11-856A spares, which I believe is the first issue TM on the R-390A. It's in TM 11-5820-358-10 so either it was overlooked initially or it was found that they did need to be replaced often in the field. It's listed as a second echelon maintenance item, so it's not something the operator was expected to do.

Date: Wed, 15 Aug 2001 12:41:48 -0700
From: "Roger L Ruszkowski" <rlruszkowski@west.raytheon.com>
Subject: Re: [R-390] Neon Antenna Overload

Shame on you, thinking the NE-45 is a light bulb and would be changed as such. It should never light as installed in the antenna relay. Its a spark gap. It has a very limited power handling capacity (relative to lighting strikes) It is intended to bleed static charge. Most R390 never got cabled direct to an antenna except in mobile field use. So the NE-45 never gets to function.

Life expectancy as used is like forever plus.

If your R390 got a strike that flashed the NE-45, then it would want more than 10 level maintenance. After a hit, you would want the receiver to get the proverbial fine tooth comb treatment from the depot.

The first run R390/a did not have the NE-45 in the antenna relay. It got added in a change. Old relays as built were not upgraded. If your relay failed it was just replaced it with a new relay that had the NE-45.

Why are you so surprised when you catch a difference between TM and publications. You need some good manuals that were really used in a shop. You know the ones with both from and back inside covers, covered with errata. add items, changed items, alternate items. missed items.

Clamp, is that part number and cage code with or with out bolt and nut. Need that bolt, order this clamp to get one.

327, 328, alternate long life what.

Microscope slide for dial glass. Warning this will get you 100. Check shop stock.

Wait until you toss the antenna relay frame in an R390 and discover it is not replaceable. Trash 1 R390 as not repairable. NO JOKE.

Man those books were done by people who cast type from hot metal and set the type lines by hand.

A copy was carbon, created with the original.

Truth be know that generation preformed much better than the generation we have today here in California High Schools.

Date: Wed, 15 Aug 2001 16:22:52 -0500
From: Nolan Lee <nlee@gs.verio.net>
Subject: [R-390] Neon Antenna Overload (long)

I've disassembled probably a couple of dozen antenna relays over the years since the mid 1970's and never seen one that didn't have the bleed resistor and neon lamp. My old early '55 Collins has one and it's shown in the schematic of the antenna relay on page 45 of my the 1956 TM 11-856A tech manual. As a result, there is no mention of it being added in any of the changes for the 1956 manual. Neither is it mentioned in the 1961 Army/AF manual and it's changes, the 1970 Navy manual, or the 1985 Navy manual in any of the "differences charts".

I'd be very surprised to find out that it wasn't included in "early" models. Even the WWII RBC model receivers that the R390A replaced used a neon lamp in the antenna circuit. They used a 991 lamp. I'd have to dig the specs out but I seem to remember that it would function at a much lower voltage than the 45's.

>Why are you so surprised when you catch a difference between TM and publications.

I've got a pretty decent selection of manuals. <grin> I'd guess pretty much all of the R-390A manuals and changes and a most of the R-390 ones along with the Changes, etc. I'd be interested in which change for which manual, or which manual, or EIB publication, MWO, etc. doesn't show the

antenna relay has having a neon lamp or mentions the production change.

A quick check of the August 1955 edition of TM 11-855 for the R-389 with all of the changes up thru 1975, makes it appear that all R-389's came with the neon lamp and bleed resistor.

Another quick check of the March 1962 TM 11-5820-357-35 (with changes 1 and 2) for the R-390 receivers doesn't list any production changes to the antenna relay in the charts or schematics. It looks like they all came with the neon lamp and bleed resistor.

Going back further in time to 1953...I checked the October 1953 preliminary edition of TM 11-863 for the R-391 receiver and found that it also came with the neon lamp and bleed resistor. It was in the schematic in 1953 for the R-391.

I do know that there was a production change for the R-388 in 1962 or so that included a transistorized overload protection circuit for the antenna input of the receiver. I don't have the R-388 manuals handy and I don't remember if they had a neon lamp or not.

Date: Wed, 15 Aug 2001 16:32:42 -0700
From: plmills@attglobal.net
Subject: Re: [R-390] Neon Antenna Overload

I think this is to prevent damage from static buildup. The R-388 uses this arrangement.

Date: Wed, 15 Aug 2001 18:45:21 -0400
From: "COWARD,JAY (A-SanJose,ex1)" <jay_coward@agilent.com>
Subject: RE: [R-390] Neon Antenna Overload

Ye Olde ARC-5 and SCR-274N had them too.The BC-348 and the LM frequency meter used a neon lamp(s) as voltage regulators.In the older phone company outside boxes there were gas discharge tubes as protection devices.

Date: Wed, 15 Aug 2001 22:25:41 -0400
From: "AI2Q Alex" <ai2q@adelphia.net>
Subject: RE: [R-390] Neon Antenna Overload

What's all the brouhaha about this neon lamp? It's there so that at any striking voltage of 90-V or more, it will go into a low-impedance conducting state and protect the downstream circuitry from spiking voltages.

That's all there is to it. Once the applied voltage goes away, the bulb stops conducting. It can do that a near infinite number of times.

I have a neon lamp permanently mounted on my antenna feedline, and every time I key the transmitter it flashes back the Morse to me visually. That bulb has been there for almost ten years, and hasn't failed.

If the lamp in the front-end of a '390 were to get a direct hit by lightning then maybe it would fail, but clamping voltages somewhat in excess of 90-V is nothin' fer this little critter. I have never seen one fail in any of the sets that I fixed in the Signal Corps years ago or on my bench at home these days.

Date: Wed, 15 Aug 2001 22:05:40 -0700 (PDT)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] Neon Antenna Overload

..... problem that could be traced to I103?

I've noticed that the neon bulb indicators on old power strips often flicker off an on instead of lighting properly. Over the years, their firing voltage has increased.

Old but unused neons used for projects seem OK, so it seems to be use rather than strictly old age that gets them. Since there are no current limiting resistors when the neons are used as antenna surge protection, I would expect them to degrade after flashing for a certain number of hits, but how would one detect time to change? The firing voltage could be measured and the bulb replaced if out of spec, but a better solution would be to install a modern gas filled surge arrestor, either in the set or externally. These have heavy duty electrodes and low inductance paths designed for this sort of service, unlike neon bulbs.

> I103 doesn't show up in the TM 11-856A spares, which I believe
> is the first issue TM on the R-390A. It's in TM 11-5820-358-10
> so either it was overlooked initially..... <snip>

I would suspect they were replaced only if mechanically broken, or if they didn't work and the RF coil got fried.

Date: Thu, 16 Aug 2001 02:03:28 -0400
From: eengineer <eengineer@erols.com>
Subject: [R-390] neon overload

Most of the new stuff, maybe some of the old stuff, might be protected by

TVS and SIDACTORS. TVS are Transient Voltage Suppressors, Solid State device typically used to absorb transients. They come in bipolar and unipolar versions.

SIDACTORS are typically used in the Telecom industries, to protect phone line POTS devices, but have a really limited voltage selection of Forward Voltage Breakdown (Fbe). TVS's and SIDACTORS are available from TECCOR, and are available from Digikey among others. I have never seen a neon fail though... and they add originality to all of the old BA stuff.. LOTs of trade-offs depending on what you are trying to do... Cheers, Jeff

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Date: Fri, 17 Aug 2001 14:20:25 -0400
From: Norman Ryan <nryan@intrex.net>
Subject: Re: [R-390] R-390x Hints and Tips>

Reading it reminded me of something. I see where you talk about using an> aspirin and a solder blob to strip-n-tin Litz wire. I tried this once and> it ran me out of the shack. The resulting stink was pretty strong. .....Walter's aspirin trick helped me save an RF coil-- it really works where nothing else did. Smell is pungent, I think, but was just using a Weller soldering station and don't remember smell being a problem.I was just happy to get the coil working FB. :-)

Date: Fri, 17 Aug 2001 13:34:31 -0500
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] R-390x Hints and Tips

The only time I tried this, it didn't work as I had expected. I was working on a wavetrap in an antique RCA receiver. The wire was covered in a waxy substance. I removed the majority of this stuff and tried the aspirin trick. It just resulted in melting what was left of the gummy stuff and making a general mess. I suppose it needs to be a "dry" Litz wire to begin with.I finally ended up separating the wires, gently scraping each conductor down to shiny wire, tinning each wire, and looping a larger piece of copper around the remaining "stub", and soldering them together -- all done under a magnifying glass. It worked, but it was certainly tedious. The sad part is I was the one that cut the wire to begin with. I mistook it for excess wax on the coil and I wanted to trim it up a bit. :(I was happy I was able to get it back together!

Date: Fri, 17 Aug 2001 16:19:41 -0400
From: "Walter Wilson" <wewilson@knology.net>
Subject: Re: [R-390] R-390x Hints and Tips

For the aspirin trick to work, the soldering iron needs to be really hot. Melt a little extra solder on the tip, and press the hot iron against the litz

wire (dry) which is being held up against the aspirin tablet. And of course don't use the coated aspirin. ;-)

Date: Thu, 30 Aug 2001 21:39:13 -0400
From: "Walter Wilson" <wewilson@knology.net>
Subject: [R-390] Bad crystals? Bad tube !

I was working with an R-390A this afternoon that would not receive on about 12 bands (6, 7, 10, 11, 13, 14,15, 23, 24, 25, 29, 31). I would get signals fine up to the grid of the 2nd mixer, and then nothing at the grid of the 3rd mixer. So I started checking the 2nd oscillator. It turned out that many bands were tied to the same crystal. Five different crystals (17MC, 16MC, 14MC, 13MC, and 9MC) covered all the non-functional bands. The 9MC and 14MC crystals seemed to come back to life as the set warmed up. Replacing the 13MC and 16MC crystals brought those bands back to life, but no 17MC crystal would oscillate to make the 14MC and 31MC bands work (I tried four crystals). I finally replaced the 5654 oscillator tube with a new tube, and the 17MC crystal came to life. I then tried the old 13MC and 16MC crystals, and they worked great with the new tube. None of the crystals were bad. Seems like the problem was all centered around the tube, even though replacing the crystals had seemed to help in a few cases. Next time I have a crystal not oscillating, I think I'll try a new tube first.

Date: Fri, 31 Aug 2001 07:59:07 -0400
From: "Peter Cade" <butrosg@bellatlantic.net>
Subject: Re: [R-390] fun and games...

Wow....fast reply...! Many thanks for the cable, many thanks for the help.....
Duh..... never thought about probe loading effects.....hanging a 1 meg resistor off the probe of my DVM made a big difference to the measurements
in some cases.....at E402, (2nd oscillator grid) it went from 0.5 to 5 volts, for instance. Also tweaking the 1st and 2nd oscillator coupling transformers - T-201 (407), and T-407 (201).....brought the voltages up withen spec. They use the same transformers in different places.....confusing. Things are starting to liven up.....including the carrier indicator - so AGC is doing something.....more to come, doubtless.....

Date: Mon, 3 Sep 2001 22:36:36 -0400
From: "Peter Cade" <butrosg@bellatlantic.net>
Subject: [R-390] Re: [R-390A]HR202 oven

Me again.....I read a few weeks back about some problems when the

HR202 oven stuck on, and cooked up. This oven is the only one that remains on permanently, regardless of the setting of the "oven" switch on the rear panel, isn't it ?..... A suggested solution was to simply clip the 6.3 volt power lead to the heater and save a lot of wear and tear. The oven runs at 85C according to the label, which is pretty warm.....If the crystals are at ambient temperature, do you think that the frequency difference would be enough to cause alignment problems in the IF stages ??

Date: Tue, 4 Sep 2001 06:56:49 -0700 (PDT)
From: "Tom M." <courir26@yahoo.com>
Subject: Re: [R-390] Re: [R-390A]HR202 oven

If you let it warm up a long time before recalibrating the calibration xtal, and you use the radio in a controlled environment (i.e. not Arctic or Sahara) it should be OK to have the oven off. This would put you in the same league as the 51J receiver which is not too shabby.

Date: Fri, 14 Sep 2001 13:09:08 -0700
From: David Wise <David_Wise@phoenix.com>
Subject: [R-390] R-390A Restoration Bulletin 6: reassembly

This will be short as I'm still busy at work. I got the gear train all back together and pretty happy, much less backlash than before. The last remaining seems to be in the interface zone between cam and follower. I was getting excited at the prospect of firing it up, so I let it go.

Unlike most of you, I'm leaving the BB caps in place unless obviously bad. Since a microamp of leakage doesn't matter, I don't treat it as "bad". Not here. I did examine them for cracks, which prompted me to replace one in the IF deck. I replaced C275 with prejudice, since the RF deck is so much harder to remove. The other two RF BBs are of no consequence and will never fail. There. If that doesn't make them go, nothing will :-)

I baked my RF and IF decks at 170 with B+ applied, and was rewarded with another bad BB which shorted in the night. This was a no-lose situation. If they held, they would hold in the field; if they didn't, I knew they were bad. Sort of a dry version of the flotation test :-)

I also checked them at RF to see if they would bypass like they should. I applied signal generator and scope to each in turn, and found that they looked as good as any OD from 300kHz to 30MHz. An interesting coincidence is that while doing this, my generator quit working. Dug into it. Shorted cap!

I installed fuseholders for F102 and F103, choosing to wire them in a way that is easy to undo rather than pretty. F103 is a pain!

I installed a CL080 inrush current limiter. The CL090 would have been better, but since I got mine at $0.25 each, I can't complain. Screw-terminal-strip warnings notwithstanding, I just soldered it in. We'll see how it goes.

Putting the modules back into the frame, I was dismayed to see that the tip of V701 was white. Somehow, the base had cracked. Of all the tubes to go... I hadn't touched it except to remove, test, and replace. Since then the PTO's been lying in the corner. I threw in a spare from my "questionable" box just to see what would happen. Got them all bolted in and plugged in, and stay tuned for the next installment :-)

Date: Thu, 27 Sep 2001 21:58:23 -0400
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] R-390 Non "A RF Deck Question

>Not only are the IF slugs different in the R-390 non-A, but I believe the RF slugs may vary in diameter. There was also a change in the core material starting with RF deck mod 2, as described in TM 11-5820-357-35, page 72.

Not only that #2 -- there was a thread back over a year ago where we learned that non-A slugs of the same size vary in composition/density? within the RF deck. The have color codes painted on the top of the slugs where the springy thing goes in. Someone wrote that these were individually matched to the coils -- or maybe they were graded and matched on a group basis. If I'm not mistaken, all the slugs in the non-A were powdered iron, where as most or all of the ones in the A are ferrite - is that right?Never did resolve what to do about it -- just don't play 52-pickup with 'em otherwise you'll be playing alignment roulette afterwards.

Date: Thu, 27 Sep 2001 21:50:10 -0700
From: "dave faria" <dave_faria@hotmail.com>
Subject: Fw: [R-390] R-390 Non "A RF Deck Question

Hi John I queried the fellow I got the deck from last night and this is his response. I checked around the office today and there is not working camera. But, this is what I can see on my deck. They used about a 15inch piece of coax. It is routed thru the same hole in the back of the RF deck as the power connector from the main chasis(its the hole about an inch in diameter. From there it is taken up to the front of the deck. At the front of the deck it is taken down the same hole that the IF deck coax feeds uses. Once it gets below deck it is connected shield to ground and center conductor to an insulated standoff. Also connected to the insulated

standoff is a small cap whose value is unreadable. The other end of the cap is connected to T207. The pin on T207 is the same one that is connected to V205 pin 1. The coax that is used is RG58C/U. Probably any cap not to small will work. Just running the numbers .3MFD or alittle smaller. Note from my source: I think the head you got has an extra cable (RG-58 black, not the small tan ones I speak of here) which might have been a mod for a panadapter. If it is, the signal would come off the last mixer plate through a small capacitor. The less sections of IF transformer, the broader the response. I believe the actual front-end selectivity set the limits at somewhere about +/- 50-100 KHz with the panadapters. Been a long time since I used a panadapted R-390. It was a tool, and did some great things in the radio fingerprinting arena of the 60's to 80's.

Date: Wed, 3 Oct 2001 18:11:57 -0700
From: "Bob Tetrault" <rstetrault@home.com>
Subject: RE: [R-390] Pointer to EIB-911/Origins of FC-7

The change was done to reduce the likelihood of spurious emissions. Whoever developed it did not elaborate any further.

Date: Mon, 1 Oct 2001 13:25:43 -0700
From: David Wise <David_Wise@phoenix.com>
Subject: [R-390] R-390A Restoration Bulletin 8: Filter ok/FC-7 downside

My 20dB-down 8kHz mechanical filter is fine. One of the mica caps tuning it was open. The open was intermittent, which had me going for a while. Now, with a new cap, all the filters are within a couple dB of each other. I have one or maybe two other intermittents. I haven't got them characterized yet.

One is a gradual drop in sensitivity, which then pops back to normal with an audible click. While tracing this I noticed that bands 0-7 are 10-15 dB below bands 8-31. The main suspect is the first oscillator. Doing the Injection Voltage Test with a fetVM (with 1M probe resistor), I read about 3V at E209

This is below the published 4V-8V range. I'm taking the probe into account. Since I had experienced a problem earlier due to installing FC-7 (the VFO quit until I put in a stronger tube), I right away suspected the same thing. I wrapped a small wire around the 1st oscillator's pin 6 and brought it out for metering. It only read around 40V. The RF deck voltage chart shows 70V (without FC-7) or 77V (with FC-7).

What's up with that? I temporarily rigged an outboard resistor to push the screen up, and was rewarded by 5-10 dB carrier meter increase, but oddly, the E209 voltage dropped instead of rising. Eh? I'll scope it if I

don't hear from you. Various tubes (osc and mixer) I swapped in all acted the same. It looks like FC-7 degrades sensitivity in exchange for stability and longer tube life. What's your experience? I'm actually thinking about backing it out.

Date: Mon, 01 Oct 2001 16:59:54 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] R-390A Restoration Bulletin 8: Filter ok/FC-7 downside

>It looks like FC-7 degrades sensitivity in exchange for stability and<sip>

Did you re-set the IF gain setting after the Field Change? The IF has lots of gain. The sensitivity is set by the front end once everything is balanced the way it should be.

Date: Mon, 1 Oct 2001 14:25:01 -0700
From: David Wise <David_Wise@phoenix.com>
Subject: RE: [R-390] R-390A Restoration Bulletin 8: Filter ok/FC-7 downsid e

> Did you re-set the IF gain setting after the Field Change?

I haven't gotten that far. What I observe is a difference between 0-7MHz sensitivity and 8-31MHz sensitivity. Regardless of the IF gain, this difference is much larger when FC-7 is present.

Date: Thu, 4 Oct 2001 10:17:13 -0400
From: P.Cade@crodausa.com
Subject: [R-390] Re: R-390/A FC-7 mod

FC-7 modified chassis..... Was never able to get the correct p.p RF voltages on the 1st and 3rd(PTO) mixer cathodes - always much lower than the reported values. Screen voltages on the 1st osc, and PTO were also much lower than listed in the FC-7 modified version...30V or so rather than 55 ish, or 65ish for the non modified chassis.

Undid the mod by replacing the 220K resistors in the cathode injection lines of the 1st osc and PTO with pre mod 56K's, and Lo !!!! the screen voltages popped up, and both PTO and 1st osc p.p voltages are way up where they should be.

S/N better, more apparent gain,..... Comments anyone ?????

Date: Thu, 4 Oct 2001 20:57:54 -0400
From: "Peter Cade" <butrosg@bellatlantic.net>

Subject: Re: [R-390] Re: R-390/A FC-7 mod

Sorry...sorry....duh...did a brain fart.....The resistors to replace are the screen droppers, not in the cathode injection line.... which figgers.....

Date: Fri, 5 Oct 2001 11:52:05 -0400
From: P.Cade@crodausa.com
Subject: Re: [R-390] Re: R-390/A FC-7 mod

Hmm.....thanks for the encouragement.....seems like I did one thing right, anyway ! This is interesting.....the actual government doc. for the FC-7 mod replaces 2 resistors - the screen droppers of the 1st osc (the 17 Mhz one in the RF module), and the one in the PTO. It is possible to have a 390/A with one, or both, or neither of these mods performed, depending on the source of the RF and the PTO modules. If you think the DC voltages measured at the grid test points (the standby tests), or the p.p RF voltages on the respective mixer cathodes are low, check the screen voltages, and the values of these resistors.....

Date: Sat, 6 Oct 2001 14:14:43 -0400
From: "Peter Cade" <butrosg@bellatlantic.net>
Subject: Re: [R-390] Re: R-390/A FC-7 mod

The resistors replaced in the FC-7 mod are R210, and R702.....the screen droppers of the 1st osc (V 207) and the PTO (V 701). Pre mod they are 56K, Replaced with 220K. Things seem to work a lot better with the 56K's.....

Date: Wed, 10 Oct 2001 15:23:33 -0700
From: David Wise <David_Wise@phoenix.com>
Subject: RE: [R-390] Re: R-390/A FC-7 mod

> Things seem to work a lot better with the 56K's.....

I have the same experience, but others (notably Bob Tetrault) see no difference whatever. I wonder if an exceptionally good crystal or strong 5654 has enough gain to put out the normal waveform even at depressed screen voltage. By the way, the manual doesn't show separate FC7/non-FC7 output voltages for the 1st oscillator, so we don't know what it should be.

Caveat: I haven't experimented with the VFO, only the 1st osc. The manual implies that the VFO output _will_ be reduced with FC-7. Presumably not enough to hurt performance.

Date: Thu, 11 Oct 2001 10:56:53 -0700

From: David Wise <David_Wise@phoenix.com>
Subject: RE: [R-390] Re: R-390/A FC-7 mod

.....Mod document talks about "internally generated interference"...

It could also be that the original oscillator output levels were loud enough to show up as spurious signals when the receiver is tuned to certain frequencies, without involving parasitics at all. The R-390 Final Engineering Report is a treasure trove of data about this.

It's fairly easy to experiment with FC-7, even in a fully-assembled receiver. To temporarily back it out, all you have to do is wrap a wire around pin 6 of the first oscillator and/or VFO (whichever has the mod) (I use wire-wrap wire), and attach it to a 75K resistor hooked to +150. The 75K in parallel with FC-7's 220K makes 56K, the pre-FC7 value.

Finding +150 is a bit of a chore; AFAIK, the only exposed point is on S102 FUNCTION, which is hard to reach with the front panel on. Instead, I just wrapped another wire around the anode pin of the 0A2. Measure sensitivity, connect resistor, measure again. Since the RF deck's gain may change, an IF gain adjustment may be in order to get a realistic reading.

Date: Thu, 11 Oct 2001 15:29:51 -0400
From: P.Cade@crodausa.com
Subject: RE: [R-390] Re: R-390/A FC-7 mod

Good idea.....i'll have a play around..... does the 150V test jack on the side of the power supply have a series limiting resistor ?.....U cd probably use that as a 150 V source.....

Date: Thu, 11 Oct 2001 13:50:27 -0700
From: David Wise <David_Wise@phoenix.com>
Subject: RE: [R-390] Re: R-390/A FC-7 mod

Duh! Sorry gang, I paid all my attention to the RF test points and didn't have any left for the DC one :-) The 150V test point is the most convenient way to get 150V. There is no limiting resistor. Just run a 75K resistor from there to your favorite pin 6.

Date: Sat, 3 Nov 2001 22:29:45 -0800 (PST)
From: John Kolb <jlkolb@cts.com>
Subject: [R-390] RF Digital display

> > I have an older Systron-Donner counter with Nixies. All I'd need is the
> > circuitry to combine the oscillators properly. Would be pretty cool --no more need to use zero-adust! Not having to zero adjust is something I

would like to see. I didn't see where any of his meters include the 390 family. I wouldn't put one on mine anyway, but something like you are talking about would be interesting.

Where is Dr. Jerry when we need him to design something like this? I used to design and sell digital displays for retrofiting to receivers for the SWL market (under the KRS label). These were for receivers mainly operated in the AM mode, and reading out to the nearest 1 kHz was close enough. The counter design will vary depending on the type of receiver.

With Wadley loop receivers, Racal RA-17 (to not get too far away from tubes), Yeasu FRG-7, Drake SSR-1, etc, which generally tune in 1 MHz wide bands, the approach was to measure the 3nd conversion oscillator, since the Wadley loop conversions are hormonics of a 1 MHz xtal, and presumed to be exact.

Using the Radio Shack DX-300 as an example (first manual I found) the tunable IF is 3-2 MHz and the 3rd LO tunes from 3455 to 2456 to cover the 0-999 kHz range, tuning backwards. The counter is a digital divider chain set as a down counter, and preset to 3455, then each cycle of the LO within a 1 secound count window decrements the count by one, ending with a final count of 0 if the LO was 3455, or 999 if the LO was 2456.

Standard frequency counters can't be used this way easily - they are seldom presetable to a number before the count interval starts, or able to count down instead of up.

Simple single or dual conversion receivers such as the SP-600 or HQ-180 are easier, preset the counter to a number, and then count up measuring only the first conversion LO. If the LO is below the receive freq, the counter would be preset to +455 or exact IF freq, if the LO is above, the counter would be preset to a -455. For the HQ-180, the counter has to be presetable to either -455 or -3035 depending on which band the receiver is set.

For sideband transmitters or receivers, a more precise measurement can be made by measuring each of the involved oscillators, including BFO and adding and subtracting as necessary to calculate the exact freq. Old style technique would to be to use a single counter chain with a seperate timing window for each LO, where the counter is either counting up or down as necessary to add or subtract a particular oscillator, then displaying the final count. The modern technique, as in the AADE <sp?> display mentioned, would be to use a microprocessor, count each freq, then let the processor act like a calculator to add or subtract as necessary.

Circuits have also been made to mix the various RF oscillator signals with

mixers and tuned circuits, and end up with an output freq identical to the received freq. This can be measured by a standard freq counter. Extremely good shielding would be necessary to prevent the generated freq from interfering with the receiver.

R-390's, of course, are fine as is and don't need any of this.

I have an HP 5245L counter with the large nixies, which I use as my main freq counter. Love those large numbers. Hamfest price for these seems to be around $20 - you'll probably want to replace the fan as all I've seen were very noisy. They may not be adaptable as receiver digital displays but are great counters - with the high stability time base option, can be accurate to 1 Hz at 1 GHz.

Date: Mon, 5 Nov 2001 14:02:41 -0600
From: "Paul Bigelow" <pbigelow@us.ibm.com>
Subject: Re: [R-390] digital display units

Check out: http://www.aade.com (Almost All Digital Electonics) The site is still there!

Date: Sat, 17 Nov 2001 23:09:26 -0500
From: "John KA1XC" <tetrode@worldnet.att.net>
Subject: [R-390] R-390 (original) - S206 Bandswitch notes: Setting the Geneva mechanism synchronization

R-390 (original) S206 Bandswitch notes: Setting the Geneva mechanism synchronization

These notes are meant to serve as a replacement for the missing Figure 76 in R-390 TM 11-5820-357-35 and to complement paragraph (50) on page 83. To some extent these notes may also be helpful to setting up the R-390A bandswitch synchronization, but of course there will be some differences.

S206 introduction

S206 is a good choice for setting the bandswitch sync as it is easy to view from the back of the chassis. It is the 6th wafer (counting from the front) and the switch contacts are on the side of the switch facing the rear of the RF deck. Essentially it is a 6 position single pole switch but it looks like something more complicated. The switch wafer was designed to be "low profile" so that it could fit into the relatively shallow underside of the 390 RF deck. In a "normal" rotary switch the contacts would be simply be placed adjacent to each other with their actual spacing depending solely on the angle between the switch stops. Some of the switch contacts would

be at the top of the switch and extra chassis depth would be needed to accommodate them. In S206 (and the other bandswitch wafers in the 390) the top and bottom of the wafer have been cut flat to save space and the switch contacts placed on the left and right sides. To make this still work as a normal rotary switch (without dead spots in the middle) a second contactor arm was added 90 degrees CW from the first, and as the first arm is disconnecting from the contacts on the left side of the switch, the second arm is starting to connect with the contacts on the right side. Whichever arm that is not being used is not connected to anything and just goes along for the ride. Pretty ingenious!

- ----------

S206 contact positions

With the RF deck upside down, and looking at the switch from the rear of the chassis, contact 8 is the contact on the bottom left; it is the wiper which makes it an easy landmark to spot. To determine a contact number find contact 8 and then count down while moving in the CW direction. S206 Contact positions are as follows (rear view):top)

5	4 (no contact)
6	3
7	2
8	1

There is no contact 4 but there is a space for it directly across from contact 5. (The contacts are somewhat circularly arranged but I typed them in columns.)

- ----------

S206 band positions are as follows (rear view):

5 (2-4 MC)	4 no contact
6 (1-2 MC)	3 (4-8 MC)
7 (.5-1MC)	2 (8-16MC)
8 Wiper	1 (16-32 MC)

- ----------

S206 Electrical connections are as follows (rear view):

5 to Z203-pin3	4 no contact
6 to Z202-pin3	3 to Z-204 pin3
7 to Z201-pin3	2 to Z-205 pin3
8 to V201 pin5	1 to Z-206 pin3

- ----------

S206 Bandswitch synch position (the missing Figure 76)

The starting position for the bandswitch synchronizing procedure is the 0.5 to 1 MC band, (contact 7): The leftmost contactor arm will be on

contact 7. The arm should be positioned so that its *lower half* is centered on contact 7.

The right-most contactor arm will be pointing almost straight up (actually slightly left of center) and not connecting to anything.

- ----------

Other notes for the .5 to 1 MC position:

1) The bandswitch shaft itself will be at a 45 degree angle, with the topside "flat" facing to the right of center.

2) The inside of each wafer section has a little pointy "nub" where it meets the top flat of the bandswitch shaft. These serve as alignment points for all the wafers; all the nubs on all the wafers should be pointing the same way. (This makes sure that a wafer isn't 180 degrees out of synch).

3) Don't worry about setting the starting position exactly, the bandswitch synch will get checked and adjusted later.

- ----------

Electrical testing of S206 alignment

The TM is a bit vague on checking the alignment but they are basically telling you to eyeball the contactor arm positions. This gets you close but I found that an ohmmeter can be used to buzz out the switch connections much more precisely.

After the 00 MC position is set (paragraph 49) the alignment can be checked pretty easily from the top of the RF deck via the V201 tube socket and the RF coil connections Z201 through Z206.

One of the really nice things about the R-390 is that good size connectors are used throughout the radio, and this applies to the coil and transformer connections too, they used Mini-Banana plugs instead of the much smaller pins seen on the R-390A coils.

Mini-banana plugs are readily available from the larger electronics suppliers and can be used to make a great connection with the 390 coil sockets for the purposes of ohming them out. You could use a regular test lead to connect to them but then you have to make sure that it stays steady while cranking the MC gears around. I happened to pick up a few Pomona mini-banana patch cords in different lengths and colors at a local flea market recently, they worked excellently.

Procedure

(This assumes you are re-assembling the RF deck and all the RF coils have

been removed. If they are still in they can still be accessed from the bottom of the RF deck, just not as easily.)

Basically you just buzz out the connections for the six different positions of the bandswitch. Using an audible beeper is a huge advantage because it'll allow you to keep an eye on the Veeder-Root readout while moving the MC gearing around.

Connect one meter lead to V201 pin 5. (I stuck a resistor lead into the tube socket to make the connection and then clip-leaded to it.)

Connect the other meter lead to the mini-banana plug (if you have one). It will be moved between pin 3 of coil sockets Z201 through Z206.

Looking at the top of the RF deck from the front, the 3 coil contacts of each of these coils form a triangle shape pointing to the rear; pin 3 is the contact in the left corner of the triangle.

The table below details the continuity between tube socket V201-5 and the S206 and RF coil contact for each MC band.

Veeder Root MC	S206 contact	RF coil pin 3
00*	7	Z201
01	6	Z202
*02	5	Z203
03*	5	Z203
04*	3	Z204
05	3	Z204
06	3	Z204
*07	3	Z204
*08	2	Z205
09	2	Z205
10	2	Z205
11	2	Z205
12	2	Z205
13	2	Z205
14	2	Z205
*15	2	Z205
*16	1	Z206
17	1	Z206
18-29	1	Z206
30	1	Z206
31	1	Z206

The asterisk pairs (**) show the MC positions where S206 actually transitions from one contact to another and continuity is lost.

Use the 5 transition points to set the bandswitch sych. exactly. (Actually once the 1st transition is set up the remaining ones will pretty much fall into place, but they should be checked.)

Use the Veeder-Root MC digits to see precisely where the switch continuity transitions from one switch connection to the other. (This is much better than watching the barely-moving bandswitch contacts). Ideally the bandswitch transitions should happen at the 50% point between MC stops.

Example:
Connect the mini-banana test lead to Z201 and change the MC band from 00 to 01 and back again to see where on the Veeder-Root MC counter the S206 switch transition takes place. Then move the test lead to Z202 and check the same transition point as it makes/breaks moving from Z202.

Repeat this technique for the other transition points, moving the test lead to the other coils as required. Be sure to move two MC stops past each transition in order to make sure the Geneva mechanism has reached its final resting position.
- ----------
Results

The first time I synched the bandswitch I found that I was pretty close to begin with and that the bandswitch moved at about 30%/70% between the appropriate MC stop positions. After I loosened up the bandswitch gear clamp and *slightly* tweaked the bandswitch shaft position. I got to within 10% to 20% of dead center between bands.
- ----------
Sanity check

Once I was happy with the way S206 was behaving I wanted to see what the other wafer sections were doing.

I checked S208 by the same method, except that I needed to connect to tube socket V202 pin5 and measure to coils Z207 to Z212. The S208 synch. also checked out good, although I noticed that at the extremes of its travel the transition points were perhaps another 10% away from dead center compared to S206. This is normal.

I called it quits here; the switching in the other bandswitch wafers gets a lot more complicated and really only needs to be checked if trouble

shooting a problem. The whole point of this exercise was to adjust and verify the bandswitch sync. before installing the RF deck back in the radio. End.

Date: Wed, 21 Nov 2001 15:57:01 -0800
From: David Wise <David_Wise@phoenix.com>
Subject: RE: [R-390] FC-7

> Hi guys I just got a R 390a with a mod by FC-7 I think someone has
> talked about this before I just wanted to know what this is .....

This Field Change was targeted at shipboard radios "In Supplemental Spaces Only". Whatever that tells you :-) Its stated intent is the cryptic "Reduce Internal Interference". It adds some shielding and reduces the screen voltage of your first and third oscillators. There are mixed opinions about the benefits/problems of screen voltage reduction: some people see no problems (and one would hope they see benefits), others see problems. In my case, it reduced my first oscillator output enough to noticeably degrade the sensitivity, and I backed out that portion. Some time I'll measure my sensitivity without the VFO part of FC-7 and report the results. With FC-7, it seems at least reasonably in line with expectations.

A while ago I had the idea that this FC was discussed in detail in a document called EIB-911. A helpful member mailed me some material, but it turned out not to be EIB-911, merely instructions for installing it. These instructions are in the Reference Section of the R-390 FAQ (http://www.r-390a.net/). Since then I've forgotten where I saw the reference to EIB-911. I thought it was in the installation instructions, but on rereading it I found no such reference. Does anyone else know? Was I imagining things?

Date: Wed, 21 Nov 2001 19:07:34 -0600
From: mikea <mikea@mikea.ath.cx>
Subject: Re: [R-390] FC-7

Somehow I suspect that those "Supplemental Spaces" are the ones occupied by NSG folks with rates like "Communications Technician" and "Non-Morse Intercept Operator". No proof, mind you, and no experience with anyone who did that, AFAIK. But if the ASA and AFSS do it on land and in the air, you can bet your bottom dollar that the NSG's doing it at sea.

Date: Wed, 21 Nov 2001 21:11:31 -0800
From: "Craig Harrison" <craigjv3@gbis.com>
Subject: Re: [R-390] FC-7

Ref. below message from Matt Parkinson As I recall, this was a spook mod to reduce local osc emissions for tempest reasons.

Date: Sat, 24 Nov 2001 20:26:46 -0500
From: "Dan Martin" <dmartin@visuallink.com>
Subject: [R-390] 390A rf deck caps

Anyone know if the .005 uf 1000V disc ceramic caps in the RF deck are particularly troublesome. My '67 EAC has about 30 of these (Solar brand) used in various bypass applications. I would ordinarily have such caps low on my suspect list. However, I finally pulled my RF deck tonight as my RF deck AGC line had sagged to only 1.7 megohms above ground instead of the "infinite" spec'd at J-208E. Something's leaky. My perfectly running 390A has fairly quickly developed a couple of odd characteristics:

1. I've become aware that sensitivity on bands below 8 megs are about 20-30 dB less than those bands above. On 7 megs the peaked calibrator signal is less than 10 db versus 30+ on 8 and above. I suspected C-327, a cap across T-207 that has been reported as the cause of dull sensitivity below 8 megs by Chuck R. and others. However, my scope shows a robust 11V peak-to-peak from the 1st oscillator circuit into the mixer, so ...

2. Grid voltage on the first mixer is 0 to slightly positive instead of -4V as spec'd. Interesting thing is, when I turn on the rig on from a cold start I can watch the first mixer grid rise to about -4V with lots of noise from the speaker. Then, within a couple of seconds, the voltage quickly drops to about -2V, then sags to 0 or slightly positive, with the speaker noise dropping accordingly. A cap spilling DC voltage to ground, I think

It was observation #2 that caused me to check the AGC line resistance and on that basis I've pulled the deck to begin an AGC line bypass cap adventure. The dull sensitivity below 8 megs may or may not be directly related but I'll attack the AGC line first.

Date: Sun, 25 Nov 2001 10:02:00 -0500
From: "Bill Riches" <bill.riches@verizon.net>
Subject: Re: [R-390] 390A rf deck caps

Don't forget grid emission from one of the tubes as it heats up could cause this problem also.

Date: Mon, 26 Nov 2001 11:04:52 +0200
From: "Bryce Ringwood" <BRingwoo@csir.co.za>
Subject: Re: [R-390] 390A rf deck caps

I have similar symptoms on my Capehart. I have replaced all the tubes, with the exception of the RF Amp. I also discovered by accident that shorting the B+ to the RF stage to ground momentarily (as happens when using a screwdriver with an uninsulated shaft to trim the RF caps - a very bad and unsafe idea) restores the set to normal sensitivity. Current suspicions rest upon one of the trimmer caps in the 17-25 MHz tuning circuits having an intermittent short circuit or dry joint. Every time I have my VTVM handy, the problem disappears. When I attempted to measure the B+ voltage on the suspect cap, the problem also instantly vanished. Haven't made a serious attempt to fix anything yet, I'm still compiling a list of things needing attention. Then I'll have to summon up the willpower to use something else while I fix the problems. Not an easy thing to do.

Date: Mon, 26 Nov 2001 07:44:14 -0500
From: Bob Camp <bob@cq.nu>
Subject: Re: [R-390] 390A RFdeck caps

The trimmer caps on the RF deck are prone to intermittent connections. On the ones I have worked on the problem is often the contact between the center shaft and the spring under the capacitor. I have had pretty good luck with De-Oxit squirted on the joint to clean out the crud that accumulates there. I don't put a whole lot on since I don't want the entire area floating in the stuff. The trimmer is fairly easy to get to. There's a screw at the bottom of the coil form that holds the assembly to the RF deck. Once it is out the assembly un-plugs and the cover snaps off. It's one of the easier R-390 things to do. While you have the assembly open you can also clean up the top of the assembly. There may be enough crud there to cause a problem as well. If you find that the capacitors are shot various people seem to have an inventory of them and they are pretty cheap. The ones that are a real pain are the ones in the crystal oscillator deck. I have yet to see a radio that had all of them working ok before I started working on it ....

Date: Mon, 26 Nov 2001 10:36:26 -0800
From: David Wise <David_Wise@phoenix.com>
Subject: RE: [R-390] 390A RF deck caps

I have exactly the same symptom, and like him I suspect a trimmer. Bob Camp reminds us how easy these are to get to. I will do a few cans as time permits. Bryce thinks it's the 1st VIF. It could just as easily be an RF coil, unless you've confirmed the symptom on all bands from 0 through 7. Given the symptom's tendency to go on vacation when the circuit's disturbed, this could take some patience. If you're feeling meditative, it may be easier to just do them all.

Date: Mon, 26 Nov 2001 10:37:38 -0800
From: David Wise <David_Wise@phoenix.com>
Subject: RE: [R-390] 390A rf deck caps

Bill Riches suggests grid emission. I agree with him. If E209 is more positive than E208, E210, or E211*, IMO it's almost certain that your first mixer V202 is bad. The fact that it reads slightly positive is a dead giveaway that it's _not_ a cap leaking to ground. The only caps that can drive E209 positive are C249-C254, the little coupling caps between Z20x-1 and Z20x-2, and a bad one would only mess up one band. Put V202 on a tester that has a Grid Emission or Gas test.

OTOH, if the whole AGC line is riding up equally, the focus shifts, and IMO C553 is your prime suspect, but only if the line only goes positive in the AGC SLOW position. Find the most positive spot in the AGC network, and that will be what's getting dragged up. The rest is only following.

On a side note, I've found that the R-390A is pretty tolerant of weak mixer tubes (not so for the other types). They're running at a small fraction of their maximum emission rating, so they have to test pretty low before they make a dent in the performance. As Roger R. eloquently pointed out a while ago, noise is a bigger problem, and you can't test that on most testers.

* Read with a high-impedance meter with an RC decoupling network at the probe. Without the decoupling, the oscillation will be rectified at the meter, giving a wildly wrong reading.

Date: Thu, 29 Nov 2001 09:27:23 +0200
From: "Bryce Ringwood" <BRingwoo@csir.co.za>
Subject: [R-390] RF Amplifier Tubes - R-390A RF Deck

The previous owner of my set was in the habit of using a 6BD6 tube rather than a 6DC6. The tube I have just replaced was a Tung-Sol (I suspect all the tubes were originally Tung-Sol, which might mean this was the original tube. Might not too.)

Any comments from the group? The new 6DC6 has much more gain, but then I haven't tested the tube I replaced yet. Does anyone know of a source of MB connectors and that funny twinax connector on the rear panel?

Date: Thu, 29 Nov 2001 08:22:43 -0600
From: mikea <mikea@mikea.ath.cx>
Subject: Re: [R-390] RF Amplifier Tubes - R-390A RF Deck

The bulkhead mount twinax connectors are duck soup -- as are just about all twinax connectors, since IBM uses them in the AS/400 computers. I get mine from a local electronics supply house, but I know Allied (http://www.alliedelec.com) has 'em.

Date: Thu, 29 Nov 2001 08:51:12 -0800
From: "Roger L Ruszkowski" <rlruszkowski@west.raytheon.com>
Subject: [R-390] RF Amplifier Tubes - R-390A RF Deck 6BD6

The new 6DC6 has much more gain, but then I haven't tested the tube I replaced yet. There are several tubes that will plug into the 6DC6 spot and operate. Some will even look good when hit with 4UV of signal from the AN/URM25. But when feed with an antenna the tubes just do not give the same performance as the 6DC6. Aggravation seams to exceed return on investment. It is easier to use a 6DC6 than work over the RF deck tube circuit to get the same or better performance from some of the other tubes. In the archives are long thread on what is the best tube to use as that first RF amp in any receiver to get the best signal to noise from the receiver. I have not seen a just overwhelming suggestion that the RF amp in the R390 or R390A be reworked to another tube for super signal to noise improvement. Get a good 6DC6 when you can. Run what you brung until you can get what you want.

> Does anyone know of a source of MB connectors?

Murphy's in San Diego has the Mini BNC used. The male deck mount connectors are $2.00 each The female connectors come with 2 inches of coax and a full size male BNC on the other end of the coax. $1.00 each These make nice adapters between the signal Gen and the IF deck.

http://www.maxpages.com/murphyjunk

> and that funny twinax connector on the rear panel?

The bulkhead mount twinax connectors are duck soup -- as are just about all twinax connectors, since IBM uses them in the AS/400 computers. I get mine from a local electronics supply house, but I know Allied (http://www.alliedelec.com) has 'em.

R. Charles Rippel at
http://www.avslvb.com/R390A/html/feedpoint.html shows how to deal with the twinax until you can get a connector and cable.

I use a short 3 foot chunk of Twinax and connector to feed my receiver. I used a tube type cap, another link of RG58 with a S0239 connector, and some heat shrink tubing to transform the Twinax to 239 and get a static

charge blocking cap all in the feed line.

I have a matching box with transmit and receive relay between my antenna, receiver and transmitter. So the short transition cable between the receiver and the antenna relay works good.

Date: Thu, 29 Nov 2001 08:52:49 -0800
From: David Wise <David_Wise@phoenix.com>
Subject: RE: [R-390] RF Amplifier Tubes - R-390A RF Deck

If you go to Al Tirevold's FAQ site (yea Al!) and read the R-390 Cost Reduction Report (basically an engineering precis on the evolution from R-390 to R-390A), you'll find that although they tried the 6BA6 (similar to the 6BD6 IIRC) and several other tubes, the just-announced 6DC6 and 6BZ6 were much more resistant to overload, and although the choice was inevitably a compromise, overall they were the clear winners. Of those two, the 6DC6 had slightly better AGC characteristics. Since they lost some AGC when they eliminated the second RF amp, they needed all they could get and this tipped the balance.

You can run an R-390A with a number of other tubes (including 6BA6, 6CB6, and 6BZ6), but it won't work as well under harsh signal conditions.

I haven't dredged the archives in detail on this, but I don't remember any later tube that was thought to be better.

A while ago Roger Ruszkowski (thanks!) sold a bunch of MB connectors, some with RG-174 pigtails, some made up as MB-BNC adaptors. Those were male connectors only, so the adaptors are not a complete solution if you're tapping into a signal for diagnosis. Better would be a tee with a female MB, a male MB, and a female BNC. I scored a few panel-mount female MBs at
a swap, and if you want, I'll ask the guy if he still has the rest.

Date: Thu, 29 Nov 2001 12:35:50 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] RF Amplifier Tubes - R-390A RF Deck

>Does anyone know of a source of MB connectors and that funny twinax
>connector on the rear panel?

Yes, RF Connections. www.therfc.com

They have MB connectors of many sorts, including adapters. Coax Twinax connectors are available in lots of places cheap. The ADAPTER for the "funny twinax connector on the rear panel" is the UG-970. It has a

male twinax on one end and a female SO-239 connector on the other end. The RF Connection has them, new, milspec, made by Kings. I know of no other source at this time at anywhere near their price (about $25). The actual connector that sticks out of the rear of your R-390A is part of the antenna relay. If you need to replace it, you are in for a job. Finding a complete antenna relay assembly is easier.

Date: Thu, 29 Nov 2001 10:15:03 -0800
From: David Wise <David_Wise@phoenix.com>
Subject: RE: [R-390] RF Amplifier Tubes - R-390A RF Deck

Correction: I got some panel-mount males; the adaptors and pigtails are female. For a given {plug,jack}, MB is opposite sex from BNC. Sorry for the confusion.

Date: Thu, 29 Nov 2001 12:09:48 -0800
From: "Bill Smith" <billsmith@ispwest.com>
Subject: Re: [R-390] RF Amplifier Tubes - R-390A RF Deck

Mention of the UG-970 adaptor leads me to a question, perhaps addressed in the archives, but I don't know how to browse through them effectively. At any rate, I have paid attention to the balanced input on many vintage receivers by the use of a TV 300-75 ohm adapter. They are far from ideal, but are a quick way to greatly reduce intermod and spurious signals from many sets.

I hook the twin leads to the receiver antenna terminals and the 50 ohm coax to the 75 ohm input (with RG-58 cable, or an adapter). I can hear the squeals of "mismatch", but all I am looking for is turns radio. It works, because receiver input impedance varies widely anyway, and 75:300 is the same as 50:200, the rated input impedance of may receivers.

I also hook a short wire from the coax shield to the ground terminal of the receiver. The effect is twofold. First, many radio station noises (particularly around 160 meters) go away. The second is when I hook the coax feed to an antenna switch such as the Delta-4, the radio falls silent unless it is selected. Actually, the latter is the test that a good balanced feed is established to the receiver.

There is a drawback to all this, TV adapters are fairly lossy below 2.5 MHz, and affect receiver reception at the bottom of the broadcast band. I haven't worried about those side effects, they aren't a nuisance here, and I plan one of these days to replace the TV adapters with proper baluns. The benefits are well worth even using the TV adapters.

Note all TV adapters are not the same, some simply have capacitors inside

instead of a small ferrite core and coil windings. But good adapters work well. At any rate, this brings me to the R-390. I have found all sorts of spurious noises in the rig, and immediately looked at the antenna connections. I didn't use a TV adapter because the impedance looked wrong, but I noticed in the schematic that the antenna input is a true "balanced" input, with a capacitor divider providing the ground for a true balanced input.

This is great for something, but it leads me to believe that an external balun must be absolutely necessary to properly feed the low impedance antenna input. One can use the high impedance input, but of course doing so will bypass the coupling in the first tuned circuit. Also, it is also unbalanced (one side is ground), and so the case and equipment ground again become part of the antenna. :-(

Now, back to the UG-970. This connector (as also suggested in the R-390 manual I have borrowed) presumably grounds one side of the antenna input coil and totally unbalances the input to the receiver. If nothing else, this also means part of the capacitor divider in the antenna line is across the antenna input and ground, further coupling ground noise into the antenna circuit. I have found this installation is a simple recipe for all sorts of spurious side effects, which indeed what I hear in the receiver.

I propose to install a 1:1 ferrite balun of my own construction between the antenna coax and the twinax connector to balance the input. The input winding of the balun will be connected to the center and ground of the antenna coax. The output winding will be connected to the two pins in the twinax shield. Leads must be kept very short. The shield of the coax will be grounded to the shell of the connector.

Has anyone done this?

Date: Thu, 29 Nov 2001 12:55:27 -0800
From: David Wise <David_Wise@phoenix.com>
Subject: [R-390] Frequency Stability Measurement Tip

If you have a Sherwood SE-3, here's a hot tip for measuring your R-390A's frequency stability. I just figured this out last night and am never going back. Take the cover off the SE-3. With the controls facing you, put a scope probe on the center contact on the right side of the X/+ switch. What you are probing, is the PLL output (if in AM Sync mode), the BFO if in SSB mode), or the R-390A's IF (if in non-sync mode). Hook the probe to a frequency counter, tune to WWV, set the SE-3 to AM Sync, lock it in, and smile. Your counter is now showing the exact frequency at which WWV is showing up in the IF strip, without any false readings from noise or fading. Since it's a PLL, tt's also immune to temperature effects in the SE-

3. If it changes, it's because the radio drifted, nothing else. If you're tuned to WWV at 10, you're seeing 10MHz + VFO - F2. If you're tuned to WWV at 5, you're seeing 5MHz + F1 + VFO - F2, where F1 is the first oscillator and F2 is the second. There are similar expressions for the R-390, but I haven't gone through the arithmetic. Is this neat, or what?

Date: Thu, 29 Nov 2001 14:40:38 -0800
From: "Roger L Ruszkowski" <rlruszkowski@west.raytheon.com>
Subject: Re: [R-390] RF Amplifier Tubes - R-390A RF Deck

Mention of the UG-970 adaptor leads me to a question, This connector (as also suggested in the R-390 manual I have borrowed) presumably grounds one side of the antenna input coil and totally unbalances the input to the receiver. If nothing else, this also means part of the capacitor divider in the antenna line is across the antenna input and ground, further coupling ground noise into the antenna circuit. I have found this installation is a simple recipe for all sorts of spurious side effects, which indeed what I hear in the receiver.

Yup, It sure does, This did not keep the military from doing it to thousands of receivers and using them that way for years. The ASA solution was super shielded buildings to keep the ground noise off cases, chassis, power lines and antenna lines. I like the balun idea. I tried once, I did not get the balun inside a good shield can so all the junk just jumped on the antenna input any way.

Date: Sat, 1 Dec 2001 10:45:34 -0500 (EST)
From: "Joseph.Fallon" <Joseph.Fallon@sun.com>
Subject: [R-390] Low Sensitivity below 8Mhz not related to a low 17Mhz osc
level

I have been working on my R-390a and have noticed that there was a difference in its sensitivity below 8Mhz. As a example of this I measured the signal level needed to produce the same diode load voltage above and below 8Mhz. With the AGC disabled(MGC on) it took 1.2 mV @7.9Mhz and 10uV @ 8.1Mhz (into the ant connector) to produce a diode load voltage of -5.0Vdc. I have measured the level of the 17Mhz osc at the plate of V207 at 13Vpp. I have checked the mechanical alignment of the IF tuning cams. The coil slugs and trimmer caps of the Z213 network were peaked at 17.5 and 25Mhz during the alignment of the radio. If the Z213 network is bypassed with a .001 uf cap between the plate of V202 and test point E210 I noticed an 10-20 db increase in the reading of the carrier meter when I was measuring the sensitivity at 7.9Mhz. I am wondering what the expected loss thru the Z213 network is? Has anyone run in to this sort of sensitivity problem that was not related to the well-known

problem with the 17Mhz oscillator level??

Date: Sat, 1 Dec 2001 19:40:31 -0500
From: "Dan Martin" <dmartin@visuallink.com>
Subject: Re: [R-390] Low Sensitivity below 8Mhz not related to a low 17Mhz
osc level

Well, this is interesting as I am dealing with just the same thing on my '67 EAC just now. It's a good one. It was "Chuck Rippel-ed" about three years ago down at his place (he's a bud). In the last six months or so my 390A has been down a little bit on 40 CW and 7290 AM compared to my 51J4. Never thought much about it since the J4 is hooked to a decent resonant 40 meter dipole and the 390A is on a modest long wire thrown over the roof.

Recently hooked the 390A to the dipole and noticed the same thing though. Then noticed the peaked calibrator signal is about 10 dB on 7 megs and 30-40 dB on 8 and above. Joe, like you, I get a pretty good signal out of the 1st oscillator to the first mixer grid, about 11 V p-p. I thought for a moment that C286, the 500V 100 pF mica input to the 2nd mixer could be suspect? It's the identical mica as C327, a known culprit in low sensitivity below 8 and a commonly replaced cap across the primary of T-207 on the plate output side of the first oscillator.

Things is, when C327 is the cause of low sensitivity below 8, you'll find the input to the first mixer way, way down. Ours isn't. Anyway, by skipping over Z213 with a .001 as you've tried (neat trick) and inputting directly to E210 you're squirting a signal into the 2nd mixer grid just ahead of C286, effectively taking it out of the circuit.

You say it's louder this way? Unfortunately ... as I checked the schematic I find that the 8-32 meg signals also go through this same C286 and those freqs are OK. Sigh... We now have at least two on the reflector with this similar problem. What does everyone else think?

Date: Sun, 2 Dec 2001 12:53:57 -0500
From: "Dan Martin" <dmartin@visuallink.com>
Subject: [R-390] Ye Olde C-275 Question

Regarding whether C-275 in the rf deck is really supposed to be .033 or .0033 uF, I'm not sure I understood a conclusive answer from the 390 archives, where this is bantered about around a year or so ago. This is the bypass cap that was originally 5000 pF and got changed to either .033 or .0033, depending. Word seems to be that the legitimate, original Mod actually called for a change from .005 to .0033 but this was "picked up" by

most ET's at the time, and carried over into later documentation for this mod, as .033 and most 390A's with this mod today have .033's in place.

I guess this has more than just anecdotal significance to me because I have a number of .0033µF Orange Drops on hand but no .033's. :-)

Date: Sun, 02 Dec 2001 16:14:22 -0500
From: Norman Ryan <nryan@intrex.net>
Subject: Re: [R-390] Ye Olde C-275 Question

It's 0.033 uF. Capacitance increased to smooth out hash from the VR tube? Actual capacitance probably matters little as long as it isn't leaky or otherwise faulty.

Date: Mon, 3 Dec 2001 08:21:50 -0500 (EST)
From: Joseph Fallon - Sun Microsystems <Joseph.Fallon@sun.com>
Subject: Re: [R-390] Low Sensitivity below 8Mhz not related to a low 17Mhz
osc level

Your observation of the difference in the peaked calibrator level above and below 8Mhz is same way in which I first noticed the problem. Yes I bypassed the Z213 network and I did see the signal go up. That is why I am suspicious of that tuned circuit. I would really like to get a better idea as to the root cause of the problem before I wrestle the rf deck of the radio...

Date: Mon, 3 Dec 2001 11:01:35 -0800
From: David Wise <David_Wise@phoenix.com>
Subject: RE: [R-390] Low Sensitivity below 8Mhz not related to a low 17Mhz
osc level

Look at the coils first! before removing the RF deck. They are socketed. Pull off the slug rack, reach straight into the coil with a #1 phillips, undo the screw and voila. Hardest part is getting enough grip on the can to pull it out. Be ready to catch the screw when you turn the coil upside down. If you know anybody local with an R-390A, ask him if he'll let you try his coils for a quick go/no-go.

Date: Mon, 3 Dec 2001 11:24:01 -0800
From: David Wise <David_Wise@phoenix.com>
Subject: RE: [R-390] Ye Olde C-275 Question

> It's .033 uF. Capacitance increased to smooth out hash from the VR tube?

>Word seems to be that the legitimate, original Mod actually called for a change from .005 to .0033 but this was "picked up" by most ET's at the time, and carried over into later documentation for this mod, as .033 and most 390A's with this mod today have .033's in place..

It had nothing to do with technicians. C275 was a Production Mod, not a Field Change. If you have a .033 Prokar (what Collins called the Brown Beauty, it came that way from the factory.

Date: Mon, 3 Dec 2001 11:26:46 -0800
From: "Roger L Ruszkowski" <rlruszkowski@west.raytheon.com>
Subject: Re: [R-390] Low Sensitivity below 8Mhz not related to a low 17Mhz
osc level

I would hold out for a round of DeOxit on the tube pins and socket for the first mixer. I also would go for some DeOxit on all three of the Z213 cans.

Theses sound like the old no trouble found problems. You have the problem OK. But once you do a Proscribed Maintenance (PM) on them the problem goes away.

We think of these beast as old. Any thing that comes down the pike looks like an exotic gotch. You could also swap out the mixer tubes. Again them just swapping tubes around and burnishing a tube contact has been known to cure the problem. Again no problem found.

Before you go deep, be sure you do the standard stuff that was practiced on these receivers when they were new. The Low Sensitivity below 8Mhz not related to a low 17Mhz osc level is a stock problem that has been with these receivers since day 2. (On day 1 they did work)

Stock Problems are:

Tubes
Contacts tube socket
Contacts Z213 cans.
Z213 cap crud.
Contacts band switch

Then the old life problems.

Caps.
Bad solvents soaking into that brown insulator board type stuff
(In the Z213 cans and switch wafers).

Date: Mon, 3 Dec 2001 14:31:39 -0600
From: mikea <mikea@mikea.ath.cx>
Subject: Re: [R-390] Low Sensitivity below 8Mhz not related to a low 17Mhz osc level

Or buy a RF deck for parts from Fair Radio or other supplier. Useful if you need to keep a 390A going, or just for quick checks.

Date: Mon, 3 Dec 2001 16:22:31 EST
From: Llgpt@aol.com
Subject: Re: [R-390] Low Sensitivity below 8Mhz not related to a low 17Mhz osc level

Or, you can contact Chuck Rippel, he had at one time boxes of coils that he purchased from American TransCoil a couple of years ago.

Date: Wed, 12 Dec 2001 09:04:14 -0800
From: David Wise <David_Wise@phoenix.com>
Subject: RE: [R-390] Low Sensitivity below 8Mhz not related to a low 17Mhz osclevel

Leslie Zwiebel [mailto:wb6orz@pacbell.net] asks what I mean by "look at the coils".

Losses. If the tuned circuits are tracking, anything that lowers their Q will reduce sensitivity. Note that on the R-390* it's pretty easy to check tracking. Tune a steady signal, and one by one, turn the relevant slug adjusters CW and CCW. (Remember where you started and put them back!) If a coil is off, you will have to turn it a ways to get a peak. If the coil is tracking right, it will already be on-peak. If not, this may merely be a sign that your receiver is out of alignment. It's much more ominous if you've already aligned the set. Then this means that the coil is no longer following the same tuning curve as the others. The cause of this can be mechanical misalignment (i.e., incorrect gear train synchronization) or a slug that is damaged or whose permeability has changed.

Let's say the set is tracking ok. Unless you have a total failure, which could involve a broken wire, there are three main suspects: (1) bad fixed caps, (2) conductive deposits on the windings, and (3) bad connection in a trimmer. All three have been seen in R-390*s. The little mica caps can go open, short, leaky, or develop high ESR (effective series resistance). People have restored R-390*s that appeared to have been buried, with mud inside the coil cans. Others look fine but don't work until washed. The rotating connection between the trimmer's rotor and the solder lug gets dirty and tarnished. Mud excepted, none of this is usually naked-eye

visible. One good sign of low Q is broad tuning on onecoil compared to its fellows; they should all be about the same.

Date: Wed, 02 Jan 2002 23:53:31 -0500
From: James Miller <JamesMiller20@worldnet.att.net>
Subject: Re: [R-390] Help

America Trans Coil http://www.atc-us.com/ATCSHOP/ Has RF chassis for $35 but without coils.

Fair Radio Sales http://www.fairradio.com/hfrece.htm Has 390a RF chassis and other modules for sale.

Not sure of their operational condition. Chances are they will not be plug and play, but they may be a good start.

Rick Mish may also have replacement modules.
http://www.dxing.com/r390/mish.htm

Also check http://www.r390a.com

Date: Thu, 03 Jan 2002 06:49:42 -0800
From: Craig McCartney <craigmc@pacbell.net>
Subject: RE: [R-390] Help

ATC has them, with counter but without RF transformers (and lists the crystal oven separately): http://www.atc-us.com/ATCSHOP/

Fair Radio has them with RF transformers but without counter (and lists the counter separately): http://www.fairradio.com/hfrece.htm

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From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
To: "R390 (E-mail)" <R-390@mailman.qth.net>
Date: Mon, 7 Jan 2002 14:26:58 -0600
Subject: [R-390] R502 and R503

I notice in the Y2k manual that the values for R502 and R503 apparently were selected for an optimal value within an appropriate range. Can someone tell me what factors control(led) the selection of these values. It appears that R503 might not be one I would care as much about as I rarely if ever use a 100 cycle bandwith, but R502 might be a useful one to optimize. Any comments?

From: David Wise <David_Wise@Phoenix.com>
Subject: RE: [R-390] R502 and R503
Date: Mon, 7 Jan 2002 12:31:31 -0800

> I notice in the Y2k manual that the values for R502 and R503
> apparently were selected for an optimal value within an
> appropriate range. Can someone tell me what factors
> control(led) the selection of these values.

Different crystals have different activity levels, so you pick the resistor to trim the circuit Q, i.e., bandwidth. If your 100Hz and 1kHz bandwidths are on-spec, the resistors are right.

Date: Wed, 9 Jan 2002 15:26:43 -0800 (PST)
From: Rodney Bunt <rodney_bunt@yahoo.com>
Subject: Re: [R-390] SP600JX17 - drift

The 6C4 oscillator at V4 is "braced" to the the chassis with a "thumb" screw, "brace" and "shield" combination. If you move this tube the oscillator frequency moves. I have seen this tube shield and "brace" arrangement replaced with "heat dissipating tube shields" without this "brace" arrangement. This is not recomended, unless the "mechanical stability" of the "Brace" is reinstated somehow. This also is a potential source of "drift" before "warm up" has stabililised.

From: "Jim Temple" <jetemp01@athena.louisville.edu>
Date: Tue, 22 Jan 2002 17:58:32 -0500
Subject: [R-390] Below 8mhz problem.

I recently bought a "massacre" R-390 and completely tore it down and cleaned and replaced all the "problem" caps. I have already replaced the 100pF cap at T-207 with no luck. The problem I have is that the calibrator is strong and loud on all bands 8mhz and above, and below 8mhz is barely audible and extremely faint. The receiver will not hear the signal generator at all, so I have not been able to align the variable IF's. The fixed IF hears fine, but the signal is injected directly into the IF module. With the variable IF's, the signal can not be heard while input into the balanced antenna input. Perhaps a kind soul has experience with the problem described and will offer some hints as to a possible fix.

From: "Walter Wilson" <wewilson@knology.net>
Subject: Re: [R-390] Below 8mhz problem.
Date: Tue, 22 Jan 2002 18:41:06 -0500

In order to verify that oscillator V207 is putting out a strong enough signal to the cathode of V202, do the following: Connect a DC voltmeter to test point E209. Put the Function switch in the STANDBY mode. You should read "approximately" -6 VDC, according to TM 11-856A, pp. 111-112. I just checked one on the bench, and it reads about -5VDC. You can

check the output to the 2nd mixer (from the xtal osc deck) and the 3rd mixer (from the PTO) this same way, but the range of correct readings varies. See TM 11-865A for more details. If the voltage is well below -6 VDC, this test won't tell you where the problem lies (V207, C327, T207, the crystal, etc). It only tests whether sufficient signal is getting to the cathode of the 1st mixer.

Subject: Re: [R-390] Below 8mhz problem.
From: "Roger L Ruszkowski" <rlruszkowski@west.raytheon.com>
Date: Tue, 22 Jan 2002 16:53:08 -0800

More than one problem here. So what did you expect? The receiver will not hear the signal generator at all, so I have not been able to align the variable IF's.

No signals but the Cal tones are killers.

It sounds like an oxidized contact point in the antenna relay. As its from the massacre you will likely find some crud in the box. Do some ohm meter checks on the antenna relay Pin inside on Mini BNC to pin in triax connector . Pin to pin should give continuity and pin to ground should be open. Do you hear the antenna relay click as you go into cal mode and out of cal mode to mgc?

Strap the break-in pin on the back terminal board to ground.
Operate the break-in switch off and on.
Do you hear the relay in the audio deck click and kill the audio hiss?
Do you hear the antenna relay click?

If a the relay is clicking and a couple operations do not clear it.
It will open up and can be fixed.
Some course paper ("newsprint") can be used to clean the contacts.
Rain condensation has likely dirtied the contacts.

Get a very good small Philips screw driver and really lean into it as you take the very small screws out of the cover plate on the relay and look into the contact cavity. (dead spider or what ever in there).

Poor performance under 8:. is 0.5 - 1, 2-3 and 4-7 all equally bad?

Look into the first mixer tube socket for crud.
Look into the fist mixer Z cans for crud.
Again likely just weather oxidation in a contact.
Look at the RF band switch for crud.

Likely you will pull a can off its contacts, open it up and put it back down

and every thing will work no trouble found The normal experience.

Pull it all apart and clean the contacts (De Oxit preferred) Use what ever you have but
1.) do not ever tell this mail reflector you did it.
2.) If what you use causes other problems always infer the trouble came with the receiver and was not self inflected.

Work over the antenna relay and get some signals coming through.

Read the manual. Read Chuck Rippel's web pages.
Down load and read the handbook.

As this was one of those receivers you will want to one day pull the every deck. pull all the tubes and all the RF deck cans and give every contact a cleaning.

On the first IF .5 - 8 Mhz. Again, just because its been outside, you may find a cap in the RF cans to be shorted. These will come apart and can be cleaned up. The little rubber disk between the cap sections gets stiff. Read Chucks and Dave Medley's R390/A and R390 web sight maintenance tips. The adjustment caps are in the RF and crystal decks and share a common problem. Do not take down any you do not have to. If and only if it is shown to be the problem. Aggravation exceeds return on investment.

Then go read the books again,
Get all the stuff you need to treat the items correctly.
Then go read the books again.
Acquire a large rewarding stock of choice beverage.
Do not start celebrating prior to completion of the task.
Then just jump in and do it.
Do not be intimidated.
If it goes wrong stop and ask.
It may take an hour or two to get mail back at 0 dark thirty
But some one will gladly talk you through it.
When its all done, just let your self go and revel in it.

While your at it you will want to give the gear train a good bath. a 32 to 40 hour ordeal is about typical.

Your only going to do it once and your only have to do it because some fool let those fine receivers set out over winter in the weather.

A good semi PM could get done on the depot bench in 4 hours.

8 hours was average for a tech his first year out of school. (to do it all and

do it right)

So 16 hours your first few times around is ok.

From: "Jim Temple" <jetemp01@athena.louisville.edu>
Subject: Re: [R-390] Below 8mhz problem.
Date: Tue, 22 Jan 2002 20:37:43 -0500

I have found that E209 before the 1st mixer V202 has a voltage of -.85 in standby. The other RF deck points are up to spec's. This indicates to me that something before the 1st mixer is bad. I will check all the coils, switchs, rotary contacts, and whatever plugs in, and thouroughly clean and inspect. When finished, I will get back to you and the list. Thanks for the suggestions, everyone!

Date: Tue, 22 Jan 2002 21:06:27 -0500
To: <r-390@mailman.qth.net>
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Below 8mhz problem.

>In order to verify that oscillator V207 is putting out a strong enough
>signal to the cathode of V202, do the following: Connect a DC voltmeter to
>test point E209. Put the Function switch in the STANDBY mode. You should
>read "approximately" -6 VDC,

Do NOT use a digital meter without a one meg resistor in series with the test lead. VTVM's contemporary with the R-390 had a 1-meg resistor in the DC probe. If it is not there, the lead loads the test point and you either kill the oscillator or get erroneous readings.

Date: Tue, 22 Jan 2002 21:06:17 -0500
From: James Miller <JamesMiller20@worldnet.att.net>
Subject: Re: [R-390] Below 8mhz problem.

Go to Chuck Rippel's 390 page, he discusses the variable IF and troubleshooting. The "below 8 mhz loss" appears to be a common problem, possibly a failure in first variable IF. Check the miniature coax connectors at the top of the RF module. I believe the first mixer oscillator is injected through one of those connectors. Here's the web site for further reading:

http://www.r390a.com/VARIF.htm

From: "Jim Temple" <jetemp01@athena.louisville.edu>

Date: Tue, 22 Jan 2002 21:34:47 -0500
Subject: [R-390] Below 8mhz problem

Hello to the list, As an update, I have found that E209, before the 1st mixer has low voltage. It should be approx -6.5 volts, and it actually is -.85. Measured with a 1meg resistor it is -.76.

The other RF deck test points have good voltage.

The faint cal signal below 8mhz is the same on all bands below 8mhz. This prevents me from hearing the signal generator signal needed to calibrate the variable IF section. The cal signal on all bands 8mhz and above is strong and loud. I have received suggestions to:

1. Check all the appropriate coils, switches, antenna relay, and anything that plugs in or wipes, before the 1st mixer v202, due to corrosion suspicions because of the "massacre" origion of the radio.

2. Check HR202 crystals, especially 17mhz.

3. Inspect circuitry between 1st mixer V202 and 1st crystal oscillator v207.

The crystal seems to be OK, because I purchased a spare HR202 with the radio. I have substituted the 6c4 and 5654 tubes V202 and V207 with no change. Thanks for the suggestions, and tomorrow I will get deeply into the above suggestions. So long for now.

From: "Spence Barton" <ence-ack@rio.com>
Subject: Re: [R-390] Below 8mhz problem
Date: Tue, 22 Jan 2002 20:27:07 -0800

Greetings R-390 list. My first post. I recently got a Motorola R-390a. My first. It works well and I have really enjoyed using it. In using the cal mode, though, I noticed that I still heard stuff from the antenna and there is no relay click between cal and mgc. A quick removal of the top cover to troubleshoot showed that the antenna relay module had been removed by persons unknown. End of troubleshooting. It also has only a hole where the balanced jack would be and the unbalanced jack is not original. The receiver is in otherwise quite good condition - very clean. It has probably been rebuilt by a past owner.

I am considering whether to try to find an antenna relay module to install. Right now I don't need the balanced jack or the break-in feature but I might want them in the future. Any thoughts on whether it should be replaced or where one might be found? I have heard that Rick Mish

routinely removes the balanced antenna jack and replaces the unbalanced jack with another type. Any truth to this?

Thanks for the help. I have really enjoyed reading this reflector for the past month.

From: "Jim Temple" <jetemp01@athena.louisville.edu>
Subject: Fw: [R-390] Below 8mhz problem
Date: Wed, 23 Jan 2002 08:03:59 -0500

Please note that the voltage measurements I have posted below were taken with the function switch in STANDBY, as printed in the TM.

From: "Jim Temple" <jetemp01@athena.louisville.edu>
Subject: Fw: [R-390] Below 8mhz problem
Date: Wed, 23 Jan 2002 15:15:42 -0500

Hello to the list, Success!! It was in the 1st oscillator circuit where I found the problem, but the fix I did not expect. I had originally checked and reworked all the grounds in the RF deck.....I thought.

Below T207, surrounded by components, is another **ground point** that also anchors T207 to the deck. The deck is coated with a shellac of some sort, and I found the ground sitting on the shellac, finger tight. I removed the shellac and tightened the ground, and the radio sprang to life. Very strong cal signal above and below 8mhz. Also, the variable IF is hearing just fine now. It goes to show that all those trees in the forest can get in the way of a simple fix. Thanks to all who offered their time and expertese in assisting me with this fix. I also know that those who may have expertese in other areas would have assisted if it was needed.

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Below 8mhz problem
Date: Wed, 23 Jan 2002 14:27:13 -0600

You guys who do these modifications just kill me. If the engineers had wanted a good, clean ground at that point, they would not have gone to the trouble of having it varnished/MFP-ed underneath it! <grin>
Congratulations on the find. Makes you wonder if it was hard of hearing from the factory and never fixed.

From: David Wise <David_Wise@Phoenix.com>
Subject: RE: [R-390] Below 8mhz problem
Date: Wed, 23 Jan 2002 16:25:50 -0800

> As an update, I have found that E209, before the 1st mixer

> has low voltage. It should be approx -6.5 volts, and it actually is -.85.
> Measured with a 1meg resistor it is -0.76.

[list of suggestions snipped] I don't quite hear you saying you checked the 1st oscillator itself. Make sure you do; without it, you won't get anything below 8, no matter what shape the 1st VIF is in. I don't remember the canonical method to check it but an easy way is to pull the 1st mixer and scope the cathode pin. This is where the 1st oscillator is injected. Should be a big, clean 17MHz sine wave, quite a few volts high (memory fade... 10?). NOTE that the 1st oscillator only runs when you're below 8. The E209 check measures this voltage in a way. When you put a voltmeter on E209, it sees the mixer grid and it looks like the plate of a diode. Every time the cathode swings negative, the grid conducts and takes the meter with it. This happens 17 million times a second; the meter averages it out.

From: "Dan Martin" <dmartin@visuallink.com>
Subject: Re: [R-390] Below 8mhz problem
Date: Sun, 27 Jan 2002 18:25:45 -0500

I took my 390A down for "below-8' sensitivity problems after I confirmed suspicions that it was considerably less sensitive than my 51J4 on 40 meters. I'd recently noticed that fact when doing A/B comparisons on 7290 and had always assumed it was due to different antennas on each rig. Then one day I used the same antenna and found the same thing. Also noticed the calibrator signal was 40-plus dB on 8 and above but barely 10 dB below that. On 40 meters the calibrator barely kicked the needle! First thing I did was confirm the 1st oscillator signal. Whether looked at p-p on a scope or by checking the rectified equivalent in standby at E209, I had lots of good 1st oscillator signal. Then I found that pin 6 on V202, the first mixer grid, was lazily 0.0 to about 0.5V positive instead of -0.4V. The resistance to ground for this pin, which should have been a couple of series resistors, a small choke, and the AGC line when in AGC, or just the series discrete components when in MGC, was infinite, or open. Hmmm... I pulled the RF deck and was very surprised to find the three series resistors, a 27 ohm parasitic suppressor right at the tube pin and a 1 meg and 22K resistor in series to a choke and the AGC line all checked fine when tested individually. However, the entire series check from the grid pin back to the J208E was again infinite! To shorten the story, after repetitive checks **I found a stone-cold solder joint** on a stand-off post where R231 (1 meg) and R232 (22K) join! I reheated the joint and got a perfect -0.4V and the proper resistance. Because this cold joint effectively opened the series line the grid was biased-off slightly positive and had no resting state -0.4V. This was my personal 390A I've had for years, a nice '67 EAC, and this particular solder junction just went south for no particular reason! Anyone else had this happen? I've often heard of a

couple of guys that "reheat all the joints in the RF deck using silver solder" during their refurbishment efforts. I've always thought that to be snake oil. While I still don't personally recommend doing that preemptively I AM more thoughtful now in checking for such conditions during my trouble shooting efforts! Finally, to get the set back to 100% I had to do a thorough alignment. I was so frustrated in my early evaluation of the problem that I fiddled around with some of the transformers to see what effect it would have. Of all of the stages I aligned, I must say the 1st variable IF took the most time. I did repetitive alignments of this stage, coils at the low end and caps at the high, over and over and over. I must say the adjustments were very interactive. Each time clear gains were realized however, and I could hear the rig coming more and more alive. Finally, after several passes I could make no further improvements. I reset the IF gain using Rippel's method. The rig has spectacular ears now and specs out fine. I also reset the PTO
endpoints while I had it out. It had gone about 6 kHz long since Chuck showed me how it was done in his shop in the summer of '98. I learned a few things doing the PTO endpoint here, but that is another posting sometime ...

Date: Sun, 27 Jan 2002 22:05:07 -0500
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] Below 8mhz problem

Yes -- me too -- and there was a thread on this way back. Cited were long term electrolytic reaction -- between dissimilar metals, and/or the result of impurities, such as those from trace amounts of rosin that didn't boil off when the joint was originally made. They said the resulting bad joint could form a sort of resistor, or even a capacitor or semiconductor -- of sorts.

>I've often heard of a couple of guys that "reheat all the
> joints in the RF deck using silver solder" during their refurbishment
> efforts. I've always thought that to be snake oil.

Probably most of the joints have another 40-trouble free years to go, however it's the two or three like the one you found to worry about. Re-doing each joint can head that off -- if you're careful, or else you'll make more of 'em trying. Someone also provided a practical metallurgical reason for using silver solder -- something like you use it when soldering on silver plated termnals to avoid de-plating action. For different situations, you'd use some other solder. I hope he who knows what I'm writing about here jumps on and clarifies.

BTW - the really slow-fail solder joints often don't have the tell-tale characteristics of a cold joint -- dullness, ring-mark, etc.

From: "Mike Melland" <w9wis@charter.net>
Date: Fri, 15 Feb 2002 11:52:00 -0500
Subject: [R-390] Re: AGC Failure Apparently Solved...

Several weeks ago many of you responded in ansewr to a problem I was having with my "new" Motorola R-390A. The problem was failure of the AGC (distortion) in any filter position on a strong signal after the set warmed up. The AGC voltage was way off the values in the manual.

I started checking tubes and found none that were obviously bad in the AGC circuit. I removed and substituted with known good tubes all of the IF section tubes and the problem persisted. After several days I also decided after speaking with Roy Morgan to try the tubes on the RF side including the 6DC6. I removed the shields, removed and replaced all the tubes after socket cleaning and turned the rig on to warm it up until the problem resurfaced as it always did as the radio warmed up. Well... it's been over two weeks and the problem hasn't surfaced again. The AGC voltages remain steady and within the range the manual states they should be. Apparently.... a tube I believe got jostled loose in transit to me and would go intermitent when warmed up. I wonder if a tube pin/socket wasn't seated well and the socket got warm and the metal expanded causing the problem.

Date: Fri, 01 Mar 2002 23:43:20 -0500
From: Al Solway <beral@videotron.ca>
Subject: Re: [R-390] IF Subchassis Resistor Value R-390

Right sounds good and thanks for the info. Just found another similar situation in the RF Deck. R221 in schematic is 27 Ohms. The resistor in the Deck is 68 Ohms but measures 73.6. Just within spec. Will not change.

Thanks to all and have a good weekend. Getting late and must get my sleep. Attending the first Ham Fest of the season tomorrow here in Montreal. BA acquisitions not allowed this year.

From: "Merle Crowley" <lal@metrocast.net>
Date: Sat, 9 Mar 2002 17:03:07 -0500
Subject: [R-390] AGC

While I had my 390A RF deck torn down this last week,I happened to read an article in an old CQ magazine that was telling about a neat way to improve the AGC action with out murdering the radio. Rather than making any changes to the RF deck I did make an easy change in the cable jack going to the RF deck which can be returned to normal very easy. Anyway I was testing this change out this afternoon, I do think it gives

you much better control with the RF Gain Control. What the change consists of is grounding the 220 ohm cathode resistor from the 6DC6, thereby, when you are backing off the RF Gain Control you do not change the gain of the RF Amp. I played with this setup by listening to many signals and switching back and forth between the stock way and the revised way, like I said, preliminary tests lead me to believe I like the new way best. Wonder if anyone has tried this and if so I would like to see what your opinions are on the subject.

From: "Jim Temple" <jetemp@insightbb.com>
Date: Wed, 27 Mar 2002 17:42:45 -0500
Subject: [R-390] R-390A trouble

OK, I want to fix this receiver. Here goes.
1. R-390A bought as a "massacre" yellow line from Fair Radio.

2. After cleaning, and replacing many of the "problem" caps (listed on many of the resident web sites), I corrected a below 8mhz problem, by finding that the ground lug under T-207 was loose and insulated from ground by a shellac layer.

3. The unit, at first alignment, aligned well.

4. At some point, within a couple of hours of operation, the receiver developed a screeching/motorboat putt putt sound.

Symptoms:

1. On bands 00,01,02, and 03, the screeching/motorboat sound is not present.

2. Above band 03, the motorboat sound will vary in amplitude and putt, putt frequency with adjustment of the antenna trim control, and becoming more intense as band increases.

3. The carrier level meter indication increases as the amplitude increases, the strongest coinciding with the antenna trim peak prior to the problem developing.

4. The AGC control will change the frequency of the putt,putt, depending on the position of the control. Fast=fast. Slow=slow, or right on the edge of putt,putting. Medium=medium frequency.

5. The AGC voltage measures about 8-9 volts during the motorboating.

6. The screeching/motorboat sound disappears with removal of

V201/'6DC6.

8. I replaced the antenna trim assembly with a spare from a spare RF deck, with no change.

9. The ohm reading of the antenna trim vertical shaft is 1.5meg, and doesn't vary with rotation of the control.

10. With the RF deck removed the antenna trim wires measure a smooth increase and decrease of the variable caps within the enclosure.

I have inspected and examined the bottom components of the RF deck several times and can find no shorts or broken wires. I am positive the RF deck timing is correct. I have triple checked the timing and am positive it is correct. The deck did work fine for a couple of hours. My troubleshooting skills are lacking, so sometimes I do not approach a problem in a logical fassion. My approach will be to thouroughly examine the RF deck components. Measure
the values of components I reasonably can. I thought the voltages in the Y2K manual were measured with the tube in place, but I am unsure at this point. There is clearly a great deal of knowledge and expertise on this list, so I hope my lack of troubleshooting skills will not get in the way of a fix to this receiver. I may need a little more "hand holding", detailed coaching, than the average owner. Thanks for listening. I hope I have given enough detail to get me started on the right road.

From: David Wise <David_Wise@Phoenix.com>
Subject: RE: [R-390] R-390A trouble
Date: Wed, 27 Mar 2002 15:30:35 -0800

Sounds to me like regeneration, frequently caused by a bypass cap letting go or something losing its ground. That bad ground you fixed might not be the only one. Divide and conquer. Got another IF deck? Swap it in; that's where most of the gain is.

Date: Wed, 27 Mar 2002 19:26:55 -0500
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] R-390A trouble

The "Yeah, But Dept." chimes in: Yeah, but ... the screeching/motorboating kicks in above the 3 MC band only. Doesn't that suggest the RF deck?

The Dumb Suggestions Department:

Jim - did you test the tubes? Do the tap test on them? Even so, some tube in the RF deck might not be handling higher freqs. (or a cap or something

else). That means swapping out some -- or swapping around. I'd also loosen and retighten likely screws/ground connections. Sometimes the oxidation or residue of MFP varnish can create an unplanned capacitor to ground rather than ground connection, or maybe even a diode -- or maybe even an LSI audio chip with onboard RF chip with programmable screech and motorboat sounds. -- OK, maybe not that. ;-)

From: "Jim Temple" <jetemp@insightbb.com>
Subject: Re: [R-390] R-390A trouble
Date: Wed, 27 Mar 2002 19:57:46 -0500

I just checked the tubes on a Hickok 6000A and they test fine, I also swapped in a different set. No change. I tapped the tubes when the putt, putt sound is occuring, and when the antenna trim is detuned and there is no putt, putt.

I checked the power supply voltages, and I get 260V at F102 and 225V at F103. The 150V regulated is 150.4V.

The sound goes away when V202 1st mixer, V203 2nd mixer, and V204 3rd mixer are individually removed. I would expect this. Concerning V202 1st mixer, the sound returns at 8mhz and above, again as expected. Also, when V201 RF Amp is removed, the sound goes away.

All I can surmise is that one or more of the ceramic caps are bad. I can shotgun the caps, but it would be helpful if I started with the most logical stage. I would pick the V201/6DC6 and go from there. What do you think?

From: "Jim Temple" <jetemp@insightbb.com>
To: <r-390@mailman.qth.net>
Subject: Fw: [R-390] R-390A trouble (CORRECTION)
Date: Wed, 27 Mar 2002 20:01:23 -0500

Correct the 1st paragraph to read.....

I tapped the tubes when the putt,putt sound is occuring, and when the antenna trim is detuned, when there is no putt, putt and I hear no harmonics or any change. Sorry. Jim

---

Date: Wed, 27 Mar 2002 20:39:35 -0800 (PST)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] R-390A trouble

Make sure ALL grounds are tight, even the screws holding the tube sockets, these radios got beat around a lot when being surplussed out.

Also, make sure your slug racks are not hanging, sometimes the cams are dirty or the racks bind in the slots. Tube extenders? Roger, are you telling me,.....
There's more than ONE way to skin a cat???
hehehehehehehehehehehehehe

From: "Bill Smith" <billsmith@ispwest.com>
Subject: Re: [R-390] R-390A trouble
Date: Wed, 27 Mar 2002 22:07:57 -0800

Sounds like one of the stages controlled by the AGC circuitry is oscillating for some reason. High probability of a leaky cap, or off-value resistor. AGC drops, stage oscillates, AGC is boosted, stage stops oscillating then AGC drops.. in a cycle. You might try manually controlling the AGC voltage and look for the (unstable) stage that is charging the AGC circuit.

From: "Bill Smith" <billsmith@ispwest.com>
Subject: Re: [R-390] R-390A trouble
Date: Wed, 27 Mar 2002 22:14:58 -0800

Try poking a scope around the test points in the RF stage. They are very high impedance, you may need to decouple the scope somehow (inductor or very low value of capacitance in series with the probe). You can get a stage by stage measurement that way, though. You can measure quite a few resistors and circuit values by poking around with an ohm meter (with power off). Between the back panel, tube socket pins and the test points, most components can be tested.

-
From: David Wise <David_Wise@Phoenix.com>
Subject: RE: [R-390] R-390A trouble
Date: Thu, 28 Mar 2002 09:13:39 -0800

I agree. I suggested the IF deck only because it's so easy. It's still possible that IF (fundamental or harmonic) is getting out of the deck and back around to the RF, with enough sneaking through to regenerate. Does the motorboat change with IF bandwidth? If not, you've eliminated that possibility, one down, ??? to go. This one's going to be a booger. You'll feel *so* good when you nail it.

Subject: Re: [R-390] R-390A trouble
From: "Roger L Ruszkowski" <rlruszkowski@raytheon.com>
Date: Thu, 28 Mar 2002 10:09:43 -0800

Jim, you're on it now. Roger.

{The unit, at first alignment, aligned well} <snip>.....

Any thing that lays out on the RF deck band switches and get changed with the band switch (.5-1, 2-3, 4-7, 8-15, 16-30) is not the problem. Forget all those cans on the tops side of the RF deck.] [any thing that change over under 8 with the band switch is not the problem. Forget those 1st If mixer and 17 mHz osc and.] [all those caps are out of bounds]

.....the screeching/motorboating kicks in above the 3 MC band only. Doesn't that suggest the RF deck?.....

Naw, you just got to get up that high so the stray capitance or large inductance of the low bands do not swamp the putt, putt, On those bands the time constant may be slow and the AGC action covers it very well.]]

.....{I checked the power supply voltages, ...

The carrier level meter indication increases as the amplitude increases, the strongest coinciding with the antenna trim peak prior to the problem developing.} {The sound goes away when V202 1st mixer, V203 2nd mixer, and V204 3rd mixer are individually removed. I would expect this. Concerning V202 1st mixer, the sound returns at 8mhz and above, again as expected. Also, when V201 RF Amp is removed, the sound goes away.} {I tapped the tubes when the putt,putt sound is occuring, and when the antenna trim is detuned, when there is no putt, putt and I hear no harmonics or any change.}

[That circuit is in the IF deck, so between the antenna jack and the end of the IF chain (where the meter circuit is) some thing makes noise. If the antenna trim is peaked to let more noise in to the 6DC6 it will mix with the internal noise and manifest on the meter. (all these actions are the same, dare I day it? Dare! Dare! There is more than one way to skin a cat.)]

{The AGC control will change the frequency of the putt,putt, depending on the position of the control. Fast=fast. Slow=slow, or right on the edge of putt,putting. Medium=medium frequency.}

Does this putt, putt occur when in the MGC function?

If no, then its most likely an IF deck AGC voltage generation problem and not the RF deck at all. If yes, then it is not and AGC problem at all and we are looking for a bad CAP.

Bill Smith adds, Sounds like one of the stages controlled by the AGC circuitry is oscillating for some reason. High probability of a leaky cap, or

off-value resistor. AGC drops, stage oscillates, AGC is boosted, stage stops oscillating then AGC drops.. in a cycle. You might try manually controlling the AGC voltage and look for the (unstable) stage that is charging the AGC circuit. Bill

Dave wise adds, I suggested the IF deck only because it's so easy. It's still possible that IF (fundamental or harmonic) is getting out of the deck and back around to the RF, with enough sneaking through to regenerate. Does the motorboat change with IF bandwidth? If not, you've eliminated that possibility, one down, ??? to go. This one's going to be a booger. You'll feel *so* good when you nail it. 73, Dave Wise

Has any of the other feed back here hit this problem square for you?

I have Thursday AM here at the end of the day am out of here until Monday AM for Easter. I hope we can get you going for the week end.

The question please.

Does this putt, putt occur when in the MGC function?

If no, then its most likely an IF deck AGC voltage generation problem and not the RF deck at all. If yes, then it is not and AGC problem at all and we are looking for a bad CAP.

From: "Jim Temple" <jetemp@insightbb.com>
Subject: Re: [R-390] R-390A trouble
Date: Thu, 28 Mar 2002 15:15:07 -0500

Hi Roger and list, OK, here is what I found. (Narrowing down the sypmtoms).

1. In AGC position.

a. RF gain at 5. AGC voltage essentially 0. Little rushing sound. Receiver apparently stable.

b. As RF gain is increased, background/rushing noise slowly increases to a level that seems normal and strong. Noise sounds normal and stable. TO A POINT.

c. As RF gain increases toward 9, the AGC voltage abruptly increases and the audio breaks into the putt, putt/screeching sound. The AGC voltage will continue to increase to about 7-8 volts, and the putt, putt/screeching continues as long as there is AGC voltage.

d. The carrier level remains essentially 0, until the putt, putt begins, then

the carrier lever meter shows a smooth increase to 100.

2. In MGC position.
   a. Symptoms are the same until the point that the background noise becomes strong (about 9 on the RF gain), then the receiver abruptly blocks as if from a strong signal. The carrier level meter will JUMP to 100.

3. An observation is that the problem occurrs at the same position of the RF gain control, whether the function switch is AGC or MGC. The only difference is that the receiver putt, putts in AGC and blocks in MGC. Both increase the carrier level to 100 (slowly in AGC, abruptly in MGC. I hope my observations are clear, if not please ask to clarify. Thanks, guys.

From: "Jim Temple" <jetemp@insightbb.com>
Subject: Fw: [R-390] R-390A trouble
Date: Thu, 28 Mar 2002 15:46:17 -0500

OK, I have a friend who inherited a R-390A from his father. I picked up his RF deck, and upon installation in my receiver, the symptoms are exactly the same as with the original symptoms below. Now what??

From: "Bill Hawkins" <bill@iaxs.net>
Subject: RE: [R-390] R-390A trouble
Date: Thu, 28 Mar 2002 15:17:56 -0600

Great progress, Jim. You have proved that the problem is not in the RF deck. The MGC test proves that the set is in fact breaking into self oscillation. The noises in AGC are the result of the AGC trying to control the internal oscillation. You should also be able to swap the IF deck without any trouble, compared to the RF deck. Or did you mean IF when you said RF deck? People do that, sometimes. I do it more often as I age.

Key question: Have you checked the gain of the IF deck per the manual? Simple clue - if the IF Gain pot is fully clockwise, someone tried to "soup up" the set. Simple test - turn it CCW and see if the MGC can be turned to full CW in MGC mode AND the receiver has acceptable sensitivity. Not all the way CCW, but a bit at a time - or set MGC full CW and back off the IF gain to see if it will stop. If the IF gain pot doesn't do anything, that could be it right there.

There aren't any wires running from IF Output to RF input, are there?

From: "Jim Temple" <jetemp@insightbb.com>
Subject: Fw: [R-390] R-390A trouble (BIG CORRECTION)
Date: Thu, 28 Mar 2002 17:01:36 -0500

Ooops..... I meant IF deck, not RF deck. Sorry for the mixup. So I substituted a working IF deck for my IF deck and the symptoms are exactly the same. Yikes, sorry.

Subject: Re: Fw: [R-390] R-390A trouble
From: "Roger L Ruszkowski" <rlruszkowski@raytheon.com>
Date: Thu, 28 Mar 2002 14:09:19 -0800

Jim, We are doing this wrong. Stop right here. Put all the correct decks back into the original receivers. Inject 150 uv at 455 into the IF deck and do the alignment and setup.

Get the -7 volts on the diode load with function set to manual.
Get the 1 /2 watt across 600 ohms on the local audio output.
Check to see if you have the 30 db difference in signal plus noise to noise.

Either this all works wonderful, or the problem is localized to the audio and IF deck (voltage was good)

Now switch the function to AGC. and hang the DC meter on the AGC jumper.

Run the 150 uv up (300) and down (50) and watch the AGC voltage.
Listen for the putt putt.

Pop the Y2K open and see if the AGC voltage follows the book.

I hold out here for another leaking cap on a grid.
I'll even go so far as to predict its in the receiver.
I do not want to get committed to this yet.

The cap shorts, pulls a grip low, cuts off a tube, we hear pu, the voltage falls below the break over voltage, the grid voltage builds, we hear tt, the voltage increases to the flash over voltage, the cap shorts.

If it is in the IF or audio deck, this test will find it.
If this test does not find it then

One tube and one injected voltage in to the RF deck at a time.
Depopulate the RF deck tubes.
Install the last 6C4 and inject 455 on it grid.
If that works install the PTO tube and inject 3-2 Mhz and mix 455 out.
Do some thing above 8 mhz for the next 6C4.

Do some thing under 8Mhz for the last 6C4. God save you from the 6DC6.

From: "Jim Temple" <jetemp@insightbb.com>
Date: Thu, 28 Mar 2002 17:29:06 -0500
Subject: [R-390] Re: (BIG CORRECTION) REVISIT OF SYMPTOMS

Hello to the group, Sorry for the misstatements. Below are a corrected repeat of the correct symptoms and reply to Bill Hawkins question. OK, I have a friend who inherited a R-390A from his father. I picked up his IF DECK, and upon installation in my receiver, the symptoms are exactly the same as with the original symptoms below. Now what?? Jim

Reply to Bill Hawkins question:

The problem begins with the RF gain at the same point, whether in AGC or MGC. With the RF gain control set to just below the point where the problem starts, an increase or decrease of the IF gain control (on the IF deck) produces NO CHANGE. With the RF gain control set full, where there is a putt, putt (in AGC), or the receiver is blocked (in MGC) there also is no change. In other words, changing the IF gain (on the IF deck) makes no difference.

Subject: Re: Fw: [R-390] R-390A trouble (BIG CORRECTION)
From: "Roger L Ruszkowski" <rlruszkowski@raytheon.com>
Date: Thu, 28 Mar 2002 14:33:00 -0800

Jim, I bet you have as many winning lottery tickets as I have. I do not know if your that kind of guy, but, now would be a good time to grab a beer and ask your self what it was that caused the spirits of creation to visit you this way.

Pull the tube off the RF deck and start them back in third mixer PTO, second mixer 5654 6AK5 on the crystal deck first mixer and 17MHz osc it is not because it does it over 8. 6DC6.

Once you find the stage and the signal level to inject to get the problem to putt, putt your only close. You still will have to find the problem under the deck.

Pull all those tubes up and clean the socket pins. De oxit if you can, use what you got. work the tubes in and out 4 or 5 times. If you just got a pin with crude or oxide, you mite as well just shot-gun it and get over it. As it puts on more than one band, 2-3, 4-7, 8-16 you know it is not in the cans and slugs on the top side or the trimmer cap in the top of the cans.

Date: Thu, 28 Mar 2002 17:47:16 -0500
From: Roy Morgan <roy.morgan@nist.gov>

Subject: Re: [R-390] R-390A trouble

Your overall receiver gain is way too high.

The noise from the receiver should be moderate to low with AF gain way up and RF gain way up and the antenna connector loaded with some appropriate dummy load like 50 or 125 ohms. It seems to me that the normal receiver front end noise should not cause the AGC voltage to rise.

Did you set the IF gain with the procedure on Chuch Rippel's site?
Did you put a 6DC6 tube in the front end? (you do NOT need any "hotter" tube in there!)
Have you got the normal tubes in all the other sockets?
Have you looked at the IF output on a scope to see what is happening there?
Have you looked at the AGC voltage on a meter or better yet on a scope to see what is happening?
Have you pulled out one tube at a time beginning at the first rf amplifier to find out where this is occurring?

Have you measured the resistance from ground to the wiper of the RF Gain
control as you rotate it to see if it has an open spot?

Have you put some Caig MCL into that control to make it operate smoothly?

Date: Thu, 28 Mar 2002 17:49:13 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: Fw: [R-390] R-390A trouble

Did you mean the IF deck, not the RF deck???

From: "Jim Temple" <jetemp@insightbb.com>
Subject: Re: Fw: [R-390] R-390A trouble (BIG CORRECTION)
Date: Thu, 28 Mar 2002 18:58:53 -0500

OK, I cleaned all the tube pins and sockets with DeOxit. I replaced them one at a time. No problems till the last tube, RF amp/6DC6, when the putt, putt came back. I scratched my head and, one at a time, removed and replaced the preceeding tubes. In all instances the problem went away. So I am unsure as to what stage is the problem. When I removed Y202, the problem went away below 8mhz and returned above 8mhz (as expected).

-
Date: Thu, 28 Mar 2002 19:22:54 -0500
From: Barry Hauser <barry@hausernet.com>
Subject: Re: Fw: [R-390] R-390A trouble (BIG CORRECTION)

Jim -- Did you originally find a 6DC6 in that socket? There was a thread on subbing the 6CB6 as I recall, but to make use of it involved changing a resistor as there is a difference in gain between the two (not sure). Maybe the deck was "converted". A long shot.

From: "John KA1XC" <tetrode@worldnet.att.net>
Subject: Re: [R-390] R-390A trouble
Date: Thu, 28 Mar 2002 20:23:32 -0500

Hi Jim, I believe I know what the problem may be with your radio....the front end is oscillating due to an open C227 (.047 uF) 6DC6 cathode bypass cap. The cathode of V201 is eventually connected to the RF gain pot on the front panel (via cathode bias line), and when that bypass cap opens the whole wiring harness gets hot with RF and feedback can occur almost anywhere.

I had the same problem and symptoms in my 390A, only I noticed the instability above 20 MHz. The ANT Trim control acted more like a VFO than anything else :^(

C227 is that little gray stud mounted cap that sits on top of the deck next to the 6DC6, I don't think anybody EVER checks or replaces it during a refurb. I didn't even realize it was there until I went troubleshooting!

Best thing to do is just snip the lead to it and wire in your own replacement ceramic cap under the chassis. Try to keep the lead lengths short, especially the ground return of the new cap. But it's not super critical; once you examine the original wiring you'll notice that the stud mounted cap was placed some distance away anyways. For my replacement cap I used five small .01 uF ceramics in parallel 'cuz I had a bunch of them.

IF this doesn't work, I still agree with the other guys that it's a regeneration problem and to go after the other bypass caps in that stage. There's a screen bypass, and also a plate bypass cap on the B+ side of all the RF coils for that stage. And last, but not least, there's that C103 50 uF bathtub electrolytic that is the audio range bypass for the RF gain pot; it has been known to cause a screech or two when it opens.

Let us know how you do, John

From: "Jim Temple" <jetemp@insightbb.com>
Date: Thu, 28 Mar 2002 20:41:59 -0500
Subject: [R-390] Putt, Putt problem.

Hello to the list, OK, I feel that I should review the symptoms and my attempts to correct the problem, so that everyone is still up to speed on the problem, as well as to correct my misstatements. First, I substituted a known good IF deck and the symptoms remained the same, regardless of the IF gain setting, RF gain setting, and AGC or MGC setting.

Second, I rotated the IF gain control (on IF deck) stop to stop during all phases of the below symptom review, with no change in symptoms.

Third, I substituted ALL the tubes with different, tested tubes. Are they good tubes?? Can't say, except that the odds go down that the tube is the problem. In addition I cleaned and DeOxit'd the tube pins and sockets.

Fourth, the symptoms are on all bands, except 03 and below.

Fifth, the problem will peak with rotation of the antenna trim control...band 03 and below will peak on internal noise. (This may or may not be significant, because of the gain characteristics of the various bands).

Symptoms....

1. In AGC position.

   a. RF gain at 5. AGC voltage 0. Little rushing sound. Receiver apparently stable.

   b. As RF gain is increased, background/rushing noise slowly increases to what seems normal and strong. As expected.

   c. As RF gain approaches 9, the AGC voltage abruptly increases to about 11/2 volts, and the putt, putt/screeching sound appears. Increasing the RF gain control beyond 9 will increase the AGC voltage to about 8-9 volts. The putt, putt/screeching sound remains as long as there is AGC voltage.

   d. The carrier level remains essentially 0, until the putt, putt begins, then the carrier level will increase as the RF gain control is rotated to the stop.

2. In MGC position.

a. The symptoms are identical to above, except the receiver blocks, instead of putt, putting. The carrier level will abruptly JUMP to full scale. As I understand it, the carrier level will increase with overload in
MGC mode.

3. It is clear that the problem occurs at the same position of the RF gain control, whether the function switch is AGC or MGC. The only difference is the receiver putt, putts in AGC and blocks in MGC. It seems that the problem is an AGC problem, except that the symptoms will not disappear with substitution of a known good IF deck. The symptoms remain with substitution of a known good IF deck. Substitution of the RF DECK TUBES produces no change. Individually removing and replacing the mixer tubes and the rf tube removes the symptoms, but each tube individually removes the putt, putt. So no help here in isolating the stage. I have just received a suggestion to look at the 6DC6 stage, specifically C227 (the metal cap on top of the RF deck). I will let you all know how it goes. Thanks, guys, for all the super suggestions. I'm still hard at work. So long for now.

From: "Bill Hawkins" <bill@iaxs.net>
Subject: RE: [R-390] R-390A trouble
Date: Thu, 28 Mar 2002 20:10:42 -0600

Barry, I think you've got it. But I thought of another thing to try. Because the set is oscillating within itself, something common to the IF and RF decks is carrying energy between them. The first thing to try is a big paper capacitor across the Heater supply at any convenient point. If that didn't change anything, try an 0.1 mfd/600 volt across the B+ line (not regulated B+). If that doesn't change anything, and using the correct tube in the RF Amp didn't fix it, I think you are left with a witch hunt for a poor ground. Ah, when you try the bypass capacitors, try several different ground points. Or you could try to talk your friend into letting you swap the RF decks. Do not try this without a manual, though. It will be an education. But I think that you are looking at removing your RF deck in any event.

Date: Thu, 28 Mar 2002 21:55:06 -0500
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] R-390A trouble

Got what? I dunno, but, hey, Bill, I think YOU"RE onto something. Jim should check out all those jumpers with the mini-BNC's -- maybe one of 'em was swapped with that Skyhighgain cable Norman told us about. Seriously, tho' -- wasn't that another thing that could cause weird problems -- bad mini-coax?

When the rational, logical, informed, incisive, deductive approach fails ... Well, let's consider ALL the clues ...

Squeal -- loud disturbing noise, alarm, or (sl.) to give information, to "rat" on. Happens over 3 MC's, that could be written as >3. Looks like a bird, don't it? Motorboating, boats, water, ocean -- could be a seagull, or maybe "putt-putt" = golf Then there's the thing about cats. Wait a minute! A bird that looks like a rat is a bat -- but then what's golf got to do with it? This is going nowhere -- might mean something to a witch. Is Les around?

Forget all that -- pull the RF deck and check it out. Could be an "underneath-ARGHHH-do-I-hafta?" problem. Give it the close eyeball inspection. By all means CLEAN the bandswitch -- twice. (unless I missed something and you did that already)

Nobody seems to be focused on the >3 thing. Why would this problem kick in there? What is different circuitry-wise about 0-1-2-3 vs 4+? I guess one thing might be a rotor section or two on the bandswitch, no? Maybe not. Any particular reason a bad cap would cause the squeal and motorboating to start at 4 MC's?

Great, now I'm gonna be up all night 'cause of somebody else's radio.

Date: Thu, 28 Mar 2002 22:05:06 -0500
From: Jim Miller <jamesmiller20@worldnet.att.net>
Subject: Re: [R-390] R-390A trouble

There is a black beauty capacitor .033 mfd underneath the RF deck (C275). connected from pin 7 of S208 rear to ground. It filters the 150V line to the 1st crystal oscillator (17 mhz). which is switched on by S208 only when operating between .5 and 8 mhz. If it was open, could some RF energy get coupled back through the 150 volt lines? Some restoration notes have recommended replacing it as a standard procedure, since these old style caps are prone to failure.

From: "Jim Temple" <jetemp@insightbb.com>
Subject: Re: [R-390] R-390A trouble
Date: Thu, 28 Mar 2002 22:56:40 -0500

OK, I replaced C227 .047. The old one measured .075 when out of circuit. I have a picked-over RF parts deck that happend to have this cap. It measured .04745, so hopefully this is the problem. HOWEVER, I am going to clean, inspect, wiggle, tap, eyeball, and generally give it the twice over before reinstalling in the morning. I'm winding down for the night. Will

report back after reinstallation of the RF deck in the morning. Thanks for the great support and suggestions. Good night.

Date: Thu, 28 Mar 2002 23:23:37 -0500
From: Glenn Little <glittle@awod.com>
Subject: Re: [R-390] R-390A trouble

What type of capacitor did you use for he replacement? Was it black in color?

Save yourself a lot of headaches and time. Replace all of the capacitors like this with a modern poly type capacitor. One that is highly recommended is the orange drop. It is rather expensive by a very good performer. The capacitors of 50 years ago,were good in their day, but they have seen too many birthdays. If the one you put in was not leaky (did you check leakage?) it will be leaky soon. All black beauties are bad by definition. A wholesale replacement of these goes against the purist, but is the best way to repair a radio of this vintage and keep it repaired. If you like pulling the radio out of the rack/cabinet, clearing the work bench, getting the test equipment warmed up, heating the soldering iron, cussing the way this and that are installed, removing a module and troubleshooting it, realigning the radio and then putting it back into the rack/cabinet, then by all means find the bad capacitor and replace only that part. If you want to enjoy using the radio, get the radio onto the bench and spend a little time replacing ALL of the black beauties in the radio. Then realign the radio once. After you put it back into the rack/cabinet, you should now be able to enjoy the radio for many years to come without having to work on it many times. If you should find a good black beauty, frame it because it will not stay good for long. They all leak, some worse than others. If you do not replace the killer capacitor, look forward to replacing the mechanical filters. The capacitor is cheap in comparison to the filters, if you can find someone to sell you a filter.

The choice is yours. Do a complete capacitor replacement and enjoy the radio, or replace the capacitor when they fail bad enough for you to tell by the way the radio performs and engoy the radio for a period of time until it fails again. And it will continue to fail until ALL of the black beauties have been replaced with a quality capacitor.

Wishing you happy listening after the capacitor replacements.

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] R-390A trouble
Date: Fri, 29 Mar 2002 07:57:00 -0600

Remember to clean the bandswitch carefully. If it is the wafer type, don't

douse it with DeOxit -- you can damage it that way. By all means CLEAN the bandswitch -- twice. (unless I missed something and you did that already)

From: "Jim Temple" <jetemp@insightbb.com>
Subject: Fw: [R-390] R-390A trouble (I FOUND THE PROBLEM)
Date: Fri, 29 Mar 2002 10:44:37 -0500

After wiggling almost all the leads to confirm security, I discovered the following..... Pin 5 of V201/6DC6, from the underside, seemed to be in place and secure. Upon wiggling, it seemed loose, so I gently **tugged on the pin lead and it came out of the socket from below the plastic. It was broken between the socket pin and where it emerges from the socket mold on the bottom.** Apparently, there was enough contact to do the initial alignment, and after
a couple of hours burn in, it insulated itself, creating the below symptoms. What was maddening was that the break was within the plastic mold of pin 5, which took a tug to break it from the plastic. Three components are attached. Later I will summarize what was affected and the fix.
WOW.....this is one for the books. I think I will go for replacement, but if there is an easy fix, I will consider it. Well, thats it. Thanks for the support and help with this problem. After I complete the repair, I will post a summary of the symptoms and fix. So long for now.

From: "Jim Temple" <jetemp@insightbb.com>
To: <r-390@mailman.qth.net>
Subject: Fw: [R-390] R-390A trouble (I FOUND THE PROBLEM)
Date: Fri, 29 Mar 2002 10:52:25 -0500

CORRECTION. The pin number is pin 1 (one). (V201/6DC6) With all those leads, walls, shields, and components to hack through, I miscounted the pin number. **It is PIN 1.**

From: "Jim Temple" <jetemp@insightbb.com>
Date: Fri, 29 Mar 2002 11:02:58 -0500
Subject: [R-390] Tube socket pin replacement

I wonder if it is feasable to remove the bad pin and push another, good pin back in to avoid removing about 15 components, avoiding possible damage while working them out and in, desoldering and soldering??? I will look into this before deciding what to do.

Date: Fri, 29 Mar 2002 11:00:31 -0500
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] R-390A trouble (I FOUND THE PROBLEM)

Ah, yessss. Close eyeball inspection (with tapping, now add wiggling) wins again! What did I tell ya'? This is a variant on the classic "dumb problem" -- looks like it's connected, but not so. Same idea as the broken ground tie point I found in a non-A audio deck connector shell a while back, and similar to bad mini-BNC jumpers, etc. "Dumb", yet calling for a sharp, forensic eye and a safe-cracker's touch. However, the mystery is not solved. We're not out of the woods yet. Why only over 3 MC's? I suppose it's possible that as things heated up, the gap in the socket pin expanded then oxidized and developed some capacitance or whatever. Let's see what happens when you fix the socket and burn 'er in.

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Tube socket pin replacement
Date: Fri, 29 Mar 2002 10:07:49 -0600

I was going to suggest this. If you can extract the remainder of the pin from the socket, I believe you push another pin in from a donor socket. It sure would beat replacing the entire thing.

From: "Jim Temple" <jetemp@insightbb.com>
Subject: Re: [R-390] Tube socket pin replacement
Date: Fri, 29 Mar 2002 11:21:31 -0500

I discovered that when I removed the 6DC6, the pin stub came out with the tube. This shows that there was, at least, enough contact to provide enough voltage to operate some of the receiver circuit. When I tugged on it from below, it totally broke. So I will heat the pig-tail of a doner to remove, push it into the original hole, then heat the plastic to remold. Carefully!! I will let you know.

From: Glenn Little <glittle@awod.com>
Subject: RE: [R-390] Tube socket pin replacement
Date: Fri, 29 Mar 2002 11:29:26 -0500

Jim, On a miniature tube socket, the pins are pushed in from the top and the tail is 'dimpled' under the socket to retain the pin in the socket. If you remove all the components from this pin and then remove all of the solder you should be able to see the dimple. But in your case the pin is already broken. You would flatten the dimple and remove the pin from the top of the socket. A replacement pin can be gotten from a salvaged socket. Insert it from the top of the socket and slightly 'dimple' it to retain the pin in the socket. Now you have a fixed socket. Resolder the leads to the replaced pin and you are ready to rock and roll.

From: "Bill Smith" <billsmith@ispwest.com>
Subject: Re: [R-390] R-390A trouble (I FOUND THE PROBLEM)

Date: Fri, 29 Mar 2002 08:22:53 -0800

Good eye, Jim. I think the receiver "wants" to work, and it looks like you helped it out a bit. :-)

You can replace the terminal in the tube socket by finding another of the same manufacturer and, using long nose pliers, remove a terminal by pushing the solder end through the phenolic. In a miniature tube socket, there is usually a "bump" in the metal that prevents the terminal from falling out. A moderate push usually is all that is needed to release the terminal, which can then be removed from the tube-end (top) of the socket.

Then, simply remove the old metal fragments in the receiver socket and insert the replacement through the top. It only goes in one way, so make sure the terminal side of the metal assembly matches the orientation of the other terminals in the tube socket. Once it is in place, give the terminal end a very slight twist with long nose pliers to secure it. Replacing tube-socket terminals in late National receivers (HRO 50's and 60's) is a routine.

From: "Bill Riches" <bill.riches@verizon.net>
Subject: RE: [R-390] Tube socket pin replacement
Date: Fri, 29 Mar 2002 11:36:55 -0500

I do it all the time - keep your eyes peeled for tube sockets at the hamfest.

From: "Glenn Little" <glittle@awod.com>
Subject: RE: [R-390] Tube socket pin replacement
Date: Fri, 29 Mar 2002 11:37:27 -0500

The socket of made of a resin that does not melt. At least all of the ones that I have seen.

Date: Fri, 29 Mar 2002 11:39:52 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: Fw: [R-390] R-390A trouble (I FOUND THE PROBLEM)

>P, ... broken between the.....

The fix is this, and is much less work and less danger than replacing the whole socket: Get a similar socket and clean the stuff off one pin, including *all* solder.. use a wire brush or sharp knocks after thorough heating. Pinch the pin with thin needle nose pliers just below the phenolic, to un-dimple the pin. The Dimple keeps the thing in the socket.

Observe the orientation as you push the pin up and out of the donor socket. Make small pushes, holding the pin firmly NEAR the phenolic with needle nose pliers. Install in existing socket. Wrap a bit of wire around the pin AT the phenolic and solder to keep in in place, OR: twist the pin next to the phenolic to secure it (in the same manner as on can electrolyics.) Reconnect the components, treat with Caig De-Oxit, and be done.

From: "Jim Temple" <jetemp@insightbb.com>
Date: Fri, 29 Mar 2002 12:51:13 -0500
Subject: [R-390] (I found the problem) NOT!!

Alas, life is not so simple. After a smooth replacement of Pin 1 of the 6DC6, (work with the dimple), and reconnection of the leads, the symptoms remain.

The symptoms are essentially the same as below, except the putt/putt/screeching is more intermittent. All bands except 3 and below are affected. The putt, putt/screeching is most pronounced with peaking of the antenna trim control. A new observation is that with careful peaking of the putt, putt, I can almost stop the putt, putt on a PUTT. At this point, I hear harmonics. Tapping anywhere on the chassis will produce stronger harmonics. Tapping on the 6DC6 will produce very strong harmonics.

I replaced the 6DC6 with two other tested tubes, with no improvement.

I will relist the total list of symptoms in a couple of hours.

For now, I am going to test/shotgun all the components associated with the 6DC6. Any other suggestions?? Hard at work, Jim

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Date: Fri, 29 Mar 2002 13:52:23 -0500
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] (I found the problem) NOT!!

> Alas, life is not so simple.

Somehow I'm not surprised. That pin terminal may have broken while you were replacing tubes and was just a coincidence, I guess.

> .....reconnection of the leads, the symptoms remain.....

Well, at least it's consistent ...

> The symptoms are essentially the same as below,.....

Which you had replaced altogether earlier ...

> A new observation is that with careful peaking of the putt, putt, I can.....

It's not out of the question that you have a bad batch of 6DC6's, but more likely that there's another broken connection. Systematically tap around mentally plotting where the harmonic is loudest -- start near the base of that tube and work outward. It may get louder somewhere else.
>
> I replaced the 6DC6 with two other tested tubes, with no improvement.

Were they all the same make, same apparent batch?
>
> I will relist the total list of symptoms in a couple of hours.
> For now, I am going to test/shotgun all the components associated with the
> 6DC6. Any other suggestions??

Yes -- more tapology -- tap on the harness components also -- particularly on the connector shells and cable bundle leading into them where the strain reliefs typically aren't relieving any strain anymore. Open up the shell(s) and check in there. If you want to escalate the shotgun process -- resolder every connection in the viciity and in a wider perimeter as well. There was that thread about cold solder connections and those that have gone bad. (There can be a long-term deterioration/failure mode due to very slow chemical reaction at the junction of the leads and the solder, sometimes having to do with residues of rosin and other impurities that failed to boil off during manufacturing or a repair.) Bad solder connections -- with a film of some oxide or other stuff involved -- can form capacitance, or even a diode of sorts. (I said "of sorts") Also, when probing around for connections that really aren't -- gently poke the leads with small screwdriver to see if anything moves. If anything moves -- shoot. Or, do the shotgun resoldering thing and if it works, it works -- you just would never know just which one it was.
>
> Hard at work,

If the next stage doesn't do it, we'll have to go for the witchcraft -- either that or I'll hold my breath 'til I turn blue. (Oh well, it used to work. ;-) Did you clean the bandswitch, Jim? Dirty contacts or rotors can cause the "harmonics" also and that switch is not far away.

From: "Bill Hawkins" <bill@iaxs.net>

Subject: RE: [R-390] (I found the problem) NOT!!
Date: Fri, 29 Mar 2002 14:34:59 -0600

What we have here is a case of the RF Amp picking up enough energy from somewhere to make it oscillate. All you need is a gain greater than one and a 180 degree phase shift. The fact that taking the IF gain from one end to the other causes no change in the symptoms kinda lets out the IF Amp module. It is time to concentrate on the RF and Antenna modules.

I'd try putting a 0.01 mfd disk from the RF Amp grid to ground. The easiest place to try this is E208 or wrap a wire around pin 1. If that stops it, the pickup is in the Antenna circuits or the AGC line. Then try grounding pin 2 (cathode). If that does it, the trouble is in the MGC line. Last, try the bypass cap on pin 6 (screen, B+ level).

From: Jordan <jordana@nucleus.com>
Subject: Re: [R-390] (I found the problem) NOT!!

Seems to me I recall something similiar to this , and it had to do with the wiring of the tube socket being incorrect from day one...I think it might have been pat of the reason the actual wiring and the manual shows changes in the wiring to the tube... Or again I could be totally off base as I do not have my manual with me right now...Perhaps the wiring itself had been changed also to get every bit of gain from the tube possible... I still think that feeding RF into the rig past the tube at the test point might help to really localize the problem... But again I am operating on only 2 hours of sleep last night so this may actually sound comical..!!!

From: "Jim Temple" <jetemp@insightbb.com>
Subject: Re: [R-390] (I found the problem) NOT!!
Date: Fri, 29 Mar 2002 17:03:11 -0500

Ha, your'e right! The sound from the tapping sounds like when a microphone is tapped. Almost like an echo.

From: "Jim Temple" <jetemp@insightbb.com>
Date: Fri, 29 Mar 2002 18:12:38 -0500
Subject: [R-390] It's fixed. Confirmed.

Hello to all on the list, It's fixed. For sure. Confirmed. At least the symptoms I have been complaining about are gone..... I tested all the resistors and caps that attach to V201/6DC6 tube socket. All seemed good, except **C229/0.005µF** looked like it should be replaced, so I did. May or may not have done any good. I also resoldered ALL the socket pins, and the leads opposite to the components attached to the socket pins.

Viola!! All bands are strong and stable. They all peak with internal noise.

This is a "massacre" radio after all, and resoldering the socket pins probably did the trick, but MAYBE replacing C229 did it. Regardless of the cause, it is workin fine for the moment, and I learned a whole lot about this radio and electronic terms in general. Too many assisted and supported my efforts to put this receiver back in service, to individually thank, so please accept my thanks to the group over all. I know that those who did not respond would have if they had the expertise to work on this specific problem. Thanks. again. Now back to the alignment.

Date: Fri, 29 Mar 2002 19:23:53 -0500
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] It's fixed. Confirmed.

> It's fixed. For sure. Confirmed. At least the symptoms I have been
> complaining about are gone.....

Well, as the doctor might say -- If the symptoms are gone, that means you're cured -- or over-medicated.

> I tested all the resistors and caps that attach to V201/6DC6 tube socket.
> All seemed good, except C229/ .005 looked like it should be replaced, so I
> did. May or may not have done any good.

Did you look sideways at it to see if it wiggled when it thought you weren't looking?

> I also resoldered ALL the socket pins, and the leads opposite to the
> components attached to the socket pins.

Like I told ya' (and a couple other guys) ...
>
> Viola!! All bands are strong and stable. They all peak with internal noise.

H'ray! Should be safe to pop the cork now, eh?

> This is a "massacre" radio after all, and resoldering the socket pins
> probably did the trick, but MAYBE replacing C229 did it.

Uh-oh. No good. You have been unscientific. Gotta backtrack now ...

> Regardless of the cause, it is workin fine for the moment, and I learned a
> whole lot about this radio and electronic terms in general.

Sorry, Jim. After all that "regardless of the cause" is unacceptable. This is NOT how FAQ's are born. Now, as a controlled test -- for confirmation of the true root cause -- reinstall that cap you replaced and test again. If the squeal, microphonics and motorboating recur, then it was the cap. If not, by logical deduction, it was a bad solder joint. Future generations are depending on you. If you don't, fifty years from now, some pilgrim is gonna be scratching his head -- Do I resolder the pins or replace C229?

> Too many assisted and supported my efforts to put this receiver back in
> service, to individually thank, so please accept my thanks to the group
.....

Not good enough. Handwitten personalized thank you notes are in order. Be sure to scent them with Eau De D5 before mailing.

> Now back to the alignment.

Uh-Oh. Maybe you should take the weekend off -- it's a holiday. You do know about staggered tuning, right?

Date: Sun, 7 Apr 2002 14:18:51 -0400 (EDT)
From: "Paul H. Anderson" <pha@pdq.com>
Subject: Re: [R-390] R-390 (not A) green gear

When I aligned my R-391 I didn't find a need for the green gear (which I don't have, but would like, too!). I got the cams aligned with respect to each other, then install the RF deck without the crystal deck behind it (so I can still see the alignment of the cams), double check and tweak the counter and 10 turn stops to match the 2 +000 sweet spot.

The MC doesn't change because of the indent mechanism, and the KC will only change a little bit if you're careful. One of the cams turns quickly with respect to the KC knob, and is easy to see, so it is easy to check that it is in the right spot. The slight down side is I had a bit of trouble getting a balanced overtravel setting (-970 to +035, or whatever). I got it less than 5KC off, and quit while I was ahead, since I don't think it matters much. All in all, it didn't seem any harder than aligning an R-390A RF deck.

From: "Mike Hardie" <hardiem@intergate.ca>
To: <R-390@mailman.qth.net>
Date: Mon, 22 Apr 2002 17:43:13 -0700
Subject: [R-390] Broadcast Band On Other Bands

My R-390A was operating normally on 3870 but after a fairly loud audio click overlapping local broadcast stations could be heard. With some tuning around these "stations" occur at various places on several bands, noteably the 3, 13,14,15 Meg bands, maybe others. It's hard to tell if the selected frequency is being received. The 1 to 2 Meg band seems OK. Ideas before the trouble shooting begins? Mike VE7MMH

Date: Mon, 22 Apr 2002 20:44:01 -0600
Subject: Re: [R-390] Broadcast Band On Other Bands
From: blw <ba.williams@charter.net>
To: <R-390@mailman.qth.net>

This makes me think of several things. First, I sometimes get a sudden pop of louder audio especially if I've had the radio parked on a frequency for a long time. Something seems to open up somewhere for full audio. It has been going on for a few years now. Turning up the RF Gain usually gives me full audio again, or turning the MC Change knob up or down a band will do it. I'm pretty sure that the racks are moving loose enough to not bind like they do on my other one. Sometimes I get the impression that crud on the Local Gain and RF Gain pots is causing the problem. Maybe some of these stations are harmonics?

From: "Bob Tetrault" <r.tetrault@attbi.com>
To: "Mike Hardie" <hardiem@intergate.ca>, <R-390@mailman.qth.net>
Subject: RE: [R-390] Broadcast Band On Other Bands
Date: Mon, 22 Apr 2002 20:43:57 -0700

My guess is that you've got a leaky cap. Check the toobs but suspect a cap. Parasitic oscillations often show themselves as audio clicks or pops and the presence of BC stations on the HF bands would make me think of a parasitic oscillator that heterodynes stuff from the BC band into the detector chain. I wouldn't hazard a guess as to exactly where in the chain, but there are gents with opinions here, Oh Jeez! Bob

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Date: Tue, 23 Apr 2002 05:19:15 -0700 (PDT)
From: "Tom M." <courir26@yahoo.com>
Subject: Re: [R-390] Broadcast Band On Other Bands

Sounds like you either had a component failure in the RF section, or the RF is out of alignment. The RF section has to track with the PTO and variable IF. You can tell if you can benefit from an RF alignment by slightly turning the MCS knob. If you turn it half way to the adjacent band, it will move the slug rack a tad prior to changing xtal position. Try this and see if you get an increase on the signal meter. If you get an increase, then you need an RF alignment (at minimum).

Date: Tue, 23 Apr 2002 14:28:41 +0200
From: "Bryce Ringwood" <BRingwoo@csir.co.za>
Subject: Re: [R-390] Broadcast Band On Other Bands

I have had this when an RF stage goes into oscillation - the pop is when it starts to take off. Usually accompanied by noisy signals on the band you want to hear. Would start with bypass caps in RF stage.

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Broadcast Band On Other Bands
Date: Tue, 23 Apr 2002 09:16:12 -0500

Mine does the same thing. It's almost like it gets a sudden 10dB gain. Is yours a '56 Motorola? I wonder if it's manufacturer/contract specific.

Date: Tue, 23 Apr 2002 09:45:25 -0600
Subject: Re: [R-390] Broadcast Band On Other Bands
From: blw <ba.williams@charter.net>

Yes, mine is a 56 Motorola and you described the effect better. It is a sudden gain without noise or harmonics. I have not had the IF or RF deck out to check manufacturers, but I am betting they are Motorola modules based on consistent metal work, lettering, and MFP type. It is pretty easy to look at everything and come to the conclusion everything was manufactured at the same plant. The PS and audio deck are Motorola. I am using an EAC audio deck at the moment until I can recap and replace resistors in the original. So, the audio deck is eliminated as cause of this phenomena.

Date: Tue, 23 Apr 2002 11:08:45 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Broadcast Band On Other Bands

- Coax cable shield grounds and connectors through out the radio.

- Grounds in module power plugs.

- Your downspouts. Yes. downspouts and other loose metal stuff around your antenna and house.. bad connections cause rectification and birdies.. not too likely compared to the coax shields though. Do you get these extra signals with the antenna disconnected/input shorted? .. with the RF amp tube pulled out? (.. and so on down the tube lineup.) Have you put a cover over the top of the radio to see if the signals get lower in strength? I look forward to hearing what you discover is the trouble.

From: David Wise <David_Wise@Phoenix.com>
Subject: RE: [R-390] Broadcast Band On Other Bands
Date: Tue, 23 Apr 2002 10:38:33 -0700

I think we're onto a trend. My '54 Motorola does it too, on 4-7. In CAL, the carrier meter reads 10-20dB lower than on the other bands. I can clear it by briefly! shorting the middle RF coil's trimmer to ground. Days go by, then it's back down. I'm not saying it's the trimmer (the short is just a convenient way of generating a lot of EM racket), but that's where I'll look first. IIRC it doesn't get detuned, just loses gain. I suspect loss of Q due to a high-resistance contact. Now that I have a nice signal generator, I'll take some stage gain readings while it's bad, then clear it and repeat. By the way. My nice signal generator does need one bit of help. Anybody got a cover plate for an HP 8640B modulator housing? Mine came without, and I bet it would radiate less if it were there. Doesn't have to be B; I'm sure an A would work fine. (Was there a non-A?) I can't fabricate one, since I don't have a milling machine to hollow it out.

From: "Bill Smith" <billsmith@ispwest.com>
Subject: Re: [R-390] Broadcast Band On Other Bands
Date: Tue, 23 Apr 2002 09:31:21 -0700

For what it is worth, I have the same problem in a Hallicrafters SX-62. It plays beautifully, then gain suddenly cuts down by quite a bit. If I switch mode to cw and back to am, I can restore normal operation. I have recapped the receiver and checked all the resistors. I suspect one (or more) mica caps inside one (or more) of the IF cans is opening up.

Couple of other notes. The R390 (non-a) here is still overloading on the AM broadcast band. I have recently rocked the bandwidth switch only to discover that the center of the bandpass changes when I hit just the right spot. Perhaps the problem is a combination of a recent alignment, and the condition of the bandwidth switch. Further, apparently due to my alignment, there are now two peaks in the 16 kHz position. The switch was cleaned, but apparently not well enough. I have samples of a conductive material, will have to try that the next time I can dig into the receiver. Perhaps this is the solution to the overload problem discussed previously (one can always hope).

In the RF section, I now notice some bands will increase in signal strength slightly when the MHz Change switch is rotated slightly. This is a departure from when I first obtained the receiver. Do R-390's need periodic realignment in the RF section? The set was pretty gummed up, perhaps it is only now loosening up a little.

From: "Claudio Spiritelli" <oldradio@tin.it>

Date: Tue, 23 Apr 2002 21:21:29 +0200
Subject: [R-390] Carriers on 2 an 3 Mhz band

Dear all, I just reassemble my refurbishing job on a 390A (second one). It looks like most thinks are working properly, and the one that do not, they have a good reason not to do so (such as a broken mechanical filter, or a missing BFO).

But there is one problem that I can not figure it out. On the band of 2 and 3 Mhz, I have very high carriers signal every 50 KHz . I can only get those if I have an antenna connected , otherwise I do not get any signal at all (and the Diode load level is showing accordingly to this fact).

When I disconnect the antenna, I do have a large oscillation signal several volts on a scope) on test point E208 only on the 2 and 3 Mhz band. When I do connect the antenna, the oscillation disappears but I have carriers every 50 KHz. (obviously RF stage is very unstable).

I checked visually V201 and all looks ok, I change the bypass capacitor C227 but the problem is still there (the modification with 47 pf in parallel is there). I am kind of suspicious about the ground connection of pin 7 of V201 (as well as pin 3, they both are connected to the center of the tube socket), it shows grounded with the meter, but I can not see were it goes to ground (unless the socket center is grounded by default), but it be grounded since it is obvious that this receiver had a long working life.

Does anybody have an idea were I should look to resolve the problem (I do not have yet a spare 6DC6 tube to try) and eliminate those carriers that make the 2 bands unusable?

Date: Tue, 23 Apr 2002 19:10:24 -0400
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] Broadcast Band On Other Bands

Possibly a lower-grade problem -- borderline switch contact or bad solder joint on one of the contacts. When you switch back and forth, it jostles the joint just enough to clear it -- theoretically.

> Couple of other notes. The R390 (non-a) here is still overloading on the
> AM broadcast band. I have recently rocked the bandwidth switch only to
> discover that the center of the bandpass changes when I hit just the right
> spot. Perhaps the problem is a combination of a recent alignment, and the
> condition of the bandwidth switch. Further, apparently due to my

> alignment, there are now two peaks in the 16 kHz position. The switch was
> cleaned, but apparently not well enough. I have samples of a conductive
> material, will have to try that the next time I can dig into the receiver.

I don't know how advisable it is to use a conductive compound on that switch. Try re-cleaning it with DeOxit or similar. It may take several go-rounds. It also may be a weak contact. There's a way to re-tension these, but you have to be careful and go slowly. Use a small piece of paper or a piece of plastic cut from a blister pack to check for tension of the contacts against the rotor. If some are weak, they can open up a smidgen more when warmed up and break contact. To add tension back, use a small allen key or a piece of heavy wire bent at the end to make it easy to slide it under the loops in the contacts and pull them away slightly. Then use a jeweler's screwdriver or some other pointy tool to press on the business end of the contact. Takes some dexterity, so... While your at it, check if the switch is tight to the module and the switch stack is tight. Also dress up the solder connections on the contacts as well as the other end of any short leads connected to them.

> Perhaps this is the solution to the overload problem discussed previously
> (one can always hope). In the RF section, I now notice some bands will increase in signal strength slightly when the MHz Change switch is rotated slightly. This is a departure from when I first obtained the receiver. Do R-390's need periodic realignment in the RF section? The set was pretty gummed up, perhaps it is only now loosening up a little.

Could be the same thing (weak contacts, deteriorated solder joints), or the mechanical synch is slightly off. It could be continuing to slip if a clamp is loose.

Date: Tue, 23 Apr 2002 16:21:50 -0700 (PDT)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] Broadcast Band On Other Bands

I think we are on to something here. I noticed on the Motorola RF deck that I have that the bandswitch is loose and sloppy, the contacts don't quite close as nicely as I would like. Is it possible that they are coming open as they heat up? Could it be worn out where the ceramic centers turn against the ceramic outer ring?

Date: Tue, 23 Apr 2002 23:15:54 -0400
Subject: Re: [R-390] Carriers on 2 and 3 Mhz band
From: Thomas W Leiper <twleiper@juno.com>

Got any switching supplies floating around near the antenna, like a PC computer...or even a household alarm system?

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Broadcast Band On Other Bands
Date: Wed, 24 Apr 2002 08:33:26 -0500

I'm guilty of spraying the wafer-style bandswitch with DeOxit. It was before I knew that was a bad thing to do. I wonder if this is phenomenon is a result of this? Perhaps the bandswitch properties are changing as the set gets warmer or sits on the same frequency for an extended time.

From: "Mike Hardie" <hardiem@intergate.ca>
Date: Wed, 24 Apr 2002 16:31:03 -0700
Subject: [R-390] Update On Broadcast Band Stations On Other Freqs

After the initial post a different (non R-390) receiver was tried with the same results, overlapping broadcast band stations on a variety of frequencies and bands. The signals disappeared on both/either receiver when the antenna was disconnected. The next day everything had returned to normal. Someone suggested a loose downspout or something similar "mixing" and re-radiating signals, which at this point seems a probable cause. So with a little luck the problem may not return, if it does the hunt will go on.

From: "Jim Temple" <jetemp@insightbb.com>
Date: Tue, 30 Apr 2002 08:11:25 -0400
Subject: [R-390] Question about R-390 (Non A)

Things have been a little slow, so thought I would ask a couple of questions.

1. After aligning the RF section, the calibrator signal peaks at a different position than where the antenna coils aligned. I did make sure that the antenna trimmer was at half mesh and did not touch it during the complete alignment. Now, the antenna peaks at "0" and the calibrator will only put out about 1 volt diode load voltage. The diode load will peak at about 5 volts if I peak the antenna trimmer, which ends up at about 2 O'clock. I tried to leave the antenna trimmer in the position where the cal is peaked, and realigning. The realignment went fine, but the cal signal is still displaced at about 2 O'clock. Adjusting the two trimmers on the Calibrator deck does nothing to move the peak to coincide with the antenna peak. Does this anomaly suggest off value parts in the calibrator deck?? Perhaps this is normal for the R-390? On my R-390A both coincide perfectly.

2. On bands below 16mhz, the antenna trimmer will peak with internal noise. At 16mhz and above, I can not detect a peak with internal noise. However, it will peak with an incoming signal. My R-390A will peak with internal noise on all bands. Again, is this normal for an R-390? I understand that the 16-32 coils, in earlier units, might have slugs and coils that do not realize the total potential that later units have. Has anyone heard of this?

Thanks for your past support. Regards, Jim

From: "Jim Temple" <jetemp@insightbb.com>
Date: Tue, 30 Apr 2002 11:14:29 -0400
Subject: [R-390] Variable caps in coils

I have one more "gotcha" that I hope the collective knowledge of this group can answer. I have found that a source of considerable noise, popping, and static are broken wafers (the wafer that sits between the rubber grommet and the actual cap).

The question is: Do both the cap and the brittle wafer work as a matched pair? Is it possible, permissible, to retain the cap and replace the broken wafer from another cap of a different value? Are all wafers created equal (from within the set in these radios)?

Date: Tue, 30 Apr 2002 13:54:21 -0400
From: Norman Ryan <nryan@intrex.net>
Subject: Re: [R-390] Variable caps in coils

If I recall right, the variable cap ceramic bits aren't matched, but one piece or the other will have more or less metal visible when you take them apart. That determines their capacity. I think that's the piece which has the capacity printed on top. It's the base that's the "one size fits all," isn't it, and it's usually the piece that cracks. I've replaced them with no problem. If you're feeling REALLY lucky, you can slip all of the variable caps apart and clean them carefully, being sure not to leave any residue in the ceramic. However, you have to be very careful around fine Litz wire, because if you break one, it's a beast to repair. I did break a Litz wire once and tried the aspirin-tablet-as-flux trick and it worked like a charm. For Litz wire to repair correctly, I think you have to connect as many strands as possible. To use aspirin, take the hot iron to the tablet and melt a lot of it and transfer it quickly to the joint to be soldered. The aspirin dissolves the insulation so you don't have to worry about trying to strip wire as fine as the hair on a gnat's eyebrow. This amazing cure supplied by someone on the r-390 list. After you're done, put a teensy dab of De-oXit on the bit that turns inside the three prong clip underneath so as cut out noise due to oxidized contacts. THEN do your alignment! :-)

From: Llgpt@aol.com
Date: Tue, 30 Apr 2002 15:59:47 EDT
Subject: Re: [R-390] Variable caps in coils

In a message dated 04-30-02 12:56:41 PM, nryan@intrex.net writes:

<< After you're done, put a teensy dab of De-oXit on the bit that turns
>inside the three prong clip underneath so as cut out noise due to
>oxidized contacts. THEN do your alignment! :-)

And, if you need or want new ones, contact chuck rippel
http://www.r390a.com/">R390A/URR Receiver Home

-
From: "Jim Temple" <jetemp@insightbb.com>
Subject: Re: [R-390] Variable caps in coils
Date: Tue, 30 Apr 2002 23:01:22 -0400

I found three variable caps in the coil line-up that had cracked wafers. I replaced the wafers with spares I had from other value variable caps. This cured the snapping and popping that was a problem with this rig. Thanks for the insights.

-
From: "Jeff Adams" <jadams@mcqassociates.com>
Date: Wed, 1 May 2002 11:37:17 -0400
Subject: Re: [R-390] Fair Radio R-390A Question?

.....My version, also, has a thin coating of some kind of shellac underneath the RF deck. After many hours of cleaning and tightening above deck screws, I finally discovered that the can attachment post of one of the transformers, UNDERNEATH the RF deck was loose and sitting on top of the shellac coat. This ground attach point was not available on top of the deck, so I was overlooking it.....

That is most likely the MFP coating of the radio. (Fungus protection)

From: "Kenneth Crips" <w7itc@hotmail.com>
Date: Sat, 04 May 2002 23:21:42 -0600
Subject: [R-390] Ballast Tubes

http://www.vacuumtubesinc.com/ballast.html

Check out the above list. All Ballast tubes. I wonder if any could be adapted to the R390?

Date: Thu, 18 Jul 2002 21:57:47 -0400
From: "John L." <larry.asp@sympatico.ca>
Subject: [R-390] DEAD BANDS PROBLEM

Just brought home a nice R-390A. Its a hot radio on all but 3 bands which seem dead - theres noise, but no signals, and no calibrator beat. The bands are 5Mc and 22mc. 30mc seems weak, otherwise a hot radio. Any ideas on what to look for before "working" on the radio would be much appreciated.

From: "Jim Temple" <jetemp@insightbb.com>
Subject: Re: [R-390] DEAD BANDS PROBLEM
Date: Thu, 18 Jul 2002 22:13:55 -0400

Bands 5 and 22 share a common crystal. I would reseat and otherwise check the Y406 crystal position, under the cover on the crystal osc unit.

From: "Barry Hauser" <barry@hausernet.com>
Subject: Re: [R-390] DEAD BANDS PROBLEM
Date: Thu, 18 Jul 2002 22:36:08 -0400

Could be Y406, the 12.5 mHz crystal which is used for both the 5 and 22 mc bands. 30 mc must be something else as that crystal (Y403, 11 Mhz) is shared by 3 other bands, 2 mc, 8 mc and 19mc. Did you check those bands also? The crystal scheme is shown in schematic form on page 3-12 of the Y2K manual (page 50 in acrobat sequence). I seem to remember a chart that showed the crystal usage, but forgot where that is.

Sometimes there's some corrosion on the xtal pins and all that's needed is some deoxit. I've also found some crystal decks with loose socket contacts. These can be tightened up with a small blade screwdriver by removing the xtal and pressing down on the flat contact stamping a bit. This applies to the simple contact type that's basically a dimple in the metal with hole in the middle and one or two slits.

I have also found some R-390A's with bad crystals. Another possibility -- the trimmers on the xtal deck have some corrosion.

From: "Barry Hauser" <barry@hausernet.com>
Subject: Re: [R-390] Gear Train Guru Wanted
Date: Sat, 3 Aug 2002 00:40:31 -0400

OK Gang, Hate to be a wet blanket, but I have an on topic type post here I've been sittin' on. One area for improvement in the Y2K manual is in the gear train department. What we still have there is that exploded line

drawing with dotted zig-zag lines. I don't know about you, but it doesn't really fill me with a whole lot of confidence to pursue a full teardown, cleaning and reassembly with that as a guide. Sooooo... it would be great if one of you geartrain experts with a decent digital camera would do a teardown/reassembly, stopping at each baby step to
snap a photo, so the rest of us can have a shot at it one of these days. It could use a little bit of narrative, but the pictures would do most of the talking. Any takers? Who's gonna be the hero?

From: "Gil Torbeck" <gtorbec@attglobal.net>
Date: Sat, 17 Aug 2002 22:10:33 +0200
Subject: [R-390] Little problem

I have a wonderful R-390A that I have been listening to on and off over the years; lately I've had it more on than off, as it should be. I listen to different bands, depending on what the time of day or night it is and how much time I can spare.

In the last week, I've noticed that I can no longer calibrate the receiver on the 25 meter band (actually anywhere in the 11+ Meg range). Whereas I get an ear-piercing squeal on all the other bands when I calibrate, on 25 m I can barely hear the BFO.

The resulting frequency calibration is about 8-10 khz off (above the correct frequency). I no longer tinker much with my radios and have no signal generator or test equipment. But I do have the manuals and I think if it isn't too serious, I could probably adjust the band if someone tells me what has to be done. I'm on digest. Thanks in advance, Gil Torbeck

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Aug 2002 06:19:38 -0700 (PDT)
From: "Tom M." <courir26@yahoo.com>
Subject: Re: [R-390] Little calibration problem

Gil: Sounds like you have a bad xtal in the osc deck if you only have this problem on one band. I think there is a 14 Mhz crystal which controls the 11 Mhz band. Sorry but the only way to check is to swap out the xtal and see. If you like I can dig up a crystal for you to try. I had this problem on a 51J-3.

From: "Frank Styron (fstyron)" <fstyron@nc.rr.com>
Subject: RE: [R-390] Little problem
Date: Sun, 18 Aug 2002 12:42:34 -0400

I agree with Tom about the 14MHz crystal. As this crystal serves the 11 MHz and 25 MHz bands, I would look at the 25 MHz band and see if it is off as well. If it is, you definitely have a bad 14 MHz crystal. Good luck,

Frank

Date: Sun, 18 Aug 2002 12:10:12 -0500
Subject: Re: [R-390] Little problem
From: blw <ba.williams@charter.net>

This would be a good time to clean all of the crystal pins and put a little DeOxit on them. Same goes for all of your tube pins. I went ahead and did all of my connectors too. I used a soft, nonabrasive, non compound type of slick eraser. It basically burnishes the crud off of the metal contacts to leave a smooth metal surface. Any fast drying liquid will leave a residue layer when it dries. When current is applied, this residue cooks and forms a shellac layer between metal contacts. The eraser polishing is fast and gives you a good metal to metal contact.
The performance increase was very noticeable after doing all of the above.

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Date: Mon, 2 Sep 2002 18:47:55 +0000
From: Philip B Atchley <ko6bb@juno.com>
Subject: [R-390] R-390A RF Intermod?

After running my recapped R-390A for a couple days I have noticed that it has high IMD on the BCB band when tuned close to my two local stations, 1480 KYOS and 1580. In other words I can also hear them when I tune to KFBK 1530 and other stations in the same frequency area etc. I don't remember EVER having this problem with other R-390A's.

This is the same set that "seems" to have somewhat lower gain in the IF section, though that may be my imagination. I'll know more when I get Don's radio done. I have done a "preliminary" alignment on the receiver and usually follow that up with a very thorough "nit picking" alignment a week or two after I put them in service. The alignment seemed to go smoothly with no slugs noticeably out of line with the other slugs in the same rack.

Date: Mon, 02 Sep 2002 14:59:40 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] R-390A RF Intermod?

> high IMD on the BCB band when tuned close to my two local stations,

Low gain in the IF would mean that the AGC has got the front end at higher gain..even maybe well up toward wide open. This would certainly lead to more intermod. Having proper "gain distribution" in this radio (any, for that matter) is the key to getting best performance in such areas as intermodulation. There are two very quick ways to spoil (ie check) this:

1) Put a "HOT" tube in the front end (or other places).
2) Mess up the IF gain by setting it too high or too low.

It might be interesting to compare the AGC voltage in this radio with others on the same station and antenna. If you find the AGC voltage is lower, it's a clue that your front end is at a higher than needed gain setting. An interesting problem.. :-) Roy

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Date: Tue, 3 Sep 2002 19:54:18 +0000
From: Philip B Atchley <ko6bb@juno.com>
Subject: [R-390] RF IMD Problem SOLVED!

Well, today I decided that I was going to "solve" the IMD problem that I was experiencing, come H#!! or high water (and that's not swearing)! So, I pulled it out of the listening position and put it back on the repair table, no easy thing since I "nearly" pulled my back out on Dons unit yesterday.

First thing I noticed is that I only had the IMD problem when using the sloper 60 foot long sloper antenna (with 2 loading coils), not on the vertical. IF a receiver has ANY IMD problem at all it will show up on this antenna as it is resonant at 1550 and I have two strong local stations on 1480 & 1580kHz, so that didn't surprise me any.

First thing I did was check the RF gain control action. While it lowered the gain of the receiver it had no affect on the IMD at all, things were still a jumble at the high end of the BCB. So, I figured, AHA! It is being generated BEFORE the first RF amplifier tube. I disassembled the relay, cleaned it and it's connectors with De-Oxit D5, No affect. Cleaned the tube socket pins of the RF amplifier and first Mixer, no affect. ALL wafer switches, coil socket pins and tube sockets had been previously cleaned and Caiged while the RF deck was out.

NEXT, out of desperation I changed the RF amplifier, 6DC6 tube with one borrowed from Dons Receiver. EUREKA!!! IMD totally gone AND the S meter moved from 80dB to fully pegged on my local station (as other R-390A's have done in the past)

What I DON'T understand is this. These two tubes checked IDENTICALLY in the B& K emission tester, both checked IDENTICALLY for gain in my receiver at 21MHz. Neither test shorted or gassy! RF GAIN CONTROL had no affect on the IMD. What really messed up my thinking was that since the RF gain control didn't affect the IMD the RF amplifier must NOT be the culprit. YOUR THOUGHTS ??? So anyway, while I have it out on the table I'm going to go ahead and do the critical "Nit Picking" alignment

that I usually don't do until a set has been in operation a week or more. That'll save pulling it out again.

Subject: RE: [R-390] RF IMD Problem SOLVED!
Date: Tue, 3 Sep 2002 13:09:03 -0700
From: "David Wise" <David_Wise@Phoenix.com>

I have no diagnosis for you, Phil, but I hope you keep that tube around so others on the list can play with it. I'd love to know what it's doing.

Subject: RE: [R-390] RF IMD Problem SOLVED!
Date: Tue, 3 Sep 2002 16:10:37 -0400
From: "Veenstra, Lester B." <Lester.Veenstra@lmco.com>

Yes, I have long maintained that the only valid tube tester is the receiver (R-390 or R-1230) it's self. Swapping around a set of "good spares" frequently shows which are critical in one location, and in another location, there is no difference in function between any of them. Another phenominon of such a swapping exercise is that pulling the inservice tube out and swapping in from the "good spares" set wuill show and improvement, and then double checking with the orginal tube will show the same improvement. At that point it is time to reach for the De-Oxit.

Subject: RE: [R-390] RF IMD Problem SOLVED!
From: pbigelow@us.ibm.com
Date: Tue, 3 Sep 2002 15:16:07 -0500

Goes to show that the best "tube checker" is the actual circuit!

From: "Bill Smith" <billsmith@ispwest.com>
Subject: Re: [R-390] RF IMD Problem SOLVED!
Date: Tue, 3 Sep 2002 14:05:00 -0700

My guess is the "bad" tube is oscillating. Might be interesting to put it back in and test with a GDO, a field strength meter or another receiver. Good hint, though, as I still have a lurking IM problem with my receiver, or did at last check.

Date: Tue, 03 Sep 2002 17:43:08 -0400
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] RF IMD Problem SOLVED!

I'm no thermionic emission engineer, but I can tell you there are toobs and there are tooobs. They have various mechanical characteristics and foibles -- not to mention a few nuances thrown in. I don't know if a mutual

transconductance tester would have shown this up -- probably not. But I have a hunch. Put the IMD 6DC6 back in and let things warm up. Tune around the subject frequencies and gently tap the tube. There's some chance that this tube has also gone microphonic, or you may find some fluctuation in the IMD action Most of the military tube tester manuals have a version of YMMV disclaimers -- "the only true test is in the actual equipment" or words to that effect and offer the suggestion to try another tube if a circuit is suspect. If this "works" or sheds any light on the situation, credit for tube swapping goes to the tube jockeys of yesteryear -- the ones who made house calls with tube caddies. If the tap test works, credit goes to early Neanderthal "technicians" who developed the "if in doubt, hit it with a stick" repair and diagnostic method. (Hey, it worked with fire ;-)

Date: Tue, 3 Sep 2002 16:22:17 -0700 (PDT)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] RF IMD Problem SOLVED!

Do you have a tube tester that has headphone jacks on either side of the SHORTS light? Like a TV-7 or TV-10? I'd sure like to know if that tube SOUNDS like it has problems, especially when tapped with your finger at each SHORTS setting. Where's one of those little rubber hammers when you need one? How did it perform under the LIFE test? We have to find a way to make that problem show up on a tester.

From: "Drew Papanek" <drewmaster813@hotmail.com>
Date: Wed, 04 Sep 2002 12:42:12 -0400
Subject: [R-390] Re: IMD

The B&K emission tube tester will only catch gross defects: shorts, gas, poor cathode emission. It will not, as some testers will, test transconductance, the ability of the tube to amplify. Many of the transconductance testers only test a pentode such as the 6DC6 in triode-connected mode. The only "tester" which will truly simulate the conditions found in an R-390a is an R-390a. The shorts function of the emission tester will allow you to disqualify from further testing those tubes which could damage your real tester-the equipment that the tube will be used in. Parasitic oscillation in the 6DC6 can be caused by a defective C227, that stud-mounted small can next to the 6DC6. There also was a production mod which added a 68 pf cap right at the tube socket, in parallel with C227 thus ensuring good cathode bypassing. I had trouble with C227 in my '67 EAC causing intermittent oscillation as the antenna trimmer knob was turned. Not all 6DC6's tried would oscillate. I also noticed lower gain on the lower bands. Replacing C227 (difficult because of tight space) cured the problems.

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Date: Thu, 5 Sep 2002 22:08:52 +0000
From: Philip B Atchley <ko6bb@juno.com>
Subject: [R-390] The R-390A, a GREAT LF rig!

Hello all. Well, here we go again, "I'm trying to stir the pot". I'm an avid Longwave Beacon chaser (NDB'S). It's no mean feat to copy a 25 watt Longwave beacon at 2000+ miles or a obscure beacon in Brazil at 6500+ miles (I've done both). It does put GREAT demands on both receiver and antennas, especially if you live in a 2 by 4 lot in a mobile home park with all kinds of computers, dish receivers and other RFI generating trash from China. Lately I've been using a homebrewed longwave converter with internal low pass filter, antenna tuner/40dB pre-amp with a Hallicrafters SX-71A receiver. In times past I've used IF filters as narrow as 125Hz and audio filters as narrow as 12.5Hz (modified DSP). At this game selectivity and frequency stability is EVERYTHING (Some NDB's with duplicate ID's are within hundreds of Hz or less of each other). Unfortunately the Halli does NOT have good frequency resolution, even with calibration charts. After I put the R-390A in the listening position and used it the past couple of nights I figured that it would make a GREAT receiver for my purposes, the limiting factor was now my homebrewed LF converter which used a NE602 mixer, known for poor dynamic range. So, I dug up the Longwave modification for the R-390A, put it on a small perf board and stuck it alongside the 1st mixer tube. I installed a solder type BNC jack in place of the IF output jack for the longwave antenna. This entire thing is a no holes drilled, no solder into the set modification, and I'm pleased to say it works very, very well. As it couples into the cathode of the first mixer it doesn't appear to affect operation above 530kHz at all. When I connected my 60 foot loaded sloper antenna (the one I use for longwave) to the LF antenna jack I was able to copy many of the daytime NDB's, though gain was obviously way down do to no RF amplifier. I then modified my Longwave converter, pulling the NE602 out of it's socket (good reason for using IC sockets). I added one more BNC jack to the two already on it and connected that to the output of the converters pre-amp section (this is a Tunable pre-amp with sharp selectivity itself). The unit was set up top ground the HF antenna jack of the R-390A when the pre-amp is on. This in effect switches the antenna between the LF and HF antenna jacks of the receiver when the LF pre-amp is turned on. Does it work??? I'LL SAY IT DOES! I have a better signal/noise ratio on longwave than I ever had through the converter itself. The 40dB gain of the pre-amp more than makes up for the lack of an RF pre-amp in the R-390A on longwave. Signals are strong and clear. If the RF gain is wide open FCH-344 in Fresno (65 miles) pegs the R-390A RF meter, yet there doesn't appear to be any IMD at all (due to the selectivity of the pre-amp). With the converter I used to hear a "ghost" of FCH-344 behind MO-367 and a couple other places. They are no longer there! AND, for the "purist"

the best part of it is the fact that the modification can be removed in about 5 minutes, putting the original IF output jack back in and pulling the wire out of the tube socket.

Date: Fri, 6 Sep 2002 15:42:43 +0000
From: Philip B Atchley <ko6bb@juno.com>
Subject: [R-390] Why 6DC6?

No, this is not to try to "second guess" Art Collins or degrade our beloved R-390A receivers. I wouldn't dare do that, especially on this list 8^) But I have a question. I had a very severe IMD problem that generated nothing but a hash of stations at the top end of the BCB band, where we have two locals at 1480 & 1580kHz. Replacing the 6DC6 RF amplifier eliminated this severe IMD. However, I have noticed that the receiver does still have what is apparently 'some' IMD as I can hear some "mixing" of one of the above local stations with a couple stations lower in frequency. Not bad like it was before, but it is there. When I first started designing and building some of my own receivers (some quite elaborate) I was "taught" from various sources that for AGC controlled stages you definitely want to use remote cutoff or (possibly) semi-remote cutoff Pentodes for those stages. A sharp cutoff pentode tends to go into a nonlinear region much faster with increasing bias. Yet here, in the R-390A we see a "Sharp cutoff" tube used in the RF amplifier stage and it has AGC applied. It seems to me that something like a 6BZ6 etc would have been a better choice. Again, I'm not criticizing "Arts" design, but inquiring minds want to know. Perhaps others on the list might also be curious. Yes, I do have some 6BZ6 tubes here and two separate identical Marconi signal generators but I really don't have all the test fixtures and additional equipment to run a total analysis comparing both tubes against each other for IMD, gain etc. Hence I'm leaving the 6DC6 in at this time. Especially as to get optimum results one would have to adjust the cathode bias, screen resistors etc to get a fair comparison of tubes and I don't feel like cutting into my R-390A (that would be blasphemy).

Date: Fri, 06 Sep 2002 08:58:57 -0700
From: rjb <rjb@lynden.com>
Subject: Re: [R-390] Why 6DC6?

This question came up on this list several years ago. I do not have the specifics (perhaps others can help here) but the gist of it was that the 6BZ6 was considered in the original design, but the 6DC6 was chosen instead, for reasons relating to better gain distribution and less vulnerability to front-end overload. If i recall correctly, someone had a reference to a Collins internal document discussing this issue - wish i had more, but others may be able to help. FWIW, i have an HQ-180 with bad cross-mod problems below about 3MHz, thanks to an extended-band rap

music station a couple miles from my QTH - i tried a 6DC6 in place of its 6BZ6 - no difference. In this case the interference is probably blasting right into the IF strip.

Date: Fri, 06 Sep 2002 12:09:02 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Why 6DC6?

The ARRL handbook tells how to build a "hybrid signal combiner". It appears pretty simple (one toroid, a few resistors, connectors and a box.) I plan to build one when I can.

> to get optimum results one would have to adjust the cathode bias, <sip>

I have an RF deck from a "junker" radio that I expect to do such experimenting with. HSN carried an article or series of them using frame-grid tubes in the first RF and some mixer stages. Changes to the circuits were involved. Greatly improved intermodulation and "overload" performance, and much lower noise were claimed. Others have since reported that the improvements were not worth the effort.PS: Who can explain in simple terms what "third order intercept" means??

Date: Fri, 06 Sep 2002 10:20:03 -0600
From: Jordan Arndt <jordana@nucleus.com>
Subject: Re: [R-390] Why 6DC6?

Howdy Roy et al.... being home with a 102F fever, gives a little light headedness and some time to search for something to distract my attention.... try this:

http://www.downeastmicrowave.com/PDF/IP3.PDF

While not exactly in simple terms, the visuals help to understand what the measurement means.... 73 de Jordan....

Subject: Re: [R-390] Why 6DC6?
From: Richard.McClung@Dielectric.spx.com
Date: Fri, 6 Sep 2002 10:10:59 -0700

Try looking at this.....It is one of Joe Carr's Tech Notes. NOTE 6 Dealing With AM Broadcast Band Interference to Your Receiver 10 Pages While it's not tube data it does strike the subject of BCB Interference..... Noted author, Joseph J. Carr, has created a series of short articles on topics of interest to the shortwave listener.
<http://www.dxing.com/tnotes/tnote06.pdf>

From: Richard.McClung@Dielectric.spx.com
Date: Fri, 6 Sep 2002 14:40:00 -0700
Subject: [R-390] RE: 6DC6

GOTO: <http://www.r-390a.net/faq-collins-cost.pdf>
Scroll to document page 9.
Report PAGE 5 PARAGRAPH 2.3.15 PART 15 - RF UNIT
Read the answer to your question.....

Date: Fri, 06 Sep 2002 16:46:35 -0700
From: Dan Merz <djmerz@3-cities.com>
Subject: Re: [R-390] Why 6DC6?

Hi all, I took a look at the Carr article and felt good about the Mackay 3010 B I've been restoring; I don't think it's reached the 390a sensitivity yet (just got it working) but the front end design is predicated on the use of attenuation and a high pass filter for hf work to reduce cross modulation. A BC band 0.6 to 1.6 Mhz high pass filter can be switched in to suppress strong bc stations and it works well; the attenuator additionally tames overload. This receiver uses a sharp cutoff 7788 rf tube (gm = about 50,000 mmhos !!!) and has tremendous front end gain. Mackay sold other front end filters to handle specific strong station problems for this set. Several years ago I made a bc band high pass filter from the 1982 ARRL radio handbook,. 8-59 that uses toroids and I tried this in substitution for the Mackay filter - works about the same as far as I could tell. It's a 50 ohm filter but could be changed to other impedances by scaling the inductors and caps. I suspect it would work ok with the R-390a but haven't tried it. Dan

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Date: Mon, 09 Sep 2002 11:27:15 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] RE: 6DC6

>Scroll to document page 9. Report PAGE 5 PARAGRAPH 2.3.15 PART 15 -RF UNIT

Which says (for the record):

2.3.15 Part 15 - RF Unit

Tests were made to determine how much the 2nd RF stage with its coils was contributing to the performance of the receiver. Its advantages were that it afforded additional AGC control ahead of the mixers, and better image rejection above 8 mc. But because of the considerable saving resulting from the removal of this stage with its associated coils, SCEL

representatives agreed it was worthwhile. In an attempt to regain some of the lost AGC control, the mixers were put on the AGC line. Attempts were made to restore some of the lost image rejection by improving coil Q and tracking, and by using better switch materials. Better antenna trimmer action on the 16-32 mc band was accomplished by mounting the trimmer closer to the high band antenna coil. This reduces stray C allowing the trimmer to be coupled tighter to the coil.

Field tests by SCEL engineers on current R-390 receivers revealed that cross
modulation is a problem in the presence of strong interferring signals. Extensive tests were made on all available miniature RF pentodes to find a tube which best combined the characteristics of low noise and low cross modulation. Late in the investigation tube types 6DC6 and 6BZ6 became available. These had the most desirable characteristics of any tube tested. Because the 6DC6 affords slightly better AGC control, it was the one selected for use as the RF amplifier. Cross modulation tests were also run on various mixers, and the 6C4 proved to be very good in this respect, actually improving slightly in performance as the bias was increased up to about 14 volts. On this basis, it was deemed safe to use AGC on the mixers. Late tests show that cross modulation is largely confined to the first IF tube at medium high levels (.05-.2 volts input) and the RF amplifier at levels above this. Investigation carried out by E. Read on the R-392 receiver showed a substantial improvement in cross modulation at signal levels exceeding the normal operating bias of the 1st RF tube when a short-time constant circuit was placed in the 1st RF grid. Subsequent experimentation on the "A" model R-391 showed a small improvement particularly at antenna levels exceeding 2 volts. The results are not nearly as spectacular as on the R-392, however.

From: ToddRoberts2001@aol.com
Date: Tue, 26 Nov 2002 22:26:00 EST
Subject: [R-390] R-390A Modified For Synthesizer Input?

<PRE>I have some pictures of an R-390A receiver modified with a special jack panel on the rear panel with 3 BNC input jacks that appear to be inputs for external synthesizer control of the receiver. I was wondering if anyone in the list has seen an R-390A modified in this manner? I'm not sure if there are any extra switches on the front panel to enable/disable the special inputs on the back. Looks very unusual. To see the pictures type in (or copy and paste) these
addresses :

members.aol.com/toddroberts2001/Item7.jpg
or members.aol.com/toddroberts2001/Item8.jpg

Thanks for any info on this. 73 Todd Roberts WD4NGG.

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From: "Jon & Valerie Oldenburg"
<jonandvalerieoldenburg@worldnet.att.net>
Subject: Re: [R-390] R-390A Modified For Synthesizer Input?
Date: Tue, 26 Nov 2002 22:49:11 -0600

NASA used R-390A' s modified to use high stability frequency oscillators. Maybe another group member can expand upon this. Jon AB9AH

From: "Tom Bridgers" <tarheel6@msn.com>
Date: Wed, 27 Nov 2002 08:19:39 -0500
Subject: [R-390] R-1247 Manson Labs

Your R-390A has been modified by Manson Labs and is now called an R-1247.. The receiver was modified to accept an external frequency synthesizer (there should be a couple of sealed relays inside the radio where the local oscillators connect to the mixers and extra connectors on the backplane) Provided the relays are still there, you don't have to reconnect the oscillators to the mixers. The default position is internal LO's. Manson Labs made the synthesizers, and the entire system was a double-diversity system, even the transmitters (modified T-368's) were locked into the same time base on the synthesizers. The above is an edited post from a year or so ago... -tom
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From: "Drew Papanek" <drewmaster813@hotmail.com>
Subject: [R-390] R-390A Modified For Synthesizer Input?
Date: Wed, 27 Nov 2002 13:39:46 -0500

Todd, The R-390A with 3 BNC jacks sounds like an R-1981. It is described at
r-390a.net under "variations".

From: "Barry Hauser" <barry@hausernet.com>
Subject: Re: [R-390] R-390A Modified For Synthesizer Input?
Date: Wed, 27 Nov 2002 14:55:49 -0500

I have three of the R-1981's -- R-390A's with a TMC Mod Kit. (I forgot the number -- there's an adhesive metal tag on the front panel. These have a small metal box mounted to the rear panel containing a solid state PC circuit board (including one or more IC's as I recall) with several BNC connectors, plus two more BNC's added to the rear panel itself. There are also a number of tee-connectors tapping into the MB (mini-BMC) cables here and there inside the radio. They don't look much like Todd's receiver. As I recall, someone wrote that this mod was to use a digital frequency counter with the '390A for added accuracy, but seems there are more

added connectors than would be needed for that purpose.

From: "Michael Melland" <w9wis@charter.net>
Date: Fri, 29 Nov 2002 12:23:25 -0600
Subject: [R-390] Interesting Finding... R-390A

This is interesting.... here is an unusual finding on an R-390A. Radio works fine.... a quick check for operational condition "sensitivity" (per manual... cal on, antenna peaked on each band and carrier meter to read no less than 40 dB at each 100 KC cal point) reveals excellent sensitivity but an anomoly on one band. 3 MC reads strangely.... carrier meter readings vary exactly 20 dB each 100 KC calibration point. The odd frequencies read 20 dB lower then the even freqs. Interestingly, 2 MC and 20 MC (share same cans/crystal I think) read normally up and down the scale (65 dB+/- all 100 KC points).

See below..... any thoughts ?
The 3 MC band exhibits the following readings:

3100 - 50
3200 - 60
3300 - 40
3400 - 60
3500 - 40
3600 - 60
3700 - 40
3800 - 60
3900 - 40
+0000 - 60

From: "Bill Hawkins" <bill@iaxs.net>
Subject: RE: [R-390] Interesting Finding... R-390A
Date: Fri, 29 Nov 2002 13:06:28 -0600

How about a sticking slug that breaks free every 200 KC? Or 200/3 or 200/5.

Date: Fri, 29 Nov 2002 12:47:14 -0800 (PST)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] Interesting Finding... R-390A

If it were not only one 1 MHz wide band, I would suspect that the xtal calibrator output were not level. Any sign at all of this effect at the top of the 2-3 MHz band or the bottom of the 4-5 MHz band? Have a calibrated output sig gen available to chart sensitivity with?

If I remember correctly, doesn't a perfect square wave have only odd hormonics, no even hormonics at all? A very narrow pulse will have pretty equal odd and even hormonics. I can see a calibrator output waveshape causing this being more likely than ripples in the response of the RF amps having peaks and dips at 100 kHz intervals.

Many moons ago, I built a xtal calibrator box out of 7400 and 74S logic which could output a narrow output puls 15-20 nS wide as I recall. Spectrum analyzer showed it as being flat out past 100 MHz. With the fast logic families available now, a much better one could be built.

My design has a chain of divide by 2's and a chain of divide by 10's switch selected starting with a 4 MHz crystal producing outputs of 4, 2, 1, 0.5, 0.25, and 0.125 MHz, and base 10 submultiples of those freqs. With this arrangement, a varity of calibration marks can be generated, 10 kHz by selecting 1 MHz and 2 divide by 10's or 125 kHz by selecting 0.125 and one divide by 10, for example. Very useful for checking dial linearity.

I built this when I bought a HRO-500 a previous owner had adjusted the dial linearity by bending the split plates on the main tuning cap to look like the teeth of a saw /\/\/\. On perfectly on the xtal cal freqs but off to 10 kHz out in between. Horrible. Took about a month to get it right again.

Date: Fri, 29 Nov 2002 14:00:40 -0700
From: Jordan <jordana@nucleus.com>
Subject: Re: [R-390] Interesting Finding... R-390A

Sounds like multi-vibrator output variation... have you tried to verify the across
the band sensitivity...??

Date: Wed, 04 Dec 2002 08:57:46 +0200
From: "Bryce Ringwood" <BRingwoo@csir.co.za>
Subject: Re: [R-390] Interesting Finding... R-390A

Hi, Look at the multivibrator following the calibrator oscillator. My 390A does this too on occasion (the odd harmonics sometimes disappear altogether) - I have to kick it to make it work. I'll fix it next time I pull the RF deck. - Bryce

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Date: Mon, 09 Dec 2002 13:03:46 -0800
To: r-390@mailman.qth.net
Subject: [R-390] 14 MHz band position on R-390A

My R-390A has decided to stop working on the 14 MHz band only. All the

other band positions are fine. I am somewhat lacking in trouble shooting expertise.and have no idea as to where to start. Any constructive comments to get me started on this would be extremely welcome. Thanks in advance,

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From: "Larry and Jody Cogan" <woodrat@citynet.net>
Subject: Re: [R-390] 14 MHz band position on R-390A
Date: Mon, 9 Dec 2002 13:34:15 -0500

The 17 MHZ crystal controls the 14 MHZ and the 31 MHZ band.....check to see if it is also dead. If so, you will need to replace the crystal. You should be able to get one from Fair Radio.

From: "Larry and Jody Cogan" <woodrat@citynet.net>
Subject: Re: [R-390] 14 MHz band position on R-390A
Date: Mon, 9 Dec 2002 13:48:21 -0500

Bill: PS.....look on the bright side.....there's nothing but annoying Hams on the band you lost.....not like loosing something serious like 5, 6, 9 or 15.....that would be unbearable!

From: "Art Usher" <artu3@ecenet.com>
Date: Mon, 16 Dec 2002 20:00:26 -0600
Subject: [R-390] T-203

Have a Stewart Warner R-390A that in the past someone juiced with rf in the 75 meter position I believe. When I have an antenna connected and change the bands all have background noise "except" the 2 to 4 mc one.. This makes me suspect someone nailed the coupling cap in the unbalanced input of T-203.. I have the RF assy out but can't get the can to budge...even tho I've removed the phillips head screw I found down in the coil form...Can anyone help me out here ?? tnx in advance

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From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] T-203
Date: Tue, 17 Dec 2002 07:36:05 -0600

Not sure, but if T203 is one of the cans that are all grouped together under the slug racks, there are two tabs that protrude through two slots in the can. Press the tabs through the slots and the can will slide off. You might look at ATC's website to see the innards of these forms.

Date: Mon, 23 Dec 2002 10:08:14 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] T-203

This is a *very* common problem with R-390's. The military blew out a lot of the 4 MHz coils. They had a problem with their setup that made this fairly common. Apparently in the AN/SRA-xx antenna coupler when you set the receiver to "idle" it winds up tuned to 4 MHz. As soon as they fire up the transmitter on that band the transmitter power routes to the receiver input. The result is what you observe on the transformer. I know that doesn't help at all but at least it's noting you did to the set. On the ones I have had replacing the transformer is the only option.

Subject: RE: [R-390] R-390A Calibrator
Date: Tue, 31 Dec 2002 09:23:20 -0800
From: "David Wise" <David_Wise@Phoenix.com>

Time for a new crystal. With the crystal's sharp resonance, the tube can't pull the frequency very far. If it's bad, it will prevent oscillation, but that's about it.

Date: Tue, 31 Dec 2002 12:57:51 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] R-390A Calibrator

Check to see that the crystal oven is working properly. There are only about three states they operate in

1) Fine - at the right temperature and everything.

2) Thermostat switch shorted - smoke comes next

3) Thermostat switch open - runs cold and the crystals are off frequency.

Repairing the crystal oven probably isn't worth the trouble. Both the switch and the wire they used in the heater are a bit tough to find. It's easier to find a whole new oven assembly.

From: "Scott Seickel" <polaraligned@earthlink.net>
Subject: Re: [R-390] R-390A Calibrator
Date: Tue, 31 Dec 2002 17:10:35 -0500

>Time for a new crystal.....

Any idea where I can get a new crystal for mine? Like an idiot I bought a small pile of these on e-pay a while back and did not check them for 2 months. Well, turns out they were all bad.

Date: Tue, 31 Dec 2002 17:38:52 -0500
From: Roy Morgan <roy.morgan@nist.gov>

Subject: Re: [R-390] R-390A Calibrator

>Any idea where I can get a new crystal for mine?

Quoting Bob Sullivan: M.H. Electronics! Good prices and they understand "Collins." http://www.mhelectronics.com 800 643 9825 Use their "Request for Quote" page since they don't list crystals of 200 kc frequency.

From: "Richard Biddle" <theprof@texoma.net>
Date: Tue, 31 Dec 2002 19:06:04 -0600
Subject: [R-390] RE: R-390A Calibrator

American Trans-Coil shows still having the "Calibrator Y201-17.0MC, Y203-200KC" in stock for $13.00. I bought one from them and it had both crystals as well.
http://www.atc-us.com/ATCSHOP/

Date: Tue, 31 Dec 2002 21:34:24 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] R-390A Calibrator

The 200 KHz crystal used in the calibrator is an odd cut of crystal. All the rest of the crystals in the radio are AT cut crystals. The calibrator crystal is below the low frequency end of the range for an AT cut. Translated more or less in to English - tough to find anything other than an AT cut these days. Tough even to find anybody who knows how to set up a saw to cut the odd cuts. I'd go for a replacement from Fair Radio or ATC.

From: "Kurt Schnabel" <classicmotorcycleclub@hotmail.com>
Date: Thu, 02 Jan 2003 11:27:10 -0200
Subject: [R-390] RF deck

Would like to begin 2003 asking the R390 experts: Can I repair the R390 RF module with all cables connected? All tubes were checked, but I could not find any faulty component with the supply disconnected. Can I tune to a specified frequency, say 10 MHz and try to find the reason for a very weak reception?

Date: Thu, 02 Jan 2003 09:40:20 -0500
From: Bob Camp <ham@cq.nu>
Subject: [R-390] RF Deck Problem

The following applies to a R-390A and may not work with a R-390 not an A. I don't have a not an A handy to check it on. However I'd be glad to give a arm and loving home to any strays out there :) There is a way to hook up the RF deck, but it's a *major* pain. The IF deck, the audio deck, the

PTO, and even the power supply all do just fine that way but not the RF. You have to more or less flip it up over the back of the radio. Imagine the radio sitting normally with and the RF deck sort of sitting straight up in the air. The issue is that both the radio and the deck are pretty big and need to be supported properly so you don't destroy the harness. It is a classic need at least four hands and a bunch of 2x4's sort of job to get it all positioned properly. The easiest way to do the same thing would be to get a wiring harness from a defunct radio and hook it up that way. The second easiest way probably is clip leads. You may have already tried the following - if so I apologize for bringing it up ....

Normally here's how it is done:

1) Figure as best you can if the problem is at all frequency dependent. Even if it's not that narrows things down.
2) Grab your supply of tube socket extenders or make a set if you don't already have any. They also show up on the auction sites fairly regularly.
3) Get a copy of almost any of the R-390 or R-390A repair TM's from the usual download sites.
4) Check the DC voltages on the module.
5) Check the AC voltages on the module.

At that point you should be able to ask - "what's wrong in the first mixer stage?". Needless to say that's a *lot* easier than going after the whole assembly. Just about everything you can get at under the module is available on one tube socket pin or another. The key to the process is the extenders. The only thing to be careful about is plugging them in to a live radio. Something about B+ on the clip on pins and your hand completing the circuit ..... (yes that is the voice of experience speaking).

Date: Thu, 02 Jan 2003 12:33:05 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] RF Deck Problem

I assume that the RF deck on the non-A has test points in the same way that the R-390A one does. These are installed for just this problem. Insert test signals at the various test points to determine which stage is giving you the low gain. Search the manual for a chart that has the approximate signal levels at each stage under test conditions. You should be able to isolate which stage is not working right. The frequencies will not be the same as the dial frequency after the first mixer. You will come to understand the mixing scheme a bit during this exercise.

Date: Sat, 04 Jan 2003 13:08:55 -0500

From: Jim Brannigan <jbrannig@optonline.net>
Subject: [R-390] 3rd mixer

While working on the RF deck I noticed that V204 (3rd mixer) is a 6BE6, not a 6C4. Connected to pin 1, the grid on the 6BE6 is a length of RG-174, that leads to an added rear panel BNC labeled SM output. Any ideas?

Date: Sat, 04 Jan 2003 13:43:19 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] 3rd mixer

How is the rest of the socket wired? Obviously somebody has moved the plate connection off of pin one .... With a pentagrid converter in there all sorts of odd things are possible. Assuming it looks like amateur work my vote would be to document it and then switch it back to stock. The 6BE6 is not going to be as good a mixer as the 6C4.

Date: Sat, 04 Jan 2003 14:47:07 -0500
From: Jim Brannigan <jbrannig@optonline.net>
Subject: Re: [R-390] 3rd mixer

Good question.....I was interrupted while working on the RF deck. I wanted to sketch out the wiring..... When I returned to the work shop, I replaced the RF deck and am now listening to WWV on 15 Mcs... ..never did document the mixer.... chalk it up to another senior moment or CRS...Grrrrr

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From: K2CBY@aol.com
Date: Tue, 7 Jan 2003 09:14:57 EST
Subject: [R-390] [R390] Field Change No. 7, R390A

In the process of overhauling and re-capping my R-390A I decided to change R702 from 56k to 220k per the Field Change 7 instructions. Following the overhaul, the sensitivity and S+N/N went west. To troubleshoot the problem, I consulted Chuck Rippel's notes of 12/24/2001 and measured the oscillator injection voltages at the cathodes of the respective 6C4 mixer stages. All was well until I got to the 3rd Mixer (pin 7 of V204) where the injection voltage as measured on my scope was only 1.5 v p-p rather than the 6 v p-p that Chuck called for in his note. I restored the 56k screen resistor and Presto! the injection voltage was back up to where it should be. The sensitivity went up and the noise dropped. Further research showed that with R702 = 220k the VFO screen voltage drops to about 30 volts while with 56k in the circuit it is nearly 70. A 6BA6 -- even one with robust gm -- a has difficulty oscillating under these conditions because the grid coupling capacitor is only 15 pf. By the way, the output waveform from the VFO was clean as a whistle viewed on

a 75 MHz scope, so I doubt very much that the Field Change 7 mod was intended to eliminate harmonics.

Date: Fri, 7 Feb 2003 12:05:13 -0600
From: windy10605@juno.com
Subject: [R-390] Some more R-390A questions

More questions for the experts.

Since this unit has not been worked on by anyone, except me replacing the one bad electrolytic, missing jumpers, one bad tube, lubricating the gear train and slug racks, etc, some improvement has been seen .....but it's not nearly enough.

So far, the unit receives the Broadcast band but the other bands are very weak. Last night the GFI tripped ....the AC filter on the unit has a problem so it will be replaced. I assume that, as with any 35 year old radio, all the tubular capacitors need to be replaced, maybe high value resistors checked, etc. What other things do I need to go through ? Or should I just replace the "definitely bad parts". I seen several pieces of military/ commercial (HP) gear with the sealed tubulars which were just fine after 40 years but not so for the rectangular paper capacitors in URM/25s or any other tubular capacitor which has a broken seal around the leads. What a marvel of Mechanical Engineering expertise.

Date: Fri, 7 Feb 2003 11:08:17 -0800 (PST)
From: "Tom M." <courir26@yahoo.com>
Subject: Re: [R-390] Some more R-390A questions

Have you checked the alignment of the cams in the RF deck? I've never acquired one that was set up properly. This will kill sensitivity if set up wrong.

Date: Mon, 10 Feb 2003 14:39:05 -0600
From: windy10605@juno.com
Subject: [R-390] 2nd Crystal Oscillator question

The levels I measure now at E402 are about half of what you should see (-2.5V to -5V should be -4V to -11V) with a good VTVM. The cathode measures 0.9V should be 2V. I replaced the 6AK5 with a better one, all the caps check good on value and leakage, the cathode RF choke measures 0.5mH, the 120K grid resistor is OK, B+ levels are OK, replaced the 12pf and 150pf capacitors anyway (with 10pf and 130pf), replaced one crystal to see what happens .....levels got a little better (to the above -2.5V to -5V). Any suggestions ?

Date: Mon, 10 Feb 2003 17:35:06 -0600
Subject: Re: [R-390] 2nd Crystal Oscillator question
From: windy10605@juno.com

Thanks for all the great input. I think I found the majority of the "won't receive" problem. While testing (wiggle the cable a little while measuring) coax cables from the RF deck to the IF deck, I noticed a glitch on P218. Took the connector loose and the center pin fell off the wire ....not soldered, **never been soldered.**

From: "Kenneth" <w7itc@hotmail.com>
Date: Tue, 11 Mar 2003 18:39:17 -0700
Subject: [R-390] Break in function

I have a Receiver Radio R-390A/URR, Electronic Assistance Corporation; Ok I am poking fun with the non-A discussion!) The above radio is hooked to a Johnson Viking II through a TR relay. It does the antenna switching and it has additional connects which I use to operate the break in function on the 390A. I have also have had to use one of its break contacts to shut the speaker off.

The manual, at least what I have found, is not clear as to just how the break in functions. The receiver is muted, however without also turning off the speaker I get feed back. My question concerns the break in relay in the 390A does it just disconnect the antenna, and mute the receiver. Is the speaker muted as well?

When I key the transmitter without disconnecting the speaker I get feedback. I can switch speaker off with the TR relay so this is no problem. I guess what I need to know is the break in on this 390A functioning as it should.

This old Viking transmitter is a real blast to operate, AM phone of course. It is also very touchy and I still have some work to do to it. Can you imagine if a transmitter such a this came to the market today. It takes skill to operate one of these buzzards.

If you don't know what you are doing you can detonate it. Of course this is what make the use of this type of equipment so much fun. Easy to fix as well. These transmitters you have to operate, it isn't like modern stuff which you just turn on and say "HELLO RADIO".

Date: Wed, 12 Mar 2003 10:35:31 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Break in function

Some time ago I wrote a detailed description of the break-in function, with part numbers and such. I can't find it just now but here are the basics for the R-390A:

- The break-in relay coil is operated with 6.3 volts AC filament current by grounding a rear panel terminal, and carries about 40 mA AC when energized.

- The relay will only operate as above if the BREAK IN switch is on the ON position.

- When the relay is energized, it does the following:
1) Grounds the common audio input to both audio preamp stages: line and local
2) Operates the antenna relay to remove the antenna input connectors from the RF INPUT circuits (both Balanced and Unbalanced) and ground both antenna input connectors.

Notes:
- The connections from the audio output tubes to the line or local audiooutputs are not affected.

- The entire R-390A is left fully operating.

- No local oscillators or amplifiers are disabled.

- No changes to the RF or Audio gain are made, except to ground the audio
signal from the detector to the audio amplifiers.

- The grounding of the antenna inputs depends on the condition of the antenna relay contacts and also the condition of the antenna relay supply
rectifier and filter cap (there *is* a filter cap, right?) Low relay voltage may cause high closed contact resistance.

- The reduction in audio signal level toward zero depends on the condition of the break-in realy contacts and grounds in the audio module.

- During "break-in" operation the whole receiver is capable of receiving, except for the grounded antenna input and the grounded audio.

- The break-in relay and antenna relay are hopelessly too slow for real QSK operation.

Subject: RE: [R-390] Break in function
Date: Wed, 12 Mar 2003 10:52:48 -0800
From: "David Wise" <David_Wise@Phoenix.com>

The R-390A antenna relay pulls in to mute. My '54 Motorola is sticky, doesn't always pull in completely in spite of normal coil voltage. I'll get to it soon. You might have the same thing. Hook up a decent amount of antenna. In CAL mode, can you hear stations? You should not hear anything, not even faintly, except the calibrator.

Date: Fri, 16 May 2003 18:27:34 -0500
From: "Robert M. Bratcher Jr." <bratcher@pdq.net>
Subject: [R-390] Below 500khz?

Is there a way to make an 390A receive below 500 khz all by itself? Is it as sensitive as above 500? What happens when you hit 500? It sounds like the audio gets muted but I'm not sure.... If it's not possible then I'll build a converter that puts 0 to 500 between 4 & 4.5mhz.

Date: Mon, 19 May 2003 16:42:49 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Below 500khz?

Yes. An article in Hollow State News detailed the technique, but basically it is this: Disconnect your regular antenna (or pull out the RF Amplifier tube) and attach it or your LF antenna to test point E208 on the RF deck.

>Is it as sensitive as above 500? No.

>What happens when you hit 500?

With the receiver in normal configuration, the front end tuned circuits do not respond well below 500kc.. all signals get attenuated compared to above that frequency.

>If it's not possible then I'll build a converter that puts 0 to 500 between 4 & 4.5mhz.

A number of converters are available to do the job, Heath made one. Look below for reference to at least one converter article. From my collected notes here are a couple of messages from the past:

>Subject: [R-390] Operating the R390 from 0 to .5
>To: r-390@qth.net
>From: "Roger L Ruszkowski" <rlruszkowski@west.raytheon.com>
>Date: Fri, 25 Aug 2000 15:54:25 -0700

>
>Roger,
>I remember that you commented once before that you'd seen the R390A's 0-.5
>band shifted down. But practically, what do you do? I presume that you >tune the tank circuits at something like 100kHz and 400kHz with the >appropriate inductor and trimmer. Then what kind of sensitivity do you get across the band? I do not know I have never measured it. I agree with your next comment. I presume not too good as Collins has a whole radio (R389?) that tunes that 0-.5mHz range in about 7 bands. Can you provide specifics on how to get the 390A to tune below 500 kHz? Tom, W4PG

>Tom, Watch the cams move as you tune from .5 to 1 and then the 1 - 2 cam as you tune from 1 - 2. The .5 to 1 cam will be high at 1 bottom out at .5 and
>then go off high again to nowhere as you tune on down to zero. There is some low point where the cap and slug just will not resonate any more this is the low end of the thing. Or you start loosing sensitivity real quick. Pick a top range point (700KHz). Run the dial over to there and get a good cal zero. Loosen the .5 to 1 clamp and move the cam so this is the high point. and clamp it back down. As you tune over 700 you go over the top of the cam and loose tracking. at 200 you meet the bottom of the cam and loose tracking. Now start to tweak the slug at 250 and the cap at 650. If you run out of slug range before you peak out, then move the cam over a bit to get back in range. This will reduce the range to less than 500. Play with this and then try to go lower in frequency if you want.
>You do not have to keep the band to full width. you can trim the cap and >slugs for some points less on all bands. I have seen a few receivers where >the 4 to 7+000 was tweaked for 7 to 7.5. And where 2 - 3+000 tweaked for 3
>3.5 for ham use. I do not know what is under .5 there is a band down there of interest to hams. It was just some thing we did to a receiver once upon a time because it could be done and we were wondering what we could hear.
>
>From: "Steve Goode" <goode@tribeam.com>
>Subject: Re: [R-390] LW reception on R390A
>
>I would also be interested in any mod for below 500 kHz. I am hoping to >build the LF converter in the April QST.
>
>From: Helmut Usbeck <vze2gmp4@verizon.net>
>To: <cbscott@ingr.com>, <r-390@mailman.qth.net>
>Subject: RE: [R-390] LW reception on R390A
>
>Disconnect your regular antenna and attach it or your LF antenna to

test point E208 on the RF deck. E208 is to the lower right of V201, the RF amp. The setup works pretty good. If you have or can build a LF antenna tuner it's much better. Any of the available published plans of converters will work.

>From: Roy Morgan <roy.morgan@nist.gov>
>Subject: RE: [R-390] LW reception on R390A
>Date: Thu, 02 May 2002 17:14:43 -0400
>
>Yup.. but listening to just 455 kc may be boring.
>A Hollow State News article that may relate to this topic is:
>Issue No 2, page 3. "Longwave Conversion" This may be the article I
>remember, or perhaps there was an Electric Radio article.

Date: Mon, 19 May 2003 19:40:18 -0500
Subject: Re: [R-390] Below 500khz?
From: blw <ba.williams@charter.net>

Phil Atchley was on the list for a while and he did this LF connection per HSN. I sent him copies of the plans. He didn't mention low sensitivity, but he did mention low output on the audio. He liked the radio but he had wrist problems with fine tuning. I tried to tell him to use the BFO more but I don't think he did. I've been DXing LF heavy since last September on a RBL-5 and belong to the NDBList. The big things you absolutely have to have in order to get decent logs are the things we tend to not want attached to boatanchors. One, you need an amplified antenna. Period. I did a winter of DXing with a passive loop of good design, and then bought the Quantum QX Pro loop for this past winter. No comparison! My best log was 5400 miles from S. America. I had some 4000 miles ones. The other thing you have to have is a good filter unit. I used a JPS NIR-12 the first year and almost all of this past winter. I recently bought a used Datong FL-3 that would have upped my logs by quite a lot if I had it when the winter DX was good. This is the last of the analog filter units and is made in England. A lot of my catches are made with a filter setting of around 500 Hz. The audio on the RBL-5 is so good that I can get a lot wide open at 3400 kHz width, but I would miss a lot too. There are normally 4-5 good beacons on any one freq that is propagating well. You can't get those unless you get very narrow with a good loop...imho. I got a lot of catches with the RBL-5/Quantum/NIR-12 that I'm sure were viewed skeptically. Wait until next winter with the FL-3. It is going to be much better over the NIR-12. The thing is, if you just hook up a passive antenna you will log a few beacons. You will get a few more with the winter DX is good, but you won't log 10% of what you can get with an amplified antenna and a good filter unit. As to the R-390A and the Quantum loop, I logged some good beacons down to around 510 kHz last winter, or some freq near that.

They drop off below that freq for a block, but the radio was absolutely superb on those beacons. Very quiet and very sensitive. If only we had a boatanchor LF converter of suitable quality we would have the best LF radio around.

From: ToddRoberts2001@aol.com
Date: Mon, 19 May 2003 22:54:45 EDT
Subject: Re: [R-390] Below 500khz?

LF Engineering makes a great VLF converter that works great with my R-390A. The L-111 is his newest model that up-converts 0-500KHz to the 4.0-4.5MHz band. The converter works well with either a longwire or active antenna/ pre-amplified loop input. You get all the sensitivity and features of the R-390A in the 0-500KHz range while tuning from 4.0-4.5 MHz. Simply ignore the first digit and you get direct

. You can see their products at : lfengineering.com . 73 Todd Roberts WD4NGG.

Date: Mon, 19 May 2003 21:01:51 -0700
From: hankarn <hankarn@pacbell.net>
Subject: Re: [R-390] Below 500khz?

What is wrong with a R-389??

From: "Kenneth G. Gordon" <keng@moscow.com>
Date: Mon, 19 May 2003 22:34:32 -0700
Subject: Re: [R-390] Below 500khz?...R-389...

So does mine: but there were less than 1000 made and most of those are now in museums... BTW, does anyone have a spare UN-DAMAGED PTO for an R-389? I know someone who BADLY wants one for an other wise pristine R-389. Somehow, something stuck in his as it was being motored and it twisted up the insides something awful! He has tried to repair it several times and it is too badly damaged to fix.

From: "Phil Atchley" <k06bb@elite.net>
Subject: RE: [R-390] Stinkin' PTO !!
Date: Sat, 28 Jun 2003 18:07:30 -0000

Hi John. Yes I have a similar box that I built, perhaps a little more elaborate. Mine is in a double shielded box and generates markers at 10. 5, 2 and 1MHz as well as 200, 100, 50 and 25KHz, switch selectable via a rotary switch the actual switching done through CMOS switches so I can run just DC control lines into the "inner sanctum". The output level is variable by a Potentiometer that feeds a 10dB pad to insure a pretty

decent match (20dB return loss minimum) to 50 Ohm receiver inputs. It has aligned many a receiver! Right now I think I have a one or two bad CMOS switches as some ranges don't work, although I can get 25 KHz out of it indicating all dividers are working properly. Luckily all IC's are socketed! The thing works surprisingly well! However, to align a PTO it is much easier to use a counter (best) or "standard" receiver as the PTO is a generator in its own right.

Date: Tue, 08 Jul 2003 19:44:25 -0500
Subject: Re: [R-390] CL80....
From: blw <ba.williams@charter.net>

My SP 600 drifted a lot all the time when I first got it. I replaced the OA2, forget the location number, and it stopped most of the drift. I didn't use the radio for a few months, came back and fired it up, and it hasn't drifted since that time. I scratched my head a few times over this but I ain't complaining. <snip>

Date: Wed, 9 Jul 2003 08:31:56 -0700 (PDT)
From: <jlap1939@yahoo.com>
Subject: [R-390] OA2 and Freq. Readout

Thanks to Barry (non) for the OA2 suggestion for a drifting 600. I had several and traded out and guess what? MUCH BETTER...(which is why I am thanking him on list- someone else may benefit, as I tried it and got a great result..) As for freq. readout, I was kidding about blasphemy regarding a modern readout...I realize it is needed on the 600..and I would not mind having one myself, for that matter..

Date: Wed, 09 Jul 2003 18:54:16 -0500
Subject: Re: [R-390] OA2 and Freq. Readout
From: blw <ba.williams@charter.net>

It would be okay if you were serious. Some folks are purists and I can understand that. The meter does look out of place next to the beautiful dial on the SP. Les (the witch) told me about swapping out the OA2 when I talked to him about the radio.

Date: Thu, 10 Jul 2003 19:23:57 -0500
Subject: Re: [R-390] OA2 and Freq. Readout
From: blw <ba.williams@charter.net>

I think I put in a used OA2 from that deal on pulls about 2 years ago. A few people on the list contacted me and ordered from that guy. I got about a dozen of them and a lot of other R-390A tubes. Anyway, it works like a champ now. I think those tubes were only a dollar each, or something like

that. Thanks for that advice on drift. I put the radio back in the Bud cabinet last night.

From: "Phil Atchley" <k06bb@elite.net>
Date: Fri, 11 Jul 2003 19:08:24 -0000
Subject: [R-390] 3rd Mixer NOISE in R-390A.

I was going to align this '67 EAC before putting it in one of the listening positions. However, another problem has reared it's ugly head. I mentioned this briefly the other day but "thought" the problem went away. When first turned on and it's "come to life" it is quite noisy, especially of there are no signals to cover it up. Any decent signal will cover it but that's not good enough for me. After the set has run awhile it seems to abate. I've traced it to the 3rd Mixer as pulling that tube OR disconnecting the PTO (and shorting the jack to complete the cathode circuit) clears it up. IF I pull the 2nd mixer it has no effect on noise level so it's between the two units or in the 3rd mixer itself (noisy resistor or capacitor). Since I had to spend significant time and work in the PTO I thought that might be the problem. However, listening to it on an external receiver shows no noise on the Oscillator. Anyway, it looks like the RF deck is going to have to come out of this receiver again. WHAT I KNOW IT'S NOT!

1. NOT a tube, all have been checked AND subbed.

2. NOT the PTO, at least it 'seems' quiet and stable.

3. Not the power supply filters, they've all been replaced.

QUESTION. Has anyone else had problems with noise in this particular circuit and if so what did you find bad? And lastly. This receiver seems to be exceptionally sensitive, even for an R-390A. Running the front end "noise test" (using line meter and peaking the Antenna trimmer) it seems to be better than 10 dB. This AFTER the warm-up noise cycle has abated.

From: "Jim Miller" <jamesmiller20@worldnet.att.net>
Subject: Re: [R-390] 3rd Mixer NOISE in R-390A.
Date: Fri, 11 Jul 2003 16:05:40 -0400

Some ideas::

(1) Bad resistor or capacitor around mixer circuit, or elsewhere in RF deck. I have found the usual suspects to be screen resistors and capacitors, cathode resistors, plate resistors...anything that handles "power". They will tend to change behavior as they warm up. Your Rx seems unusually hot (sensitive). That could be a clue. The gain of 3rd mixer or another

stage is abnormally high maybe? Is AGC working properly in the RF deck? Bad AGC resstor or cap maybe?

(2) Loose screw or hardware, usually the screws that hold the tube sockets or ground lugs. They loosen with repeated temperature cycling. Tighten them all.

(3) Noisy or corroded switch contacts on the RF deck switch wafers. Carefully clean with deoxit but don't get any on the wafer material itself...it can act as a "load" in the high impedance circuits. In fact, AGC behavior can be reduced if you're too liberal with cleaners or lubricants in and around switch wafers and the Ant. Trim gears.

Date: Fri, 11 Jul 2003 18:31:49 -0400
From: Jim Brannigan <jbrannig@optonline.net>
Subject: Re: [R-390] 3rd Mixer NOISE in R-390A.

I had noise in my '67 EAC third mixer. On inspection it was a 6BE6 mixer instead of a 6C4. (and you had this radio how many years, Jim?) I replaced the 6BE6 circuitry with the proper 6C4 components and that cured the problem. I don't know which resistor or capacitor was the culprit, but there are only a few components in the mixer, so replace them all.

From: "Phil Atchley" <k06bb@elite.net>
Date: Mon, 14 Jul 2003 23:05:41 -0000
Subject: [R-390] My 'new' '67 EAC is now "on line" 8^) Ballast Tube question.

<snip> Only one minor glitch was noted during alignment. The 28 MHz band was dead,
removing its Xtal and tightening up the pins of the socket cleared that problem. Whew, thought I had a bad Xtal at first. <snip>

From: "Barry Hauser" <barry@hausernet.com>
Subject: Re: [R-390] My 'new' '67 EAC is now "on line" 8^) Ballast Tube question.
Date: Mon, 14 Jul 2003 19:37:14 -0400

<snip> I've found the same thing as well as some bad xtals here and there. The crystal sockets vary, but not the greatest in the later receivers. Probably the stamped cupped type. Not much contact area and metal is none too springy. Fix is easy. You probably just staked them down a bit. Was it just the 28 MC band? Is that the one solo crystal -- usually two or three bands are involved. Anyway its fixed. They tend to loosen up when the radios are moved or shipped and the crystals actually wobble in those

holders. Further compromised as a tiny bit of oxidation will cut them out.
<snip>

From: "James Bischof" <jbischof@nycap.rr.com>
To: <r-390@mailman.qth.net>
Date: Thu, 17 Jul 2003 12:30:09 -0400
Subject: [R-390] crystal pack adjustment

Crystal pack r390a, there is a transformer how do I adjust for highest out put. I know that if I turn the transformer I get higher out put. There must be some reference point cause one can adjust the trimmer capacitors for highest out put. So what I think in need is a reference point before I adjust the trimmers.

Date: Thu, 17 Jul 2003 13:29:11 -0400
From: Gord Hayward <ghayward@uoguelph.ca>
Subject: [R-390] Re: Crystal Oscillator Coil Adjustment

When I rehabilitated my R390A I asked the same question. The advice (good) was that because the resonance depends on both L and C, if all the trimmer caps give a peak not at the end of their ranges the coil is set right. If one cap hits the end before it peaks, then adjust the coil a bit and realign ALL the others again.

From: "James Bischof" <jbischof@nycap.rr.com>
Date: Fri, 18 Jul 2003 13:20:58 -0400
Subject: [R-390] crystal pack

Gord, this is what I did. I tweaked the nine megahertz crystal trimmer capacitor and at the same time kept adjusting the coil back and forth to see which gave me the highest out put. Then I tweaked the rest of the trimmer capacitors.

From: "Phil Atchley" <k06bb@elite.net>
Date: Wed, 23 Jul 2003 02:22:15 -0000
Subject: [R-390] Did the LF Mod today. . .

Hi All. Today I finally got around to doing the LF mod to my R-390A. Now before any of you scream bloody murder, holler "Blasphemy" etc let me hasten to add that this is a simple no holes drilled no soldering to the radio mod. It simply consists of a small piece of PC board containing two capacitors and an RF choke which comprise a LP filter/matching section. On the output side of the PC board is a short piece of hookup wire that pokes into pin 7 of tube socket V202 (1st mixer cathode). The input side is the coax cable that connects to your LF antenna. In operation there is no switching involved as the LF input comes into play below about 500

KHz (actually is usable above that frequency). For the input Coax lead I used the old Coax cable with mini BNC that was removed from the parts PTO where it had cracked at the PTO body. It was long enough to reach the BNC 455KHz IF output jack and that is what I used for my LF antenna input. The actual mod suggests using the "Whip" jack for an LF input but it's an odd connector!

How does it work? VERY WELL, right down to 10KHz the lower limit of my LF tunable preamplifier. Oh yes, sensitivity at the input to this mod is very low as you're bypassing the RF amplifier tube and feeding the cathode of the first mixer. I have a 35 dB Tunable pre-amplifier which also contains a 500 KHz low pass filter. With that unit the R-390A makes a decent LF set. BUT, it is a little tedious on the wrist if you chase beacons for lone periods of time like I do!)

Date: Tue, 22 Jul 2003 22:22:45 -0500
Subject: Re: [R-390] Did the LF Mod today. . .
From: blw <ba.williams@charter.net>

Knowing how those beacons cluster up I suggest using the BFO knob a little to go up and down some to fudge on the tuning. This should be your 'fine tuning' method to save on the wrist. I did catch a few above 500 beacons with my stock PH-56 with the Quantum loop. Wow. That was a great night. I did the same thing with the BFO tweaking.

From: "Phil Atchley" <k06bb@elite.net>
Subject: RE: [R-390] Did the LF Mod today. . .
Date: Wed, 23 Jul 2003 17:03:29 -0000

Hi. Right now I'm using a slightly modified version (Varactor tuned) of the "Universal Preamp" that is on one of the Lowfer sites. I don't have the URL right now but a Google search for Universal Preamp always brings it up. I 'think' it's on Lyle's Lowfer site. I also have a homebrewed 500 KHz Lowpass filter that can be switched in before the preamp which is part of a homebrewed multipurpose antenna/receiver control box.

Date: Thu, 24 Jul 2003 13:34:59 -0400
From: AdamAnt316@aol.com
Subject: [R-390] Crystal calibrator issues on some bands

Hello everyone. Today, I attempted to calibrate my 390A while listening to 16M, but discovered that I wasn't getting any 100KC markers on the 17MC band. I then decided to see if any other bands weren't getting the markers, and discovered that bands 16 through 24 do not seem to have the calibration points, while at least most of the other bands do have them. What could be causing this, and how hard is it to find the required

parts?

Date: Thu, 24 Jul 2003 14:46:40 -0400
From: Glenn Little WB4UIV <glennmaillist@bellsouth.net>
Subject: Re: [R-390] Crystal calibrator issues on some bands

Do you still receive signals on the bands that you cannot hear the calibrator?
If so possibly the tube for the calibration oscillator is weak.

From: "John KA1XC" <tetrode@comcast.net>
Subject: Re: [R-390] Crystal calibrator issues on some bands
Date: Thu, 24 Jul 2003 14:54:22 -0400

You can be rest assured that if your 100 kc calibrator is working at all, then it is supplying calibration harmonics to all the bands, including the ones that are giving you difficulty. So that means something is up with the 16-32 MC slug rack or RF coils. If some of these bands work and the others don't, most likely you have a mechanical or electrical alignment problem. Take a look at the slug rack while you're tuning or changing bands and make sure it isn't hanging up
somewhere. Did the 16-24 MC bands ever work? Can you hear any signals?
Also, try turning on the BFO and crank the gain all the way up and give another listen for the calibrator signals; they may be there, just very weak. This should help get you pointed in the right direction.

From: "RJ Mattson" <rjmattson@hvi.net>
Date: Sun, 27 Jul 2003 10:05:29 -0400
Subject: [R-390] R390A Crystal Osc subchassis

I have removed the RF and IF/xtal osc subchassis for recapping. I notice that the Xtal osc bandswitch contacts are slightly off center in making contact. My mechanical head says loosen the shaft coupler and center the contacts and retighten? Will this solution cause another problem I am not aware of? Scaredy cat first timer,
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From: "Jim Miller" <jamesmiller20@worldnet.att.net>
Subject: Re: [R-390] R390A Crystal Osc subchassis
Date: Mon, 28 Jul 2003 00:15:25 -0400

If it works best leave it alone. There is a bit of "play" in the switch. If you turn the shaft clockwise, you will notice the contacts slightly off center toward one edge. If you turn the shaft CCW, the contacts will be slightly offset toward the opposie edge. If you try to center the contact, this free play may cause misconnection as you change direction in the band

switch. BTW be very careful in cleaning the contacts. They bend very easily.

[the next five posts are also located in the PTO chapter]

From: "John Page" <k4kwm@hotmail.com>
Date: Wed, 30 Jul 2003 02:00:27 +0000
Subject: [R-390] bottom 200 kc dead

My Collins R390A just suddenly developed an odd ,to me, problem. It suddenly decided it would not receive anything from X.200kc down. This on ALL bands. Really didnt have a clue as where to start as signals from 200kc up were great. It was as though you flipped a switch when you tuned below 200kc on any band. I did check all tubes. Just to try something. All checked good. Thought a cam had slipped so I compared it with my stewart Warner which works great. All seemed ok. Had a occasion to be talking to Jim Garland W8ZR this evening and he thought I should check out the PTO. Jim knows his stuff so I went home and decided the easiest check was a new PTO tube. WOW it works. Old tube still checks good and returning it to the PTO brings back the problem So Thanks Jim, you fixed it. Not sure why that happens but at this point, who cares. Just wanted to share this with the group. Might be some newbys to 390's like me on here.

-

From: "g4gjl" <g4gjl@btopenworld.com>
Subject: Re: [R-390] bottom 200 kc dead
Date: Wed, 30 Jul 2003 09:17:02 +0100

I had the same problem, and it turned out to be the 6BA6 in the PTO had gone
low emission. Change it before you look any further.....could save a lot of time!

From: <Tarheel6@msn.com>
Subject: Re: [R-390] bottom 200 kc dead
Date: Wed, 30 Jul 2003 09:01:51 -0400

Check the mixer rack and slugs to the right, rear of the rf deck. Usually when something like you experienced happens to me, I find that the rack is sticking. It may be a subtle binding, so look very carefully at whether the rack is moving through its entire range.

Date: Wed, 30 Jul 2003 09:59:07 -0400
From: tbigelow@pop.state.vt.us (Todd Bigelow - PS)
Subject: Re: [R-390] bottom 200 kc dead

Thanks for posting this, John - these are the kinds of things you'd (we'd?) not normally associate with this behavior (I was thinking something along the lines of a crystal problem). Just goes to show, you can never trust a tube even if it checks 'good'. There's a reason why they list "substitution with a known-good substitute" as being the best method for testing a tube or given circuit.

Subject: RE: [R-390] bottom 200 kc dead
Date: Wed, 30 Jul 2003 12:26:05 -0700
From: "David Wise" <David_Wise@Phoenix.com>

I bet that PTO has FC-7 installed.

From: "Drew Papanek" <drewmaster813@hotmail.com>
Date: Thu, 31 Jul 2003 14:01:27 -0400
Subject: [R-390] Bottom 200Kc Dead

<snip> it would not receive anything from X.200kc down. T.....

As Dave Wise (he truly is) pointed out, your PTO may have Field Change 7 installed. That changes the value of the screen resistor with the intent of reducing radiated signal. Low(er) screen voltage may cause the problem you described. Someone else had the same problem a while back. The cause turned out to be low PTO tube heater voltage caused by a defective BallasTube. Replacement of the 6BA6 was the temporary solution. Verify correct heater voltage at PTO tube with tube in socket. Those BallasTubes can fail in ways other than going open, and some were out of spec to begin with.

From: "g4gjl" <g4gjl@btopenworld.com>
Date: Thu, 13 Nov 2003 22:04:51 -0000
Subject: [R-390] LF on the R-390 etc

I know there have been several solutions to the problem of wanting to receive MF/LF/VLF on the R-390 series. I tried the cheat wire into the RF Deck test point and whilst this works, there are birdies introduced by that mod and it affects the HF performance adversely. The solution I use instead is an outboard convertor from the Jackson Harbor Press see: http://jacksonharbor.home.att.net/lfconv.htm

I built the PCB's inside an hour and had the convertor working fine immediately on power up. Its is very economical at USD15 shipped to UK...less if you are in the USA! The unit has an IF amplifier and has ample gain, without overloading the front end of the receiver. There are 7, 10

and 14MC IF versions available. I chose 7MC and was surprised that there is little if any discernable HF breakthrough, and I'm using a 40 metre resonant dipole as the LF antenna.
I think this little kit represents the best soultion I have seen so far...It receives Alpha down at about 11.1kc and othere stations well up above 500kc, the 'official' lower limit of the R-390 series. It is really something to hear the VLF Alpha at 7011 kc on the Veeder Root of my R-391! Saves 6U rackspace for an R-389 too! I have no connection whatsoever with the supplier: Im just a very satisfied customer.

From: David Hallam <dhallam@RapidSys.com>
Date: Mon, 22 Dec 2003 08:50:24 -0500
Subject: [R-390] R-390 VFO

I am looking for advice. The VFO in my R-390 has quit working. From a completely cold start, it will for a minute or two and then quit. I have done the obvious of checking the tube; it tested OK, substituting a couple of different ones, and checking the connection in the power and RF sockets. Any advice on where to start looking for the problem?

From: "JamesMiller" <jmiller1706@cfl.rr.com>
Subject: Re: [R-390] R-390 VFO
Date: Mon, 22 Dec 2003 20:09:47 -0500

How do you know its the VFO and not something else? Did you look at the VFO output level? Or if the radio just quits receiving, it could be some other things. If you are sure it's the VFO, look at the filament. All the oscillator filaments are regulated through the IF module's 3TF7 "ballast" tube. If that tube is flaky, or the IF connector is loose, it can cause the oscillators to shut down due to loss of filament voltage. May be heat related... could be a component beaking down with increased temperature. You could try this: Let it warm up, when it quits, use some freeze spray (from Radio Shack) to cool own different areas.. such as the compartment underneath the tube...if it starts up again, then something is bad under or around the tube socket. If it's something inside the sealed can then that's another matter. Also, tighten the screws holding the tube socket, they could be loose. Hopefully it's not a cracked coil slug expanding as it heats.

Date: Thu, 08 Jan 2004 20:27:19 -0600
From: Mahlon Haunschild <mahlonhaunschild@cox.net>
Subject: [R-390] I just HATE it when this happens...

Hi. Well... umm... OK, here's the story:

Colleague of mine accosts me four/five months ago, asks "You do something with R-390s, don't you?" I cautiously assent that I have been

known from time to time to dabble in old tube radios, and one of them was indeed the R-390A (over the years I've learned not to admit too much in such conversations, you see). Colleague owns up that he has an R-390 that's been in the attic for ten years, would I be interested in it? I allow as how I wouldn't mind taking a look at it. What next? So, he's got me thinking about this, and time passes, and I think he's forgotten about me, and I meet up with him again, and remind him, and, well, it takes him until today to get the receiver to me to take a look at.

Finally got it home & stripped the covers off of it this evening. Get this: it's all Collins, from the '55 contract. Correct silk-screened front panel in nice shape, considering it's almost forty years old. Original Simpson meters. Interior is surprisingly clean except for the crud that filtered through the slots in the top cover onto the IF and crystal oscillator decks.

Incredibly, both electrolytics test OK on my capacitor checker (they are Spragues, which seem to last longer than others I've seen). Looks like some conscientious maintenance activity has applied most of the field changes, including replacing the rectifier tubes with s/s rectifiers.

Dymo tape on top cover (yes, has all three covers) leads me to believe that it has the 7/74 HR product detector mod (haven't pulled the IF strip yet, so don't know for sure).

Now for the bad news: the gear train is super-clean, but bone dry. No grease, no oil. That's bad, because just about every split gear spring and the Oldham coupler spring is corroded rotten. Where can I get some of these?

ALso, because of its vintage, it needs a cap kit to replace all of the BBsOD. I can't imagine that they all survived ten years in a Florida attic without some major "life changes", if you know what I mean. So, the question I'm faced with tonight is: do I buy it? As if I need another one of these (I've already got two, after all). MOMMY! HELP ME! I'M SO CONFUSED!!!!! :)

Date: Fri, 09 Jan 2004 10:36:29 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] I just HATE it when this happens...

Of course you buy it. Just don't pay $650!! The springs you can likely get from Small Parts, Inc., though I have not run down the correct size, length or other details for those springs. **http://www.smallparts.com/**

This page describes Beryllium Copper coil springs..the smallest is .073" OD and .37" long. Someone should measure the springs we are looking for and post the measurements, diameter and free length. The number of

coils may matter some what. These things seem to be around $2 each, and I am sure we can find sources for much less.
http://www.smallparts.com/products/descriptions/cs.cfm

On the other hand, if you extract the springs you have, treat them with rust remover (I have has some success with "CLR", Corrosion, Lime, Rust Remover) you may find that they work just fine.

From: "bernard nicholson" <vk2abn@batemansbay.com>
Date: Fri, 9 Jan 2004 22:50:17 +1100
Subject: [R-390] Re: R-390 digest, Vol 1 #950 - 5 msgs

About the problem with corroded springs etc, Fair Radio in Lima, Ohio has the RF deck and gear assembly for around $40,..... <snip>

Date: Sat, 31 Jan 2004 01:45:33 -0600
From: Tom Norris <r390a@bellsouth.net>
Subject: [R-390] wrong part in RF deck found

This is an addendum to my last post about poking around the RF deck of the 63 Imperial -- I found a wrong part that looked as if it were there from production. C275, originally a .005 mf, changed to .003 mf somewhere along the lines according the mod notes in the TM. In mine it was a *.033 mf* big old paper cap. It's just a bypass on the B+ to the first mixer, but still... That big sheep lovin' BBOD appeared to have been there since the deck was put together and not just a maintenance mistake. In fact the whole radio doesn't look like it saw much use or maintenance at all. Other than a big Navy ID tag glued on the front, along with an engraved tag that says "RCVR 1" under the KC knob, the thing looked like it just came out of its crate. It's worked fine for me the past ten years or so, so it should keep on ticking for quite a few more years.

From: "JamesMiller" <jmiller1706@cfl.rr.com>
Subject: Re: [R-390] wrong part in RF deck found
Date: Sat, 31 Jan 2004 05:41:31 -0500

It is SUPPOSED to be 0.033 according to common wisdom, so it was assembled correctly. Maybe the schematics are printed wrong in some cases, showing an incorrect value of 0.003. When you thnk about it, a B+ bypass should be hefty in value, like 0.01 to 0.05. The smaller value .003-.005 doesn't make sense. Put a 0.033 Orange drop in there.

Date: Sat, 31 Jan 2004 16:59:56 -0600
From: Tom Norris <r390a@bellsouth.net>

Subject: Re: [R-390] wrong part in RF deck found

If you look at the schematic of the RF deck, the rest of the bypass caps are 5000 pf . Looking physically at the deck, the rest of the caps are .005 ceramic disks. In fact, if you look through the R-390A, .005 mf is the value of the majority of the bypass caps used in the RF, Osc, mixer and IF circuits. With only a couple exceptions, that is the value used through about the 4th IF amp. The R390 non-A was apparently designed using more common wisdom, as it is chock full of more normal values like .01mf.

The pictorial in all the manuals I have shows it as a ceramic disk instead of a BBOD. It has been a couple years since I have even had an RF deck apart, so I don't remember on the if the older pre '54-55 decks had R-275 at this value or .033.

In the original schematics, this cap is marked as a 5000 pf cap, but the later manuals list the MOD note that it was changed to 3300. Online MOD notes, such as Chuck Rippel's site has posted, list this value (3300) as well. If it was a mistake, it has made it to every version of the schematic I have from the original '51 to whatever the latest revision is. The latest Army manual, change 4, 1988, does not have the value corrected to what "common wisdom" says it should be.

All that being said, I seem to remember that there was a discussion on the list years ago 'bout this very same issue. Couldn't find that thread in the archive. Maybe is really is *supposed* to be what was in there. Regardless, I replaced the thing with a .033 film.

From: "Michael Murphy" <mjmurphy45@comcast.net>
Date: Fri, 9 Apr 2004 11:16:39 -0400
Subject: [R-390] R390A Basics Finished

Well folks, I have finally completed the basics on my 1960 Stewart Warner. This radio had good synchronization and basically worked on all bands like a normal radio. All tubes were tested as good. I had five problems which were driving me nuts:

- 1. The classic stuck ON power microswitch
- 2. I had a weak band (8-16 MHz) with no antenna trimmer action
- 3. Sensitivity to varying wildly day to day. Shorting the hot plate trimmer
  on the RF coils to ground (Z20x series) would temporarily fix the problem -
  spark!.
- 4. Cal signals weak.
- 5. I had a a weird audio gain control problem at the top of the range

and
generally low audio gain.

Anyway, I did the did the basic IF Module and Audio Module cap and resistor
changeouts and pulled the front panel and did the RF Deck. The power supply was inspected but not touched. 149.9 Volts on E-607. I also did the typical gearset cleaning using Mystery Oill and a lube with Mobil-One. The thing was reassembled. I then did a quick tune up per the manual.

The results: <snip>

Weak Band - After re-furbing the RF Deck and reinstalling everything, the Front End coil assembly was removed from the top of the deck and dis-assembled. I simply hit the trimmer with deoxit and cleaned the contacts. The band came back and the front panel trimmer now worked on that band.

Intermittent Sensitivity - The paper caps changed in the RF deck apparently fixed this. Just as a precaution, I changed several of the 0.005 1KV caps around the RF amplifier too. No idea which one fixed it. Found a weird thing at C257. It was a 47 pF NPO dogbone cap but no C227 at all. I added C227, 0.047 uF in parrallel with it.

CAL Marker - Besides replacing the paper caps and a couple of 1/2W resistors, I found that the resistors in the plate circuit of the multivibrator, R224 and R226 were pretty much cooked and double value so I replaced them with 10K, 1 Watt flameproofs. <snip>

Date: Wed, 16 Jun 2004 17:08:45 -0500
From: Tom Norris <r390a@bellsouth.net>
Subject: [R-390] DSP 390... hmmm

Found on the boatachor list, posted by Chuck Swiger -- Now here's an idea. I use my 756 Pro to demod the IF out every now and again, but this looks like it might be fun. Tom NU4G

>From: cswiger <cswiger@widomaker.com>
>To: Old Tube Radios <boatanchors@theporch.com>
>Subject: R-390A to digital signal processing

>Gang - Here it is, someone with an R-390A, a downconverter to~13 kHz, pc
>sound card and from there on out it's all in software.
>http://www.detomasi.it/en/project.html --Chuck

Date: Thu, 17 Jun 2004 09:59:00 +0200
From: "Bryce Ringwood" <BRingwoo@csir.co.za>
Subject: RE: [R-390] Don Reaves - SAQ 2004-07-04 (Dumb question)

No R-389 :(. Planning to use a sound card with a tuned filter ahead of the microphone input + software. Dumb question - how does one set about winding the VLF coils - ? Are they just pile wound on a transformer core (leaving an air gap) like a power supply choke, or are they just like MW universal windings with lots of turns what do members suggest ? What do radios like the R 398 use? Sorry for the simple questions, but I suffer from dark ignorance concerning VLF. Don't even know if VLF from Grimeton will cross the equator. - Bryce

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Date: Sun, 20 Jun 2004 16:47:20 -0500
From: "Lee Bahr" <pulsarxp@earthlink.net>
Subject: Fw: [R-390]

I went to the Arlington Ham Comm in Texas yesterday and bought my third R-390A. It was a Motorola, serial # 1587. All meters are intact but the chap who sold it to me for $250 said it does not work on all bands and he didn't know what was wrong with it. He said he found it in a corporation's disposable pile. Now I have 3 of them to restore! (The other two are EAC units). The Motorola unit looks clean and the front panel is nice but not perfect. All the covers are there. What would be the most logical reason for some bands not working? I guess crystals would be suspect and maybe switch contacts, if nobody was screwing slugs around in the unit. (I'll check to see if rack coil slugs are moving). Also, what do you guys think of the latest Electric Radio's article (June, 2004) on improving R-390A audio? I'm thinking of trying this if I ever/when get my radios up and running, I just ordered the two sets of Hi-Res videos on the R-390A as well as the set for the SP-600JX but they have not arrived from Hi-Res as yet. My two cap kits for my first two R390As have been sitting on the work bench for weeks now. Maybe the videos will get me going!

Date: Sun, 20 Jun 2004 18:10:26 -0400
From: Glenn Little WB4UIV <glennmaillist@bellsouth.net>
Subject: Re: Fw: [R-390]

Check the input coils for the bands that do not work. I have found these to go bad, probably from a close by transmiter when they saw their first life. Hope it is this simple.

Date: Sun, 20 Jun 2004 17:34:35 -0500
From: Tom Norris <r390a@bellsouth.net>

Subject: Re: Fw: [R-390]

Before checking if the coils are blown, make sure the slug racks move as they should. Sometimes one of the clamps that hold the gears onto their shafts can break. Think Hank Arney has the clamps if needed. Next step is to see which bands it does not work on if the slug racks are indeed moving. Crystals do go bad every now and again. Most I have found that did not receive on several bands either needed gear clamps or a good alignment. The Chuck Rippel video will painlessly step you through a complete alignment, it goes into great detail and is a good investment if you have not messed with these receivers before.

Date: Sun, 20 Jun 2004 20:00:14 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390]

Hi The first thing to do is to figure out *which* bands it does not work on. If it's just random bands here and there with none of them next to each other then the crystal oscillator tube may be the problem. If it's one of two random bands then it *might* be a crystal but I have never seen more than one or two bad crystals in any one radio. My bet would be that you will find that all the bands above or below X don't work or that all the bands between X and Y don't work. Since some tubes are only used on some bands you can't even rule out a dead tube. II would bet you have a dead coil somewhere in there. Best bet is always the input coils. Between lightning and high power transmitters the input coils sometimes lived a short and sweet life. Next best bet is that the 17 MHz oscillator has died and everything that uses it is out. If it's input coils there are sources for RF decks complete with all the coils in them. If you have several radios to work on it may not be a bad way to go. If it turns out only one or two coils then I suspect that you can get them here on the list for a lot less than the price of a RF deck.

Date: Sun, 20 Jun 2004 21:21:50 -0400
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390]

There are a number of things that can cause a "some bands syndrome". You need to list out exactly which bands don't work. Step through them looking for known, identifyable signals, like WWV, etc. or whatever makes sense on that band. Severe misalignment can cause some signals to turn up in the wrong places, giving the impression that a band is working. If it's a matter of totally dead bands, you can use the calibrator.

You'll should also refer to the manual's explanation of the vs. triple

conversion, and the bands vs. crystal schemes for the crystal oscillator deck. You should also "walk through" the mechanical alignment process. Chuck's tapes are great, but are not stand-alone references when it comes to this detail.

Based on what bands are not working (an odd handful, vs. all those over 7 MC's, etc.) you can often "noodle out" the likely culprit. I've found as many as 3 bad crystals and each one covers more than one band. Sometimes the crystals are good, but the pins and sockets may have some corrosion or not make a tight fit. A dose of Deoxit is in order. A bad or weak tube can do it. You could have a combination of a couple of these minor problems which will render an odd bunch of bands inoperative.

While walking through the alignment, do a close eyeball inspection of the geartrain and slugracks. As someone pointed out, it can be caused by a loose or broken gearclamp. I've found that a hanging slugrack can cause all kinds of dead band patterns. When stepping through the MC bands, the slugrack tracks the cams on the upstroke, but hangs up partway down on the downstroke. It sits there and then re-synchs itself on the upstroke again. It's hard to spot at first -- work the MC's through the full range -- up and down. As the appropriate slugrack(s) are on the downstroke, watch that the cam followers (little rollers) are actually riding on the cams an not floating at some point. If one does hang, unhook the springs and carefully lift it out. Dust off the slugs -- no need to use anything on them. Blow out or swab out the coils. Line up the slug springy-thingies -- if they are all over the place then you can gently bend the springies or use the lateral adjusters. While the rack is out of the deck, it's also good time to make sure the cam follower rollers spin freely. Drop it back in and check it without replacing the hold-down tension springs -- it should nearly work with gravity alone. If all is well, reinstall the holddown springs.

Spotting a broken or slipping clamp takes a good eye. A similar part-cycle effect can occur as with a hanging rack. The resistance on a particular gear can be low through part of its rotation and it will turn. Then it gets to a higher resistance point and slips. A relatively slight misalignment of the bandswitch can also cause a mix of dead/live bands.

So, through a combination of "noodling" - logical-deductive analysis with the manual in hand, and tinkering, as per above, you should be able to zero in on the problem. Most likely it's something simple -- once you find it. Barry

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Date: Wed, 01 Sep 2004 14:37:07 +0100
From: Charles B <ka4prf@us-it.net>
Subject: [R-390] Frequency meter

Is there any place inside the R-390A where a frequency meter can attached to get a frequency reading?

Date: Wed, 1 Sep 2004 11:10:39 -0500
From: mikea <mikea@mikea.ath.cx>
Subject: Re: [R-390] Frequency meter

Well, yes. But what frequency do you want to read? If it's the freq that the radio is tuned to, I don't remember anyplace with an osc that puts out _that_ freq. You'll find frequencies that are _related_ to it, but not in any way that'd be obvious just from taking a freq reading at one point.

http://mikea.ath.cx/R-390A/TM_11-5820-358-35.pdf,

the Field and Depot Maintenance Technical Manual, is a really good place to look for what you can expect to find -- especially around pp. 4-5 of the manual (pages 18 and 19 of the PDF).

Date: Wed, 1 Sep 2004 09:20:06 -0700
From: "David Wise" <David_Wise@Phoenix.com>
Subject: RE: [R-390] Frequency meter

Theoretically, yes. It's harder than it sounds.

Within any one 1MHz band, it's easy to snoop the VFO output, and there are companies selling display modules just for this purpose, which can be programmed with an offset to account for the target receiver's frequency changer topology. However, in addition to not giving the full story, this ignores the inevitable inaccuracies in the 1st and 2nd crystal oscillators, which vary from band to band. This is the main reason the radio contains a 100kHz marker. To get a true readout, you'd have to snoop all three oscillators and either mix them, or measure each and combine the results digitally. As a compromise (the best possible one to my way of thinking), you could read the VFO alone, provided your readout module had a "Cal" button to press after calibrating the radio when you change bands. This button would cause the readout to snap to the nearest 100kHz value. I doubt there is a pre-built module that does this, but it would make a *very* interesting project. There are a few R-390x variants out there that bring all three oscillators out to the back panel, so at least you wouldn't have to hack the radio, but you'd still have to combine them, and in any case you will have problems with RFI unless you're very careful with shielding.

Date: Wed, 01 Sep 2004 18:22:28 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Frequency meter

As the other posts have mentioned it's not a simple thing. A lot depends on how accurate you want to get. RTTY and SSB are the two things that most people would like to tune accurately. With AM the bandwidth of the filters makes a 10 or 100 cycle error a lot less important. If you are going to tool up to do a full readout for SSB or you would need to measure:

1) The first crystal oscillator
2) The second crystal oscillator
3) The VFO
4) The PTO

The digital stuff to do that isn't terribly expensive these days, but it does make noise. Once you had all the frequencies measured then oddly enough you would have to know what band you are set to. It turns out that several of the crystals are used for more than one band so there is no direct and simple way to guess the band in every case. That all sounds like a lot of work and I'm lazy. If I was going to do it I'd fake it: No matter what you need some way to track the band switch. Say we slave a pot to the shaft and measure the resistance. The 17 MHz ovenized crystal isn't going to drift much I would simply measure it's frequency with a bench counter and store the result somewhere. The same thing is true to a lesser extent for the crystals in the crystal deck. They do drift but maybe by sixty cycles. I would just measure them and store their frequency as well.

That gets us to the BFO and the PTO. There is an old military mod that puts a multi turn gear drive and readout on the BFO shaft. The net result is the ability to reset the BFO very accurately. If you can lock down the BFO shaft fairly well
(maybe mechanical detents) you can get around reading the BFO. All that's left is the PTO. You can either count it's frequency or try the slave a pot to the shaft trick. The cute thing about doing it al with pots would be that you have no RF
counters at all. You are dependent on the radio not drifting but that's what the 390 is known for. Definitely a bit far from the "well enough alone" zone thought ....

Date: Wed, 1 Sep 2004 18:59:59 -0400
From: "Michael Murphy" <mjmurphy45@comcast.net>
Subject: Re: [R-390] Frequency meter

Here are a few links. The DFD series is popular. MM WB2UID

http://www.aade.com/dfd.htm#prices
http://www.eham.net/reviews/detail/1457
http://www.ohr.com/dd1.htm

http://www.radioadv.com/ham_radio_equipment/FreqMC/A2.htm
http://www.qsl.net/k5dkz/r4digital.html
http://www.circuitsonweb.com/resources/Projects/fc50.html
http://www.aade.com/Applic~1.htm

Date: Wed, 1 Sep 2004 20:44:58 -0700
From: "Dan Merz" <djmerz@3-cities.com>
Subject: Re: [R-390] Frequency meter

Hi, I can't resist - maybe a pun is intended - as Bob suggested taking care of the whole thing with a PTO coupled variable resistor as an option. But since accuracy wasn't mentioned, I would say just use the mechanical indicator on the radio and let it go at that. If you want to do more work and want to know how accurate your radio is, just make some notes using a notebook and pencil, on how far the dial is off using a known signal or xtal calibrator for reference. Pretty soon you'll know just where you are and you'll know more about your radio than anyone else, which is hard to accomplish on this listing. You'll have become an expert.. Eventually, you'll be unhappy because you'll hate having a radio that's that as good as it could be. This will lead you to tear open the PTO and fix it - then you'll discover not all crystals are where they should be - life gets interesting. But you're an expert enjoying a good radio.

My opinion is to enjoy the radio as much as possible the way it was built, fix some things that you can't live with. I left my 390a freq. readout as-is but I added a digital frequency readout from AADE for about $60 + to my Mackay 3010C. This is a programmable readout and works fine (all the programming was done by AADE and is amazing itself), no noise that I can tell but I shielded and isolated it pretty well. According to the online info the DFD3 works for a 390a. And I used the offered 20 preamp to give more isolation. I have no experience with it's use for the 390a, but I especially like it for the 3010 because it eliminates the backlash of the tuning mechanism belt mechanism, ever so slight but makes tuning ssb tricky. hope this helps, Dan

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Date: Thu, 2 Sep 2004 08:29:18 -0500
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] Frequency meter

have watched this thread for several days....interesting. I have had nothing of any real help to add...until I had an idea this morning that took me back to the days of rock bound transmitters (Xtal) and "Spotting" your transmit freq. on the receiver.

High quality signal generators with digital displays have become relatively cheap in the last few years...why not pick up a nice HP-8640B

signal generator....set the TCXO reference on frequency (zero beat WWV on your receiver) and the display and output will be dead on the money. Generate a spotting carrier with the signal generator on the desired receive frequency, zero beat it with your receiver and there you are. If you want to know where you are tuned sweep the generator across the part of the band you are in until it is zero beat the signal generator with your radio and read the freq.

I use a similar technique when using my old HP-606A tube type Signal Generator...I pass it's output through my frequency counter and pretty much ignore the analog dial during setup, then reduce the output level and go to
aligning.

You could probably pick up a working 8640B for around $200 on one of the auction sites and it can serve other duties around the shop as well....you can even use it as a frequency counter by inputting a frequency to be counted to a front panel jack. Just a thought!

Date: Thu, 2 Sep 2004 11:11:36 -0500
From: Tom Norris <r390a@bellsouth.net>
Subject: RE: [R-390] Frequency meter

Of various ones that have the BNCs in the rear, such as the R-1247, the BNC's are used as oscillator INPUTS rather than outputs.

Date: Thu, 2 Sep 2004 11:27:11 -0500
From: Tom Norris <r390a@bellsouth.net>
Subject: [R-390] Whoopsie... RE: Frequency meter

Looking closer at the R-1247, I see references from Tom N5OFF that say it is possible to *output* the internal oscillators via the rear connectors. Hmm, might work for external freq sampling then. I guess I should pay closer attention...

Date: Thu, 2 Sep 2004 15:20:00 -0700
From: "David Wise" <David_Wise@Phoenix.com>
Subject: RE: [R-390] Frequency meter

I browsed all of the links below, and none of these inputs all three oscillators, although some have a "BFO" input which might be usable. In my opinion, if you want an outboard readout, the AADE DFD3 is the ticket. It stores up to 32 separate frequency offsets. Downside: You have to turn two band switches instead of one.

Date: Thu, 2 Sep 2004 16:07:52 -0700 (PDT)

From: Tony Angerame <tangerame@earthlink.net>
Subject: [R-390] Re: R-390 Digest, Vol 5, Issue 3

A man after my own heart. For authenticity I picked up and old LM/BC freq meter and a T connector to my freq counter and to the blank port on my multicoupler. Zero beat and instant readout....well almost.

Date: Sun, 26 Sep 2004 09:49:49 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Below 500 kHz mod, again?

I have seen a no change mod for the Racal 6790 but I don't think there is one for the R-390. The way the front end of the R-390 works it would be a major mechanical mod to get the poor beast running below 500 KHz. The best bet on an R-390 is to use an outboard up converter to boost the DC to 500 KHz band up to something like 2 to 2.5 MHz. There are a number of designs out there for these converters. Some of them do the up conversion at the antenna so they can combine a whip antenna pre-amp with the up converter. A bunch of the guys that show up in the archives here have a neat little whip pre amp they came up with. It would make an interesting starting point for a high performance antennal mounted converter.

Date: Sun, 26 Sep 2004 19:33:16 -0400
From: "Michael Murphy" <mjmurphy45@comcast.net>
Subject: Re: [R-390] Below 500 kHz mod, again?

Never heard of this R390A sub-500 KHz mod either. The up-converter idea Bob is talking about should work great with the R390A. Active voltage probe antennas and active loops work fantastic with an upconverter. There are plenty of antenna projects out there.

In the R390A I would try upconversion to a band like 10 MHz (as the tunableIF). A few advantages here: First the R390A is dual conversion 8 MHz and up and that means more stability, less noise and potentially fewer birdies than at 2 MHz where it is triple conversion. (Bob?). Secondly, 10 MHz crystals and 10 MHz stabilized references are easy to find for your converter. Finally, WWV lives here, so we can always "zero" everything.

Tuning will be normal - upward, that is 10.200 MHz = 200 kHz.

Of course we want to use a nice vacuum tube circuit with a 6BA6 preamplifier and a couple of 6C4s, one as a mixer and one as the 10 MHz oscillator and some serious tuned circuits up front. Anybody got a circuit? It seems that everybody uses boring solid state upconverters! These usually are simple circuits with a low pass filter followed by single or

double balanced ICs like the MC1496/1596 or the NE602 or SA612. Passive switching converters using CMOS gates or analog switches can also be utilized. Double balanced mixers used backwards are very effective with an active antenna ahead of them.

Here is a simple circuit: http://jacksonharbor.home.att.net/lfconv.htm

Here is a link to a circuit which is very similar to the first LF converter that I built back in the late 1980's. Mine was a bit simpler, but used the diode mixer idea as shown and it worked very nicely. I think I used a 4 MHz tunable IF. http://www.lwca.org/library/articles/kf5cq/lfconvtr.htm

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Date: Sun, 26 Sep 2004 20:33:50 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Below 500 kHz mod, again?

At least from what I have seen the R-390 does a very good job from 6 MHz on down. I would not be concerned about the 390 limiting the process of up conversion down there at all. As far as a reference is concerned it's pretty easy to divide what ever you have handy down to what ever you need. A reference TCXO out of an old cell phone should be up in the > 10 MHz region. You could divide it down to just about anything you needed.

To keep from changing bands on the 390 I would say there is a significant advantage to converting everything into a single 1 MHz span. Doing everything at exact 1 MHz multiples probably will get you in spur trouble so I would not go to great lengths to make that part of it happen.

A reasonable cell phone TCXO should be in the 1 ppm range over normal operational temperatures. That would give you a 4 Hz error / drift with a 4 MHz conversion oscillator. At 12 MHz you would get 12 Hz. In this case lower is better for drift.

Depending on the antenna you may not be able to cover the whole band from DC to 500 KHz in one swoop. On the 390 they work pretty hard to only cover an octave (2:1 frequency range) with any one set of RF coils. The guys who did the 390 did a pretty good job of it. Duplicating the same thing probably isn't a bad idea ...

If we stick with octaves then we get something like 512 to 256, 256 to 128, 128 to 64, 64 to 32, 32 to 16. Setting up five front ends is a construction project of the first order.

Once you get to about 110 KHz LORAN-C at 100 KHz is about all you will hear. There isn't a lot of stuff below that, that is very interesting to listen to. Dedicated receivers seem to work better for LORAN, WWV-B and that

sort of thing. That would eliminate all but the top two octaves and get the construction project back to some kind of reasonable level.

Of course you could always just pick up a BC-453 and do it the easy way

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Date: Sun, 26 Sep 2004 21:36:33 -0500
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] Below 500 kHz mod, again?

Guys I don't remember the specifics but there is a mod where one moves a couple of cables which bypasses part of the tunable front end/1st RFamp... and allows the radio to tune down below 500KC with reduced sensitivity and selectivity. It has been posted here several times in the past and documented in one of the publications...either Electric Radio or HSN...I can't remember. I think that is what is being asked about....no one remembers that one?

Date: Sun, 26 Sep 2004 22:23:07 -0500
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] Below 500 kHz mod, again?

This was posted from Walter Wilson in January of 2001:

<HSN issue 2 pages 3-4, or HSN reprints page 10 have the information you
<need. The simple solution is to couple the antenna via a 0.05 mF capacitor
<to test point E209. This bypasses the antenna coils and RF stage, but
<allows you to receive longwave signals. Some people have used the
<unbalanced input to feed directly around the RF amplifier stage to E209
<through the coupling capacitor, and they hook their longwave antenna to the
<unbalanced connector. I have not tried either of these.

I found this while searching the archives....which ain't as easy as it used to be I might add...so much for progress!

Date: Mon, 27 Sep 2004 00:38:12 -0400
From: "Ray, W2EC" <w2ec@attglobal.net>
Subject: Re: [R-390] Below 500 kHz mod, again?

Index indicates it should be in Volume 2, page 3.

Date: Mon, 27 Sep 2004 09:21:42 -0500
From: John Seboldt <k0jd-l@seboldt.net>
Subject: Re: [R-390] Below 500 kHz mod, again

Yes, I knew it was something like this - quick and dirty - and I thought I remembered somebody talking about wrapping it around one of the tube pins too... you probably would want to build your own outboard input filter...Now gotta check for an equivalent point in the R392... After I posted I looked through the archives, and for some reason it wasn't easy to find, perhaps the thread subject wasn't totally relevant to the contents. To all those suggesting the upconverters... yes, duuh, that is always possible with any receiver <g>

Date: Mon, 27 Sep 2004 23:49:12 -0400
From: "John KA1XC" <tetrode@comcast.net>
Subject: Re: [R-390] Below 500 kHz mod, again?... yes it works!

I just tried this mod and it really works, not great but it only took a minute to hookup and try. Took a test probe and plugged it into E209, clip leaded it to a .01uF cap I had handy, and then clip leaded that to a 150 ft long wire. I left the clip leads, cap, and extra probe wire just sitting on top of the crystal compartment. In a few minutes of tuning I heard LOTS of power line buzz and the following air navigation beacons which were all MCW transmission. Freqs are in KC followed by call letters and sig level.

402 KC, LW, +20 dB
(this is local and is for Lawrence Airport, Lawrence, MA. I actually found the transmitter by accident one day, it's next to the water department building on RT 133 here in Andover, MA)

415 KC BC, in the noise
393 KC, ML, in the noise
382 KC, ??, very weak, could hear the CW but couldn't make the ID
333 KC, YFM, in the noise

Not bad for a few minutes playing around. A better, less noisy antenna (like a loop or dipole) would definitely help as this temporary long wire I'm presently using is very poor with respect to line noise pickup. Anyone have a beacon database?, I'm curious to know the locations of the ones I heard.

Date: Tue, 28 Sep 2004 11:16:01 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Below 500 kHz mod, again?... yes it works!

There are a number of beacon databases. (I've sent to John separately the files I list below): There is a whole community of beacon hunters. Below is the section of links from my bookmarks file related to VLF and beacons. NDBRNA0413.PDF is also available in an Xcel spread sheet form. You

can get an updated version online..

URL is: http://www.dxworld.com/ndblog.html

statesort.pdf may be the same info sorted by state.

hunter.pdf tells you ALL about hunting beacons.

index.htm is the front page of a thing called "On the Art of Long Wave DX-ing" and that is a must read. It's on the LWCA club site. (the title graphic is not there, but the links should word to get you back to the original.)

Here are a bunch of links: You should start at http://www.lwca.org/

http://www.beaconworld.org.uk/info.htm
http://www.qsl.net/on7yd/136lit.htm
http://www.contelec.com/ATU.htm
http://www.alan.gale.clara.co.uk/beacons.htm
http://www.pacificsites.com/~brooke/electron.shtml#Broadcast%20Band
http://frodo.bruderhof.com/ka2qpg/
http://www.vlf.it/trond2/list.html
http://beaconworld.org.uk/
http://www.weaksignals.com/
http://www.g0mrf.freeserve.co.uk/lf.htm
http://web.inter.nl.net/hcc/Shortwave/
http://www.wireless.org.uk/index.htm
http://lwca.org/sitepage/lfutil/index.htm
http://www.cl.cam.ac.uk/~mgk25/lf-clocks.html
http://dybka.home.mindspring.com/jill/radio/beacon.html
http://lwca.org/wwwboard/wwwboard.html
http://www.lwca.org/
http://www.spaceweather.com/glossary/inspire.html
http://www.qsl.net/on7yd/software.htm
http://www.qrz.com/
http://web.tiscali.it/vlfradio/index.htm
http://www.coastal-radio.org.uk/
http://www.highnoonfilm.com/xmgr/
http://www.computerpro.com/~lyle/
http://www.cp.duluth.mn.us/~lyle/
http://home.att.net/~n.gianakopoulos/wsb/html/view.cgi-home.html-.html
http://www.vlf.it/easyloop/_easyloop.htm
http://www.vlf.it/
http://204.108.4.16/

Date: Tue, 16 Nov 2004 18:46:53 -0500

From: "Steve Hobensack" <stevehobensack@hotmail.com>
Subject: [R-390] 200 khz crystal

Fred, my crystal went on the fritz also, but I managed to repair it. I opened the can and removed the 200 khz crystal. I opened the crystal and found one of the fine wires came off the quartz due to some kind of green corosion. The wire was too short to reuse, so I used a piece of nr38 copper wire that I cut and bent to size. I filed a find point on my iron and tack soldered it in. It wasn't pretty but it worked. Some types of those crystals are really fragile, because the fine wires actually suspend the crystal in space instead of the normal pressure plate type of contact.

Date: Mon, 27 Dec 2004 13:46:11 -0500 (EST)
From: "Paul H. Anderson" <paul@pdq.com>
Subject: Re: [R-390] 390() vs 390(A)

> There is also the R-391, which is basically the same as an R-390 with an
> electromechanical autotune mechanism added. There is an extra 8-channel
> knob, little window showing the current channel and special MC and KC
> knobs with locking keys.

Don't forget the R-389, which is about as much alike as it is different. The frame is very similar to the R-390 frame (maybe the same, I haven't looked real closely yet), and uses the same IF, AF and PS. Early R-389's used a PS with different output B+ wiring. Supposedly these were retrofitted so that PS's were compatible across the R-389/R-390 and R-391 (MOD-1, I think). The VFO and RF decks of the R-389 are very different, and there is a rectifier stack for producing DC for the R-389 tuning motor. Oddly, the R-391, which also has a DC motor for tuning, doesn't have the rectifier stack. There probably wasn't room, if I had to guess.

Date: Mon, 27 Dec 2004 14:29:10 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] 390() vs 390(A)

>Don't forget the R-389,
>The VFO and RF decks of the R-389 are very different,

An understatement!

>and there is a rectifier stack for producing DC for the R-389 tuning motor....

The auto tuning motors in the R-391 take MUCH more current than the tuning motor in the R-389. In the R-391, both the KC and MC setting mechanisms are moved by (separate) Motors and associated position setting mechanisms. The DC supply for that is external to the radio, and if I remember correctly, is about the same size as the radio itself. In the R-389, only the single tuning knob is moved, so the mechanical work (torque times rotations per minute) is much less. There is no presetting of frequencies in the R-389. The motor is there to assist the operator in moving the many many turns (up to 50) from one spot in the frequency range to another.

Date: Mon, 27 Dec 2004 17:46:34 -0500
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] 390() vs 390(A)

> The auto tuning motors in the R-391 take MUCH more current .....

Not so .. only one motor in the R-391. I have two of the beasts. Each one has a single motor made by Hamilton Beach -- and when they're running, it sure sounds like a Mixmaster run amok. (OK, Mixmaster is Sunbeam or whatever.) The motor is located behind the panel at the lower left and drives a single shaft with three worm gears on it that runs horizontal across nearly the entire lower front. There are five major components --

The MC and KC positioners, the control module , a sealed relay, the single motor and an essential but not so major channel switch. The MC and KC positioners are identical except that the MC one has a detent on it. The Control Module includes a couple of wafer/rotary switches (some other stuff) and the indicator wheel with "1" through "8" on it which shows through the hole in the panel. There is a rather involved description in the manual of the logical steps. The whole cycle is triggered when the setting of the channel switch is changed from equal to the control module indicator to not equal. There are mating worm gears for the two positioners and the control module.

The positioners consist of a stack of disks with indentations and mating spring-loaded pawls -- look like the guts of some kind of combination lock -- or maybe an old mechanical adding machine. Basically, there are 7 "memories" and one extra. When you manually tune the receiver (keys must be loosened/unlocked), you are changing the MC and KC settings for the channel that's showing in the window.

One rule is to never operate the autotune with the locking keys unlocked. There is no electrical connection between the autotune system and the radio. The whole business meshes up to a standard R-390 RF deck. The

aluminum casting behind the panel is special to provide mounts for the autotune components, motor gearing, plus protrusions in the casting with sintered bronze bearings ("oilite") for the worm drive shaft. In an R-390, there's mostly open space there. Originally, they hired Rube Goldberg to design the thing, but he couldn't work in such a small space. No room for the sliding pond, bass drum, pulley system -- let alone the chicken. ;-)

The R-391's have the same round 4-pin power connector on the back panel as the R-390. Two are the AC, one ground, and the fourth one is for 24 vdc for the autotune motor. As I recall, it needs 3 Amps continous, but surges to something like 5, so a heavier supply is needed, and 7 or so isn't a bad idea -- maybe necessary. It may need more current if the disks and pawls are gummed up, the contacts in the sealed relay are sticking, and the thing tries to tune past the 10-turn stops and wreck the RF deck. It's possible that the original power supply was rated higher to provide DC to more than one R-391, or an R-391 and a DC malted mixer. Anyway ... one motor -- whole bunch of other stuff, but just one motor.

Date: Mon, 27 Dec 2004 18:05:56 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] 390() vs 390(A)

Thanks for the clarification. I had some mis-conceptions. All the more reason to own one so I can learn the beast!

Date: Mon, 27 Dec 2004 19:06:47 -0500
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] 390() vs 390(A)

Well, if you get one, YMMV. Odds are the autotune doesn't work -- and it's not a good idea to try it before overhauling the thing, no matter how tempting. Most owners of '391's use them like 390's and have never powered up the autotune. So, they've been sitting for ages. The switch contacts in the control unit are probably oxidized, and the stack of pawls -- they're like a sandwich -- are all glued together by the petrified lube that is needed to be super-slippery for the thing to have snowball's chance to work in the first place. Also, the thing probably needs to be re-synched -- after it's overhauled. It is impossible to walk this gizmo through manually in steps, though you can put a bristol wrench in the synch adjuster, lock the knobs down and rotate it. However, it's not a complete simulation as the relay and control unit aren't doing their things. It's all hard-wired together -- including the relay -- no socket. So, having one offers no assurance of comprehending how it's supposed to work, let alone master. You have to walk through the manual explanation, and that's lacking. Actually, the equivalent manual section for the R-105 (ARR-15?)

does a better job. The mechanisms are similar. The best procedure is to open up whatever you can, degrease, clean contacts, re-lube, see if things move, set the synch. Then, make darn sure that the channel selector is set to the same number as shows in the window. Lock the locking keys down tight. Then apply 24 vdc to the 4th pin -- use an outlet strip to cut the supply if there isn't a handy switch. Then change
channels --which will start the show. Even if it's working, you'll be startled at the noise and the gnashing of gears, slamming and banging. It is a wild experience the first time you see a '390's knobs turning by themselves. Both turn, then one stops, then the other turns. If it was past the point, it rewinds. After what seems like a few minutes (or hours), it will stop at some frequency. If it runs amok and tries to modify/remachine the 10-turn stop (to infinity), cut the DC. The thing's a puzzle -- what's that saying? -- an enigma, wrapped in a paradox -- never could get that right, either. There was supposed to be an R-391A, but there wasn't. I suspect it was partly because by the time they got around to it, there was some field experience with the first one. Also, it needs the beefier geartrain of the original item. It's a good idea to take an 83 mg. aspirin about an hour before you start -- or a couple a' good snorts. It's scary. After we spend all the time cleaning, lubing, replacing broken clamps, synching, aligning, recapping,
meditating over the ballast tube considerations, refinishing panels, re-stuffing plugins, etc. we have a tendency to treat these things with some delicacy and respect. The autotune mechanism doesn't know from that. If it isn't working right or not synched up, it may well try to tune your '391 into the '389 range -- or to 2.4 ghz -- or maybe even 5.8 to listen into the new cordless phones. Yup, it'll wreck yer deck -- if the vibration doesn't kill half your tubes. (Make sure the filament in your ballast tube is nice and flexible before powering up.) Poll -- how many of you guys have R-391's with working autotuners? How many with non-working ones? How many unknowns? Actually, I think it was Paul who rebuilt his '391, right?

Date: Mon, 27 Dec 2004 21:40:13 -0500 (EST)
From: "Paul H. Anderson" <paul@pdq.com>
Subject: Re: [R-390] 390() vs 390(A)

> Well, if you get one, YMMV. Odds are the autotune doesn't work -- and it's
> not a good idea to try it before overhauling the thing, no matter how tempting.

I agree!

> the knobs down and rotate it. However, it's not a complete simulation as
> the relay and control unit aren't doing their things. It's all hard-wired

> together -- including the relay -- no socket.

Fortunately, the two mechanical tuning mechanisms and the control relay in the center are three independent units. You can drop the front panel, remove the KC and MC mechanical tuning units and just work on the control relay alone until it and the motor appear to be working properly. The KC and MC units are nearly identical, but one is tapped for another screw, if I recall - I forget, but I think it is for the MC indent lever.

> So, having one offers no assurance of comprehending how it's supposed to
> work, let alone mastery. You have to walk through the manual explanation,
> and that's lacking. Actually, the equivalent manual section for the R-105
> (ARR-15?) does a better job. The mechanisms are similar.

It isn't too horribly bad, as long as you understand the failure modes (some of which you mention here).

> The best procedure is to open up whatever you can, degrease, clean contacts,
> re-lube, see if things move, set the synch. Then, make darn sure that the
> channel selector is set to the same number as shows in the window.

Personally, I'd suggest starting with the motor and relay first. You don't need to pull any wires. Just drop the front panel, pull the two tuning units from the KC and MC side, then see if you can use the channel changing to do something (anything) reasonable with the motor, relay and channel indicator. Put the tuning mechanisms back in only after ensuring that the slip clutch in it is free. From memory, I don't recall if you can do that easily. But making sure you've cleaned the whole mechanism of all crusty grease is a good step. I soaked mine for a week each in kerosene. If the slip clutch does not slip, then you will discover a failure mode of the 391, which is that either the gear driving the long cross shaft will strip (if the oilite bearings are loose enough), or you will start breaking things in the RF deck or both. If the slip clutch does slip, then you're a whole sight safer, because the unit is designed to slip to a) prevent damage, and b) allow for the tuning to work (it tunes both KC and MC down to the low end 10 turn stop, and the slip clutch starts slipping in each tuner unit - that happens in association with the control relay to "reset" the tuning to a known spot - at the low end of the 10 turns).

> new cordless phones. Yup, it'll wreck yer deck -- if the vibration doesn't
> kill half your tubes. (Make sure the filament in your ballast tube is nice
> and flexible before powering up.)

I can't recall exactly which cam it is, but if the KC 10 turn stops aren't aligned, then the mechanical tuning can drive the cam to a point where the clamp may break. I believe if the stops are correctly set for both the KC and MC mechanism, that there isn't anything the autotune can damage in the RF deck.

> Poll -- how many of you guys have R-391's with working autotuners?

Yup - got mine working - am working on another one. Basically, if your RF deck 10 turn stops are in alignment, and if the slip clutches are free, you can't easily damage your 391 autotune. You'll know for sure if your slip clutches aren't free by the horrible gear grinding noise as the motor gear tries to strip the long shaft gear. Paul

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Date: Mon, 27 Dec 2004 21:44:28 -0500
From: "Jim Temple" <jetemp@insightbb.com>
Subject: RE: [R-390] 390() vs 390(A)

I have a beautiful R-391, s/n 379, which I believe is one of the last made. It has the RF deck cans that are of the smaller dia slugs in the lowest bank that the later R-390's have. Since I obtained this unit, I have only tested it for power and have not got into restoring it yet. Any comments or advice about the autotune mech will be greatly appreciated. Looking forward to seeing more scoop about the autotune mechanism.

Date: Sun, 26 Dec 2004 22:50:35 -0500
From: "Michael Murphy" <mjmurphy45@comcast.net>
Subject: Re: [R-390] 390() vs 390(A)

Before we leave autotunes: I have owned an ARR-15 /R-105 RX and an ARC-2 XCVR and they both had very nice (and similar) autotunes and tube lineups for that matter. My guess is that they were sisters; contemporary mid 40's designs. The late 1930's autotune in the ART-13 takes the cake though. When I set that thing loose, it is a wonder to behold. I have a converted SCR-522 aircraft rig which had autotune, but I ripped it out in favor of local controls. Anybody ever fired up one of those VHF autotunes with the 832's and butterfly capacitors spinning up??

Date: Tue, 28 Dec 2004 21:30:05 -0500
From: "Dave Maples" <dsmaples@comcast.net>
Subject: RE: [R-390] 390() vs 390(A)

All: I once had an ARC-38A and associated 180L-3 automatic tuner. Autotune mechanisms in both of those were typical Collins. The most bizarre part of the operation was the frequency control for the ARC-38A.

They used an electromechanical phase-locked loop. It was strange: the VFO frequency was compared to a crystal-synthesized reference switched by the autotune mechanism, and the VFO shaft was driven with a motor to match the reference. The control loop was a proportional / integral loop! Very strange...they had crystals to synthesize the reference in 500 Hz steps...why not just use that to control frequency???

Date: Tue, 28 Dec 2004 23:42:49 -0500
From: "John KA1XC" <tetrode@comcast.net>
Subject: Re: [R-390] Synthesizers, was 390() vs 390(A)

Well, a communications frequency synthesizer must not only generate the desired frequency but must do it cleanly, meaning without adding noise sidebands AND reference sidebands. In a typical synthesizer the PLL bandwidth is usually made sufficiently high to knock down the VCO phase noise, but this is exactly the opposite of what is needed to attenuate the reference from frequency modulating the VCO; this would require using a loop bandwidth MUCH smaller than the reference frequency. It's the classic engineering example of conflicting requirements which in turn leads to increasing design complexity. Good modern synthesizers must use two and even three loops to achieve small tuning increments without generating all kinds of garbage off the side. Sounds like the guys who designed the crystal synthesizer were able to make good reference frequencies, but they were probably full of mixing products and thus unusable directly. But by locking a high Q (thus low noise) LC VFO (not VCO) to them with an electro-mechanical feedback loop, it completely isolated the VFO from being modulated by the reference frequency. I bet the whole thing probably had an effective loop bandwidth of just a few hertz! Electro-mechanical PLL's and FLL's are classic 1950's and 60's technology, just like the R-39x mechanical RF deck. Other related gear that made use of electro-mechanical tuningloops were the CV-116 FSK converter and CV-157 SSB converter

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Date: Sun, 02 Jan 2005 18:16:58 -0800
From: "Dennis L. Wade" <dwade@pacbell.net>
Subject: [R-390] T-205 Core needed (390-A)

During the cleaning of the 8-16 mc/s slug rack, the core of T-205 broke off of its adjusting screw. Anyone have an extra core/adjusting screw assembly I can purchase?

Date: Sun, 2 Jan 2005 21:45:50 -0500
From: "David Humbertson" <w3np@atlanticbb.net>
Subject: RE: [R-390] T-205 Core needed (390-A)

I have been able to repair all of these that I have run across. I use 5

minute epoxy and have never had one break the 2nd time. The trick is to rig up a little jig ahead of time for the 10 min or so that the epoxy needs to set up. Its sort of tricky getting the shaft screw to stand up straight but it can be done. I usually use my Pana-vise. Sort of build up a little bead from the top of the core up the little flexible shaft. Don't get any on the side of the core. Even if you pick up a replacement later on, this will give you an emergency spare.

Date: 10 Jan 2005 15:41 GMT
From: jrg.dk3ng@t-online.de (Joachim Groeger)
Subject: [R-390] Weak receive volume

Looking for ideas as to the possible source of this problem: Very low receive volume when using AGC, very strong volume when in MGC and RF gain control cranked fully clockwise. Also, RF gain control seemingly active over only, say, last 10 percent of pot with very sharp transition from no signal and to full blast at the 90% point. Thank you in advance for your suggestions.

Date: Mon, 10 Jan 2005 15:25:19 -0500
From: Gord Hayward <ghayward@uoguelph.ca>
Subject: [R-390] Re: Weak Receive Volume

It looks like there's an open in winding (carbon film) the RF gain pot. It biases the cathode of the RF amp so no current, no signal. It might not be completely open so you get a bit of signal. Deoxit? Something looks like its driving the AGC negative (check the voltage on the back panel). Failure of the 0.1 uF in the AGC time constant section might do it?

Date: Sun, 16 Jan 2005 18:16:10 -0500
From: Walter Wilson <wewilson@knology.net>
Subject: Re: [R-390] RE: New R390A owner with some questions.

>While twiddling knobs I have discovered a few things:
>Radio works on all bands that I have tested so far
>except 1000kc to 2000kc. Seems stone dead on that <snip>

If the problem is only in the 1-2 MC range and does not include 18-19 MC, it won't be a crystal. It will be the 1-2 MC section of the RF deck. You may have the slug rack getting stuck, an RF can gone bad, a busted gear clamp, or broken slugs. First, set the frequency to 7+000 (1KC above 7 999) and see if the camshaft at the back of the 1-2 MC range aligns properly. Then move the KC knob throughout the 1-2 MC range, watching the movement of this slug rack in particular.

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Date: Tue, 18 Jan 2005 14:19:59 -0800
From: "David Wise" <David_Wise@Phoenix.com>
Subject: RE: [R-390] RE: New R390A owner with some questions.

> Radio works on all bands ... so far except 1000kc to 2000kc. Seems stone dead on those.....

Welcome! And enjoy your radios, they're joys, both to work on and to use. I agree with Walter that your prime suspect is the RF tuned circuits. There are separate sets for:

0.5-1 1-2 2-4 4-8 8-16 16-32

Contrariwise, most if not all of the crystals are used on two or more bands each, so a bad crystal will knock out several bands with no obvious numerical relationship. <snip>

Date: Sat, 22 Jan 2005 11:34:55 EST
From: R390rcvr@aol.com
Subject: [R-390] Motorboating on R-390A

Good day all: Nice weather here in Michigan, about 12" of snow, and soon to be 30 mph winds! I just put a Motorola R-390A up on my bench for the first time. The first sympton that popped up was motorboating on all bands. It occurs every 70-75 KC, like clockwork. In some cases, it is louder with the BFO on. It disappears with the antenna disconnected. The motorboating is 5-7KC wide, with a slight peak in strength centrally. I have subbed every tube except the rectifiers, 3TF7 and OA2 without any effect. If there is a very strong signal, it isn't very noticeable, but in quieter areas of the band, its is quite loud. I haven't found any switch settings that effect it at all, except, not present in Calibrate setting. I would appreciate any thoughts you might have. Thanks. I will be out shoveling for a while!

Date: Sat, 22 Jan 2005 11:48:43 -0500
From: "James Miller" <JMILLER1706@cfl.rr.com>
Subject: Re: [R-390] Motorboating on R-390A

Seems like I saw something like this in mine once, it appeared to be related to AVC level. A number of the tubes in the RF-IF chain are powered from a 180V (?) line which is unregulated. As AVC action causes these tubes to draw less or more plate current, there is a changing load placed on that B+ line. The same B+ line also powers the mixers and maybe even the Xtal oscillator (I'm working from memory here). As that line fluctuates, the oscillators could also. However, in my case it turned out to be a bad mixer tube loading down the oscillator that drives it... I

think the 2nd mixer is controlled by AVC also. As it's operating point changed with AVC, it would load down the output of the oscillator that was driving it causing the oscillator to shift. Replaced the mixer tube and it got better, JM

Date: Sat, 22 Jan 2005 19:57:49 -0500
From: "Steve Hobensack" <stevehobensack@hotmail.com>
Subject: [R-390] Re..Motorboating on R-390A

Randy, Since the noise is not present when the calibrate signal is on, it sounds like it is interference external to the receiver. The calibrate position just opens the antenna connection and then injects its signal. Switching power supplies are notorious for that type of repeating interference. Look for something in your home such as wallwarts, tv, vtr, programable thermostats,etc. I have problems of that type due to a tv cable power supply box 300 ft away, but its fairly weak. I once had oscillations generated within my R-390a. The bfo was not neutralized. I had all kinds of trash around 3500 kc, with and without an aerial.

Date: Sat, 22 Jan 2005 20:19:50 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Motorboating on R-390A

Does the calibrator work correctly when it is switched on?

Does the problem go away when you pull out the first RF amplifier tube?

If the calibrator is working properly then this isn't the multi-vibrator in the calibrator circuit getting goofed up.

If the is still there with the RF tube gone then it is coming from inside the radio. Otherwise this sounds a lot like a problem external to the radio.

Date: Mon, 14 Feb 2005 05:24:12 -1000
From: "pete wokoun, sr." <pwokoun@hotmail.com>
Subject: Re: [R-390] Gear Diagram Needed

When we did the Y2K we knew it NEEDED this drawing cut up and simplified but we didn't have the time or capability to do it right back then...so it was left to a later generation!

I have the Army TM 11-856A manual which has a pretty good exploded view of the gear train assembly (fig 84). It even seems to show all the spacers, washers, etc.

The latest Navy manual also has this diagram as Fig 6-36. The Y2K has it

reproduced on page 6-92 but I think you'll do better getting a bigger copy off one of the earlier manuals. The army manual may be one of the earliest and clearest and all the others are just copies of it.

Date: Mon, 14 Feb 2005 11:06:25 -0500
From: "James A. (Andy) Moorer" <jamminpower@earthlink.net>
Subject: Re: [R-390] Gear Diagram Needed

As noted, the original Army manual (TM11-856A) has this diagram as Figure 84. I have high-quality scans on my web site that include this manual with this particular figure here:
http://www.jamminpower.com/main/r390.jsp

These are big and many folks have trouble downloading them. I have just the wide figures in a separate file here:
http://www.jamminpower.com/PDF/TM11-856A.wide.pdf

Or, broken up to print on an 11x17 printer here:
http://www.jamminpower.com/PDF/TM11-856A.11x17.pdf

If for some reason you can't download these, I'll send a CD-ROM (or I can print 11x17 for you as well).

Date: Tue, 15 Feb 2005 11:09:16 -0500
From: N4BUQ@aol.com
Subject: [R-390] RF Deck Parts update

Thanks to all who have replied. I looked at the camshaft assembly drawing and the holes are supposed to be 0.078" +0.003/-0.000 so it looks like these are 5/64" pins, not 3/32". A list member has replied and says he has these so it looks like my roll-pin need will be met. I'm going to disassemble the cams and see what size those washers are. Hopefully, I can locate a few of these locally; if not, then maybe someone can point me to these as well. My main reason for asking here is I was hoping someone might have a donor deck. I'm sure I can buy these parts via the net or mail-order, but the shipping and handling costs just kill you for things like this. One supplier I looked into had great prices on the parts ($1.00 for 25/ea. packs, etc.), with no minimum, but their $12.00 shipping cost just made this very cost ineffective.

Thanks again guys!

Date: Mon, 21 Feb 2005 22:11:42 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] 200 kHz Crystal

The 17 MHz crystals are still made and relatively easy to find. It's the 200 KHz crystals that are a problem. The radio is in big trouble with no 17 MHz crystal. Without a 200 KHz crystal it still limps along with no calibrator.

Stuffing a 100 KHz crystal into the 200KHz position might work with minor circuit modification. I am not sure that helps since all of the old crystals below 500KHz are pretty darn tough to find. There are people who make them but the cost is staggering.

The simplest replacement probably is a (yikes!) solid state divider tacked on to a cell phone TCXO. In order to switch it on and off you probably would have to do at least one solder junction inside the radio.

Date: Wed, 23 Feb 2005 21:13:03 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] 200 kHz Crystal

The ceramic resonators normally have a frequency tolerance of a few tenths of a percent. Their temperature stability is in the same range for most "mixes" of powder. In both cases these numbers are tens to a few hundred times worse than a typical crystal. They work fine for some things like simple computer clock sources but do not do as well for frequency standards.

Date: Mon, 28 Mar 2005 21:23:01 -0600
From: "Barry" <N4BUQ@aol.com>
Subject: [R-390] C227? I can't find it

I'm still working on this Amelco RF deck. I got to looking at the modification that adds a 47pF cap across the 0.047uF cap (from cathode to ground) on the first RF amp (V201). For some reason, the 47pF (dogbone) cap is there, but the 0.047uF cap isn't. Has anyone seen this before? According to TM 11-5820-358-35, C227 is supposed to "prevent cathode circuit degeneration." I'm not sure exactly what that means. Was this cap intended to prevent the tube from oscillating? Should I be concerned that it is missing?

Date: Mon, 28 Mar 2005 21:53:44 -0600
From: "Barry" <N4BUQ@aol.com>
Subject: Re: [R-390] C227? I can't find it - Never Mind

I see where that cap is now. Kinda hard to miss (he said sheepishly...). I got to thinking that a cap of that value would be substantially larger than the other components in the area and that's when I remember the chassis mounted cap. The wire that connects it to the pin is really hidden

underneath all the components and I had to look very hard to see it. At least I know the 47pF mod was done to this deck. Sorry for the dumb question.

Date: Tue, 29 Mar 2005 07:16:22 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] R390-A Contract Choices

The 47 pf cap is there to take care of the inductance of the chassis mount cap that is on the cathode. Apparently they found that some of the parts were not low enough impedance at the high end of the band. Fixing the problem isn't quite as easy as it looks. You want to be sure you don't create a parallel resonant circuit between the two caps. Normal advice on bypass caps is not to worry to much about values as long as they are higher than what is specified. This is one place where the normal advice doesn't apply ..

Date: Tue, 29 Mar 2005 12:19:33 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] C227? I can't find it

I didn't see anyone talk about what "cathode degeneration" is, so here goes:

The first RF Amp tube, a 6DC6 had R202, 220 ohms in it's cathode line, and C227, 0.047uF bypassing that to ground. The grid is connected to the AGC line through the RF input transformers.

The cathode resistor creates DC self-bias because of the tube current. If that resistor were not bypassed for RF, it would create "bias" at those frequencies in opposition to the signal applied to the grid. This is "cathode circuit degeneration." The result would be less gain than desired.

The fix is to bypass the cathode to ground for RF voltages, thus the 0.047 uF cap. We could assume that the cap is pretty much a short circuit to RF, and even more so at higher frequencies. However, caps are made of real stuff, including coils of metal foil or film on paper, and so practical capacitors can be somewhat inductive at some frequecies. This effect would depend on how the cap was made, and one batch might work well and another batch, or caps from anther manufacturer might not.

It appears that in some RF decks, the caps used caused reduced gain in the first RF stage due to inductance (and maybe series resistance) in the cap. So the filed change added the small 47pF cap to make it really bypass at the higher frequencies.

Date: Tue, 29 Mar 2005 14:02:45 -0500
From: "John KA1XC" <tetrode@comcast.net>
Subject: Re: [R-390] C227? recap note

That's a good description from Roy. I also found that this cap IS needed for stability as well, but for reasons not particular to the way that stage works. The front end in my EAC 390A liked to take off on the higher bands and the oscillations varied with the ANT TRIMMER control. It turned out that the C227 .047 uF bypass was open, and since the cathode is connected to the RF
GAIN pot via an unshielded lead in the wiring harness it was pumping RF somewhere where it shouldn't of been and things got unstable. This cap is often overlooked in recaps; I replace it now as a standard practice if the RF deck is being recapped. The new bypass cap can be located adjacent to the tube socket in the *same* compartment as its tube pin connection and grounded locally as well, rather than connecting it through a relatively long (inductive) lead to the adjacent compartment where the original cap is located. The old can cap stays there for looks but is disconnected. See link for pic, the old cap is of course is barely visible and the new cap is the yellow axial leaded one.

http://img226.exs.cx/img226/2469/c227recap5yo.jpg

Date: Tue, 29 Mar 2005 15:23:08 -0500
From: "John KA1XC" <tetrode@comcast.net>
Subject: Re: [R-390] C227? recap note

Hi Barry, yeah I agree, that's one of the unpleasant areas of the radio to work in because of the tight space. That pic was from several months back so my memory has QSBed on the particulars but I don't recall having to do anything extreme to get the new cap in there. Unfortunately I don't have a real good close-up pic of the area or one from a different angle because about that time the zoom button on the Nikon 4500 broke and I couldn't enable the macro mode, so I had to shoot from at least 18" away to get a focus until I figured out how to fix the button. My notes say that on this particular RF deck pin 7 was directly grounded so I used it for the caps ground return, although there's another good spot where that grounding screw is fastened to the compartment wall, it is easy to add a solder lug there.

I might have been able to get to pin 2 directly by just pushing some things out of the way, it depends on how "tight" they were with lead lengths at the factory, it varies. Plus I've got small nimble fingers and always use an assortment of sturdy tweezers, hemostats, and an ring-illuminated mag lens on a desk boom when working in a spot like this (I suppose I'd made a good surgeon in another life). If there's a danger of burning something

that's too close with the soldering tip I use aluminum foil or brass shim stock as a heat shield, a trick learned from Nolan Lee :^)

Also what works good in this spot is to use the existing lead from C227 to splice to. Since it's already connected to pin 2 just clip it from near C227, pull it through the compartment wall, then trim it, clean it up, and twist a solenoid type coil around a small diameter drill bit to make a female splice. Now you can solder a short lead from the new cap into the splice at a spot that's in the clear; it makes for a very solid joint. John

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Date: Tue, 29 Mar 2005 23:44:15 -0600
From: Tom Norris <r390a@bellsouth.net>
Subject: [R-390] Core Values and the 390 non-A

As I was in the middle of RF alignment I on my "new" 390 suddenly noticed that things weren't as linear as they had been earlier. Chased my tail looking at the mechanical alignment, but it was fine.

Seems the slug for Z-224, second mixer, was broken. No binding, no undue lateral movement in the rack, just poof. It was fine the day before. While I know '390 cores are a pain to match, does anyone have a red core? Just lying around....? Or better yet the coil & the "matching" core? Thanks in advance

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Date: Wed, 30 Mar 2005 00:34:53 -0600
From: "Bill Hawkins" <bill@iaxs.net>
Subject: RE: [R-390] Core Values and the 390 non-A

I remember threads that said it was perfectly fine to glue the core bits back together. Use something strong and thin, like cyanoacrylate 'super glue'. The iron particles are what matters, not the conductivity of the core. The only challenge is to keep a common centerline through the broken bits. Perhaps a temporary paper sleeve would work.

Date: Wed, 30 Mar 2005 02:28:01 -0600
From: Tom Norris <r390a@bellsouth.net>
Subject: RE: [R-390] Core Values and the 390 non-A

It seemed to do well, can't really tell where the break was. I was just concerned about the longevity of the repair and that 390 non-A parts seem to be much more scarce lately.

Date: Thu, 31 Mar 2005 21:48:05 EST
From: Flowertime01@wmconnect.com
Subject: [R-390] 200Khz marker Crystal

As pointed out in other mail the 200Khz crystal for for the marker is hard to find. Push come to shove, you can open a crystal can with the trusty solder iron. The old inards can be removed by heating the pins and extracting the wire lead. A new small 200Khz marker crystal can then be installed into the old salvaged pin base. With luck and care the old can top can be soldered back on.

As the circuit has a cap adjustment to pull the frequency into alignment all the way to the 320 or so harmonic, most any crystal marketed for use as a marker crystal will function. You need not open up a 200Khz can. Any can will work. It may be a 200Khz crystal and have a cover stamped with what number.

I did a 455Khz can that way for the 0.1Khz IF filter. I simple ran some solder over the can top to cover the original stamped crystal value. So when you look at the can in the IF deck it has no value displayed. At least when you look at it you see a can with more solder than expected and are not looking at some thing marked 22Mhz and wondering why its stuffed into the IF deck. Roger KC6TRU

Date: Mon, 25 Apr 2005 19:50:54 -0700
From: "Dan Merz" <djmerz@3-cities.com>
Subject: RE: [R-390] R390 progress

Bob/others, I pulled the crystal oscillator chassis out of the 390 (non-a)and got it open down to the heater surrounding the crystals and then reconsidered. I started thinking maybe it's the position of the switch like someone mentioned relative to the 390a - I decided to check that before tearing into the heater. I put it all back together and now found 7 to 8 Mhz worked most of the time - good enough to hear at least one ham mid-day. But I then checked all the bands using the crystal calib and found all bands worked but noticed 4-5, 5-6, 6-7, 7-8 and 8-9 Mhz were quite a bit weaker receiving the marker compared to the other bands. I would say 7-8 is not working very well but seems to mostly work. Occasionally it seems to not work. I tweaked the appropriate caps and tuning rods a bit at 4.6 and 7.8 Mhz but this didn't seem to strengthen reception much. I'm wondering what to try next to find the problem. The high bands seem to work ok judging by being able to peak the background noise and picking up signals on the ones where there's some activity. That's as far as I got. Is tearing into the heater box surrounding the crystals straightforward ? - the manual I have doesn't show that detail or the position of various crystals within the box. I guess I should check the condition of the oscillator tubes, duh

I got the line meter to work by putting the missing jumper back on the

11/12 positions on the rear - seems to be ok now. The dial calibration was correctable from the front panel, or very nearly so. I'll deal with that later.

Date: Mon, 25 Apr 2005 22:58:07 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] R390 progress

I have never torn into the crystal "box" on a 390 so I am just assuming it's set up the same way as the 390A. If so then it's not terribly hard to get into. While you have it open I would at least pull each crystal out and re-seat it. There is a test point that will let you figure out if the oscillator is the issue. That should give you a pretty good idea how to track the problem down. I'm still betting on an oscillator problem. You could be correct in saying that your bandswitch is out of synchronization.

Date: Mon, 2 May 2005 10:39:40 -0700
From: "Dan Merz" <djmerz@3-cities.com>
Subject: [R-390] R390 progress 6AK5/6AJ5

Hi, I decided to get into the non-a 1st/2nd oscill crystal box and see if jiggling/cleaning the xtal pins would clear up the problem I've been having getting the 7-8 Mhz band working.

The task was easier than I thought because Collins must have anticipated my skill. I took the oscillator chassis out, removed the box that covers the oven/xtal array on the end away from the two tubes and got down to my previous point of trying to get the heater box off. It was relatively simple, the four standoff posts unscrew and then the oven can be slipped off without even disconnecting the heater wires. I removed each crystal, put a tiny amount of deox on each pin and reinserted them. I put the unit back in place with the oven slipped back on but without replacing the oven cover to see if anything was improved. It wasn't!! Some background: I had noticed before all this disassembly that the screen voltage on the 2nd oscill (the one that was giving a bad 10/20 Mhz waveform for the 7-8 band was about 90 volts instead of the 60 volts specified. The plate voltage was close to the specified 160 volt value. The 1st oscillator, which has nearly identical circuit, had more or less the correct voltages on screen and plate. I am using 6AK5's instead of the specified 6AJ5's. Switching the 6AK5's in the two oscillators did not change the voltages so I ruled out an individual tube effect. Putting a 6AJ5 into the 2nd oscill did bring the screen down to 70 volts, closer to the spec. value. This is a bit of a puzzle. I still haven't figured out if I should be concerned about the 90 volts on the screen using the 6AK5 in the 2nd oscillator. If both oscillators showed this, I'd shrug it off as 6AK5 vs 6AJ5. But the 1st oscill seems to operate to spec with the 6AK5. Now after the xtal

disassembly, with no improvement, I decided to tweak T402 the output transformer in the plate circuit since this is one of the items that is adjusted in a complete alignment of the oscillator circuit. I was hesitant to mess with this initially because most of the bands seemed to work ok. But turning this produced a big effect on the waveform of the 10/20 Mhz output and I was able to get it looking like I thought it should with a nice 20 Mhz harmonic without the distorted form I saw before. I now suspect, even though most of the bands were "working ok" , this transformer was not adjusted correctly when I got the set. I note in the manual that T402 is adjusted only once on band 31 and the procedure is somewhat cryptic It is adjusted so that the trimmer for band 31 can produce only one peak on a VTVM over the trimmers whole range. I interpret this to mean that the inductance of T402 is reduced to the point so that only one set of overtone harmonics are produced using the trimmer, and presumably this is the correct overtone for band 31. My question is: when using a VTVM to monitor this adjustment, does production of an overtone produce a peak in reading? It seems to make sense to me that it would. The waveform in seeking out overtones, as the trimmer is adjusted, goes from complete waves where the average pp would be high through regions where the peaks are not reached then to the next overtone where the peaks are again completely formed Am I interpreting this correctly? I'm embarking on doing the complete alignment of this oscillator, Dan.

Date: Mon, 02 May 2005 15:16:50 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] R390 progress 6AK5/6AJ5

>The task was easier than I thought because Collins must have anticipated my skill. Dan,

Collins anticipated the skill and time available with the military folks who kept these things running. I'm confident that you are now far ahead of some of the repair people of back then!

>.... I decided to tweak T402 .....

Hah.. not the first time we have found cryptic alignment instructions (the HQ-170A manual has some, too.)

>It is adjusted so that the trimmer for band 31 can produce only one peak on
>a VTVM over the trimmers whole range. I interpret this to mean that the
>inductance of T402 is reduced to the point so that only one set of overtone

>harmonics are produced using the trimmer,

Generally, the term "overtone" is used with crystals that are oscillating at a multiple of what would be their normal, fundamental, frequency. Some crystals are made to operate this way, where the frequency of oscillation is three or five times what it would be in a normal circuit. My guess is that T402 is being resonated with the trimmer on band 31 so that the inductance of it will be right for the other bands, which all have separate trimmers. Note that most of the trimmers have a fixed capacitor in parallel. This sets the range of capacitance that will resonate the primary of T402 to the desired frequency.

>... My question is: when using a VTVM to monitor this adjustment, does production of an overtone produce a peak in reading?

We could say it this way: tuning of the T402 and band 31 trimmer is done so the crystal's second harmonic is peaked by noticing the DC voltage at the (mixer ?) grid.

>... The waveform in seeking out overtones, as the trimmer is adjusted, goes >from complete waves where the average pp would be high through regions >where the peaks are not reached then to the next overtone where the peaks are >again completely formed. Am I interpreting this correctly?

I think what you are seeing with your scope is the result of tuning the circuit to the fundamental or to the harmonic of the crystal frequency. Very likely the range of a trimmer is not enough to tune both the fundamental and twice the crystal's frequency. Or, if it is, then the band 31 procedure is intended to set the T402 inductance to make sure you can get only the fundamental or the double of it as you tune the trimmer for each band. Note that the majority of the crystals are used on two bands (at least one is not.) The manual may mention this, but if you find after setting T402 and the band 31 trimmer, you cannot get a good peak on some other band(s), you may be able to tune T402 differently and still get the peak on band 31, but then be able to get the needed peak on the other band(s). Is there a picture of the trimmer positions that correspond to max and min capacitance (there is in the Collins S-line manuals.) If so, think through where the band 31 trimmer setting is in it's range, and the resulting T-402 inductance, and what that might mean to the alignment on another band when you get there. A couple of notes:

1) make sure as you measure the DC voltage at an oscillator or mixer grid that you have a high impedance probe - that is the probe of an old time VTVM that has a one meg resistor in it, or if you are using a DMM, put a 100 K to 1 meg resistor on the end of the probe. This is all to prevent loading the RF in the circuit or adding extra capacitance.

2) If you are using a scope on a high impedance circuit or on a tuned circuit, make sure you have a 10:1 probe for the same reason.

>I'm embarking on doing the complete alignment of this oscillator,

It sounds like a fine idea!

Date: Mon, 2 May 2005 14:33:03 -0700
From: "Dan Merz" <djmerz@3-cities.com>
Subject: RE: [R-390] R390 progress 6AK5/6AJ5

Roy, much thanks for the comments. I concluded from your comments that the multiple peaks that might occur with T402 adjusted with too much inductance are due to occurrence of various harmonics as the trimmer on 31 is swept. The goal is to have only the right harmonic there and low enough inductance that the others can't be produced, and only one (at least according to the manual procedure). I'll go with that interpretation and see what falls out when I start alignment. The VTVM measurement in the manual is made on the grid of the mixer tube - the oscillator signal is injected to the cathode. The Engineering Report on the 390 says about 10 to 15% of the injection shows up on the grid so I guessed that's what was being measured at the test point specified. However, in rethinking this, the VTVM measurement is a dc measurement of negative voltage on the grid so probably reflects how the bias on the grid peaks as the various harmonics are produced by the trimmer sweep and not really an integration of the rf voltage that I had in mind. I've been measuring at the cathode with the scope so far and using the 10x probe on the scope. I don't have a vacuum tube VTVM, but do have a 1 gigohm input impedance "electrometer" that I built for looking at grid voltages. It should work fine as long as we're talking about dc voltages.

Date: Mon, 2 May 2005 17:05:22 -0700
From: "Dan Merz" <djmerz@3-cities.com>
Subject: RE: [R-390] R390 progress 6AK5/6AJ5

Roy, I'm going the right direction now. Things are looking better. I did the 31 band exercise to start the 2nd oscill alignment using the scope (wasn't able to see much voltage on the grid, low mv range so just kept going using the scope). Then I went down to 14 and 7 bands and both tuned to very nice waveforms using the trimmer caps and 20 meters really came alive. I'll redo all this and the other bands when I get the oscillator reassembled and the crystal switch hooked back up to the gear train. I'm still looking at the high voltage on the screen grid of osc #2 and think I may have that cause figured out. The grid leak resistor has aged to about 60 kohms in both oscillators (orig. 47Kohms) and is about the

same in both oscillators so that doesn't account for the difference between the two oscillators. I'll probably replace these anyway. However the screen resistor in #2 is 58Kohm (68K orig) and this would tend to make the screen voltage higher than spec. In osc #2 the screen resistor has aged to 158 Kohm (82 Kohm orig.) and this would tend to make the voltage lower. I put the 6AJ5 in osc #1 and it lowered the screen there compared to the 6AK5W. The conclusion is, the 6AJ5 I have shows lower screen voltage than the 6AK5W's. I expect this difference will persist even after I replace the aged resistors which I think are the cause of the different screen voltages of the two oscillators. The 6AJ5 tube I'm using may be a poor example in making a general comparison of the two tube types since it didn't test as good as the new 6AK5W's that I'm using.

Date: Mon, 2 May 2005 21:35:35 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] R390 progress 6AK5/6AJ5

Sounds like you are making progress. Start hanging a DC volt meter on the diode load. You are looking for -7 volts. every place the procedure says tweak and measure some point, just tweak for maximum signal on the diode load.

Put the scope away.
Hang a DC meter on the diode load.
Hang a 600 ohm 1 watt resistor on the audio output and an AC volt meter with
a DB scale across the audio output and resistor.

When the BFO is on read the AC volt meter for 1/2 watt of power. The DC voltmeter will peg off the DC scale with over -30 volts.

When the BFO is off read around -7 volts on the DC load.

If you have more than -7 volts (with the BFO off) back the signal drive down
of reduce the DC gain in the IF deck. Just do all you adjustments for maximum signal on the DC load. The goal is signal you can hear. The DC load is where you can hear it. Set the receiver to CAL and the BFO off. Pick a 100 KC dial setting.

Start at 31 so you can adjust the transformer and the cap for maximum signal and a single peak. On each band roll the KC knob around for a maximum cal signal and tweak the OCS trim cap for Max peak. Just monitor the DC load and peak them out. You need to get a signal generator on the antenna and start looking at your signal to noise. Until you see how close to the minimum 10:1 you are. How close you are to the

20:1 you should have. And how close to the 30:1 you can get, you just have no idea if the problem is a real problem or not.

How old is the receiver?
How exact is your line voltage?
How exact was the TM reference?
How exact is your meter?
How does your meter load your circuit?
How does your scope load your circuit?

Just to many questions to mix in. Go to the bottom line. DC load voltage and Signal to noise ratio. Then any thing you try either makes an improvement, makes no difference, or makes the situation worse. Use the same test for every thing so you can at least compare the results. You will wonder for ever about voltages on grids and is the TM correct. At least your down to the 7Mhz band. And it sounds like your narrowing in the problem. Sounds as if their are some side benefits coming out of the effort as improved performance on other bands. Roger KC6TRU

Date: Mon, 2 May 2005 23:43:51 -0700
From: "Dan Merz" <djmerz@3-cities.com>
Subject: RE: [R-390] R390 progress 6AK5/6AJ5

Roger, I like your approach. But I like to examine circuits within the radio. It helps me understand some of the whys and hows for the adjustments. I'm just about at the point to do what you are suggesting. I replaced four resistors in the two oscillator circuits, two were probably not that far out but since I had it open I replaced them and one was definitely well aged and about twice its original value. Pretty tight quarters in those little compartments. With a couple more checks on things, I'll put it all back together and hook the switch shaft back into its coupler.

The waveforms are definitely cleaner looking now, probably mostly due to starting the alignment at 31 and going from there. I've only done 80 meters, 40 meters and 20 meters as a quick check on what I'm doing and seeing that it works ok before putting the oscill chassis back in. I'll start over once I get it all reassembled and pull out the tube extenders that I have in now. I think most of the problem I was originally having with 40 meter band was due to bad positioning of the T402 output transformer on oscill #2. I was fooled because so many of the bands seemed to be working ok. The switches in the oscillator chassis are so buried that it's hard to deox them so I didn't try. I really haven't seen any indication that these switches are dirty or are not making good contact. <snip>

Date: Thu, 5 May 2005 09:14:13 -0500

From: "Barry" <n4buq@aol.com>
Subject: [R-390] Should this work?

Working on the "new" R390A. I have it mostly back together (at least enough to run some tests). I tested everything except the RF deck by substituting the modules into my working radio and everything I tested checked out functional. When I powered up the radio, I got nothing on the audio except a small hum when the volume is turned up to 100%. I didn't figure on hearing anything in the way or radio signals since the RF deck is in complete need of an alignment, but I did expect to hear some noise. I injected the audio signal generator into pin 7 of the plug that connects the IF deck (P112) and was able to get good audio on both line and local. I then decided to take the IF output from the working radio's RF deck (with the radio tuned to a good strong station) and plug it into the input of the IF deck on the radio under test. Since I had checked the IF deck by substituting it into the working radio and it does work there, I figured I should get some signals that way. Still nothing. Is this a valid thing to try? I realize the IF deck still needs a touchup for alignment, but it should be close enough to hear something through the chain. It worked when I substituted it into the working radio a few weeks ago so I assume it should still be working. Unless something has broken since then (and I'll try substituting it again to make sure), I would think this should produce some signals. No?

Date: Thu, 05 May 2005 10:42:43 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Should this work?

>I then decided to take the IF output from the working radio's RF deck.....

Good idea. Does the non-working radio show any RF signal level on the meter? Probably not. It sounds like your RF deck is not putting out any signal(s), Have you put some 455 kc signal into the INput of the IF deck? Try that next. Then run some signals into the test points on the RF deck. Start just before the last mixer and work forwards toward the antenna. (use a capacitor to couple the signal in, there are likely DC grid voltages at some points.)

I wish I had a little table of frequencies to share but I have not made one up yet. We need a troubleshooting aid like this: frequencies and normal voltages all along the RF and IF chain, by receive band and frequency. The manual IF gain setting procedure gives you a number for the IF input voltage. You may have a broken wire in the cable feeding B+ to the RF deck or some other place.. test for B+ at a plate pin of both if deck and rf deck.

>Is this a valid thing to try?

Yes, you did good. First see if the input of the IF deck gives you signals.. 455 kc in (at maybe 200 mv ?) Then, move towards the input of the radio with test signals. I have at least two radios with dead RF decks. A likely culprit is a shorted screen bypass cap, or open screen resistor.

Date: Thu, 5 May 2005 10:01:45 -0500
From: "Barry" <n4buq@aol.com>
Subject: Re: [R-390] Should this work?

> Have you put some 455 kc signal into the INput of the IF deck?.....

That's what I was trying to do with the cable from the working RF deck. Perhaps I need to try it using a signal generator?

> Then run some signals into the test points on the RF deck.

I figure if I'm not getting signals through the IF deck by injecting a signal into the input, going further up the RF chain won't help, will it? I'm wondering if I have a broken wire in the harness. Given the tests I've performed, that seems the logical thing to look for. By the way, I am getting 151v at the official 150v test point on the IF deck.

Date: Thu, 5 May 2005 11:57:40 -0400
From: "John KA1XC" <tetrode@comcast.net>
Subject: Re: [R-390] Should this work?

Yeah, you should of heard something. Even with no input to the IF deck I think you can still hear the noise spectrum change when the IF bandwidth is changed around. Since that IF module tested OK it sounds like a wiring problem. The audio path is somewhat twisted - out to the Diode Load (is the jumper there?) - back into and out of the Noise limiter circuit and front panel control - and then to the audio deck.

Date: Thu, 5 May 2005 11:14:54 -0500
From: "Barry" <n4buq@aol.com>
Subject: Re: [R-390] Should this work?

Hmmm. I just realized something. Without the meters in place, C101 isn't grounded (limiter circuit). Perhaps that's why the thing isn't working? I'll have to ground that tonight and see if it makes a difference.

Date: Thu, 5 May 2005 13:23:50 -0500
From: "Barry" <n4buq@aol.com>
Subject: Re: [R-390] Should this work?

I think you may have the answer. I grounded the point I was talking about earlier and that didn't help. It grounds more than just the capacitor, but it still didn't help. I put a tube extender on V509 and checked plate voltage at pin 6. There should be185V there and I'm getting a small negative voltage (< 1v). Probably either a blown fuse or a bad wire in the harness. Didn't have time to explore any further on my lunch break, but I assume I'll find this pretty quickly tonight. Thanks, guys!

Date: Thu, 5 May 2005 14:26:53 -0400
From: "John KA1XC" <tetrode@comcast.net>
Subject: Re: [R-390] Should this work?

<snip> Without the meters in place, C101 isn't grounded (limiter circuit).....

Doubtful, that circuit is usually grounded anyway through the shielded cable connections to the limiter control.

Date: Thu, 5 May 2005 22:19:21 -0500
From: "Barry" <N4BUQ@aol.com>
Subject: Re: [R-390] Should this work? YESSSS!

The B+ fuse was blown. I thought I had checked it, but maybe not. I didn't have a 1/8A fuse, so I put the trusty amp meter across it set to the 120mA scale and brought it up on the variac in the standby position. It drew about 5 to 10 mA in standby and about 70 to 80 mA in AGC position. Yeah, I know that when I switched from standby to AGC, there was a chance of it suddenly drawing a lot of current through the meter, but I took my chances. My Motorola is a 1-fuser, so I guess I wasn't too particularly worried.

I then took the IF output of the working receiver's RF deck and fed it to the IF input of the "new" radio. It worked great! Even with my "golden screwdriver" action on the IF deck, it still is aligned close enough to get a good, clear audio path through it. (Yes, I plan to align it too, but not quite ready yet).

Next, I switched to the CAL position and ran the PTO down to the nearest 100kc position (I don't have the Oldham coupler installed yet), and I was able to hear a weak calibration signal! I was kind of surprised to hear anything because I played "musical slugs and slug racks" when I rebuilt the RF deck. Granted, it hears nothing in the way of a signal all the way through the RF chain, but that's expected. A little more mechanical stuff to assemble and I'll be ready for a full alignment. The weekend is coming up and I don't have much of anything

else on the schedule so I know I'm going to enjoy it. This is just too much FUN!

Date: Thu, 23 Jun 2005 14:00:34 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: [R-390] Toasted R216 (2nd mixer plate resistor)

In my yellow-striper's R-390A RF deck there's an obviously toasted,baked, and swelled R216. It's changed value to something in the hundreds of ohms from its original 2200 ohms. If this was part of a pentode mixer I would think that bad voltages on a control grid was causing too much plate current. But it's part of the V203 2nd mixer.

Could really wacky AGC voltages (which sets the DC bias on the 2nd mixer) have caused so much current flow that the plate resistor smoked? I'd think that this would take tens of volts An alternative explanation might be a short in V203 (a 6C4), plate to filament, and that doesn't sound likely.

Or (and this is the scariest) a short to ground inside Z216? R215 on the cathode seems fine. Normally whatever DC current goes through R216 would go through R215 too. Any thoughts, experience?

Date: Thu, 23 Jun 2005 19:45:06 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Toasted R216 (2nd mixer plate resistor)

Past live stories are that the tube went shorted and smoked the plate resistor, Since then some has changed the tube. Did not pull the RF deck for inspection and left you with toast. Not such a strange thing to happen. Tubes die and kill plate resistors on a regular basis. This is why PM was done ever six months. To get the tubes before the tubes got the resistors.

Date: Thu, 23 Jun 2005 21:43:21 -0400
From: "John KA1XC" <tetrode@comcast.net>
Subject: Re: [R-390] Toasted R216 (2nd mixer plate resistor)

Tim, actually it's easy to toast R216, and also R212 in the first mixer and R205 in the RF Amp by accident. In all of these Variable IF or RF stages the coil electrically closest to its associated tube has the B+ going through it, which means the trimmer cap and its adjusting screw in that coil assembly are hot with B+ as well. So if someone adjusted the cap with a metallic screwdriver it would be easy to cause a short circuit to ground and fry these decoupling resistors. Same situation with the R-390 too, that's why they say in the TM to use an insulated tuning tool.

Date: Thu, 23 Jun 2005 21:50:18 -0400
From: shoppa_r390a@trailing-edge.com (Tim Shoppa)
Subject: Re: [R-390] Toasted R216 (2nd mixer plate resistor)

> that's why they say in the TM to use an insulated tuning tool

Very good advice! Now that you give a "causality chain" right out of a three stooges episode, I can easily see doing the same thing myself :-). Hey Moe, there's electricity in this pipe! ("A Plumbing We Shall Go"). Of course it's possible that a short in a tube could've taken it out too. I found about a half-dozen other resistors in the IF deck out of tolerance by 50 to 200%, all but this one were in the "high" direction.

Date: Thu, 22 Sep 2005 18:46:09 EDT
From: ToddRoberts2001@aol.com
Subject: Re: [R-390] SAQ transmission on 17.2KHz / VLF ????

>....What would one recommend? I will probably never get the chance to own a 389.

Recommending a good VLF RX could probably open up a whole new big topic here! One suggestion would be using a good VLF converter in front of an R-390A. Palomar Engineers sell a good one, also LF Engineering still sell some good ones. A few good older boat anchor RX choices would be :

RAK - TRF/Regenerative Detector 15-600KHz WWII vintage

RBL - TRF/Regenerative Detector 15-600KHz WWII vintage

SRR-11 - Superhet Sub-mini tubes 14-600KHz 50's vintage

FRR-21 - Superhet Sub-Mini tubes 14-600KHz 50's vintage

RBA - TRF 15-600KHz WWII vintage

SP-600VLF - Superhet15-600KHz 50's vintage

WRR-3 - Superhet 14-600KHz 60's vintage

There are several other older TRF/Regen sets out there like the Mackay and Radiomarine. Also many of the newer premium RX's will tune down to the VLF Range like the Harris RF-590, Several Racal sets like the RA-1772, RA-6778 and others too numerous to mention here! Good luck, 73 Todd WD4NGG

Date: Thu, 29 Sep 2005 20:52:58 -0400
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] Xtal Question

Can anybody tell me -- is the 17 MC xtal in the calibrator/oven interchangeable with the one in the xtal osc. deck, or is some parameter different? I think they're the same standard mounting style.

-

Date: Fri, 30 Sep 2005 17:08:30 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Xtal Question

The 17MHZ crystals are the same and interchangeable

Date: Fri, 30 Sep 2005 20:56:55 -0400
From: Dennis McLaughlin <dmclaughlin3@neo.rr.com>
Subject: Re: [R-390] Xtal Question

The one in the calibrator/oven is a CR-27/U type. Crystal specs are at 75 deg C and it should be operating at this temperature or the frequency will be off.. The ones in the crystal oscillator chassis are CR-36A/U type. Speced at room temperature. Some one on the list had the MIL specs in pdf format on their web site.

Date: Sat, 1 Oct 2005 18:23:59 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Xtal Question

Because we run the receivers with the ovens off, should we be using the speced at room temperature CR-36A/U type in the first Oscillator? Instead of the calibrator/oven CR-27/U type l specs at 75 deg C. I have gone and misplaced my TM !!!. Does the oven in the 17MHZ and calibration crystal run all the time even with the ovens off? How far off will the frequency be for these crystals if we run them at the wrong temperature?

Date: Sat, 1 Oct 2005 16:26:42 -0700 (PDT)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] Xtal Question

Yes, it does run all the time, you should hear it clinking on and off while the set is operating.

Date: Sat, 01 Oct 2005 21:27:01 -0400

From: Dennis McLaughlin <dmclaughlin3@neo.rr.com>
Subject: Re: [R-390] Xtal Question

I think the round oven in the back left corner of the RF chassis is on all the time. It has the first crystal oscillator (17MHz) and the calibrator crystal (200 KHz) in it. Only the second crystal oscillator chassis and the PTO ovens are controlled by the ovens switch on the back. I did a test a while back and the 17MHz oscillator started 342Hz high at a cold start and after 47 hours the oscillator was 223Hz high. The spec is 20ppm or 340Hz.

Mine is running on the high side but still within spec after 40 years. Not bad. What a great radio.I guess of you disconnected the oven and realign the RF chassis you could use the other crystal. The stability on the 0-7MHz bands might suffer.

Date: Sun, 2 Oct 2005 13:24:29 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Xtal Question

Thanks for the input. Good exact experience and knowledge. It looks like if we use the wrong crystal we could be off by 500 or less hertz. Maybe not within specifications for certainly operable and within alignment range.

Date: Fri, 02 Dec 2005 10:10:25 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Fixture for finding low-noise 6DC6's?

>I....a test fixture or something I can lash up to find the lowest noise 6DC6's of my collection?

Tim, yes, you could build one: Take the front end of an R-390A, hook up power and mechanicals, feed the IF to another radio and do measurements. Of course you should not bother doing that. Just use your radio as it is.

>Or is the only real test putting it in the R-390A itself and measuring S+N/N >(probably with the GAIN ADJ for each one, I guess.).

It's not the "only real" test, but it certainly is the easiest and most practical. The IF Gain Adjust should not have too much effect as you find the lowest noise tubes, as long as it's not set too high so the IF strip noise masks the RF section noise! If when you pull the RF tube out, the noise in the speaker does not get lower, you have some work to do before you test for lowest noise tubes.

Roger has posted the way he and his fellow R-390A technicians selected tubes for best noise ratio. There is also a very long collection of similar articles, including Roger's, posted on the net. It's called sensitivity-alignment.pdf and came from W. Li's Pearls of Wisdom page, which I cannot find just now. In the past, I got it from the Frequently Asked Questions page, and even though I now can't find it in the web page, it is there:

<http://209.35.120.129/Pearls/sensitivity-alignment.pdf>

In summary, I suggest you get an AC voltmeter and resistor load on the line output, a signal generator with some modulation and a 3- or 6- or 10db pad at the receiver input. You are looking for the tube(s) with the lowest signal to noise ratio, NOT just the lowest noise. (A really dead tube will give you very low noise, but no signal either.)

Notes: General Radio and others made "Output Power Meters" that are very useful for this job. The GR types are 583 (low power), 783(high power), and the most recent is the 1840A. These things present a wide range of resistive loads and a meter to measure power delivered. There are a couple versions of a military meter also, some TS- number I can't recall. Any AC meter that will measure the audio output level can be used (with a resistor for a load) - a dB scale is useful but not necessary. An oscilloscope will do the job.

Pulling hot tubes out of the chassis is less painful if you have a tube puller of any kind. Some rubber roller "tires" from the copy machine repair person work very well, the wire kind recently discussed on the list work fine, rubber covered chemistry lab grabbers work fine. It would be a shame to drop and break the hot rf tube you just decided was the very best in your collection. Those rectangular carpet samples from the rug store work well on the bench to help prevent breaking and losing stuff and save paint jobs on radios. Happy Noise-Figuring, all.

Date: Fri, 2 Dec 2005 10:02:21 -0600
From: "Barry" <n4buq@aol.com>
Subject: Re: [R-390] Fixture for finding low-noise 6DC6's?

TS-585. Fair Radio sells them (I bought one from them).

Date: Fri, 09 Dec 2005 10:17:18 -0600
From: Conard Murray <cmurray@tntech.edu>
Subject: [R-390] 17 MHz osc pull from AGC

Hey gang, I'm working on a '62 Amelco and I have just noticed the 17 Mhz xtal oscillator in the first mixer is pulling just under a hundred cps or so

in step with the AGC voltage. The stronger the signal, the further it shifts. CW on the bottom 8 bands is chirpy when using the AGC. MVC is fine. Signals above 9 MHz are fine. Replacing the oscillator tube and mixer tube didn't make things better or worse. The 150 volt line is dropping about a volt between AVC and MVC
mode with a strong signal applied. I don't think that is enough to cause this problem .... is it? have had other lesser receivers with combined mixer/oscillator stages chirp, but I refuse to believe the '390A is supposed to act in this manner as some of the posts in the archives suggest. I have owned three other 390As in the past 25 years and I don't remember any of them doing this. Has anyone else been able to cure this problem?

Date: Fri, 9 Dec 2005 11:44:38 -0500
From: roy.morgan@nist.gov
Subject: Re: [R-390] 17 MHz osc pull from AGC

.. the 17 Mhz xtal oscillator in the first mixer is pulling just under a hundred cps or so in step with the AGC voltage.

Are you sure it is the crystal pulling, or the PTO?

> ... CW on the bottom 8 bands is chirpy when using the AGC.

Likely it's the crystal oscillator, then.

>... The 150 volt line is dropping about a volt between AVC and MVC mode with >a strong signal applied. I don't think that is enough to cause this problem .... is >it?

It might be.. have you tried a different (new) VR tube? That would be my next step. (I can't say what variation is expected on the regulated B+ line normally - do you have another receiver to test?) See if the VR tube is starved by a drifted-high dropping resistor. (I can't remember if that is a wire wound unit or a carbon one.) Some speculations:

1)You may have leaky or resistive capacitor(s) in the 17 mc oscillator section. Are tube voltages and resistances normal in that circuit? For instance, a leaky screen bypass cap can bring the screen (or plate) voltage down so the oscillator is running weakly, or at very much changed voltages and currents. This can get the thing into a state where slight, normal, changes in voltages(due to the AGC action) cause frequency drift.

2) The 17 mc crystal, or it's oven, may be the trouble. Try another oven if you have one. The oven should be cycling after warmup. If it's thermostat is stuck ON the crystal will be baking at a much-too-high temperature and be far away from it's stable region. Same if the heater or thermostat is

open.

I look forward to hearing what you find. You are right, the receiver should not
act this way. A hundred cycles' wander in detected tones would wreak havoc
with an RTTY comm channel. Roy

Date: Fri, 9 Dec 2005 14:06:05 -0500-
From: "Jim M." <jmiller1706@cfl.rr.com>
Subject: Re: [R-390] 17 MHz osc pull from AGC

I have noted the same thing. I put a counter on each oscillator and ran some tests looking at the frequencies as AGC voltage changed. It is indeed the 17 osc. Trying different tubes in the mixer that it drives seemed to improve things. My guess is that as the AGC to the first mixer grid (V202) changes, it changes some operating condition or impedance that the 17 osc looks into through T207, and that pulls the osc. slightly. There is also a variation in B+ to the osc. as the AGC changes current draw by the other tubes. The B+ to the 17 osc. is not regulated. That could be causing some pulling. I thnk both the osc. and 1st mixer tube operate from the same B+ line, maybe there is some interaction there. It does this more on my Collins than on my SW radio. Could be some aged resistors or caps, ... don't know. I have been thinking of going in to check values but too lazy.

Date: Fri, 9 Dec 2005 19:16:33 EST
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] 17 MHz osc pull from AGC

Roy offered up some of the best things to try first. You may be dealing with an old age problem here. Do the stuff Roy suggested: first, it's easy, painless and most likely to fix the problem. I was thinking you may have a bad wire in the harness or a contact problem in the RF deck connector. Not a real open but enough to get you a voltage drop. My though was that as AGC voltage goes down (more AGC) the IF stages get cut off. The IF stages and the first crystal ocs share the RF IF B+ line. Plug 108 pin K at the RF deck. As AGC changes tube gains, the B+ line voltage may be changing.

You may try a visual inspection on the back side of Plug 108 for frayed wires. The other end of that is the RF IF B+ fuse. A bad fuse could be getting you or poor connection in the fuse holder.

You should also go the other way and try to look into plug P112 at the IF deck.

After this you could try a tube extender into the osc tube and see if you can watch the B+ shift as the AGC is built-up with a strong incoming signal.

You may have to pull the RF deck and do a real visual for a poor connection. It may or may not be on the B+ line. It could be in the cathode circuit or in the screen circuit for the Osc tube. It could also be in the grid and the crystal can socket.

In MGC you just hold the AGC line flat and thus do not shift the current operating points of the tubes. Signals run through the tubes and current varies but not to the extent the AGC shifts the operating points of the tubes. You are seeing a 17,000 to 1 shift on the Osc. The amount of B+ shift you see at the tube may well be under a volt. We have seen cold solder in the IF cans. You could have a cold solder joint in T207. Not an easy place to inspect but it can be done. Good Luck with this one. Let us know what you find. Roger KC6TRu

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Date: Sun, 11 Dec 2005 19:40:14 +1100
From: "bernie nicholson" <vk2abn@bigpond.net.au>
Subject: [R-390] Osc pulling with AGC

I would check the resistors around the various oscillators and specifically the plate feed and screen resistors , But first I would check the regulation of the 150V supply and also the series resistor for the regulator tubes 73 s from Oz

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Date: Sun, 11 Dec 2005 18:16:22 -0600
From: "Conard Murray" <ws4s@charter.net>
Subject: [R-390] Shifty 17 MC osc report and survey please

Hey gang, I have seen parts of my R-390A this weekend I didn't plan on seeing for a long time. It was a positive experience though and I managed to get the symptoms under control and maybe most of the problem taken care of. I still don't have a good explanation of what was happening.

Pulling the RF deck revealed C275 (150V bypass) to be a BBOD with several cracks and quite a bit of leakage. I replaced it with a .033 uF mylar and added a 5000 pf mica across the mylar. I also replaced C326 with a mica cap since I was in the neighborhood.

Everything else was fine. Oh, I also replaced the two .1 uF BBODs while there. After replacing the RF deck, I found the pull to be about half of what it was previously.

Adjusting T207 slightly off resonance got rid of the remaining chirp

without reducing sensitivity more than a negligible amount. Before replacing the two caps, I couldn't eliminate the chirp by detuning T207 without almost killing the sensitivity. So, what of the survey? Tune in a strong local AMBC station, flip on the BFO, AGC on fast and then swap between AGC and MGC.

Notice if there is any change in pitch. A low tone makes it easier to detect a shift. You can also listen to the 17 MC oscillator in another receiver. Please drop me a note and let me know the results. Thanks, Conard, WS4S

Date: Mon, 19 Dec 2005 20:52:00 -0600
From: "tfrobase" <tfrobase@kitparts.com>
Subject: [R-390] What To Do With Your Old Capacitors -- Only Slightly OT

Speaking of old capacitors, I replaced another C-327 100PF in an EAC radio. Interesting candidate for an eBay sale, hi hi, after I replaced it I checked the capacity on my Tektronics 130, 100PF, just like the label said, put 1000 volts across it and did not leak, guess it just does not like to resonate at 17 MHz, go figure. I guess I could put it on the 250 Boonton to see where it does resonate. An interesting failure mode ... Tom, N3LLL

Date: Thu, 22 Dec 2005 21:21:08 -0500
From: Mark Huss <mhuss1@bellatlantic.net>
Subject: [R-390] Nuvistaplug?

Here is one for all the experts. A plug-in modification for SP-600's was the Nuvistaplug. This was a replacement for the first RF amplifier in SP-600 that substituted a pair of 6DS4's in a cascode circuit. The resulting 6 to 9 dB increase in Signal to Noise level made the SP-600 sound like a new receiver. My brother recalls that there was a similar modification using a 6CW4 for the R-390A, popular with MARS operators. I happened across the schematic today, and it looks like with changing one pin in the Nuvistaplug, you could drop in the replacement for the 6DC6. This should increase the signal to noise level of the first RF Amp. So has anybody even heard of this being attempted?

Date: Fri, 23 Dec 2005 08:22:34 -0500
From: Mark Huss <mhuss1@bellatlantic.net>
Subject: Re: [R-390] Nuvistaplug?

The installation manual and schematic is here:
http://www.mines.uidaho.edu/~glowbugs/receivers.htm see item number 7.

Here, in .PDF format, is an upgrade for the 1st RF amplifier in a

Hammarlund SP-600 receiver via a tech bulletin dated 1965. This has application to other GB receivers, both commercial and homebrewed. What it essentially consists of is two 6DS4 Nuvistor triodes in a low-noise cascode circuit, mounted on a small board enclosed in a tubular bit of stock with a 9 pin miniature plug at the bottom. One simply removes the first RF amp tube and plugs this creation in its place. Reportedly improves the receiver noise characteristic by from 2 to 9 db depending on frequency tuned to. A schematic is included. This .PDF file is about 1 megabyte. If space is NOT a concern, there are other, triodes, and dual-triodes with even LOWER ENR (Equivalent Noise Resistance) than the 6DS4. One excellent candidate is the sub-miniature 7963 dual triode.

I figure you can either use it unmodified (will have to substitute 6CW4's for the 6DS4's, because the 6DS4's won't handle the higher B+ voltage) and sacrifice AGC control of the first RF Amp, or you can rewire pin 8 of the first 6DS4/6CW4 to connect to the unused pin 2 of the seven-pin plug to restore some AGC operation. In 2004, W3CRR was going to build one, and wondered if there was any interest in copies. Now, the 6CW4 has a higher noise than the 6DS4, but the 6DS4 is rated for only 135VDC plate voltage. Can any tube gurus out there tell us if using a 6DS4 as the first tube and a 6CW4 as the second would be safe? This might give a better noise figure than two 6CW4's. Further thought tells me that most receiver locations would have an ambient noise at their location to make this no real improvement except above 20 MHz.

Date: Fri, 23 Dec 2005 09:27:06 -0500
From: "Steve Hobensack" <stevehobensack@hotmail.com>
Subject: RE [R-390] Nuvistaplug?

I've tried other tubes. I always go back to the 6DC6. It's resistant to overload especially on strong nearby stations. The nuvistor mod would work great for an r-390/sp-600 more or less dedicated to 14 mhz and above. A nuvistor would make a great 10 meter receiver. I use a 6DC6 in my sp-600 also. Just have to touch up the RF slug.

Date: Fri, 23 Dec 2005 09:42:20 -0500
From: Mark Huss <mhuss1@bellatlantic.net>
Subject: Re: RE [R-390] Nuvistaplug?

I'd beleve it about the overload. Just wondering if theree would be a significant improvement in cases where this is not a concern.

Date: Fri, 23 Dec 2005 08:45:34 -0800
From: "Kenneth G. Gordon" <kgordon@moscow.com>
Subject: Re: [R-390] Nuvistaplug? Other possible tubes.

I am thinking that a better, much lower-noise, Nuvistaplug could be made using a single 7963 submini dual triode instead of the Nuvistors. The 7963 has far higher transconductance, 13000, than either of the two Nuvistors mentioned. However, its maximum rated plate voltage is only 100 VDC, so allowances would have to be made for that. Go here:

http://pw2.netcom.com/~wa2ise/radios/penciltubes.html

for details on submini tubes. And thanks for the plug to the Glowbugs web site. I administer that.

Date: Fri, 23 Dec 2005 08:58:03 -0800
From: "Kenneth G. Gordon" <kgordon@moscow.com>
Subject: [R-390] Another tube for a NuvistaPlug.

A PAIR of 7994 subminis would also make an excellent low noise front-end for a receiver. That tube has a gM of 18,000. Max plate voltage of 100 VDC again however. BTW, filament requirements are 6.3 VAC at 350 mA for the 7963 and 6.3 VAC at 250 mA for the 7994.

Date: Fri, 23 Dec 2005 12:10:34 -0500
From: Mark Huss <mhuss1@bellatlantic.net>
Subject: Re: [R-390] Nuvistaplug? Other possible tubes.

I thought about 7963's as well, but for two factors. First is that I don't know of a good way of reducing the 150 volt B+ to under 100 volts. The second is personal experence. Two receivers, part of the TRQ-23, that I worked on in the Army, used peanut tubes like the 7963. Every time I pulled them in for annual maintenance, I always had to replace several of the peanut tubes for low gain. It is like they don't last as long when you run them for any length of time. It could have been the receivr circuits were designed too critical. I don't know.

Date: Fri, 23 Dec 2005 12:13:43 -0500
From: Mark Huss <mhuss1@bellatlantic.net>
Subject: Re: [R-390] Nuvistaplug? Other possible tubes.

Besides, the receivers (HF and VHF) were terrible. At least compared to the R-725's in the accompanying TRR-20.

Date: Fri, 23 Dec 2005 12:36:04 -0500
From: "Drew Papanek" <drewmaster813@hotmail.com>
Subject: [R-390] RE: Nuvistaplug?

Perusing the R-390 Final Engineering Report (at r-390a.net) I see where the Collins engineers tried a cascode circuit using a dual triode TV front

end type tube. They found that the RF amplifier stage so configured had insufficient AGC control range.

Perhaps the 6CW4 is different; that tube was not available back in 1948. A cascode circuit using 6CW4's might have a comparable AGC control range to the 6DC6 circuit if the 6CW4 has a variable mu characteristic. I don't know what dual tiode types were tried at Collins nor do I have a set of characteristic curves for the 6CW4 to compare. Maybe in our application we could tolerate less AGC control range.

That said, the 6DC6 circuit in a properly functioning R-390A can hear right down to the thermal noise level and no additional gain would be required. More gain would reduce reduce the radio's dynamic range (more tendency toward the dreaded intermod). The R-390 and R-390A have quiet 6C4 triodes as mixers and do not need much RF amplifier gain to override the small mixer noise contribution. The SP-600 uses a 6BE6 pentagrid converter as a mixer; that is one of the noisiest mixers known to mankind. The SP-600 needs plenty of RF amplifer gain ahead of the mixer, particularly on the higher bands, so that signal can drown out the mixer noise.

Date: Sat, 24 Dec 2005 09:05:48 -0500
From: shoppa_r390a@trailing-edge.com (Tim Shoppa)
Subject: [R-390] Something in the RF deck breaking into oscillation...

On most bands my R-390A is breaking into oscillation during the first hour or so of warmup. After an hour, it's rare for it to do this. An important clue is that as I rotate the "ANT TRIM" I can start/stop/modulate the oscillation. It sounds sort of like a regenerative receiver as it breaks into/out of oscillation. The gears/insulators in the "ANT TRIM" drivetrain are clean. It's most likely to break into oscillation when "ANT TRIM" is peaked but sometimes it does it no matter what and other times (especially after warmed up) it never does it. It's only when it's going from stable to oscillating that the ANT TRIM has an effect. Is this a common problem with a known solution, or am I gonna have to resort to shotgunning everything around the 6DC6 RF Amp? (I already subbed out the 6DC6 with no apparent change in symptom.) I do not have extender cables/etc for the RF deck so getting underneath is a rather laborious process and I don't want to do this more than once. Looking at the schematic for bypass caps that might go bad and cause this I see

C227 - .047 as the cathode bypass. Is this a brown beauty? But being in the cathode bypass it seems unlikely to be causing oscillation.

C229 - 5000mmF as the screen grid bypass. I guess a ceramic disc?

I remember seeing three brown beauties in a RF deck - two as bypasses around the crystal calibrator, and a third somewhere in a mixer. So maybe C227 isn't a brown beauty... but then what is it?

Date: Sat, 24 Dec 2005 12:43:50 -0500
From: "Jim Temple" <jetemp@insightbb.com>
Subject: RE: [R-390] Something in the RF deck breaking into oscillation...

I had this problem a couple of years ago. It turned out to be one of the caps on the RF deck not being properly grounded. After reworking all the grounds, I found that one of the ceramic cap grounds that is underneath one of the cans, was corroded. Tightening the lug on the can restored the ground, and solved the problem. So, the moral of the story is that these old r-390a's, especially the "massacre" ones, need at least a one time rework of most of the grounding points.

Date: Sat, 24 Dec 2005 09:58:46 -0800 (PST)
From: Joe Foley <redmenaced@yahoo.com>
Subject: RE: [R-390] Something in the RF deck breaking into oscillation...

NUTS! You beat me to it. Don't forget to tighten the tube socket bolts,..... ah, just go through and tighten everything!

Date: Sat, 24 Dec 2005 12:22:24 -0600
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] Something in the RF deck breaking into oscillation...

Be careful in tightening everything. I found, in the last night or so while working on my SJC project, that there was an insulated standoff on the back side of one of the screws that holds one side of a tube socket in place that was rotating while I was turning the screw top side. Luckily I took a look underside and found that before I turned it more than 10 or 15 degrees. Could have twisted off whatever was soldered to that point creating more work. Bottom line is look at what is attached on the bottom side of what you are twisting on or damage may occur.

Date: Sat, 24 Dec 2005 19:17:24 +0000
From: odyslim@comcast.net
Subject: Re: [R-390] Something in the RF deck breaking into oscillation...

I had the same problem, the plates in the antenna trimmer were corroded and rubbng one another.

Date: Sat, 24 Dec 2005 16:55:59 -0500
From: "Michael Murphy" <mjmurphy45@comcast.net>

Subject: Re: [R-390] Nuvistaplug?

I don't know if anyone talked about the voltage situation. As far as voltage goes, the cascode circuit can be done in a parallel or series bias configuration with good results. In the parallel, the stages are usually cap coupled and each tube is given the full B+ voltage through a choke or tuned circuit. In the somewhat simpler series cascode configuration, sometimes preferred in VHF and UHF circuits, each stage gets around half of the B+. The series circuit is commonly used with bipolar and J-FET circuits as well.

Date: Sat, 24 Dec 2005 19:16:20 -0500
From: Mark Huss <mhuss1@bellatlantic.net>
Subject: Re: [R-390] Nuvistaplug?

In that case, the 6DS4 or 7963 may well work. Now, if anybody runs across a Nuvista-Plug, Stock number 5960-H00-9058, grab it so we can drop it into an R-390A and see how much improvement we get. I'm betting there will not be that much, but would be interested to find out. And if not, then one can always sell it to a poor SP-600 owner so that he can get reasonable performance out of his receiver;)

Date: Sat, 24 Dec 2005 19:40:35 -0600
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] Nuvistaplug?

Well whatever the SP-600 may lack in performance against the R-390A (the boys radio I'm told) it makes up for in its tuning system, audio and classic looks.....we don't call any of them "Depot Dawgs" either do we Mr. Moorer. (does have a pedigree though!)

It's molded paper caps fail just as often as the ones in the R-390A and the government never set a mountain of them out in the weather for an extended period (that I've heard about anyway)....which has been blamed for the failures of those in the R-390A. Much scientific testing, such as boiling (or was it baking) and freezing of them many times over to simulate the SJC conditions has been conducted, as I understand it, to substantiate that conclusion. (results published elsewhere)

HA!...just a little Christmas Eve fun folks...they are both great radios and I am proud to own several of each!

Date: Sat, 24 Dec 2005 22:18:42 -0500
From: Mark Huss <mhuss1@bellatlantic.net>
Subject: Re: [R-390] Nuvistaplug?

Oh, I could go on and on about the comparative performance of the R-390/R-390A as opposed to the Sp-600 (including you need 21 major changes to get it right!), but to be honest, I'm one of the guys that have been bidding unsuccessfully for an SP-600 on E-Bay, so I shouldn't talk. Indeed, the only reason I don't have one yet is trying to decide which of the 21 different models is best for MW DX'ing. I saw some down in the Air Force place, and was not impressed with it's ability to dig some very weak signals out of the noise that you knew were there. But for scanning for unknowns, it felt very good. A hassle converting the tuning to an exact frequency. So anybody want to sell me their #5 SP-600? Maybe give me a better idea of the differences in the various models off the group. P.S. Another writer sent me an e-mail at my direct address about the Nuvistaplug. Said that it gave his SP-600JX1 another 9dB S+N/N, dropping the noise floor to about equivelent to the R-390A, and he liked the broader slope of the filters. Gave it more of an R-390 sound.

Date: Sun, 25 Dec 2005 16:46:53 -0600
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] Nuvistaplug?

Les Locklear can speak better to this...as can Andy and Al Parker but there aren't really 21 different models....I think there were just a group of different contracts of sorts over the years in the JX series and the JX numbers were not in order of manufacture. Just because it had a different JX number didn't mean it had a change to the circuit configuration. I think the JX-1 through JX-14 were pretty much the same then came the JX-17 which is know as the "Diversity" model and then back to the pretty much standard circuit configuration from that point on up to the top...which was what the JX-26 or 31 or something like that.....Then there was the VLF!

There were a few field modifications released by the military such as the variable IF gain control on the front panel which is a nice mod!

They changed from paper caps to ceramic caps at some point.

I'm not partial to the Diversity model but they seem to bring more when sold than the others....

If buying I would be more concerned about the condition of the radio than the model designation, but they are all getting more expensive for sure! I own a JX-1 and a JX-14 and I think the JX-1 is the nicer of the two and will probably be my keeper along with the VLF and the SP-600 Leary.

Those who are more knowledgeable in the models please correct me if I have led anyone down the wrong path!

-
Date: Sun, 25 Dec 2005 22:54:59 +0000
From: rbethman@comcast.net
Subject: Re: [R-390] Nuvistaplug?

I've got one of the "infamous" Northern Radio diversity types of the SP-600. mI find it "very" nice, and it seems to hold its own with a well aligned and tubed R-390A. I don'tknow how or why. I only know that its own alignment is a royal pain, especially because of the changes done by Northern.

Date: Sun, 25 Dec 2005 17:35:17 -0700
From: Les Locklear <leslocklear@cableone.net>
Subject: Re: [R-390] Nuvistaplug?

I saw that remark earlier, but let him slide. He obviously doesn't know what he is talking about. And, I have tuned up enough people this year, my quota is almost used up. Actually there were over 40 different suffix numbers, the highest suffix number being the JX-39 which was built for the FAA. The last SP-600 series built was the JX-21A which had the product detector and 22 tubes vs. 20 in the standard models. Early versions didn't have a suffix number, simply marked
SP-600JX.

A properly aligned and operating SP-600 will hear anything you can hear on a R-390/URR or R-390A/URR (see how simple that is) (for the NON-A crowd). Those that whine about the frequency readout don't know the bands very well, I know exactly what I'm listening to when tuning with an SP-600. But, knowing the bands has become a lost art for the digital generation.

Date: Sun, 25 Dec 2005 20:53:36 -0500
From: Mark Huss <mhuss1@bellatlantic.net>
Subject: Re: [R-390] Nuvistaplug?

Oops, there was supposed to be a" ;) " at the end of that "(including you need 21 major changes to get it right!)" Sorry if I offended anyone. Indeed, as I said, I am looking seriously about getting one of my own, preferabilly one without Diversity. And for the people in the business of listening to the HF bands, the SP-600J series is perfect for scanning for new signals, and the
R-390A for monitoring. As for difference in sensitivity, there are few people that can afford to live at the very quiet sites the professionals use.

Date: Sun, 25 Dec 2005 22:19:20 -0500

From: "Steve Hobensack" <stevehobensack@hotmail.com>
Subject: Re: [R-390] Nuvistaplug?

Many years ago, I think it was Popular Communications magazine, I read an article on broadcast band dxing. The champion dx (the most qsls + countries) person used the Super Pro 600. I have the JX-17 model. Raymond Moore's magazine "Communications Receivers" explains most of the differences in the models. Most all of the receivers have the same basic circuit and performance.

Date: Sun, 29 Jan 2006 16:17:32 -0700
From: DW Holtman <future212@comcast.net>
Subject: Re: [R-390] VFO endpoint adjustment - stumped!

<snip>.....I think most RF decks havea lot of bad 2.2K resistors. Most of the tubes in the RF Deck have 2.2K resistors as plate loads such as V202 and V204 with the plate current going through them.

Date: Tue, 28 Feb 2006 14:55:09 -0800 (PST)
From: Masters Andy <nu5o@yahoo.com>
Subject: [R-390] 5 khz difference?

Good evening. I have an EAC-67 series R-390A that I am working through and learning about R-390A's in the process. Using a recently cal'd counter, I was able to set my BFO for top dead center on 455khz and it tracks +/- 3 khz nicely as indicated by the ticks on the panel. I also adjusted the crystal calibrator by counting it on frequency at 200 khz. It stays put rather nicely as well. Having done this, I then went through all the bands to have a look at dial calibration and have discovered that .5-8.0 mhz, the dial reads 5 khz low on each band but on the higher bands it is relatively dead on. (or it might be said it can be set dead on using the Zero Adjust for the lower freqs and is actually 5khz high on the higher ones). In any event, what gives here and why the disparity? I first thought it might be my 17 Mhz oscillator. When I count the 17 mhz oscillator it indicates it is 4.790 khz low on all bands 0.5 through 8 mhz. After 8 mhz, it changes, but I can't get an accurate read on its error. I don't see a way to "warp" the 17 mhz crystal on but I am not convinced that is the problem or that there is only one problem. Any suggestions?

Date: Wed, 01 Mar 2006 07:57:16 -0500
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] 5 khz difference?

><snip>When I count the 17 mhz oscillator it indicates it is 4.790 khz low on all >bands 500KC through 8MC. <snip>

That certainly points at the 17Mc oscillator. I can't blame you for wanting it to point somewhere else, but it's hard to avoid...

> After 8 mhz, it changes, but I can't get an accurate read on its error.....

Check the voltages etc. around V207, the 17Mc oscillator Pin 6 is supposed to get regulated +150V through R210 (to make a nominal 77V on the screen) when you are below 8Mc. Above 8MHz it looks like it floats (DC) but is grounded to RF. When tuned above 8Mc this oscillator is not supposed to be oscillating, probably the reason why you can't read it so well, but...! Check bypass caps C275 and C326 (screen grid) and bypass cap C328 (plate). There has been some argument about what C275 is supposed to be, in my RF decks it happens to have been a 0.033uF black beauty, but what they probably *meant* to put in was a 5000pF or 3300pF disk. The Y2K manual in different places names all 3 values, obviously put together by a committee :-). Check resistors R211, R210, and R207 for value and charring. It is very common for especially the plate resistor to have gone up in value by hundreds of percent, and this is generally not good. There was a sub for one of these resistors to reduce the amplitude of oscillation (Tempest it was later called) and if you see this mod made you may want to reverse it. Check the peaking of T207, part of the plate tank. I don't see an official "tune-up" procedure for this but having the plate tank out of whack isn't good for an overtone oscillator.

> I don't see a way to "warp" the 17 mhz crystal .... <snip>

All of my suggestions are ways of finding the problem in something OTHER than the 17Mc crystal, since this is the hardest crystal to come by! It won't hurt to open the crystal oven can and make sure that the crystal is seated reliably etc. You might even try turning on the ovens and see if the frequency shifts the right way! Again, grasping for straws so you don't have to find a replacement crystal... If anyone has ordered a "new" 17Mc crystal from one of the custom crystal makers I'd be curious what its parameters are.

Date: Wed, 1 Mar 2006 07:26:15 -0600
From: "Dave Merrill" <r390a.urr@gmail.com>
Subject: Re: [R-390] 5 khz difference?

Fair Radio has 17 MHz crystals - bought some myself in October. Talk to Gary,

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Date: Wed, 1 Mar 2006 07:26:15 -0600
From "Roy Morgan" <roy.morgan@nist.gov>
Subject: Re: [R-390] 5 khz difference?

What type of crystal did they send you: CR-36 or CR-27? There is a bit of confusion here. A zip file I have of the spec sheets says Y-201 is a CR-27, but the Y2K manual says it's a CR-36. Also, what was their price?

Date: Wed, 1 Mar 2006 09:02:37 -0600
From: "Dave Merrill" <r390a.urr@gmail.com>
Subject: Re: [R-390] 5 khz difference?

You would make me get out the magnifier! All are marked: 17.00000 MC CR-36A/U CZX Price was $10 ea or 5/$35, same as all their R-390x crystals. Gary took these out of his stock on the bench as I stood there.

Date: Wed, 01 Mar 2006 13:41:43 -0500
From: Mark Huss <mhuss1@bellatlantic.net>
Subject: Re: [R-390] 5 khz difference?

Depends on the age of the crystal. I have an R-390A with an original (1956) 17 MHz crystal. With an average aging rate of 5ppm a year on a 50 year old crystal, 5 khz off is close to the specified aging rate. In other words, if the unit was made before 1960, you are probibily talking about normal operation. Younger than that, there is probibily a little contamination, increasing the frequency offset. In my receiver, all the crystals are about 2 to 4 kHz low, except for three that were probably replaced during it's life.

Date: Mon, 6 Mar 2006 14:49:54 -0800
From: "David Wise" <David_Wise@Phoenix.com>
Subject: RE: [R-390] 5 khz difference?

Ahem. 8MHz and above does not use the 17MHz oscillator, so your frequency counter observation completely accounts for the discrepancy. Maybe someone else can say whether 5kHz is small enough to be correctable and big enough to bother.

Date: Thu, 9 Mar 2006 21:28:56 -0800 (PST)
From: Perry Sandeen <sandeenpa@yahoo.com>
Subject: [R-390] Inexpensive Nuvistor Tube Mod

A while back several members were looking at using the dual 6DS4 nuvistor mod for the R390a and SP-600. The nuvistors are in the range of $15-$25 a piece making it a an expensive experiment. The website posting the schematic suggested using the dual triode 7963 "peanut tube".

I found a website for SND Tube Sales in MO who sells them for $4 each. All the info for the tube can be found at: the WA2ISE sub-miniature tube page. The short specs are:
7963 twin triode 8DG h: 6.3,0.35a Rk=270 mu=40 p:100v, 7.5ma gm=13000 Rp=3100 ...

If one can get a 7 pin header, this combination may prove to be a cheap performance enhancement. The site does mention that for the SP 600 one needs to do some aligning. This is also true if one uses a 6BZ6 sub for the 6BA6 and want optimum performance. Regards, Perrier

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Date: Tue, 21 Mar 2006 08:13:48 -0500
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: [R-390] JAN vs JHS spec tubes, mixer specs, etc.

<snip>.... And some further thoughts about how these tubes are used.....

I recently opened up my copy of Seeley's "Electron Tube Circuits" and was looking through the section on mixers. There he makes the comment that anything that lowers the gain of a mixer can greatly impact conversion efficiency, and this is related to the DC operating point and AC injection levels of the mixer. This got me thinking of the three mixers in the 390A:

1. Each has a 27 ohm resistor on the grid, where the signal is fed in. The DC level on the grid comes from the AGC line (except for the 3rd mixer).

2. Each has a 2.2K resistor on the plate and a tuned circuit for extracting the output.

3. Each has a (bypassed) 2.2K resistor on the cathode, through which the oscillator feeds in. The oscillator outputs are all transformer coupled so the bottom of the 2.2K is at DC ground.

This exact circuit is replicated 3 times. Looking at the schematics the repetition is almost monotonous. Anyone care to comment on the circuit? The 3-time repitition looks like some kind of holy mantra this morning. My experience probing around with a scope is that the cathodes get several volts of oscillator signal. If I wanted to translate this circuit and levels to a conversion efficiency, I'd start by finding the voltages and currents for various grid biases (AGC voltages), and then reading the transconductance off the curves, right? Where does the 27 ohm resistor on the grid come in? The DC impedances around the grid are in the Megohms, I don't really understand (off the top of my head) how the 27 ohm resistor does much of anything. Unless it is there to add a little bit if AC impedance so the previous stage's plate circuit doesn't get detuned by grid current? In which case the AC impedances must be in the tens of

ohms? Isn't this a bit on the low side for a typical RF grid or plate circuit?

Date: Wed, 22 Mar 2006 09:28:15 +1100
From: "bernie nicholson" <vk2abn@bigpond.net.au>
Subject: [R-390] 6C4 tubes

Tim, the 27 ohm resistors in the grid circuits are parasitic stoppers, they stop oscillations that are at an unrelated frequency some times VHF or UHF, these can be caused by unforseen resonances ie bypass caps etc, it is normal to include them in all sorts of circuits even audio, regards to all from Oz
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Date: Mon, 24 Apr 2006 22:59:56 -0500
From: "Barry" <n4buq@knology.net>
Subject: [R-390] E209 Test Point Voltage Is Low

I've been doing some tube-pin and test-point voltage checking. According to the manual, E209 should have approximately -6.8V. I'm getting approximately 1/10 of that or less. Looking at V202 (1st mixer), the manual calls for -0.4V on pin 6. I'm getting a voltage pretty close to that -- approximately -0.5V. Pin 6 is connected to E209 via R208, a 27-ohm resistor. How can it be that E209 should have such a larger voltage than pin 6 considering the only thing between them is R208?

Date: 25 Apr 2006 13:15:37 -0000
From: "n4buq@knology.net" <n4buq@knology.net>
Subject: Re: [R-390] E209 Test Point Voltage Is Low

Okay, I scanned the Y2K manual this morning and noticed something I missed last night. Apparently I was supposed to place the radio on STDBY before checking E209 voltage. I'll check this tonight. Sorry for the low signal/noise.

Date: Fri, 05 May 2006 19:16:27 -1000
From: "pete wokoun, sr." <pwokoun@hotmail.com>
Subject: [R-390] Where's L402?

The Crystal Oscillator Subchassis Bottom View picture (Fig. 6-23 or Fig 62, depending on what manual you look at) shows a L402 on that little board below J410. I don't see any L402 on any schematic. Am I missing it somewhere? If you have one of these modules open, is there anything physically in that position? if so, what?

Date: Sat, 15 Jul 2006 07:25:24 -0500
From: Tom Norris <r390a@bellsouth.net>
Subject: [R-390] Strange 390A problem

For several years, my '63 Imperial has had an odd presumably AGC related problem. At intervals sometimes approaching hours, it will reduce gain by as much as 30db. It does this regardless of IF module installed, tubes, etc. Voltages remain constant. (just something I ask every couple years or so)

Date: Sat, 15 Jul 2006 15:19:23 +0100
From: "Peter Worrall" <g4gjl@btopenworld.com>
Subject: Re: [R-390] Strange 390A problem

Grid / cathode intermittent partial short problem in RF deck?

Date: Sat, 15 Jul 2006 09:59:22 -0500
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] Strange 390A problem

What brings it back.....cycling of the rig to standby...or Cal positions....a band change. Power down and cool off?

Date: Sat, 15 Jul 2006 11:23:31 EDT
From: ToddRoberts2001@aol.com
Subject: Re: [R-390] Strange 390A problem

Does it do this on all bands or just one band? I have seen an R-390A where the gain changed up and down and traced it to a bad / leaking silver mica cap in one of the RF Deck transformers. Replaced the cap and everything was normal again. The old ruby-red moulded Silver Mica caps are notorious for intermittent / weird behavior. 73 Todd WD4NGG

Date: Sat, 19 Aug 2006 16:46:11 -0400
From: "dmartin" <dmartin@visuallink.com>
Subject: [R-390] C227 Bypass Question

Regarding C227, the .047 pf oil filled, chassis mounted bypass of the cathode of V201, the rf amp tube:

1. This cap was augmented with a field change that added an additional 47 pf cap, C257, in parallel and mine has it. Seems to me if 47,000 pf isn't quite enough to start with, 47 more pf doesn't really help? When replacing the C227/C257 combination with a new single bypass, what would a new recommended value be?

2. Would one of the modern, tubular, axial lead yellow poly caps be OK in this application? I seem to recall a general rule of thumb that suggests poly-type and Orange Drop-type caps as best for audio to IF and ceramic

and mica for RF bypass applications?

Date: Sat, 19 Aug 2006 18:29:35 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] C227 Bypass Question

The idea of the 47Pf cap in parallel with the C227, the .047 pf oil filled, chassis mounted bypass on the cathode of V201, RF amp tube has nothing to do with shoving the .047 up another 47Pf. Think about today's three terminal voltage regulators. There you often see big filter caps and small caps beside them. Its in the nature of caps. That big (; ? .047 just does not filter a lot of small pop corn noise. So the little 47Pf gets the little stuff while the big one provides filtering to stabilize the cathode bias point on the RF amp. If you are doing a recap, leave that big oil job right on the deck. It looks good from the top side and fills the hole. Just detach the lead under the deck.

Place a new .047 under the deck. Place a good 47Pf under the deck also. Neither of these two values are exact items. You need a big one and a small one because neither one will do every thing that needs to be done. They function as filters and act different. A 0.1µFd at 25 volts would work. If the tube shorts then a 300 volt cap would be in order. So a 0.1 at 300 volts to .033 would do. More is better.

Some folks of certain mind set will argue for nothing lees than a NOS replacement.

Do go for a good 47Pf cap and not just a low cost ceramic disk cap. The function of that cap is to reduce some spurious noise in the amp. A better cap here is worth the trouble to hunt one down. Again the value is not an exact item. Some thing under a 100 RF and over 33Pf will work.

>Would one of the modern, tubular, axial lead yellow poly caps be OK
.....

Dan, again good caps are good caps. The problem is you do not want to be into the receiver every other month working on some problem. And you sure hate to be wondering if the problem is some part you just put in last year. It is worth the time to use better parts. This is the first RF gain stage and it sets the noise level for the entire receiver. Hear some of that hype form the gold plated audio world may be in order. Any thing that will help the noise in the RF amp would be in order. So a 600 volt orange drop working at the cathode bias voltage of the RF tube would be in order. A couple good small quite PF caps that grab some of the hash noise would also be in order. Good installation with short leads would also help. Plenty of solder to provide a good conducting cross section would also be

in order.

Date: Sat, 19 Aug 2006 18:17:27 -0500
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] C227 Bypass Question

That's good stuff Roger..... I learned a bit on that one....it goes in the file here for future reference...

Date: Mon, 21 Aug 2006 19:49:25 -0500
From: Tom Norris <r390a@bellsouth.net>
Subject: [R-390] Anyone interested in yet another R390A crystal list?

If anyone is interested in taking a look, I threw together a quick all-encompassing R-390A crystal list. This list cross references band position with crystal frequencies and oscillator out and is a bit easier to read, IMHO than the diagram in the y2k manual. This builds on Nolan's crystal list that gave the
milspec information for the crystals.

http://r390a.fernblatt.net/xtals_390a.pdf
http://r390a.fernblatt.net/xtals_390a.gif

(Just for fun, leave out the file name for this week's example of another hobby, web error pages) Comments and brickbats appreciated. Particularly the latter. I had written a similar document to help with troubleshooting the R-390, but that needs to be gone over again, not sure it's worth it unless someone might find it useful - could be the beginning of an R-390 troubleshooting guide. If I've overlooked something and such a list already exists, please disregard.

Date: Tue, 22 Aug 2006 06:23:51 -0400
From: "dmartin" <dmartin@visuallink.com>
Subject: Re: Anyone interested in yet another R390A crystal list?

Nice job, Tom. About two years ago I got written quotes via e-mail from International Crystal for all of the 390A crystals. As you have said, simply providing them with the CR-series designator and frequency was all they needed. At that time, any of the 15 CR-36/U crystals were $24.95, the 17.000 meg CR-27A/U was also $24.95, the 200.000 kHz CR-47/U was $85.54, and the 455 kHz CR-45/U was $85.54. For perspective only, this would have made a complete re-crystaling a nearly $600 undertaking! I suppose an a la carte selection of one or two specific crystals, as needed, wouldn't be a bad deal, assuming Fair Radio and other usual sources of used crystals were unavailable. Again, this quote was 2-3 years ago so today it would likely be more.

Date: Thu, 24 Aug 2006 20:54:41 -0700
From: "Craig C. Heaton" <wd8kdg@worldnet.att.net>
Subject: [R-390] Real Quiet R-390/A

Yesterday my R-390/A got real quiet. If I turned up the local gain to max, I might be able to hear a local broadcast station. Well, today after looking under the hood of the beast, I think the offending component was located. The RF gain pot has seen better days. It is now a 8.6K pot and doesn't adjust any lower than 1.6K ohms. So does anyone on the list have a spare R103 RF gain pot, 5K 2W? Would like to have one per specs. Panel mount, 2W, correct shaft length, etc.
Please contact me off list. E-mail..... wd8kdg at worldnet.att.net

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Date: Fri, 25 Aug 2006 06:20:09 -0400
From: "dmartin" <dmartin@visuallink.com>
Subject: Re: [R-390] Real Quiet R-390/A

Clarostat JA1N056S502UA, Allied part number 753-2206, is an exact electrical and physical match and drop-in replacement for R103. It is probably available through several of the major catalog suppliers, I just happened to have the Allied Electronics part number.

Date: Fri, 25 Aug 2006 22:27:01 +1000
From: "pete williams" <jupete@bigpond.net.au>
Subject: [R-390] Ref. xfmrT 401 removal

Don't worry listers..... I sorted the removal problem by just doing it....Undo the nuts, desolder the connections and away it comes--- you've got to take the RF module out first tho'

Incidentally, problem appears to be dry joint on the 5000pf by pass and a manufacturing error wherein excess solder on the internal connection formed big enough blob to intermittently short to the xfmr case. That's the theory and reassembly will put it to the test. Thanks to Bill Hawkins for words of encouragement.

Date: 25 Aug 2006 13:25:51 -0000
From: "n4buq@knology.net" <n4buq@knology.net>
Subject: Re: [R-390] Real Quiet R-390/A

Also see Mouser's P/N 526-501-0009. Electrically it appears to spec out the same and you'll have to cut the shaft to length, but it costs a bit less than the Clarostat. It does have the original size 3/8-32 threads as opposed to a lot of the pots out there now with metric threads.

Date: Sat, 9 Sep 2006 16:33:28 +1000
From: "pete williams" <jupete@bigpond.net.au>
Subject: [R-390] R-390A - lan odd fault.

Hi group... just a recent anecdote which may be of interest...After installing a relatively new looking(?) RF module in a rejuvenation project.,I had a marked drop in gain/sensitivity during alinement on the 4 - 8 MC range.

The input xfmr T204 appeared to tune very broadly and most sluggish. Figuring bad contacts or capacitor I removed it, slipped off the cover and was amazed to find the antenna coil primary winding at the bottom end was a tangled mess ---- not only did it LOOK burnt , but the former at the lower end completely missing ! carbonised I expect.

Conjecture ..... the module was of ex-Navy stock labelled repairable.. .. maybe HT through the balanced antenna or a dose of high power RF. ?...The rest of the rx I don't have to check the relay. It is of interest to note that the band covers marine freqs... No aspersions intended . ! A new T 204 fixed that one ... there's a moral before using surplus stuff whether or not marked "repairable" !

Date: Sat, 9 Sep 2006 10:43:41 -0500
From: "Barry" <n4buq@knology.net>
Subject: [R-390] Crystal Deck

I finished the crystal deck work last night. Thanks to all who offered advice. It worked out very nicely to pre-assemble some of it. The two caps in the lower-right-hand corner would have been pretty much impossible to solder with the lug in place. Instead, I soldered them (as well as one of the ground wire connections) to the lug first, bolted it onto the chassis, and then soldered the other ends. You can see the results here:

http://www.knology.net/~thelanding/crystaldeck2.jpg

Now to solder the new IF connectors onto the new coax and give this all a try.

Date: Wed, 13 Sep 2006 19:01:51 -0400
From: "Dave Maples" <dsmaples@comcast.net>
Subject: [R-390] Another R-390A question

Gents: All this discussion has prompted me to wonder about the performance of my R-390A. It's probably stupid question time, but after

watching the responses I'm willing to throw another one in the pot. I have never had the courage to pull the RF deck out (the gears don't bind, everything is free, all the coils have tuned, etc.). I have completely recapped the IF and AF/PS sections.

Here's my question:

When I rotate the RF gain counterclockwise on my 390A, there is minimal effect on overall sensitivity (some reduction, but signals are still clearly audible). Recently I worked on another R-390A for another fellow, and lo and behold when the RF gain control was turned CCW the receiver would quiet right down to nothing. I've only had the two to look at (never owned or used another one). Which kind of behavior (some reduction or lots of reduction) should I expect?

Date: Wed, 13 Sep 2006 21:27:30 -0400
From: "David C. Hallam" <dhallam@rapidsys.com>
Subject: RE: [R-390] Another R-390A question

Remove the jumper from pins 1 & 2 on TB102. Connect your ohm meter between pin 2 and ground. As you turn the RF gain control, you should read from 0 to 5K ohm. I would suspect you have either a short in the pot or a short someplace in the circuit.

Date: Thu, 14 Sep 2006 10:15:29 -0700
From: "David Wise" <David_Wise@Phoenix.com>
Subject: RE: [R-390] Another R-390A question

I wonder if his "bathtub" bypass cap C103 is leaky.That would limit the maximum resistance to ground. It's been a while and I'm too lazy to look it up; isn't it mounted inside the rear skirt?

Date: Mon, 18 Sep 2006 13:39:34 -0700
From: "David Wise" <David_Wise@Phoenix.com>
Subject: RE: [R-390] Leaking C103?

>discovered C103 (the 50uF > bathtub cap) appears to be leaking .....

You are measuring it wrong, Barry. The leakage current of electrolytic caps like C103 is not proportional to applied voltage - you can't express it as a resistance. The fact that you did suggests that you used an ohmmeter, which probably did not apply more than a volt or two. The cap would have to leak at least a few mA to give the behavior you observed*. Suitable replacement caps (47uF/100V) caps are abundant and cheap. The easiest way to check the original is to temporarily remove it. This is feasible because its only role is to keep the scratchiness of the pot from

blowing your ears out as you turn it.

* I hope I'm not confusing threads. Someone reported unexpectedly high gain when RF GAIN was set to minimum, and I replied that a possible cause was a leaky C103.

Date: 18 Sep 2006 21:18:45 -0000
From: "n4buq@knology.net" <n4buq@knology.net>
Subject: RE: [R-390] Leaking C103?

Yes, I happened to check it with an ohmmeter. I was checking the RF gain via the back panel with the jumper disconnected. I happened to connect the meter to the C103 side and observed the meter climb to 500k and stop. I expected it to go nearly to infinity. Now knowing the function of C103 and how it doesn't really matter since the RF gain control is approaching its low end at fully CW, then I'm not going to worry about it. If I'm unable to reduce the gain, then I'll know it could be the cap.

Date: Mon, 18 Sep 2006 19:33:48 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Leaking C103?

500K is nearly infinity. It was back in 1950. Now we have these new meters that have pushed infinity out a meter range or 2. 500K on a paper cap soldered in a sardine can is pretty fair.

Date: Thu, 19 Oct 2006 12:30:45 -0400
From: Mark Huss <mhuss1@bellatlantic.net>
Subject: [R-390] Another possable mod.

There are several modifications that have gained popularity. Among these are the SSB mod by Lankford, the receifier mod, the audio mods, etc. One thing that has been an annoyance for me is the error in frequency when switching bands. This is caused by the crystals aging at different rates. In my receiver (made in 1955), some of the crystals are over 50PPM off frequency. One is 200PPM off frequency! The simple cure is to use a DFD-3 to convert the mechanical dial with a electronic counter display. Then the oscillators, including the PTO being off would not matter. But while looking around, I ran across some articles on a 'HUFF-PUFF' oscillator stabilizer. Seems to me that, as best I can understand it, it would make a nice circuit to pull in the 2nd crystal oscillator using the 200 khz calibrator as a reference. From what I can gather, this might be a simple fix, involving very little circuitry.Anybody ever give this a try? Anybody?

Date: Mon, 30 Oct 2006 16:33:52 -0600

From: Tom Norris <r390a@bellsouth.net>
Subject: [R-390] The R-390 and the 6AB4

Another slow Monday... So I was playing around with this one R-390/URR that was in the pile that I hadn't gotten around to checking out - I did the usual quick check of the IF followed by an RF check and noticed "this is a hot receiver..." It was easily reading it's -7 volts with 0.1 microvolts in, in fact I had to use an attenuator. With no signal in, it had no real audio noise nor diode load voltage out to speak of. Pretty sensitive compared to the other radios that I've been slowly getting around to checking. (very slowly...) Most have been lucky to meet spec at initial check out. This one doesn't, really.

The gain was because the 6C4's were subbed with 6AB4's. With the 6C4's in place, the initial reading was about 10 microvolts for a -7 volt reading. So far I've not been able to make it overload or see any odd signals and there doesn't seem to be any unusual distortion - which I think I should be seeing considering the the mixers stages should have a nominal gain of 2 using a 6C4, best I can tell. (In the R-390, the mixer gain is fixed vs the '390A) They're subs, and they work well in most apps, supposedly, look up the specs - they work *really* well here, and for folks that don't want to go digging into their radios it may be a solution. They made no difference in the mixer and rf "alinement" by the way.

I'll end up pulling the RF deck to clean the geartrain and replace resistors, tempting as it is to just leave it alone and just listen to it - since it works. But, it's not to spec and the resistors keep getting, ummmm more 'resistor'-y. Many of the higher value resistors in it's brother were 100% high. This isn't a spring- chicken R-390A we're talking about. Just thought it was an interesting checkout after I finally got around to it. Anyone looking for these tubes on purpose can find them under the number 6664 as well.

Date: Mon, 30 Oct 2006 21:29:53 -0500
From: "Charles A Taylor" <wd4inp@isp.com>
Subject: Re: [R-390] The R-390 and the 6AB4

Now THAT was an interesting story. I can't use it, but it was interesting! I've been into an R-390 (OK, OK. Just this once: R-390 NON A) and it's a witch's brew of gears and decks. Kinda like putting the engine of a car on a hinge, and ramping it up and down to change the acceleration! Plus, it cost the Gum'mint a fair share of Fort Knox. No thank you, sir!

Date: Wed, 22 Nov 2006 14:51:56 +1100
From: "pete williams" <jupete@bigpond.net.au>
Subject: [R-390] Meter repair/RF xfmr repair

<snip> 2. I found another RF antenna xfmr wouldn't peak on alinement..--- nothing wrong with the coil primary but the trimmer cap and fibre plate burnt--- too much RF from somewhere. The trimmer and parts can be replaced with care after disassembly but check the thin insulating wafers at the base of the capacitor.. if they rotate and not firmly glued to the fibre plate tuning anomalies eventuate. Maybe Fair have replacements but they're not close by here !

Date: Tue, 13 Feb 2007 10:39:14 -0500
From: "Jim M." <jmiller1706@cfl.rr.com>
Subject: [R-390] Low Sensitivity 8-16 Mhz

On bands between 8 and 16 mhz the hearing on this 390A goes down considerably. Cal signal on other bands is about 50 dB, but on the 8-16 band it is down to 20 dB. I suspect something in the RF coil set for that 8-16. I went through the RF alignment procedures and it appears to align correctly but the signal levels are very low compared to other bands. Any ideas? Jim N4BE

Date: Tue, 13 Feb 2007 12:15:30 -0500
From: "Jim M." <jmiller1706@cfl.rr.com>
Subject: Re: [R-390] Low Sensitivity 8-16 Mhz

Solved ! - After some experimentation and swapping of coil cans, I suspected the fixed mica capacitors inside the Z205 can had failed or drifted in value. Opened the can and replaced the 180 pf and 68 pf mica caps with new ones, and the problem is solved! So not only are the large BBODs a problem in these radios, even the little mica caps can go bad with age. 73 Jim N4BE

Date: 23 Feb 2007 18:00:38 -0000
From: "n4buq@knology.net" <n4buq@knology.net>
Subject: [R-390] 17mc Crystals

Has anyone explored the possibility of having some 17mc crystals made? I know some folks have gotten crystals made for a fairly reasonable price from the current manufacturers so getting these made might be a possibility. Also, the new ones are probably a lot closer than some of these older crystals are now.

Mine is off several kc causing me to have to compensate for it with the zero adjust quite a bit more than I'd like. I know there are ways to set the radio up to compensate for this, but it would be nice to have the thing closer to 17.000 than it currently is (~16.996).

Date: Fri, 23 Feb 2007 12:19:24 -0600
From: "Dave Merrill" <r390a.urr@gmail.com>
Subject: Re: [R-390] 17mc Crystals

Fair Radio is currently advertising 17Mc (and other freqs) on their webpage. When I was there about 1.5 years ago they had a substantial supply. Most sell for $10 each.

Date: 23 Feb 2007 19:32:26 -0000
From: "n4buq@knology.net" <n4buq@knology.net>
Subject: Re: [R-390] 17mc Crystals

Can you post a link to them? I searched their website and did not find them.

Date: Fri, 23 Feb 2007 13:27:29 -0600
From: "Dave Merrill" <r390a.urr@gmail.com>
Subject: Re: [R-390] 17mc Crystals

Scroll way down - They list crystals for both the R-390A and R-390:
http://www.fairradio.com/catalog.php?mode=view&categoryid=161

Date: 23 Feb 2007 19:51:51 -0000
From: "n4buq@knology.net" <n4buq@knology.net>
Subject: Re: [R-390] 17mc Crystals

Is the 17mc crystal they list there the one for the crystal deck or for the 1st crystal oscillator (or are these the same size crystals)? I was thinking the 1st crystal oscillator was a larger crystal with a different base but maybe not? If they're the same, I may have an extra 17mc crystal from an old deck. I just can't remember what the crystal in that little ovel looks like.

Date: Fri, 23 Feb 2007 13:44:58 -0600
From: "Dave Merrill" <r390a.urr@gmail.com>
Subject: Re: [R-390] 17mc Crystals

They are all the same crystal - 17MC CR-36A/U

Date: Fri, 23 Feb 2007 19:56:33 -0600
From: "Dave Merrill" <r390a.urr@gmail.com>
Subject: Re: [R-390] 17mc Crystals

Just for kicks I measured the five NOS 17MC spares I picked up at Fair:

17.00156
17.00169
17.00143
17.00157
17.00160

Equipment: HP 5334A Counter, HeathKit TO-1 Test Oscillator

BTW, the TO-1 is a very handy piece of test gear. Generates RF at 262KC, 455KC, 465KC, 600KC and 1400KC and can be modulated @ 400 CPS. Has two crystal sockets (HC-6 and FT-243 style) for adding other IF frequencies or just checking crystals.

Date: Fri, 23 Feb 2007 20:41:04 -0600
From: "Barry" <n4buq@knology.net>
Subject: Re: [R-390] 17mc Crystals

The second crystal I picked out of the drawer was 17mc. Swapped it and it runs at 17.0004. I love it when a plan comes together!

Date: 23 Feb 2007 20:39:55 -0000
From: "n4buq@knology.net" <n4buq@knology.net>
Subject: Re: [R-390] 17mc Crystals

Great. If I don't have a spare (I've given some crystals away so not sure), I might be able to swap the one in my 2nd Crystal Deck with the 1st oscillator. It might be closer. Of course, the bands controlled by the 17mc crystal in the 2nd Crystal Deck would be affected, but that would be less of a bother than the main oscillator being off and affecting all bands.

-

Date: Mon, 26 Feb 2007 10:31:02 -0500
From: "Charles A Taylor, WD4INP" <wd4inp@isp.com>
Subject: [R-390] 200-kHz calibrator crystal

I looking for a current source for the 200-kHz HC-6/U calibrator crystal. Looked that the usual crystal manufactures. Their sites don't give much information: I don't want a quote. I want a per-crystal price plus shipping.

Date: Mon, 26 Feb 2007 13:12:41 -0500
From: Roy Morgan <roy.morgan@NIST.gov>
Subject: Re: [R-390] 200-kHz calibrator crystal

One supplier known to make low frequency crystals is below. It's possible he is one of only maybe two who still make them.

Universal Crystals Inc.
Jim Little
5407 Payne St., Shawnee Mission KS 66226,
United States
(913) 334-6254

Note that the R-390A calibrator crystal lives in an oven (at 75C, I think).

Date: Mon, 26 Feb 2007 17:07:12 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] 200-kHz calibrator crystal

It's been a *long* time since that crystal was a common item. You probably will have a lot more luck finding an old one that still works ok.

Date: Tue, 27 Feb 2007 08:52:46 -0500
From: Mark Huss <mhuss1@bellatlantic.net>
Subject: Re: [R-390] 200-kHz calibrator crystal

Good Luck. The only source I know of is to buy the 17 Mc Oven PlugOin, then see if it works. I did this for my R-390A, and had an extra 17 Mc crystal left over. Getting crystals cut for under 1.0 MHz is very difficult nowdays, with the exception of 32.768 kHz. This is one of those places where someone may need to design a 17 MHz and 200 kHz oscillator that will work as a plug-in (a 17 MHz programmable osc block with a divide by 85 circuit to generate 200 kHz squarewave?).

How about using two of those Programmable Oscillators that cost about $7 each? Buy two surface mount ones, one for 17 MHz and the other for 2 MHz. Add a tank circuit for the 17 MHz one to round it off, and a divide by ten for the 2 MHz one. The 20 ppm ones would only be off about 350 Hz at 17 MHz, and off 4 hz at 200 kHz.

100 kHz crystals are more readily available. Has anyone tried to substitute a 100 kHz crystal for the 200 kHz one? Looking at the schematic, this should work as V205A should oscillate fine at 100 kHz. Then V206 should divide it to 50 kHz, and the tank circuit on V205B should give you 100 kHz markers with suppressed 50 kHz markers.

Date: Tue, 27 Feb 2007 18:38:54 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] 200-kHz calibrator crystal

Be careful of the phase noise on some of the parts out there. If you put in a poor phase noise source for the 17 MHz oscillator you will significantly degrade the performance of the radio. Your best bet probably is to grab an

old cell phone TCXO and divide it down to 100 KHz. Mount it under the deck where you can get voltages to it.

Date: Fri, 09 Mar 2007 08:24:47 -0800
From: "Kenneth G. Gordon" <kgordon2006@verizon.net>
Subject: Re: ECC88

ECC88 Those are the European equivalent of a 6ES8 which is a premium remote cutoff dual triode. I think they are the only remote cutoff dual-triode that was ever made. There is a mod for the 75A4 to change the first mixer to a Pullen type using one of those tubes that is supposed to make a really big difference in both sensitivity and overload characteristics. Written about in ER a while back.

Date: Fri, 09 Mar 2007 09:17:11 -0800
From: "Kenneth G. Gordon" <kgordon2006@verizon.net>
Subject: [R-390] ECC88

Sorry. I meant 6DJ8

Date: Fri, 09 Mar 2007 12:59:38 -0800
From: "Kenneth G. Gordon" <kgordon2006@verizon.net>
Subject: Re: [R-390] Mixer mod for 75A4 - possibly adaptable to the R-390?

Probably. I will dig out the ER magazine in which that article appears, and forward the info on to you. Ray sells all back copies of ER for $3.85 each. I find the magazine very useful and enjoyable. I have posted the schematic for that mod to the Glowbugs website here:

http://www.mines.uidaho.edu/~glowbugs/75A4Pullen.pdf

It may have enough information that you won't need the ER article, although that article contains some reliable test information on what was discovered about how well it works. IMHO, it is well worth doing.
<snip>

Date: Sat, 10 Mar 2007 12:58:11 EST
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] 17mc Crystals

Some more things we need to write up and get into the Pearls.
There are two 17Mc Crystals in the R390's.
One is for the second mixer in the can with the calibration crystal.
A second is in the crystal oscillator deck.

Both are the same form factor in size.
They will interchange.
They have a difference in temperature ratings and thus a different part number.
That has all run through the mail before and we need to get it all over to Wei-Li's Pearls.

If you are not operating your receiver in a "harsh" environment the temperature range is not an issue as you have the heaters off and the "oven" containers are running over room temperature because every thing in a box with glowing tubes is over room temperature. The crystals are different and have different part numbers. Some folks will want the correct parts in the correct spots and need to know these little details. Some folks just want the receiver dial to agree with the frequency being received. Such luck to find one so close in frequency.

Date: Sat, 10 Mar 2007 13:15:48 EST
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] 200-kHz calibrator crystal

The crystal cans in the R390's will unsolder nicely and the crystal unsolders from the cans pins. Many of the new small size crystals will fit in the cans nicely. Some wire lead crystals have the same size can. These can be set on an old crystal can base and the wire leads soldered into the socket pins. These will set up a bit higher due to the old crystal can base. Some of the new resonators will fit in the old cans. I have used old cans and repacked them a lot like rebuilding caps. I just run a bit of solder over the top of the can where the frequency is stamped in. This lets me recycle some old crystal cans I have picked up. So I do not have to melt down a working crystal that just is not exact enough for whatever I want. I have rebuilt several 455 KHz crystals in the IF deck this way for decks that had lost the crystal.

Just an Idea as you need to get a particular part replaced.

You may find the crystal frequency cheap in the wrong package and can live with it after some soldering on the bench.

Date: Sat, 10 Mar 2007 20:43:17 -0500
From: roy.morgan@nist.gov
Subject: Re: [R-390] 17mc Crystals

This is good to know. Off the top of my head, I do not know the temperature the multiple crystal oven on the Crystal Oscillator module runs at. If the samples of small octal plug-in ovens I have at hand are

right for R-390/URR (26.5 volts) and R-390A/URR (6.3 volts), then they all operate at 75_C. BUT,note that The "OVEN" switch on the back of the R-390A does NOT control the 17 mc and 200 kc octal plug-in oven. It does run both the Crystal Oscillator module oven and the PTO oven.

Date: Sat, 17 Mar 2007 16:31:32 -0800
From: "Craig C. Heaton" <wd8kdg@worldnet.att.net>
Subject: [R-390] WTB: Y405 Crystal

Well, I've got another R-390A and it's an Amelco in great shape except for one small part. After recapping the little beast and giving it a lick & promise alignment, bands 4,9,& 21 are real quiet (not working). Pulled Y405 from my Motorola, did the swap and all the bands works. So I'm looking for someone that has a 12,000kHz Y405 crystal for sale!

Date: Sat, 17 Mar 2007 19:49:08 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] WTB: Y405 Crystal

Fortunately that's a crystal that' s still being made. If you can't find one surplus you should be able to get it from International or somebody like that.

Date: Sun, 18 Mar 2007 16:12:41 -0700 (PDT)
From: David Medley <davidmed82@yahoo.com>
Subject: [R-390] R-390/390A Crystals

I have many R-390 crystals and somw R-390A crystals still left. I do note from time to time folk needing xtals. Let me know.

Date: Tue, 27 Mar 2007 10:07:05 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] R-390 zero adjust problem fixed and have more questions.

>.....Crystals not only drift with temperature,.....<snip>

My experience is that the 17Mc crystal drifts far more than the ones in the bandswitch. A good chunk to a few kc is typical of the 17Mc in the 0-8Mc converter, while the band-to-band difference on my rigs (keeping within 0-7 and 8-32) is just a few hundred Hz.

> Since heat accelerates this process, ... <snip> I haven't seen that much! Heated crystals in OCXO tend to show a bake-out time, during bake-out they will drift a good amount but after bake-out they're fairly flat. But those are very well sealed OCXO cans, I think the 17Mc crystal is less

hermetically sealed and perhaps foreign contaniments prevent the "flattenning out" from occuring.

Date: Wed, 28 Mar 2007 11:10:06 -0800
From: "Craig C. Heaton" <wd8kdg@worldnet.att.net>
Subject: [R-390] 200KC calibration crystal?

Well, the old fingers let one slip and bounce around on the floor. So, the 200KC calibration crystal is really broke! Still have some issues in the circuit, think one or more mica caps in that area are going south. So, I've sent out a couple e-mails to persons on the list and other places, no replies yet. I did find out this morning that MH Electronics no longer makes anything under 1MHz AT cut. Guess the 200KC would be a center cut or at least was told this was the case. Didn't try International Crystal yet. Instead, via MN Electronics, I was referred to Universal Crystal of Kansas City, Kansas. Anyone ever dealt with Universal? Price is about $55, two to three week delivery. Or does anyone on the list have a spare for sale?

Date: Wed, 28 Mar 2007 18:30:10 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] 200KC calibration crystal?

I would be careful that you are getting the right crystal. According to the guys at Collins that crystal was tough for them to get even back when the R-390A was a new design. You might ask them what the price for 5 or 10 crystals would be. It may be surprisingly low compared to 1 piece. I'd bet there are several people on the list looking for the 200KC crystals.

Date: Thu, 29 Mar 2007 22:21:10 +1000
From: "pete williams" <jupete@bigpond.net.au>
Subject: [R-390] 200 kHz xtals

I have 5 spare 200kHz xtals at US $ 25 each airmail posted... Type CR-47 U. If all else fails I recommend contact with Jim Little at Universal Crystals at Kansas City. He made me 3 LF xtals at 89.98kHz for a special project and that worked out AOK

Date: Thu, 29 Mar 2007 10:20:04 -0700 (PDT)
From: Perry Sandeen <sandeenpa@yahoo.com>
Subject: [R-390] 200KC calibration crystal source

Perhaps a heretical solution is to build the marker generator in the ARRL handbook (which is conveniently impossible to find rationally listed in the index). It has jumpers that allow the choice of several reference xtals or an input from a high stability source. Jumper selection can give a 200Khz signal. I don't know if its amplitude can be used as is or how one

would couple it. There is a PC board available. One advantage would be avoiding the 85C oven and its accelerating effects on aging.

Date: Thu, 29 Mar 2007 13:16:21 -0500
From: "Phil M." <pmills7@houston.rr.com>
Subject: Re: [R-390] 200KC calibration crystal source

I don't think this is exactly rocket science....but...Remove the oven. Take the 17 mc xtal out of the oven and solder tube pins to it. Insert this xtal in the socket so that it is between pins 4 and 6. Take a common 100 kc calibrator xtal, solder tube pins to it, and insert it in the socket so that it is between pins 2 and 8. Now you can have markers at each 50 kc point as well as each 100 kc point.

-

Date: Thu, 29 Mar 2007 19:34:52 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] 200KC calibration crystal source

The divider in the R390 is an injection locked multivibrator. It will only divide reliably at 50 KHz if you change some parts around. Taking the 17 MHz crystal out of the oven is not going to help the stability of the radio much at all.

Date: Fri, 30 Mar 2007 04:43:22 -0500
From: "Phil M." <pmills7@houston.rr.com>
Subject: Re: [R-390] 200KC calibration crystal source

> Taking the 17 MHz crystal out of the oven is not going to help the stability <snip>

I don't think it will hurt the stability of the radio much at all either for typical swl and amateur. It is used only on the bands up to 8 mc. Many other fine receivers are quite stable with none of their xtals in ovens. Many of us use our R-390A's with the ovens turned off anyway.

Date: Fri, 30 Mar 2007 07:30:59 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] 200KC calibration crystal source

The little oven that the cal crystal and 17 MHz crystal sits in actually works pretty darn well. The big "heated chamber" that the rest of the crystals sit in is useless. The PTO heater is also pretty useless.

Date: Fri, 30 Mar 2007 08:48:32 -0400
From: Roy Morgan <roy.morgan@nist.gov>

Subject: Re: [R-390] 200KC calibration crystal source

>I....hurt the stability of the radio much at all either for typical swl and amateur.....

I agree, though I have not done any tests.

>... Many of us use our R-390A's with the ovens turned off anyway.

You may know that the OVENS switch does not control the little round octal plug-in oven that houses the 200 kc and 17 mc crystals. The OVENS switch runs the PTO oven and the Crystal Oscillator deck oven. I have heard of one or two failures of the little plug-in oven: the thermostat stuck ON, and overheated the thing. I n at least one case it damaged at least one crystal. Maybe a switch in that line would be a good idea - it runs on 6.3 volts filament power. The other ovens run on the 25.2 volt line.

Date: Fri, 30 Mar 2007 07:54:52 -0500
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] 200KC calibration crystal source

If I'm not mistaken the crystal oven for the 17Mhz crystal and the 200KC crystal are not ovens that are turned off by the switch on the rear. The difference between these crystals and those in other radio's that don't use ovens is in the design of the crystal. The crystals in the 390A were designed to be operated at an elevated/controlled temperature to perform properly....the ones in other radio's were designed to perform properly at ambient....operate either outside those parameters and the frequency/stability changes dramatically. A look at the stability -vs- temp curves for the two types would reveal this quite clearly. (I'm sure there is some technical name for those curves...just don't know it) I do know that ovenized crystals have a long flat plateau in their curve that once up to temp allows a fairly wide (relative) window of temperature variance with little resulting frequency change. Below that temp. you fall over a knee in the curve and it's down hill pretty much for a long way. Just some thoughts...

Date: Fri, 30 Mar 2007 08:09:26 -0600
From: "Francesco Ledda" <frledda@verizon.net>
Subject: RE: [R-390] 200KC calibration crystal source

The temperature at which the Freq/Temp ratio is minimum is called the Crystal Turning Point.

Date: Fri, 30 Mar 2007 23:24:18 -0400

From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] 200KC calibration crystal source

The 17 MHz crystal is an AT cut, so it has two turnover's in it's frequency temperature curve. The one it operates at is the upper turnover. The 200 KHz crystal is probably an X cut. It's frequency / temperature curve is parabolic rather than third order. Since it has only one change point in the frequency / temperature curve it is called an inflection temperature. Strange but true ...

Date: Tue, 17 Apr 2007 23:53:48 -0400
From: "Fred Stillwell" <roswell@apk.net>
Subject: [R-390] T-207 / T-401

Good morning, after looking through the Army TM's for the 390A and the first version of the Y2K manual and some time in the archives I think it is time to ask... What is the recommended adjustment for T-207 and for T-401 ? and why is the transformer can marked with both numbers?? Where IS T-401? The voltage measured at E-209 when in the Standby position was around 0.960 volts after replacing C-327. I am able to get it to 1.80 volts with the adjustment on T-207 all the way down but can't get it to 3 volts. This is one of the St.. Juliens Creek units! any thoughts ?

Date: Wed, 18 Apr 2007 23:20:27 -0500
From: "Barry" <n4buq@knology.net>
Subject: Re: [R-390] T-207 / T-401

T401 is the transformer mounted on the top of the second crystal oscillator deck. I've had trouble getting 3V from my crystal oscillators as well. I replaced C327 and it didn't help that much. As long as the radio works, it may not be necessary to worry if you get a full 3V.

Date: Thu, 14 Jun 2007 10:20:53 -0400
From: "n4buq@knology.net" <n4buq@knology.net>
Subject: [R-390] 200kc crystals

Is it possible to disassemble an HC-6 crystal and grind it to a different frequency? Since 200kc crystals are getting pretty rare, I was wondering if a 455kc could be ground to 200kc. More trouble than it's worth?

Date: Thu, 14 Jun 2007 10:31:38 -0400
From: wabate <wabate@verizon.net>
Subject: Re: [R-390] 200kc crystals

When you grind a crystal it goes up in frequency not down. Good thought though. BTW, before you ask, I don't know if you could move a 100 KC

that far.

Date: Thu, 14 Jun 2007 09:41:03 -0500
From: "Bill Hawkins" <bill@iaxs.net>
Subject: RE: [R-390] 200kc crystals

First you'd have to put three 455 crystals together and somehow fuse them so that they became one crystal. Then you could grind off material to raise the frequency.

Date: Thu, 14 Jun 2007 10:46:37 -0400
From: "n4buq@knology.net" <n4buq@knology.net>
Subject: Re: [R-390] 200kc crystals

Oops. I wasn't thinking. I've seen some posts on other groups about grinding crystals (never tried it myself) and was thinking a 455kc crystal being sort-of close to 200kc, it would be an option. Thursday-morning-think at its worst...

Date: Thu, 14 Jun 2007 10:48:12 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] 200kc crystals

>Is it possible to disassemble an HC-6 crystal and grind it to a different frequency?

In general, yes. Grinding or etching to shift a crystal up a few kc is not so bad.

>Since 200kc crystals are getting pretty rare, I was wondering if a 455kc could be
>ground to 200kc. More trouble than it's worth?

Not gonna happen that way. You're not talking about a percent or two shift upwards, you're talking about a complete shift downward by more than an octave. I'm not an expert in the 200kc crystal cans, but below a frequency in the kc range the crystals are done as tuning forks rather than as rectangles. ART-13 crystal calibrators use 200kc crystals, if you've got one of them lying about for parts. Some folks use 100kc crystals in their R-390A's, and get 50kc calibration marks with a small modification to the stuff around the 5814A's on the RF deck.

Date: Thu, 14 Jun 2007 10:59:40 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] 200kc crystals

In this world any thing is possible, however every thing is not likely. You could grind a 100K to 200K with some good lapidary equipment. The quartz is metal plated and the wire lead bonded to the plating. Grind some, replate and test the frequency, Repeat until exact. A one off venture with scouring powered on a glass plate has a low probability. You can open the current crystal cans and replace the contents. I have put small 455 crystal cans into the R390 HC-6 crystal size cans and had it work well. If we can find some 200KHz in the new smaller can sizes they could be mounted into the HC-6 cans. The HC-6 have hollow pin leads and much easier to rebuild than the power supply filter caps.

Date: Thu, 14 Jun 2007 11:12:18 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] 100kc crystals and 50kc Cal Tones

Tim has a good point here. Some folks use 100kc crystals in their R-390A's, and
get 50kc calibration marks with a small modification to the stuff around the 5814A's on the IF deck. We need to collect this information and develope a schematic and change part list. Then get it over to Wei-Li for the Pearls of Wisdom. As it is a modification rather than a maintenance history topic for the Y2K Manual. We can get small 100kc crystals and mount then in the HC-6 cans. Any old HC-6 can will work it need not be your 200kc can. Then the crystal would be a plug into the oven. Some cap and resistor changes to move the multi vibrator time constant down to a 50kc frequency from its 100kc frequency. Does any one have any parts values? Any one on the reflector have a receiver running that way now?

Date: Thu, 14 Jun 2007 11:30:55 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] 100kc crystals and 50kc Cal Tones

In the divide-by-two, doubling C313, C314 and C315 to about 470pF won't hurt any. I believe that all this is documented in an ER from a decade or two ago but I don't see it in the index.

Date: Thu, 14 Jun 2007 10:20:53 -0400
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Subject: Re: [R-390] 100kc crystals and 50kc Cal Tones

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Date: Thu, 14 Jun 2007 18:11:53 -0400
From: "Drew Papanek" <drewmaster813@hotmail.com>
Subject: [R-390] Re: 200kc crystals

>If we can find some 200KHz in the new smaller can sizes they could be mounted into the HC-6 >cans. .....

And no uckumpucky to dig out! It is quite likely that a 100 Khz crystal of the correct type would lock the multivibrator at 100 KHz and no modification to the multivibrator would be needed.. Of course, if one wanted 50 KHz cal points then the multivibrator could be so modified. I see where Mouser offers 100 KHz electronic watch type crystals from several different manufacturers. The watch crystals have a high ESR at resonance; they might not oscillate in the circuit of the R-390A. However, they cost less than $2.00 and so might be worth a try.
For 100 KHz cal points, one could also use a crystal at some other multiple of 100 KHz. As the multiple is increased, the scheme loses practicality because the mutivibrator free-running frequency has to be held closer to 100 KHz. The R-390/URR (AKA non-A) uses a 1 MHz crystal which locks the 100KHz mutivibrator at the 10th submultiple. An occasional problem with the R-390/URR calibrator arises due to tube or component aging where the multivibrator locks onto another submultiple

of the 1 MHz crystal frequency. The result is 90.9 KHz or 111.1 KHz cal points. That radio's calibrator multivibrator has a trimmer cap to enable setting the free running frequency.

Date: Thu, 14 Jun 2007 22:07:43 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] 100kc crystals and 50kc Cal Tones

The thing you have to worry about is the resistance of your 100 Kc crystals. They may be a *lot* different than the 200 Kc ones. Getting the thing to oscillate properly may take a bit of fiddling. When you take the oscillator down in frequency you will also have to re-tune the multivibrator to get it to 45 Kc.

I once asked the guy who designed the 200 Kc crystals into the R390 why he did it. His answer was pretty simple: "we were sold a bunch of hogwash about them". His opinion was that there was no real advantage to the 200 Kc crystals in the end. Neither one is really all that great a crystal.

Rather than rip out a bunch of stuff, why not just come up with a little drop in to generate a 200 KHz square wave off of a cell phone TCXO? Just plug it in where the crystal used to be. If you find a crystal later, pull it out and throw it away.

Date: Sat, 23 Jun 2007 16:01:00 -0700 (PDT)
From: Perry Sandeen <sandeenpa@yahoo.com>
Subject: [R-390] Re: 200 KHz crystals again

I would respectfully offer that these cures are far worse that than the disease. IIRC I posted this a while back but I'm re-posting it as I believe this is the path of leastresistance to solving the 200 KHz problem.

First though the true source of the problem. The oven runs at 85C. This will always be a problem. Finding a way to lower it to say 45C would go orders of magnitude to keep both crystals running for probably an indefinite time. The cure for this is another rant. Contact me off list if you want a simple heater ckt.

A Simple Solution. (Purists close your eyes so you won't be contaminated)

1. Obtain a copy of the ARRL handbook 2004 to 2006 , which are the only copies I have.

2. Go to section 25.15 (2006 manual). There is circuit called "A Marker Generator With Selectable Output".

3. Buy the PC board, 5 IC's, a few miscellaneous parts and an aluminum box. If you don't want to buy the board RatShack has dual IC boards that can be used. Build unit. One can obtain 1 or 10Mhz TXTO's very reasonably for a master oscillator. A side benefit to using a TXTO is that one can slave the 17Mhz oscillator. Or one can use either a 1, 2, or 4 MHz crystal on the marker .generator board.

4. Set jumpers to any desired sub-multiple of your choice. Inject the cal signal into Pin 5 of 205. The harmonics are probably strong enough that you won't need any amplification. If not increase the 20 pf cap to .001 mfd or larger. Then V205 and V206 become redundant.

Date: Sat, 23 Jun 2007 19:39:46 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Re: 200 KHz crystals again

The crystals in the oven are specifically cut at an angle that gives minimum temperature slope in the vicinity of 85_C. Dropping the oven temperature to 45_C will make the oscillators significantly less stable. It will also walk them off frequency by more than just a little. I'm not sure what is right with using the ARRL circuit and so bad with coming up with one of your own. I'm also not quite sure why a "free" cell phone TCXO is worse than one you pay for. If 1 and 10 MHz miniature TCXO's (not XO's) are out there free I haven't seen it ....

There have been a number of papers published on crystal reliability. Do a Google on "Frequency Control Symposium". A good library may have copies as well. I have not seen any that substantiate a *reliability* issue on crystals run at 85_C versus crystals run at 45_C. I also have not seen any indication of it in any of the work we have done.

Date: Mon, 25 Jun 2007 08:41:13 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] Re: 200 KHz crystals again

>If 1 and 10 MHz miniature TCXO's (not XO's) are out there free I haven't seen it ....

Not for free, but they are readily available, along with a lot of other ones that will divide easily down to 100kc. Depending on "free" ones is not so good because these sorts of projects depend on a specific surplus source that usually doesn't last for more than a year or two. But a TCXO is way over-engineering IMHO. Tweaking 100kc (or 1Mc or whatever) cal crystals works just fine, even easier to adjust today than 50 years ago.

> There have been a number of papers published on crystal reliability.....

My big problem (working on equipment from 5 to 50 years old) is ovens that get stuck in the "on" position despite the fact that the thermostat was supposed to turn them off. Everything bakes. The modern high-tech high-temp insulating materials (e.g. kapton) turn into broken little flakes. Older stuff just turns into burnt-looking crud. You might think that since I'm working with older equipment that they're all mechanical thermostats, but you'd be wrong. I've
seen a lot of really nice HP OCXO's turn into burnt lasagna when the solid-state temperature control circuitry got stuck "on". Many modern crystals are remarkably well-sealed comapred to the state-of-the-art from 50 years ago. Usually the crystal and its hermetic seals survive the baking quite nicely, it's just everything else that is burnt up.

Date: Wed, 27 Jun 2007 23:19:52 -0400
From: <radio52@sbcglobal.net>
Subject: [R-390] question

I'm new to this list. I have a Collins R-390A that receives very well from 8Mhz on up... but from 7Mhz on down the receive goes completly out and then comes back on. Anyone have some clues where I should start to look on solving this problem? I am not to tech savy

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Date: Thu, 28 Jun 2007 09:05:14 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] question

Saying the stage involved is easy in this case: there's a tunable IF (including switch contacts, mixer, 17Mc osc, and more switch contacts) that exists below 8Mc but not above 8Mc. This tunable IF is in the middle rear of the RF deck with the 17Mc osc can in the extreme right rear. If it "goes completely out and then comes back on" can be split up at least 4 ways:

If it "comes back on" below 8Mc as a result of twiddling the MC knob, it's probably switch contacts deep in the RF deck and might be fixed by cleaning these up, or (more likely) realigning the bandswitch mechanism.

If it "comes back on" below 8Mc after a while with no knob twiddling, maybe the 17Mc osc has a hard time starting.

If it "comes back on" below 8Mc as a result of AGC recovery time, then you might have drastically low sensitivity below 8Mc, which might be a misaligned IF section or even the

IF slugs not moving in and out or just a crappy tube or something under the IF deck. (I've also seen some funky self-oscillations in some IF stages that can seriously whack out auto AGC while being completely inaudible to the ear).

If it only "comes back on" by tuning Mc knob at or above 8Mc, then it's not an intermittent but solidly down, and could be anywhere in that IF stage or its switches.

There are test points on the top of the RF deck and you can also check the 17Mc osc with a loop of wire hooked to a scope, placed around the vicinity of the 17Mc osc.

Date: Thu, 28 Jun 2007 09:16:51 -0400
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] question

>.....can also check the 17Mc osc with a loop of wire hooked to a scope,.....

Scopes are for wimps. ;)

Date: Thu, 28 Jun 2007 09:58:16 -0400 (EDT)
From: John Lawson <jpl15@panix.com>
Subject: Re: [R-390] question

Um, no. 'Tube Testers' are for wimps. Scopes are for KL3WL3SS N00BZ
I can't wait to see what kind of loser I am for having/using a spectrum analyzer...

Date: Thu, 28 Jun 2007 11:27:57 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] question

Well, what other cool tools are good for checking out that the 17Mc osc is running? Yes, I could fire up a second 390A and listen for the 17Mc note... and "weenie" seems to be the more modern term!

Date: Thu, 28 Jun 2007 12:01:19 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] question

Good response to Radio52.
Think this receiver use to work.
It was moved.

Now it does not work?
There fore something come adrift. (IT BROKE)

A place to start is with the eye balls.
Pull the top cover off if the receiver has one.
Pull the Utah RF deck cover off (so named for its shape) the RF deck.

Under 8Khz is the first crystal osc V702 a 6ak5 or 5645 tube.
Is it lit?
As this is a new receiver to you. you need to locate the HR 202 crystal oven.
This is a round can on an 8 pin crystal socket off on the right side rear corner.
It should have two springs and cross clip holding it in.
Slip the clip over to one side.
Pull a couple tube to get some finger room and pull the can.
The cover comes off the can with little screws around the base.
Then there is another cover on the oven can inside.
Its a press fit and slips off.
Inside the can should be two crystals.
Check that they exist and are seated.

We Fellows believe in a product called DeOxIt. clear liquid in small bottle that cleans out crud from contacts. You may need some between the crystal and
the contacts in the oven can and between the can and the octal socket contacts.

Put that all back once you know you own those parts.
Make sure the two crystals are in the correct location in the oven.
You can have cal tones with swapped crystals.
A Fellow would know the symptom of swapped crystals but only from experience.

Check V202 a 6C4. Is it lit?

Grab the MC change knob and roll the dial from 00 to 08.

Watch Z213-1 ,2, 3 This is the back corner left set of three cans under a slug rack.

As you go through the MC change steps the rack steps up 00 is slugs in the cans 07 is slugs out of the cans.

As you run the KC dial from -000 to +000 the rack should move up slowly the

small amount of a step between the MHZ steps.

Look to see that all three slugs are moving and the rack follows the cam and does not hang up some where on the rails. Mostly a slug hangs in a core and
the rack does not follow.

Set the dial to 7+000 and check that all the cams line up close to the mechanical alignment point.

You may have to use the zero adjust to get some small adjustment on a cam or two.

If all the cams are not close then look for a loose or broken clamp in front of a gear. That's a whole another mail subject.

Do not worry about dial over run being exact or zero adjust being exact at this time. They should be close unless something come loose in the mechanical
stuff.

The next visual check is the RF band switch. As you run the MC knob from
00 to 01
01 to 02
02 to 03
03 to 04
07 to 08
15 to 16

You should observe the band switch changing position. You can see the shaft gears in the front once you learn where to look. If you actually have to adjust this gear, shaft, switch timing, you need to pull the RF deck and do the adjustment by eye. You want to insure maximum switch contact at all bands on each of the switch segments. It's a look at the whole problem and select the best average for the longest switch life. Your receiver may have a burnt corner on a switch contact from pass life experience and you may need to adjust the switch around it.

You have eyeballed,
Two tubes.
Two crystals
The cam alignment
The rack motion
Three slugs
The band switch motion.

Time 10 minutes. (you pulled a can and looked inside it)

Run the tubes through the tube tester.

If this has not brought you back to life the work starts:

Next stage of work is to pull the slug rack and the three IF cans.
Slips the two springs off the slug rack.
Lift the rack out of the cans.
Do the slugs all look the same color and have the same length?
Broken springs can be soldered back end to end with acid core flux.
Broken slugs can be glued with super glue (out of the can and with care).

A good small dia number 2 Philips screw driver will remove the machine screw in the bottom of the slug tubes.

The cans will then unplug from the RF deck. Push the two side clips in with care and the can covers will slip off the can frame. Inside is the coil winding on the tube, the trimmer cap and maybe some fixed caps.

The clip can be slipped off the bottom of the trimmer cap and it will disassemble. The cap parts can be cleaned with soap and water.

Hear again you are looking for crud in the contacts where the cans plug into
the RF deck.

Check for a broken wire between the can frame contacts and the tuning coils.

This is all still mechanical inspection and eye ball with cleaning.

You should check the tube socket pins for crud and clean them as you go.

After you pull the IF cans apart this far and put them all back together you
can expect you will need to realign the whole stage.

You can do the alignment of the IF stages using the cal tones, an AC volt meter and 600 ohm resistor on the local audio output on the rear terminal of the receiver. Panic Not about taking these cans apart for inspection.

If this amount of visual inspection and cleaning did not restore operation on the receiver below 8Mhz, your next venture is going to be pulling the RF deck.

As this is your first venture into your new to you receiver it will take you some time. Fear of doing things will slow you down. Fear not you have no idea how many young GI's have had their hands in that receiver and did it no harm.

The receivers are not bullet proof but are very tolerant of being petted.

Tim is right, if this shot gun eye ball does not disclose a problem, its time to start the signal injection and voltage tests in the TM.

You need to down load a copy of the Y2K manual and burn your self a CD for reference. If you do not have a fast net line, A Saturday afternoon at the library will be in order. (Or from work.) Scope out the environment and come back with the media you need in hand to save a copy. The old TM is also on line for reference.

The options are a prior owner let some tubes go to the point of burning things under the deck, or moving the receiver jarred something loose including old solder joints.Or age has allowed crud grow a contact open. Or a tube has gone bad.

I think you need to inspect for problems from this list bottom up.

Let us know how these inspections go and what you find.

We love to read the stories.
We all learn.

Post everything out to the r-390@mailman.qth.net so it gets shared with everyone. Roger L. Ruszkowski AI4NI

Date: Thu, 28 Jun 2007 20:36:31 -0700 (PDT)
From: "W. Li" <wli98122@yahoo.com>
Subject: [R-390] re: question

>Think this receiver use to work.
>It was moved.
>Now it does not work.
>Therefore something came adrift. (IT BROKE)

Nice going! Good advice. This is a logical, straightforward method of checking out a near-*dead* recvr. It would do us (except former ET's) good to remember this sequence. Do not worry, this is going into *Pearls* (unashamed plug).

Date: Fri, 29 Jun 2007 00:44:16 -0500
From: Tom Norris <r390a@bellsouth.net>
Subject: Re: [R-390] question

Indeed so, Roger. We all started with the basics. Those who think they know always have more to learn. :-) All of us need to go over troubleshooting technique on a regular basis.

Date: Mon, 06 Aug 2007 14:31:01 -0400
From: Barry <n4buq@knology.net>
Subject: [R-390] 200kc crystals

Anyone know what would happen if the 200kc crystal was replaced with a 2000kc crystal? Would the oscillator and divider still work at that frequency? It would yield calibration points at the top and bottom of each band and, if the PTO is tracking correctly, would be a sufficient calibration point for each band, would it not? Just a thought.

Date: Mon, 6 Aug 2007 19:37:14 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] 200kc crystals

To get a 2 Mc crystal to work in the circuit you would need to change the oscillator around a bit. A 10X frequency change isn't generally going to work without some parts mods. The same thing goes for the divider circuit. It's a locked oscillator and it "wants" to run at 100 Kc. You might be able to get it to lock to 20X it's natural frequency, but that would make it pretty touchy. Since it's just an R-C oscillator, moving it up in frequency should be possible.

Date: Thu, 30 Aug 2007 21:00:23 -0400
From: "Jim M." <jmiller1706@cfl.rr.com>
Subject: Re: 17MC pulling

Sorry if I was critical, it is interesting but I would really like a solution to another more esoteric problem as long as the gray matter is networked here - that is the "pulling" of the 17 Mhz 1st crystal oscillator by strong signals with AGC turned on. As the AGC varies, the osc. pulls 50-80 Hz causing a chirp or whoop on CW signals. Turn AGC off and it doesn't do it. Noodle that one. I am out of ideas - doesn't happen on my other 390a. Have changed tubes, swapped crystals, nothing. N4BE

Date: Thu, 30 Aug 2007 21:43:58 -0400
From: Bob Camp <ham@cq.nu>

Subject: Re: [R-390] 17MC

To make the AGC swing the oscillator, the agc has to get to the oscillator. There are two basic routes. One is via the B+ and the other is by the oscillator load.

FIrst thing to check is to see if you have field change 7 on the screen grid of the oscillator. Your crystal oscillator may also be a VHF vfo. All kinds of strange stuff will happen when that's going on.

Next thing to check would be to see if the regulated B+ is stable. Your regulator tube may have reached end of life.

If you are swapping tubes, check the first mixer tube. If you have something other than a 6C4 there, that may be the problem.

Check the grounding on the coax at J221, and take a look at C-327. If the tank is significantly off tune odd things can happen. T207 should have a "real" peak.

If nothing has popped out so far, next step it to dig into the voltages on the first mixer. It may be getting to much AGC, or it may have to large a cathode resistor

Hope that helps ... Bob

Date: Thu, 30 Aug 2007 21:55:32 -0400
From: "Jim M." <jmiller1706@cfl.rr.com>
Subject: Re: 17MC

These are good ideas. I do notice that the effect varies if I change the mixer tube, which is AGC controlled. But there's another twist - this may be a combination of oscillators. I have had counters on all of them as this happened to see which was affected the most. So far only the 17 Mhz is significant, but there is also something going on with the BFO. When the BFO is close to zero beat with the strong carrier, I think it is also being pulled by some kind of phase locking that happens between a strong IF and an injected BFO - the IF signal feeds back into the BFO and makes it try to phase or frequency lock. I have checked everything I can think of around the BFO, changed tubes, etc but still happens. The BFO pulling is less when the BFO is offset farther away from zero beat. The PTO isn't pulling significantly, nor is the band xtal oscillator. This is a true Collins deck with a Motorola IF, which is very sensitive. Of course, nothing like this is seen in my other radio (a Stewart Warner) which leaves me stymied.

Date: Fri, 31 Aug 2007 07:56:53 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Oscillators

The BFO can injection lock. It's one of the reasons you don't want to go to crazy increasing the size of the coupling cap that goes between the BFO and the mixer. You are correct that it happens when the two frequencies are close to each other. If you want to go into all the math, dig up a paper by a guy named Adler. He was trying to make it happen all the time, but the math is there.

All of the oscillators will behave the same the same way with AGC. The regulated B+ is never 100% stable and they all have a frequency /voltage effect. You can muck with the feedback capacitors to change the effect a little, but you may make the oscillator more noisy by doing it.

Others have dug into this before, there's probably data in the archives. The bottom line is that some pulling is going to happen and it's more on some radios than on others ....

Date: Fri, 31 Aug 2007 11:40:19 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] re: oscillators

I have not dealt with this one, but here are my ideas:

- The 17 mc signal goes to a mixer - that mixer may be affected by the level of incoming signal and change the load on the oscillator. Part of the oscillator-mixer design is to minimize this effect.

- The AGC is likely reducing the load on the B+ used by the RF and/or IF stages. This B+ may well be affecting the oscillator itself. Test by measuring carefully the oscillator B+ level. Is the oscillator fed from regulated B+? Test by pulling the regulator and feeding the regulator tube output pin with a separate, preferably regulated, supply.

- there may well be some component in the oscillator such as a bypass cap, that is B+ sensitive.

- If you have another R-390A, you might feed the 17 mc from the other radio, or feed a 17 mc signal into the crystal oven socket from a stable signal generator.

Date: Fri, 31 Aug 2007 11:49:11 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] re: Oscillators

There has not been a TMC GPR-90 I've worked on that does not do this. The suspected cause (not proven) is just what you describe: feedback path that locks the incoming signal with the BFO. The cure (in the R-390 which does not normally do this to the same degree that the GPR-90 does) may well be to correct poor grounds or replace now-ineffective bypass caps. If you go LOOKING for IF signals throughout the radio, you may be surprised where you find them: filaments, screens, audio output from detectors, and other unlikely spots. You may learn something from the expected phenomenon that the IF signal pulls the BFO *toward* the IF signal. Up if the IF signal is approaching from above in frequency and vice versa.

>... This is a true Collins deck with a Motorola IF, which is very sensitive.....

Do you mean that it has way more gain than it needs? If the IF gain is set too high, the signals will be higher than they need to be, especially toward the detector where the BFO is operating.

Date: Sun, 2 Sep 2007 19:36:09 -0700 (PDT)
From: Rasputin Novgorod <priapulus@yahoo.com>
Subject: [R-390] 390A crystal ovens

Should I leave my crystal ovens on, or turn them off?

Date: Sun, 02 Sep 2007 21:54:52 -0500
From: Dan Arney <hankarn@pacbell.net>
Subject: Re: [R-390] 390A crystal ovens

Off unless you live in or at one of the poles. and then off in a warm monitoring hut that is on 24/7 with racks of R-390-A's

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Date: Sun, 23 Sep 2007 17:42:02 -0500
From: Jim Green <jagreen3@sbcglobal.net>
Subject: [R-390] Where is the xtal Y201 located?

In Document TM 11-5820-357-20 On page 26, Section 14 Troubleshooting Techniques, Paragraph e, step (5) It says "If all bands except 00 through 08 operate change crystal Y201. My R-390 goes from weak to completely deaf from 0.5mc to 2mc . Then is completely deaf from 2mc to 7.999+mc. It receives well from 8mc to 32mc. I suspect Y201, but do not know where to find it in the radio. I have looked over the schematics and all the figures in both TM 11-5820-357-20 & TM 11-5820-357-35 all to no avail. Can anyone tell me where to look?

Date: Sun, 23 Sep 2007 19:22:58 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Where is the xtal Y201 located?

Take a look inside the little round crystal oven on the RF deck. It's got two crystals in it. One is for the calibrator, the other is a 17 MHz "first oscillator" crystal for the low bands.

Date: Sun, 23 Sep 2007 19:44:22 -0500
From: Jim Green <jagreen3@sbcglobal.net>
Subject: [R-390] Where is the xtal Y201 located? More info

By the way, My R-390 is a R-390/URR (not A). I can find no xtal oven on the top side right (or left) rear of the RF deck. I can find one in the R-390A manual RF deck top view. Unfortunately, where the xtal oven is located in the R-390A, the R-390 (not A) sports a xtal oscillator module. No Y201 is not inside (at least not that I can tell from the manual). Any more thoughts?

Date: Mon, 24 Sep 2007 17:57:36 -0500
From: Jim Green <jagreen3@sbcglobal.net>
Subject: [R-390] I may have located one BIG problem with my R-390 (not A)

Thanks to all who help me locate the non existent Y201 crystal in my R-390 (not A). For those of you not up to date on this there is no Y201 crystal in the R-390 (not A) receiver. There is however an error in my TM 11-5820-357-20 document. This is clearly intended to be for the R-390 (not A), but it still refers to a part that is not in the R-390 (not A) but is in the R-390A. Namely the Y201 crystal. Be forewarned. One would think a document written in 1961 would be fully vetted by now. Perhaps there are later revs. of this document. <snip>

Date: Tue, 09 Oct 2007 17:41:58 -0400
From: Charles A Taylor <WD4INP@isp.com>
Subject: [R-390] hum problem

I had a serious problem of 60-Hz hum in my Motorola SERNO 4823. One would expect this to be a problem in the power supply, and possibly one of the two 25Z5 not conducting to the extent that the other one was. Remember, hum problems tend to be 120 Hz because the power supply is full wave. Replacing a 5814 in the noise limiter circuit reduced the problem but didn't eliminate it. I tried swapping out all the subassemblies except for the R-F deck (for obvious reasons) . That failed to bring down the 60-Hz hum. Next I went through the audio supply subassembly because it was was a prime suspect.

That didn't eliminate the hum problem.

Then I went through the R-F deck replacing tubes pursuing the problem. It should be remembered that this appeared to perhaps be a case of heater/cathode leakage.

Finally, I tuned in a calibrator harmonic and tried adjusting the 17 MHz transformer.

THAT fixed the problem, although it's not quite logical this being a 60-Hz problem vice a 120-Hz problem.

As one tunes the 17 MHz-transformer through resonance, two points are found where the output of the circuit "squegs," or goes into and out of oscillation at an rate of several times a second.

Carefully tune the 17-MHz oscillator with the set tune slightly offset on a mechanical filter resonance slope.

Tune for minimum hum, as a hum problem in the 17-MHz oscillator would tend to manifest itself as phase modulation, and tuning a calibrator signal (preferably on a higher order harmonic toward 30 MHz.).

Remember, teardrops can cause temporary shorts in circuitry!

Class dismissed. Pop quiz tomorrow at 0800.

Date: Tue, 09 Oct 2007 17:45:55 -0400
From: Charles A Taylor <WD4INP@isp.com>
Subject: [R-390] 00.000 on your dial

I forgot to note: in case you haven't noticed it, tuning your R-390A to 00.000 MHz ought to cause the carrier meter to pin upscale. Even at 100 VAC mains voltage. That makes a fairly rough indication of merit of an R-390A.

Date: Mon, 22 Oct 2007 20:42:08 -0600
From: "Tony Casorso" <canthony15@msn.com>
Subject: [R-390] Some Crystal Info

Hi everybody. Sorry that my image thread got so long. I'm still looking at the problem but I'll keep the details to myself and only post here if I make some headway. For a while now I've been wondering what the difference between a CR36/U and a CR27/U crystal was. I found a reference to them in an old paper that is only available to paying members of IEEE. I believe

the paper is from the 1950s as it is full of tube oscillator circuits. I started a new job in July and it turns out that I have access to all of the IEEE papers. This one is called "Design Data for Crystal Oscillators" By H.E. Gruen of the Armour Research Foundation. It says that the CR18/U, CR27/U, and CR36/U crystals are all designed for 32pf loads to be used in parallel resonant mode (antiresonant mode in the paper). The difference between them is that the CR18/U is not for use in ovens while the CR27/U is for oven applications at 75 degrees C and the CR36/U is for oven applications at 85 degrees C. Hopefully someone will find this information useful.

Date: Tue, 23 Oct 2007 07:47:49 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Some Crystal Info

If you rummage around long enough, there is a military specification on all of the crystals in the R-390. It's pretty specific about the load, temperature, and tolerance of each crystal. They even go into stuff like spurs, resistance, aging, and motional parameters. What makes it *very* confusing is that after the military standardized everything we all started using the mil designations to refer to the crystal packages rather than what's inside ....

All of the military crystals were designed under contract out of Ft. Monomoth. The agency involved changed names so often it's sometimes tough to figure out who is who. Some of what was done is reported in the Proceedings of the Frequency Control Symposium. A lot of what was done was published in separate reports. Most of those are *tough* to find these days. Occasionally you will find references to them in the FCS papers.

Date: Tue, 23 Oct 2007 12:43:49 -0600
From: "ANTHONY CASORSO" <canthony15@msn.com>
Subject: Re: [R-390] Some Crystal Info

It's funny how these things happen. I looked all over for info about these crystals several times. Now that I made that post yesterday, suddenly I can find it easily. I'm not sure if links are OK in a post here. There is a good pdf with a table of all of the military CR types and their specs at www dot euroquartz dot co dot uk slash pdf slash cr-crystals.pdf

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Date: Wed, 24 Oct 2007 05:16:24 -1000
From: Raymond Cote <rjcote@hawaii.rr.com>
Subject: Re: [R-390] Some Crystal Info

That is a very good lead Tony. IT most likely will end up in everyone's SAVE file as we all have crystals that we look at and scratch our heads.

Thanks from many of us. Ray

Date: Wed, 24 Oct 2007 11:57:07 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Some Crystal Info

I have a zip file that has relatively recent MIL SPEC's for:

CR27AU.PDF CR45AU.PDF CR47AU.pdf
along with some more or less irrelevant changes and administrative baloney.

This zip file came from Nolan Lee's website:
http://www.acadiacom.net/nlee/

and there it is under: http://www.acadiacom.net/nlee/r-390a_index.html
at: http://www.acadiacom.net/nlee/r390a_cr.zip

I suggest anyone interested download that file and keep it.

Date: Wed, 24 Oct 2007 18:24:27 -0500
From: Tom Norris <r390a@bellsouth.net>
Subject: Re: [R-390] Some Crystal Info

I've ordered several milspec crystals from International Crystal (ICM) by just giving them the frequency and the spec #. They were no more expensive than any other new crystal. I rue the day I come across a bad cal oscillator crystal. There are a couple other crystal sources I've used that are maybe $5 less than ICM, I'll see if I can dig them up.

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Date: Wed, 24 Oct 2007 19:33:12 -0500
From: Tom Norris <r390a@bellsouth.net>
Subject: [R-390] Simple Crystal Guide

There is a basic crystal guide for the R-390A, good for printing, available at
http://www.fernblatt.net/crystals/consolidated_list.pdf

It's simply a table of crystal freqs as selected by band, but in a cleaner format than the manuals. I'll try to put one together for the R-390/URR if there are any requests

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Date: Sat, 27 Oct 2007 14:26:45 -0500
From: Jim Green <jagreen3@sbcglobal.net>
Subject: [R-390] Still deaf below 8 Mc

I'm still plugging away with my R-390/URR (Not R-309A/URR). The main struggle is the deafness below 8 Mc. I am following the Third Echelon troubleshooting procedure in TM11-5821-357-35. I've made it to Signal Substitution Part e IF sub-chassis tests Step 2 where the procedure is to apply a modulated 2Mc signal to E-210 with the receiver in standby mode. I am supposed to hear a signal in the headphones. I hear nothing. If nothing is heard the procedure is to:

1) check V205 (checks good),
2) check V701 (checks good)
3) check the V701 components by voltage and resistance measurements.

All voltages seem within range except Pin 1 at -0.46 VDC (should be -1 VDC to -2.3 VDC). All resistances are OK except Pin 1 at 178K (should be 150K) and Pin 5 at 19.8K (should be 8.5K, however the voltage at pin 5 is right on the money at 178 VDC). Does anyone see any major issues with these readings? Note I'm using a Fluke model 77 to take the measurements.

4) Check the vfo operation by measuring the DC voltage at E210 (measured 0.000 VDC). The manual goes on to say: The voltage should be between -3VDC and -11VDC. If the voltage outside these limits check J223 and P723. J223 looks OK, but the cable P723 is connected to has a kludjy splice in it. When I measure the voltage from the center pin of P723 to ground I get 0.000 VDC. Perhaps this is OK since it's likely an AC signal (I measured 0.01VAC). When I measure resistance I get a dead short to ground. Are these measurements normal?

Date: Sat, 27 Oct 2007 16:08:02 -0500
From: Jim Green <jagreen3@sbcglobal.net>
Subject: [R-390] Still Deaf below 8 Mc one more question

I mentioned in my previous posting Pin 1 of V701 measures 178K Ohms and should measure 150K Ohms. I looked at the schematic, and it looks to me like this resistance is governed by R701. R701 resistor in the receiver was a Brown Green Yellow or 150K resistor. I measured it and it measured 178K. Therefore I replaced it with a new resistor that measured closer to 150K. Pin 1 now measures 150K Ohms to ground. However, tthe DC voltage at Pin 1 remains at around -0.46VDC (should be -1.0 to -3.0 VDC according to the manual).

I took another look at the schematic, and on closer inspection R701 looks like it should be a 150 Ohm resistor. Can this be right? It looks like someone forgot to put the K on the resistor value on the schematic. Comments?

Date: Sat, 27 Oct 2007 17:55:22 -0400
From: "Walter Wilson" <wewilsonjr@gmail.com>
Subject: Re: [R-390] Still deaf below 8 Mc

I always replace C327, especially if signals below 8MC are a problem:
See http://r-390a.us/R-390A%20Restoration%20Checklist%20v2.htm for a
more detailed checklist. Chuck Rippel's site also has this listed as a common problem:
http://r390a.com/Commonfail.htm#I%20was%20finishing

Date: Sat, 27 Oct 2007 17:59:15 -0400
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] Still Deaf below 8 Mc one more question

I'm new to these receivers but have been familiarizing myself with them as I await arrival of the one I have purchased. A feature of these receivers is that it is double conversion above 8 MHz and triple conversion below 8 MHz. Below 8 MHz, an extra mixer (called "1st Mixer, V203, 6C4") is inserted into the path after the 2nd RF stage. It seems this is the most likely area to look meaning V203, V401 and the switching that inserts V203 into the signal path. In regards to the VFO (PTO), V701, since your receiver apparently works above 8 MHz. It's probably safe to say that the VFO itself is working. The value of 150k is reasonable as a grid leak resistor. 150 ohms is too low.

Date: Sat, 27 Oct 2007 16:43:12 -0600
From: "Tony Casorso" <canthony15@msn.com>
Subject: Re: [R-390] Still deaf below 8 Mc

I think he said R-390 not A. Chucks fix is for R-390A. Not sure if it applies.

Date: Sat, 27 Oct 2007 19:13:50 -0400
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] Still deaf below 8 Mc

Looks like the R-390 (non A) doesn't have a tuned plate load like the "A" does so there's no equivalent cap in R-390

Date: Sat, 27 Oct 2007 19:00:50 -0700 (PDT)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] Still deaf below 8 Mc

If you're going to compare voltages in the radio to voltages in the manual

you NEED to get a volt meter similar to what they used to make the manual. Your Fluke is a high impedance meter, they manual authors used something with a much lower impedance like a VTVM. Also, a needle-type meter will be much more useful in tuning the coils in your radio. Have you done the resistance checks and voltage checks listed in the manual yet? Just to establish a baseline. Are the controls set to the conditions shown in the operator's manual for testing?

Date: Sat, 27 Oct 2007 22:28:15 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Still deaf below 8 Mc

Item number 4 on your list sounds like your problem. I don't have a manual in front of me, but that section sounds like it's checking the oscillator output. If so your oscillator is dead.....

Date: Sun, 28 Oct 2007 11:38:33 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Still deaf below 8 Mc

> Substitution Part e IF sub-chassis tests Step 2 where the procedure
> is to apply a modulated 2Mc signal to E-210 with the receiver in
> *standby* mode. I am supposed to hear a signal in the headphones. I
> hear nothing. If nothing is heard the procedure is to:

A TM typo here. The receiver needs to be in MGC not standby. Standby takes the B+ off a lot of IF plates via the switched B+ line.You will hear no signals from the receiver in that state. Set the receiver to MGC and do the test again.

Date: Sun, 18 Nov 2007 13:30:13 -0500
From: roy.morgan@nist.gov
Subject: RE: [R-390] A Few R390A Issues Zero Adjust

I remember a comment on the list earlier that the R-390/URR calibrator uses a 1MC crystal, and the mulitvibrator is running if synched correctly at 100 kc. So, the adjustment of the multivibrator is somewhat critical. If the calibrator is producing about 90 kc or 110 kc, then this is the direction to look in. The 1MC crystal will be less expensive to replace (new) than a 200 kc one as used in the R-390A/URR. If it's the crystal, you may well find a workable substitute for very little. I don't know what might happen if you put a garden variety crystal into that oven, but of course you could make a plug-

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Date: Sun, 18 Nov 2007 13:54:58 -0600
From: "Grant Youngman" <nq5t@tx.rr.com>

Subject: RE: [R-390] A Few R390A Issues Zero Adjust

Thanks, Roy ..It does appear to be related to sync (or not) of the multivibrator. Even after adjustment, it will eventually begin wandering in and out of sync, and rather than a nice cal tone at the correct frequency I get a rough buzz well away from where it should sit. That may indicate the multi is running on its own without 1Mc input from the crystal, or is simply ignoring the sync signal. I found and purchased two spare calibrator modules, one with a crystal (untested). Haven't had the time to put a scope on it and try to understand what's happening. Hopefully soon. In the meantime, the R-390A is back onthe table. Too much work in the queue and too little time :-)

Date: Sun, 18 Nov 2007 13:30:13 -0500
From: roy.morgan@nist.gov
Subject: RE: [R-390] A Few R390A Issues Zero Adjust

I remember a comment on the list earlier that the R-390/URR calibrator uses a 1MC crystal, and the mulitvibrator is running if synched correctly at 100 kc. So, the adjustment of the multivibrator is somewhat critical. If the calibrator is producing about 90 kc or 110 kc, then this is the direction to look in. The 1MC crystal will be less expensive to replace (new) than a 200 kc one as used in the R-390A/URR. If it's the crystal, you may well find a workable substitute for very little. I don't know what might happen if you put a garden variety crystal into that oven, but of course you could make a plug-in adapter to use any crystal from an octal tube base.

Date: Sun, 18 Nov 2007 17:05:54 -0600
From: "Bill Hawkins" <bill@iaxs.net>
Subject: RE: [R-390] A Few R390A Issues Zero Adjust

The multivibrator tube for calibration is intended to produce 100 KC when it is synched by the 1000 KC crystal. Ten to one is not easy to do without precise parts. That's probably why the 390A went to a 200 KC crystal and a simple flip-flop to divide by two with lots of harmonics Normally the MV free-runs at something slightly below 100 KC for worst case environment. The earlier xtal pulse locks it to 100. If the components drift a lot, it could lock up at any sub-multiple of the xtal frequency, or jump between them. There is a trimmer cap across one of the MV timing caps that can change the free-running frequency by quite a lot. Trimmers are among the kinds of caps than can fail (actually, all caps can fail). First, verify that the crystal is producing exactly 1000 KC.

You need a scope to do it right, but I think the cal module can be pulled without removing the RF deck. Trigger the scope from the crystal

frequency with a 10 microsec/cm sweep. Probe the crystal frequency and verify 10 cycles in 10 cm. Now probe the 100 KC MV output (after the buffer amp). If a cycle over or underruns 10 cm, adjust the trimmer to about halfway between stable at 10 cm and stable at 11 cm (90 KC). If the trimmer can't do that, try another tube, measure the resistors, and finally replace the timing caps with micas for low pF stability.

Date: Sun, 18 Nov 2007 17:22:52 -0600
From: "Bill Hawkins" <bill@iaxs.net>
Subject: RE: [R-390] A Few R390A Issues Zero Adjust

Correction - adjust the MV trimmer to a point midway between first lockup at 90 KC and at 110 KC.

Date: Mon, 04 Feb 2008 12:47:36 -0500
From: wabate <wabate@verizon.net>
Subject: [R-390] Looking for a 455 KHZ crystal and other stuff

I need the 455 crystal for Z501 in my 390A. I know these are hard to get. I also need a 4 KHZ mechanical filter and those damn meters. For trade I have the even pricier 200 KHZ calibrator crystal. I was saving it for the next 390A that I restore but these needs are more imminent. I just checked with International Crystal and the 455 is $25 but the 200 KHZ is $104.58 with a 10 week wait! OUCH!!! Anyone out there that needs my 200 KHZ and has some things that I need?

Date: Mon, 4 Feb 2008 13:37:26 EST
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Looking for a 455 KHZ crystal and other stuff

You can get a small 455Khz crystal with wire leads. You may also be able to find 200Khz crystals this way. I have not needed to find one of this value yet. You can then apply a solder iron to a proper size case and remove the current contents from said case. The value stamped on top of the case will be wrong. I just clean the case top and solder over the value to erase it. You can then use the wire leads on the new crystal to mount it into the old case that will have the proper socket prongs to plug in. A good marker will let you re label the case with the crystal value inside.

Date: Thu, 14 Feb 2008 08:00:23 -0800
From: "Robert Lonn" <roblonn@cox.net>
Subject: [R-390] Reception BELOW 8 MHz Dead!

Recently I tuned my R-390A below 8 MHz and the reception was DEAD. 8 MHz and above was fine. The interesting part is the RF noise is still present, but I am unable to get any stations even on strong local AM

broadcast as if the antenna was disconnected?

When I turn on the CAL-BFO, You can barely hear the CAL.. I was wondering if anyone can lead me in the right direction about something unique about 7 MHz and below that would kill the RF gain, yet we still have RF noise??? Thank you in advance! R-390A, Motorola Built, SN 2937,,, WA6PHN

Date: Thu, 14 Feb 2008 08:04:07 -0800
From: "Robert Lonn" <roblonn@cox.net>
Subject: [R-390] UPDATE,, Reception BELOW 8 MHz Dead!

One other thing I noticed is the Carrier Level Meter is now PEGGED full scale regardless of what band I am on. Only way to make it go down is place the radio in Standby??? Not sure if the two problem are related?

Date: Thu, 14 Feb 2008 11:11:09 -0500
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Reception BELOW 8 MHz Dead!

Classic symptom of losing the signal from the first oscillator.

Date: Thu, 14 Feb 2008 13:51:09 EST
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Reception BELOW 8 MHz Dead!

You need to look at the 5654 setting over in the back right corner. As you get a weak cal tone through, remember that has every harmonic in the HF span in it. It will mix any where and every where to bleed through. The noise is typical most of the receiver works so most of the noise is there. It varies all over as you are tuning the filter circuits and adjusting the band pass the noise can filter through. The circuit may not be DEAD. just so weak you cannot get an AM signal through the circuit. Along with the first oscillator 5654, also look at the first mixer a 6C4 there in back. Look at the crystal oven can. It has the cal crystal and 17Mhz first mixer crystal in the can. It could be crud in a crystal to socket or can to octal socket pin. Most likely either the mixer tube or osc tube gave up on you. Crud in tube, crystal or filter can sockets is next in line of probable cause. Then look to see if a cam clamp broke and the first mixed rack is no tracking. Look for a bad slug in the first mixer rack (not likely but possible).

Then you need to pull the RF deck and look for a cold solder joint. Old plastic cap under there that has not yet been changed. A resistor that has gone way high in value.

Not a serious problem. Any 4 hours should get it fixed. Likely 30 minutes of tube checking.

Date: Thu, 14 Feb 2008 13:59:28 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Reception BELOW 8 MHz Dead!

Specifically, the 17 mc crystal in the little round oven at the back rear of the chassis.

Date: Fri, 22 Feb 2008 15:02:44 +1100
From: "Pete Williams" <jupete@bigpond.net.au>
Subject: [R-390] Oscillator xtal

G'day..... I was figuring why a R-390/URR was 1.5Mhz off freq when aligning the radio.... a look at the oscillator box showed a 12.5Mhz xtal in the holder where there should've been a 11 Mhz... Who knows how or why? Anyone got a 11 Mhz xtal in exchange for a 12.5 Mhz ?--I've got 2 . Alternatively a compensation can be arranged.

Date: Sat, 23 Feb 2008 22:31:39 -0500
From: roy.morgan@nist.gov
Subject: Re: [R-390] Crystal 200 KC

There have been found one or two souces of low frequency crystals. Most manufacturers will not make them any more. There have been reports of one fellow in Mexico I think, but I don't have any info on that source. The only other one reputed to make low frequency crystals is:

Universal Crystals Inc.
Jim Little
Private Company, Headquarters Location
5407 Payne St., Shawnee Mission KS 66226,
United States
(913) 334-6254,
Line of Business: Manufacturing: Quartz crystals

Here is the source of my information:

To: <PHIL13@STNY.RR.COM>; "Collins Reflector Posting"
<collins@listserve.com>
Sent: Friday, July 01, 2005 12:46 PM
Subject: Re: {Collins} xtal-75a-1

Is there a source for the 500 kc xtal for the 75a-1? or does someone have one to sell?

Phil and others, I have just gotten the following from Glenn Nash about a source for low frequency crystals:

"Mel" is the guy at: www.mhelectronics.com. (800 643 9825)
Mel said that the best guy on the planet for those is : Universal Xtal in Kansas City, phone 913-334-6254 ask for Jim Little.

I called Little and lo and behold he says he bought up just about every low frequency xtal blank in the US and is at this very minute cranking out a bunch of 455KC types. They are a bit expensive, around $50, but less than half what International Xtal gets for their low freqs. Try to contact "Mel" and let us know what you find out, please. Roy

Roy Morgan
13033 Downey Mill Road
Lovettsville VA 20180

Date: Sun, 24 Feb 2008 17:39:26 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Crystal 200 KC

The problem with the 200 Kc crystals is that they are not a "normal" low frequency cut. You have to chop quartz at a special angle for oven crystals at that frequency. It's not going to be easy to find somebody doing that.

Date: Sun, 24 Feb 2008 17:12:10 -0600
From: <wb5uom@hughes.net>
Subject: Re: [R-390] Crystal 200 KC

I got in on the tail en of this I guess. You might try (for grins):
http://www.icmfg.com/crystals.html#ranges

Now I know they are not really interested in selling just one or two BUT I called a place one time looking for ONE special intergrated chip, not a 1000 or 10,000 just ONE. I called them and the lady said they didnt sell in that small of quanity BUT if I was doing a pilot project they would send me 1- 20 for FREE !! It took me just a microsecond to affirm this was a "pilot" project !!! Have plenty of spares now! So, it might not hurt to make a call!

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Date: Sun, 24 Feb 2008 22:10:05 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Crystal 200 KC

I"m not sure that we all understand just how unusual a crystal the 200 KC rock really is. Most of the crystals in the R-390 are AT cuts. They are as common today as they were back when the radio was new. Quartz is grown oriented to make cutting AT blanks efficient and cheap. You can buy cut to spec blanks from companies in at least a dozen countries. That's true weather you want to buy one or a million pieces. There are hundreds of companies worldwide that can and do make AT's that are capable of being dropped into an R-390.

Below 1 MHz AT's become impractical. A number of other cuts are used. The raw quartz needs to be oriented correctly for each cut. The blanks get big and the cutting becomes difficult. To really appreciate what all that means you have to get into some nasty physics. Forty years ago there where maybe ten to twenty people in the world who actually did it. That's not companies, I indeed mean people who could set the cutting up.

Next up is that people have simply stopped making crystals below 1 MHz the way they used to do it. The approach now is to use a tuning fork or flex bar that uses enormously less quartz than the old cuts did. Your 32 Khz watch crystal is one example. It would not sell for 3 cents if they hadn't done an enormous change in it's design. You could make 500 watch crystals out of the quartz in one old style crystal. By making the crystals smaller they changed their characteristics. The electrical performance of the tiny crystals is very different than the big old ones. They don't work in the same circuits.

Finally this is an oven crystal. It's temperature characteristic is *very* different than a room temperature crystal. That makes it a rare bird in a rare flock of birds. Most of the low frequency work in this country ten to twenty years ago was going into 455 KC crystal filters. What ever is left of that effort is bits and pieces. Adapting a filter crystal setup to chop 200KC frequency standard crystals is going to be a real chore.

When I asked the guy at Collins *why* he designed this crystal into the R-390A, his answer was simple - "we were sold a bill of goods". Oddly enough through the course of many mergers I now work for the company who sold him that bill of goods ... small world. ... We haven't made those crystals in 20 years. Hang on to any of these you have. If you part out a radio, keep the 200 KC crystal. Unless you want to cobble something together, they will be the death of more radios than dead power transformers.

Date: Mon, 25 Feb 2008 21:53:27 +1100
From: "Pete Williams" <jupete@bigpond.net.au>
Subject: [R-390] REF 200 kHz Xtals /

Hi List.... I have 5 or 6 xtals HC6 holders at 200 kHz to the CR-47/U specification. They came from 5 or 6 xtal ovens which had been jettisoned cos the heating element was stuffed. How would $30 per each sound airpost included ? I'll check operation before shipping . BTW... I'm still after IF xfmrs for the R-390--- now got 2 others with open secondaries in addition to the input one - the Z501.

Date: Mon, 25 Feb 2008 08:52:54 -0500
From: "Patrick" <brookbank@triad.rr.com>
Subject: Re: [R-390] Crystal 200 KC

Thanks Bob, it was very informative. For what is worth, yesterday, looking around my "yunk" pile, I found seven 8 pin ovens with 200 kc crystal in them, (BLILEY ELECTRIC CO: ERIE PA) 26.5 volts .3 A 75 Celcius. I took the crystal out and checked them on a signal generator that has a crystal checker. They are all right on the money. I guess I did find a small treasure.

Date: Mon, 25 Feb 2008 13:51:51 -0500
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] Crystal 200 KC

Fair Radio (and undoubtedly others too) sell the Crystal Calibrator from the ART-13. It has a 200kc crystal in it and some tubes to do divide-by-four.

Date: Mon, 21 Apr 2008 13:34:56 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Need some R-390 info please

Down load a PDF copy of TM 5820-357-35 for the R390 off the R390/A web pages. A goggle search will find the TM for you. The two MWO's were early changes to resistors and filter caps in the RF section of the R390 to prevent some parasitic problems. These MWO's have nothing to do with the other mods you are listing in your mail..... <snip>

Date: Thu, 24 Apr 2008 14:47:36 -0500
From: "Phil M." <pmills7@comcast.net>
Subject: [R-390] Some R-390 questions...please help if you can.

<snip> Through dilligent application of a frequency counter and a firm wrist turning the bandswitch, I have determined that the crystal oscillator frequencies do not match with what the manual shows the bandswitch should be. While it appears to be fairly easy to remove the crystal oscillator, adjust the bandswitch inside, and reinstall it, this will not necessarily do any good unless the bandswitch in the RF deck

matches the band indicator. Yes, I know that many band changes do not cause the RF deck bandswitch to do anything. My question is, is there any kind of measurement that I can make without removing the RF deck to confirm that the RF deck bandswitch position correctly matches the front panel indicator?

Date: Thu, 24 Apr 2008 15:59:04 -0400
From: Roy Morgan <k1lky@earthlink.net>
Subject: Re: [R-390] Some R-390 questions...please help if you can.

<snip> > ...the crystal oscillator frequencies do not match ..... <snip>

With this situation, the receiver will act dead.

> .....confirm that the RF deck bandswitch position correctly matches the
> front panel indicator? <snip>

Yes. Get another general coverage receiver, or your frequency counter If it is sensitive enough (not likely), and see what frequency the crystal oscillator is on by sticking a probe wire next to the crystal oscillator tube. That goes to the antenna input of the other receiver. (The R-388 is ideal for this use.) OR: put the probe wire down next to the mixer tube. It's plate will have enough LO signal in it to give you a signal. Normally, you can adjust the linkages between the MC set gears and the LO switch to get it right. You will need a bristol wrench to loosen the clamps, and possibly a long nose pliers to move and then hold the shaft in position while the clamp is tightened again. There's another possibility in the "duhhh!" category: are the crystals in the right sockets? Maybe someone had them out and got them back wrongly.

Date: Thu, 24 Jul 2008 09:05:42 -0700
From: "Craig C. Heaton" <wd8kdg@worldnet.att.net>
Subject: [R-390] Need value of R235 from a RF deck

Every now and then I get the urge to tackle a little issue with my 62 Almelco R-390A. The crystal calibrator isn't quite right! If I use the trimmer to zero beat WWV life is good until I turn the calibrator off or switch to a different band. Then the calibration is as much as 20-30 KC's off. I've used different crystals from working R-390A's, checked voltages, resistances, changed tubes, etc. The only thing I can find, easily, is the R235 in my RF deck measures 47K, not the 47 ohms listed in the Y2K manual. Even with the discrepancy of this value, I don't think it would have any effect with the operation of the calibration circuit.

Getting ready to change out some silver mica caps at this stage. So, is

there anyone out there in cyber space that has a RF deck they can flop belly side up and check the resistance of R235 for me?

Date: Mon, 28 Jul 2008 19:48:56 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] RF gain

You can adjust the IF GAIN ADJUST resistor on the top of the IF deck to move the receiver gain up or down. There are as you imagine for military receivers many exact detailed procedures to do calibrated settings. Just twist that pot around to get a response you like. Not knowing how many hours the receiver has operated since its last go around with tube testing and good alignment and inspection with a signal generator and voltmeter hung on the audio output with a 600 ohm load, It may be time to test all the tubes in a tube tester and do what you can to check the alignment and signal to noise. All you really need is a RF signal generator. It need not be calibrated. An AC volt meter, any one will work. A DC volt meter, Again any one will work. A 600 ohm resistor. a couple 1200 ohm 1/4 or 1/2 watt work fine.

Then of course better signal generators, meters, power meters just make the job more detailed. They will not get you one signal better, the stuff just makes the process proceed with a warmer better fuzzy feeling. Fear not you can do this your self. The US Army fellows taught other US Army fellows to do it and passed it down from one to another for years and years. The US Army TM 11-5820-358-35 is on line as PDF. But look up the Y2K manual on the R390 web site and down load it. It is so much more readable than the original TM. All R390 and R390/A parts are available. If you need something ask here first for leads on the exact parts you need. Different parts come from different places.When you get into doing an alignment with the Y2K manual in hand and have a problem, post some mail here on the R390 reflector and detail your problem as best you can, Someone or several some one's will post you some mail back. Good luck with the receiver and hope you enjoy many hours listening.

Date: Tue, 29 Jul 2008 07:26:00 -0700
From: "Craig C. Heaton" <wd8kdg@worldnet.att.net>
Subject: RE: [R-390] Need value of R235 from a RF deck

Barking at the right tree, just haven't found the correct leaf. What you have described, turning on the BFO, setting the receiver to AGC or MGC, tune in WWV at 5 10 15 or 20 Mhz, zero WWV against the BFO: and when I switch from AGC or MGC to cal (back and forth) the calibration jumps around 30 Mhz.

The first inspection found the R235 wrong value according to the Y2K

manual, but I don't think it has any connection with the crystal oscillator. I've swapped tubes from other sections of the radio, used NOS tubes from the stash, used another H202 from my Motorola R-390A. No joy yet.

Last night I loosened the retighten the mounting screws for the three tubes in that section of the RF deck, no joy! Also replaced the silver micas surrounding V205, no joy there either.

Thought the air variable cap used to adjust the crystal oscillator might be bad or damaged, checked it with my Sprague TO-6A, it's spot on, no joy here either.

Maybe a possible clue! The point where the air variable cap gets the oscillator circuit to zero beat is near minimum capacitance, plates unmeshed. So within a few degrees of rotation there are two points that will zero beat? Minimum capacitance is near 3.5pF

Almost like a passive component has a lead going in the wrong direction or too close to sometime else? Just guessing here, can't believe it could be that critical on a point to point wiring radio. Don't care to take both R-390A's apart to compare circuits.

Date: Tue, 29 Jul 2008 13:02:17 EDT
From: DJED1@aol.com
Subject: Re: [R-390] Need value of R235 from a RF deck

Not sure I understand. First, is it an oscillator problem or a calibrator problem? If you zero the BFO while receiving WWV, does the note change between AVC and manual (remember full open manual will overload the receiver, so turn it down)? If not, then probably not a downconversion oscillator problem If yes, then one of the downconversion oscillators is being pulled by the AVC. If, on the other hand, the cal oscillator is changing after zero beating with WWV, then it must be a cal osc problem. Could be a bad cal crystal or dirty crystal socket also. Let us know what you try- we'll figure it out, especially with Roger here.

Date: Tue, 29 Jul 2008 11:12:15 -0700
From: "Craig C. Heaton" <wd8kdg@worldnet.att.net>
Subject: RE: [R-390] Need value of R235 from a RF deck

Cal changes when switching from Cal position to either AGC or MGC or changing bands. I've tried the crystal from my Motorola R-390A and a crystal
someone sent me and a new crystal from International Crystal, they don't buy any happiness.

All these crystals work in the Motorola, no joy in the Amelco. So the problem is with something in the crystal oscillator circuit of the Amelco.

As we swap e-mails, the RF deck of the Amelco is belly side up, the rest of the silver mica caps around V206 and those leading to V207 are being replaced. Just stopping for a lunch break.

Date: Tue, 29 Jul 2008 19:12:23 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Need value of R235 from a RF deck

I understand that you believe the problem is in fact the crystal cal oscillator shifting to some new frequency every time you switch the function switch to CAl. Ed W2EMN put in some good thoughts on the crystal contacts.

Remember the crystal oven is also a plug in device. You may want to check the octal socket contacts under the oven can and the crystal contacts in the oven can also. And as long as you are checking contacts do the tube socket pins also.. I think the variable cap is good as you describe it. As you get two null points, you are not out beyond the limit of the cap to yield a proper adjustment. Once you get past the easy mechanical ground tie points and socket points and do not cure the critter, you may have to go looking for bad solder joints in the circuit. Something is changing resistance and or capacitance in the circuit as it get switched on each time. Eye ball the resistors real close. Finding one that flakes under load is a real challenge for test equipment. You almost have to get luck with an eye ball.

I would hate to think you have to live with this problem until it goes to failure so you can find it.

If the deck is still open and you have not done it yet, eye ball the RF band switch contact mesh and make sure it is in its best alignment through all the band stops and on each wafer switch section.

Are you getting any direct mail with additional ideas?
Let us know what you are finding.
Thanks for sharing with us.

Date: Tue, 29 Jul 2008 20:57:26 -0700
From: "Craig C. Heaton" <wd8kdg@worldnet.att.net>
Subject: RE: [R-390] Need value of R235 from a RF deck
To: <Flowertime01@wmconnect.com>, <r-390@mailman.qth.net>

Replaced about 5 silver micas this evening. Will double check my

wiring/soldering in the morning.

Going to check the circuits in the morning with a frequency counter & scope. Might be able to narrow the problem down to the 200KC circuit or the multivibrator.

Note: one of the silver micas (15pF) had a crusty coating on one lead. I've tried to remelt most of the solder joints, but this cap was in a position hard to reach. Had to remove other components to replace it. That's when I found the crusty coating. Don't know if the solder area was clean, it was damned hard to remove! It's clean now.

Date: Wed, 30 Jul 2008 09:30:33 -0400
From: Barry <n4buq@knology.net>
Subject: Re: RE: [R-390] Need value of R235 from a RF deck

I was going to advise just what you're planning. If you have a good frequency counter, look at the 200kc oscillator while switching bands, modes, etc. That should tell you if the problem's in the marker or elsewhere.

Date: Wed, 30 Jul 2008 09:37:43 -0400
From: "Rich Baldwin" <rbaldwin14@NC.RR.COM>
Subject: [R-390] Silver Mica Caps

If any of you need silver mica caps, I have probably 50,000 NOS items at all of the value levels. These are clean parts with full leads. I can make assortments available if any of you are interested. Some time ago, I did an assortment of 5 of every value for $85.00, but we could work any assortment you think you can use.

Date: Wed, 30 Jul 2008 09:52:31 -0400
From: Roy Morgan <k1lky@earthlink.net>
Subject: Re: [R-390] Need value of R235 from a RF deck

OR, just listen to it on any other receiver to see if the frequency is stable.

Date: Wed, 30 Jul 2008 16:29:29 -0700
From: "Craig C. Heaton" <wd8kdg@worldnet.att.net>
Subject: RE: [R-390] Need value of R235 from a RF deck

Might want to break out your Y2K manual to follow along. So far, in checking out passive components around V205 & V206; C311, C312, C313, C314, C315, C316, & C320 have been replaced with new silver micas. A few resistors too boot, R235, R220, & R227. R235 was a 47K ohm resistor, Y2K calls for a 47 ohm. The other two had drifted up almost

50% and I was nearby with a hot iron. Page 5-15 of the Y2K manual gives some voltages of tubes. The only thing far off is V-206, pin 7. The value given is -16.6V, this beast is -6.6V. Hasn't changed with any of the component changes. New clues for those who are interested, to chew on for a while: Most of the time the oscillator starts at 151Khz, not 200Khz. To get it fired-up, gotta tweak the adjustment on the air variable cap. Near max capacitance, the oscillator jumps to a value near 200Khz then I have to adjust the air variable to min capacitance for a zero beat to WWV. My thought is the air variable should be somewhere in the middle of it's range when zero beat with WWV????Something is pulling this little bugger. Ok, last clues for today, beer locker is just about empty and I might have to declare an emergency or quit working on this beast for a while. Page 5-28 of the Y2K manual. Step 20, After getting the oscillator running at 200Khz, indication is 30DB, should be 40DB. near 0DB running at 151Khz. Step 21, about 40V P-P, should be 54V P-P, with my Tek 2336. (Good calibration voltage on the scope, .2V P-P.) Step 22, 9V P-P, should be 13.5V P-P. On step 22 there is a good sine wave, but have to have the oscillator running at 200Khz before removing V206 or the oscillator will not start. On step 21, a half decent square wave, sort of at 100Khz. Tops are square, bottoms are pointed like the sine wave.
Leaning toward something pulling the air variable. Now returning the list to condition NORMAL, awaiting comments. Thanks, Craig PS: After dinner, will pull the H202 out of the Motorola and try it again in the Amelco. Haven't tried it since replace the caps. Might be more than one thing wrong.

Date: Wed, 30 Jul 2008 21:03:23 -0700
From: "Craig C. Heaton" <wd8kdg@worldnet.att.net>
Subject: RE: [R-390] Need value of R235 from a RF deck

Major announcement follows! The Motorola and Amelco have come to a compromise! Hence forth known as the "Springfield Compromise".

To refresh memories, the Amelco followed me home I think sometime late 2006. It was in almost new condition, original tubes, green head captive screws untouched, etc. But like most/all R-390A's, had those BBOD's to deal with.

So it got the recap treatment and a good alignment. At this point I noticed the crystal calibrator was not working properly. I tried a few things; like the H202 from the Motorola, different tubes, De-Oxit on the pins of H202 & tubes, etc. Really didn't feel up to pulling the RF deck out so soon. I'd deal with it later. Another tid-bit, in attempts to trouble shoot the crystal calibration issue I was prying the 200KC crystal from the H202 when it popped out and bounced on the floor several times. Didn't work at all after that. Tried a crystal that someone sent me and no luck there either. Even

the crystal from International hasn't worked in the Amelco.

Tonight I tried the H202 from the Motorola again. It worked in the Amelco; the adjustment for the air variable zero beats WWV about mid-range. Strange enough the H202 from the Amelco works in the Motorola with no adjustment
needed.

So, with a few new silver micas, couple resistors, and the H202 from the Motorola; I now have everything working on the Amelco. The Motorola is happy with a crystal from International. And I getting pretty good at removing & replacing RF decks in R-390A's.

Goes to show you, one R-390A isn't enough, gotta have at least two.

Thanks for any & all support/ideas.

Date: Thu, 31 Jul 2008 19:30:10 -0400
From: Barry <n4buq@knology.net>
Subject: [R-390] 200kc crystals?

I was looking at the latest Fair Radio catalog and came across the following:

http://www.fairradio.com/catalog.php?mode=viewitem&item=6348

I'm not familiar with that case type but perhaps it would be compatible? I know the 200kc crystals are hard to find.

Date: Thu, 31 Jul 2008 20:56:06 -0400
From: "Patrick" <brookbank@triad.rr.com>
Subject: Re: [R-390] 200kc crystals?

I got two 200Kc (tested and the right size for a R-390)) crystals left over, they are $30.00 a piece plus actual shipping cost, if interested, drop me a note..... Pat

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Date: Thu, 31 Jul 2008 22:24:27 -0400
From: Roy Morgan <k1lky@earthlink.net>
Subject: Re: [R-390] 200kc crystals?

> I was looking at the latest Fair Radio catalog .....

The case is described as CR-2D, and the pins are the size of an octal tube. Unless the outer sleeve can be unsoldered, they won't fit the oven socket. Also, I don't know what the CR-2D specs are, but the one used in the R-

390's is meant for oven operation - 75 degrees C I think. What the CR-2D would do under those conditions, I have no idea. Of course you could turn off the oven, but then the 17 mc crystal would be running cold.

Date: Sun, 3 Aug 2008 13:33:50 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Need value of R235 from a RF deck

So are we going to write this one up as no trouble found? Just crud on pin and plug contacts and after enough parts are pulled and replaced, enough crud gets displaced to return the circuit to operation. Another routine R390/A problem.

P.S. It sure was fun while it lasted. Maybe not for you Craig, but I'm just looking on.

Date: Sun, 3 Aug 2008 13:41:59 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] 200kc crystals?

> I was looking at the latest Fair Radio catalog and came across the following:
 http://www.fairradio.com/catalog.php?mode=viewitem&item=6348
> I'm not familiar with that case type but perhaps it would be compatible? I
> know the 200kc crystals are hard to find.

That critter has the correct size.
It may not be the exact temperature range as the original.
But it would run a lot closer to than no crystal at all.
If someone needs one I would suggest spending the 6.95 and postage for one.
Good Find.

-
Date: Sun, 3 Aug 2008 15:56:20 -0400
From: Roy Morgan <k1lky@earthlink.net>
Subject: Re: [R-390] 200kc crystals?

> That critter has the correct size.<snip>.....

But the PINS won't fit into the socket in the crystal oven - they are the big diameter.

> It may not be the exact temperature range as the original.

If it's a room temperature thing, and you oven it up to 75C, odd things may happen.

> But it would run a lot closer to than no crystal at all.

Oh YES, .I agree, and wait for any reports.

Date: Sun, 3 Aug 2008 12:52:38 -0700
From: "Craig C. Heaton" <wd8kdg@worldnet.att.net>
Subject: RE: [R-390] Need value of R235 from a RF deck

I don't think it was crud. When I brought the Amelco home in 2006 and recapped the beast, the crystal calibrator section never worked correctly. In trouble shooting it, I swapped crystals, the entire oven, and tried a crystal that someone sent me. De-Oxit was applied to the pins. Nothing is impossible, but dirty pins on the crystal or oven are highly unlikely. Must of pulled it out a dozen times! Also had the original crystal pop out of the heater as I was prying on it. Bounced on the floor a couple of times, and rattled ever since. Done broke it. Those that have recapped the RF section know there are two BBOD's in the crystal calibrator section, but are connected to the heater element of the oven. Kinda hard to mess things up. I looked for hours trying to find any passive components touching, wires rubbing, etc., before warming up the soldering iron. My guess it was a combination of things. There is a 1meg ohm resistor paralleled across a 15pF silver mica. Its value had drifted to around 1.5meg when hot, dropping in resistance as the circuit cooled. A couple other resistors had increased 20% or more. Then R235 was just plain wrong, but has no bearing on the oscillator circuit.

What I don't understand is why the new crystal from International Crystal Manufacture doesn't work in the Amelco, but in the Motorola it functions just fine? My guess is not too many people get enough practice making crystals of that type, and I was sent one that is just border line. Just, almost, good enough to be sold for $104.00 US dollars. They made one and they sold it, hoping it would work.

I have no way of testing what they sent, but bet there is someone that has the equipment and/or the experience to do so.

Date: Sun, 3 Aug 2008 16:01:18 -0400
From: "Patrick" <brookbank@triad.rr.com>
Subject: Re: [R-390] Need value of R235 from a RF deck

Craig, I have a signal generator that has a plug for testing crystals, it has never failed to tell me, with a frequency counter attached, if a crystal is good or bad, if you want I can test the crystal for you

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Date: Sun, 3 Aug 2008 13:19:28 -0700
From: "Craig C. Heaton" <wd8kdg@worldnet.att.net>
Subject: RE: [R-390] Need value of R235 from a RF deck

Thanks for the offer, at this point I have two working R-390A's. My luck the crystal would be damaged in shipping. PS: What type of sig-gen?

Date: Sun, 3 Aug 2008 18:29:51 -0400
From: "Patrick" <brookbank@triad.rr.com>
Subject: Re: [R-390] Need value of R235 from a RF deck

It is a Hampden and that is the only use I have for it, as a signal generator I use a 0-464/SRC synthesizer that is stable as a rock..... by the way I have a couple of spare 200KC crystals, if you have a need for one, let me know.....Pat
---
Date: Sun, 17 Aug 2008 10:24:39 -0700
From: "Mike Hardie" <mike46@shaw.ca>
Subject: [R-390] R-390A "Dial" Problem

Not much trouble shooting has been done yet, and this problem has been present since square one.

On all bands below and including 7 mcs the dial is just about dead on with the dial clutch adjustment about in the middle, but when the 8 mcs band is selected the dial reads 10 kc higher than it should. (Confirmed by listnening to calibrator and WWV, the zero adjust won't go quite far enough to make the dial read corrrectly) This 10 kc discrepancy is present on all the higher bands, although it's very possible the higher bands are accurate and the dial should be 10 kc low on the lower bands. This appears to be a problem with the first crystal oscillator. It might be possible to make an adjustment that would result in the lower bands reading correctly at one end of the clutch travel, and the higher bands OK at the other end of the travel, but that wouldn't really be fixing the problem. Has anyone else experienced or better yet cured this problem?

Date: Sun, 17 Aug 2008 17:42:23 EDT
From: DJED1@aol.com
Subject: Re: [R-390] R-390A "Dial" Problem

It does sound like the first crystal oscillator is off. I would first check the frequency of the oscillator to confirm that it is the problem. Then you have a couple of choices: replace the crystal, or jigger the dial until all bands are within range of the zero adjustment. Obviously, the first is the right way to solve the problem, but it may be hard to find a good crystal.

The second way may be adequate for practical purposes. I think the R-390 FAQ page does have a reference to the crystal specs. Ed

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Date: Mon, 18 Aug 2008 15:23:49 -0700
From: "Mike Hardie" <mike46@shaw.ca>
Subject: [R-390] Problem, 1st Crystal Oscillator, Solved

First of all thanks to all who offered help, all the replies centered around the 17 mcs crystal having drifted, and that turned out to be the problem.

I hooked up a frequency counter to J221, which is basically the output of the crystal oscillator, and with nothing changed the indicated frequency was 16991.42 kcs, an "error" of almost 9 kcs. Next the cylindrical oven assembly was pulled and the cover removed. With the help of long nosed pliers the 17 mcs crystal came right out, I expected this to be more difficult with maybe some sort of screw down retainer, but not so. A spare 17 mcs crystal obtained from Fair ages ago was inserted, and the assembly plugged back in the chassis. Result - 17000.46 mcs, close enough for you-know-what.

This turned out to be an easy fix. It would be an interesting experiment to see if the old crystal could be ground up to 17 mcs.

Date: Fri, 31 Oct 2008 10:10:28 -0400
From: Barry <n4buq@knology.net>
Subject: [R-390] RF Gain Pot

Is the RF Gain pot linear or audio? If linear, there are some nice pots on eBay right now, item #150210952395. If the RF Gain pot is not linear, then never mind... I don't think these are exact replacements as I think the originals have a flat on the shaft that also corresponds with the keyed pin on the panel, but again, if the pot is a linear, then these might not be a bad substitute.

Not my pots, not my auction, etc. Just thought I'd pass it along.

(from the Collins reflector)

Date: Thu, 22 Jan 2009 19:58:47 +0000
From: John Hensley <w5jv@hotmail.com>
Subject: [Collins] 75A4 Roofing Filter ?

Is anyone aware of a tested roofing filter mod for the A4 which actually improved the receiver performance? TIA, John

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Date: Thu, 22 Jan 2009 23:49:47 -0800

From: "Adam Farson" <farson@shaw.ca>
Subject: Re: [Collins] 75A4 Roofing Filter ?

The architecture of the 75A-4 is such that a "roofing filter" in the modern sense is an invalid concept. The 1st mixer down-converts the RF signal to a 1.5 - 2.5 MHz variable 1st IF. The 1st LO is crystal-controlled; the bandswitch selects the appropriate crystal. The 2nd mixer (excited by a PTO tuning 1955 - 2955 kHz)
down-converts the variable 1st IF to a fixed 455 kHz IF. The 2nd IF filter is a 455kHz Collins mechanical filter; this is the selectivity filter, not a roofing filter.

http://www.collinsmuseum.com/75a4.html
I hope my explanation is reasonably accurate, and helpful (I am not a Collins owner, but would love to have an HF9500 in my shack!)

Date: Fri, 23 Jan 2009 09:47:31 -0600
From: "Dr. Gerald N. Johnson" <geraldj@storm.weather.net>
Subject: Re: [Collins] 75A4 Roofing Filter ?

That's all correct. What I was going to say when I got around to it. With different frequencies the explanation also applies to all the 75A, 75S, 51J, 51S, and R390() receivers. The broadband exposed mixers are the weak points in all these receivers, the multigrid tubes make noisy mixers and have limited dynamic range. Though the RF bandpass filters that are often tracked with the LO are not nearly as wide as DC to 30 MHz often seen in the recent receiver designs that upconvert to a roofing filter at 45 MHz. The tuned RF stage definitely helps keep out strong signals from other band. It doesn't help keep out the KW station down the block in the same pile up. It is possible, and there are numerous articles about, to work over the mixers in these receivers to improve dynamic range. WOMLY (now SK) used to sell a solid state mixer for the 75S receiver, though he and I disagreed on which mixer was most critical. One published mod for the 'A4 replaced the first mixer with a 12AT7 long tail mixer circuit that was lower noise, but also lower gain.

From: "Adam Farson" <farson@shaw.ca>
Subject: Re: [Collins] 75A4 Roofing Filter ?

Many thanks for your comments. The nicest tube mixer I ever encountered was
the 7360, which I used as a combined RX 1st mixer and TX balanced modulator
in a transceiver which I designed and built in 1964.

Modern up-converting receivers generally have a bank of switched half-

octave
RF bandpass filters ahead of the 1st mixer. The better receivers switch these filters with relays or MMIC switches rather than diodes, and often incorporate a high-Q tuned preselector in the RF chain.

Date: Fri, 23 Jan 2009 14:38:03 -0500
From: "Carl" <km1h@jeremy.mv.com>
Subject: Re: [Collins] 75A4 Roofing Filter

The 7360 conversion and lately the Pullen is the best of the tube versions. The Pullen can use a 6ES8 for best performance but even a 12AT7 is decent. Then change the RF to a 6GM6 and a 75A4 will run circles around most riceboxes for MDS and IMD. If your stuck with a 6BE6 radio then a 6J6 in a Pullen will really make you sit up and listen. And a 6SN7/6SC7 for you octal guys. This is for those who really want to use their radios and not just get on a SSB net for an hour.

Date: Sat, 24 Jan 2009 11:08:22 -0600
From: "Dr. Gerald N. Johnson" <geraldj@storm.weather.net>
Subject: Re: [Collins] 75A4 Roofing Filter ?

> Many thanks for your comments.The nicest tube mixer I ever encountered was the 7360, which I used as a combined RX 1st mixer and TX balanced modulator in a transceiver which I designed and built in 1964.

Yes that tube had advantages, but not enough to keep it in production a long time.

> Modern up-converting receivers generally have a bank of switched half-octave
> RF bandpass filters ahead of the 1st mixer. The better receivers switch
> these filters with relays or MMIC switches rather than diodes, and often
> incorporate a high-Q tuned preselector in the RF chain.

Sometimes they have the filters, sometimes not. And sometimes the relay contacts aren't good for low level and go open with time. Sometimes those relay circuits need biases added to clean the contacts. And sometimes they don't allow for the second mixer to have greater head room than the first and that leads to greater intermod within the roofing filter pass band (e.g. closer than 20 KHz spacing). There are many innovations, and some trips backwards in modern receiver designs. There is much to do to handle the modern RF environment including much attention to phase noise. Last October I gave a presentation at Microwave Update 2008 on phase noise. Yesterday, I posted my annotated PPT slides at http://www.geraldj.networkiowa.com/papers There are two versions, one

power point and one pdf. K0CQ2008MUD.pdf and .ppt. It will probably show up some day on the NTMS archive site. Phase noise from local oscillators and interfering signals is a real problem on HF and through microwaves. And there is more to learn that I'm working setting up experiments to find out. Good phase noise is a characteristic of the tube type Collins receivers with crystals for the high frequency mix, and the PTO for the tuned mix. No synthesizers. I'll probably use my 75S-3B in my phase noise tests this year. I have been studying alternatives to the 6BF5 in S line receivers. I need to organize my conclusions and make a web page of them soon.

Date: Sat, 24 Jan 2009 07:46:54 -0500
From: "Mr. and Mrs. Magoo" <magoo@isp.ca>
Subject: [Collins] 75A4 CONVERSION

I really like the 6ES8 mixer/6GM6 front end conversion I did on my 75A4. The only problem I encountered is that the RF gain is now significantly higher resulting in overload on strong SSB signals. I can live with this by reducing the RF gain control but somewhere down the line I will tackle this problem. Apart from this, my 75A4 is an excellent performer in digging weak ones out of the crud on CW and is sure a much more enjoyable receiver to operate than the stock version.

Date: Sat, 24 Jan 2009 18:12:27 -0500
From: "Carl" <km1h@jeremy.mv.com>
Subject: Re: [Collins] 75A4 CONVERSION

The 6GM6 only needs enough gain to overcome the mixer noise and if a Pullen is configured properly it shouldnt overload except under extreme conditions. A straight dual triode mixer isnt as robust. With the plate and screen at 125V, and plenty of AVC action there shouldnt be a problem. I modified my A4 with the 6GM6 and 7360's in both mixers in 1965 along with cascaded filters and AVC changes and today it still outperforms anything I own for pure battle condition digability on 80/160 CW DX. If I get a K3 as planned that just may change and force me to install 6ES8 Pullens.

Date: Tue, 03 Feb 2009 02:47:43 +0000
From: wb3fau@att.net
Subject: [R-390] R390A- no sigs-4 to 8mc.

I have been beating my brains on this receiver for weeks. I am ready to give it up for adoption. This was a put together project. From pieces all over the country. It does work on the other bands. Thanks for your advice- Russ.

Date: Mon, 02 Feb 2009 20:52:32 -0600
From: Gary Pewitt <n9zsv@magtel.com>
Subject: Re: [R-390] R390A- no sigs-4 to 8mc.

Could be bad mechanical filter? Check the killer cap.

Date: Mon, 2 Feb 2009 20:55:50 -0600
From: "Barry" <n4buq@knology.net>
Subject: Re: [R-390] R390A- no sigs-4 to 8mc.

It would seem that's something in or around one of the IF transformers. A single crystal wouldn't take out a range of frequencies and the 17mc oscillator would take out everything below 7mc so I'd figure an IF transformer.

Date: Tue, 3 Feb 2009 09:17:36 -0500
From: Roger Gibboni <rgibboni@dulye.com>
Subject: Re: [R-390] R390A- no sigs-4 to 8mc.

Well, if you've been working on it for weeks, you've probably tried these things but I would try:

2nd LO oscillator frequencies
Mechanical line up of RF rack cams---see pic in the manual

You didn't say how it worked on the other bands. Is the sensitivity good? Less than a few microvolts? If it is good elsewhere, that usually means the IF and audio are fine--not that this would be an audio problem.

Date: Tue, 3 Feb 2009 9:41:04 -0500
From: <jmiller1706@cfl.rr.com>
Subject: Re: [R-390] R390A- no sigs-4 to 8mc.

I once had one of the RF coil cans go bad in an RF deck.. Knocked the whole band out. Check continuity of all the coils for that band. Check the crystal for that band to be sure it is oscillating (look at the osc output).

Date: Tue, 3 Feb 2009 11:07:48 -0600
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: [R-390] R390A- no sigs-4 to 8mc

Two other areas that can cause a dead band;

Look at the rotary switches under the RF deck and under the oscillator deck.

I had a very slight mechanical misalignment and severe oxidation that caused the 2-4 MHz bands to be dead.

The two problems were not obvious on a visual inspection. I had to ohm though the switches from the cans on the RF deck and had to have the oscillator deck powered up and checked the output on the coaxial cable to catch the oscillator switch problem.

Date: Tue, 3 Feb 2009 10:39:59 -0800
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] R390A- no sigs-4 to 8mc

It's the RF deck; probably its bandswitch or one of the 4-8mc RF transformers. Those are the only circuits that operate by octaves. It can't be a slipping 4-8 gear; that would misalign everything mechanically downstream, i.e. 8-16 and 16-32 PLUS the 7-25 variable IF which brings you 0_500 to 7+000; in short, everything.
Crystal problems would knock out two or three seemingly unrelated 1mc bands, or (in the case of the 17mc oscillator) 0_500 to 7+000. Look for a dropped slug, a bad winding, or failure to "make" in the bandswitch, which can be picky. Ohm it out as Tisha suggests. Do this first so flexure doesn't miraculously cure it and leave you without a diagnosis. Since it's some work to R&R the RF deck, use the opportunity to replace any molded oil/paper caps lurking there, and check for out of tolerance carbon comp resistors.

Date: Wed, 04 Feb 2009 00:50:52 +0000
From: wb3fau@att.net
Subject: Re: [R-390] R390A- no sigs-4 to 8mc.

Not meaning to be argumentive, but, how do you conclude there is a bad IF can if the radio works on higher and lower freqs OK? I did change out the set of RF coils for the 4 to 8 mc range, with a set from another receiver. no help. I think the band switch is the problem- S203-204-205, but not certain.

Date: Tue, 3 Feb 2009 20:58:11 -0500
From: "Jim M." <jmiller1706@cfl.rr.com>
Subject: Re: [R-390] R390A- no sigs-4 to 8mc.

There are two IF chains. The so called "IF Deck" is at 455 Kc, and yes it is not suspect. But there are also two "variable IF" stages in the RF chassis, and a set of coils is dedicated to those.

That is what I meant by "IF". More than likely it is one of the RF coils associated with that band. They do go bad so they make them plug

replaceable. Remove the slugs and drop a very small Phillips head screw driver down into the coil. The coils are held in their sockets by a small screw at the bottom of the coil.

This site may help with alignment:
http://r-390a.us/R-390A%20Alignment%20v2.htm

Here's the Y2K manual. A good source of info:
http://www.hausernet.com/r390a/

Date: Tue, 3 Feb 2009 21:19:40 -0500
From: "Jim M." <jmiller1706@cfl.rr.com>
Subject: Re: [R-390] R390A- no sigs-4 to 8mc.

I seem to recall that I had an RF coil go bad in an R-390a I have here. It was one of the front end coils in the Z-201-1 to Z-206-1 range, The failure was a cap inside the coil that went bad. As it turn out these coils (Z-210-1 to Z-201-6) have B+ on them since the plate of the RF amp V201 is fed through them. I isolated the bad coil and replaced it. (I think Fair Radio still has replacements). You can also replace the cap inside the coil itself if it is bad. If the radio is completely silent then it may not be this RF stage however...possibly a bad crystal for that band in the 2nd crystal osc. Good luck.

Date: Tue, 3 Feb 2009 20:35:29 -0600
From: "Barry" <n4buq@knology.net>
Subject: Re: [R-390] R390A- no sigs-4 to 8mc.

>I seem to recall that I had an RF coil go bad in an R-390a ..... <snip>

A single crystal in the 2nd crystal oscillator would not take out the range of bands he's listing. A single crystal functions for 2 bands, but I don't think any of them are adjacent bands (e.g. a crystal might take out the 10mc and 18mc segments (don't quote me on those, I'm just making up an example) but not 4mc through 8mc. I believe it's in (or around) one of the IF coils (the ones in the RF deck).

Date: Tue, 3 Feb 2009 21:38:39 -0500
From: Roy Morgan <k1lky@earthlink.net>
Subject: Re: [R-390] R390A- no sigs-4 to 8mc.

> I once had one of the RF coil cans go bad in an RF deck.. Knocked
> the whole band out. Check continuity of all the coils for that band.

OR: loosen, wiggle and then tighten each of the RF coils. (The mounting

screw is down at the bottom of the slug hole, right?) You have to remove the slug rack for that band. A bit of De-Oxit on the contact pins is a good idea if you are doing an all-out restoration.

> Check the crystal for that band to be sure it is oscillating (look
> at the osc output).

OR: slip a bit of wire down beside the crystal oscillator tube and hook it up to a bench receiver tuned to the expected frequency. (I recommend an R-388 for a bench receiver.)

Date: Tue, 3 Feb 2009 18:40:07 -0800
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] R390A- no sigs-4 to 8mc.

(I presume you mean RF can not IF can.) If you're on 0-1, the radio uses the 0-1 RF coils; the 4-8 coils are out-of-circuit. Same for all bands except 4, 5, 6, 7, and 8. If known-good 4-8 coils didn't help, you've eliminated two suspects: the coils, and the socket contacts they plug into. Almost the only thing left that's
specific to 4-8 is the bandswitch itself. It may be oxidized; it may also be slightly misaligned. If it's not that, there's nothing left but a broken wire. Everything else is used on at least one band that works.

Date: Wed, 4 Mar 2009 10:52:55 -0800
From: Rick Popovich <RickP@fndmail.csus.edu>
Subject: [R-390] R-390 Meltdown - the Saga Continues

Don't worry - I'm pretty much a novice when it comes to these receivers as well and I am not taking the information and disappearing. I was also of the opinion that C325 was the problem and after performing resistance checks using information given by some folks here I completed the repair last night.

The results were mixed, now R220 is not burning up but there now seem to be a problem downstream so to speak. After letting her warm up & switching on the B+ I knew from the sound that something wasn't right. Shortly there after a little smoke started to come from somewhere else - this time it was on the topside of the RF deck and since I was viewing things from the back side it took a moment for me to notice it. (I'm working with the RF deck sitting on top of the xtal osc but connected to the rcvr Power lead)

I immediately shut it off and needless to say was a little frustrated so I just put down my tools & called it a night.

Another potential suspect identified by some of the veterans was T207. Since it is connected to this circuit and the smoke appeared to be coming from the topside of the RF deck I'm going to check this part tonight. Some early very preliminary checks of T207 didn't show any problems - but now I'm thinking it may also have some issues. So Chris welcome to my learning curve and check back whenever you like. Best regards to all.
- Rick

Date: Wed, 4 Mar 2009 12:05:15 -0800
From: Rick Popovich <RickP@fndmail.csus.edu>
Subject: [R-390] R-390 Meltdown - the Saga Continues

Thanks for the reply - actually it looks like C325 was actually part of the problem - now I just have to find the other part <LOL> I know what you mean about getting to the projects - I have a few others waiting in the wings myself.

Date: Mon, 9 Mar 2009 09:02:35 -0700
From: Rick Popovich <RickP@fndmail.csus.edu>
Subject: [R-390] R-390 Meltdown - Problem solved!

Just checking back in with the group to say that the original suspect in this case **(C325)** was indeed the only bad component. This caused R220 to go up in smoke. I will be replacing all of the other caps with mica's as soon as I get them ordered. While I did report that I had observed a possible problem downstream (possible issue with T207) - it turns out that it was A-Ok.

What I did find was a cold solder joint in one point of my original repairs - after using a magnifying glass it was pretty obvious (getting old sucks) After I touched up the connection everything worked just fine - no smoke to be seen.

Sensitivity seems to be down slightly but this can be addressed easily. Now I can continue to use this ugly duckling as my study tool. Thanks again to all who offered their help, knowledge and suggestions - it is sincerely appreciated. I know where to come for the next one!

Date: Fri, 13 Mar 2009 00:40:41 -0400
From: "Richard Spargur" <k3ui@comcast.net>
Subject: [R-390] T401

Anybody replaced T401 in an R-390A XTAL oscillator. Does anyone have an alignment process for this tunable inductor. I have had to replace one when V401 was driven to hard burning up T401 and resistors R406 and R407. They have all been replaced.

Date: Sun, 15 Mar 2009 12:42:23 EDT
From: Flowertime01@wmconnect.com
Subject: R-390A: aligning T401

>Does anyone have an alignment process for the tunable inductor T401 in an
>R-390A XTAL oscillator ?

Very good question.

R390/A TM11-5820-358-35 Para 74 omits this subject. More than once we tried to get it into a new edition of the TM. (1968 - 1975)

R390 TM11-5820-357-35 Para 77 give a procedure to do the alignment in the R390. We just used this procedure on the R390/A. I do not have my Y2K manual on this computer to see if the subject is covered.

>From the R390 TM.

Hang a Neg DC voltmeter into E210 grid test point of second mixer.

Set the slug of T401 at about 1/4 out from all the way in.
Set the receiver to 31 Meg.
Get a tweeker on the 31 meg trim cap in the osc deck.
Get a tweeker on T401.
Get the Voltmeter scale readable.
Spin the cap around.
It should peak twice.
Turn T401 out.
Spin the cap around.
It should peak twice.

Repeat
Turn T401 out.
Spin the cap around.
It should peak twice.

Or
Find the point of the trim cap between the two peaks. (max cap)
Adjust T401 out until the meter peaks)

At some point the cap it will only peak once. (max cap but not enough cap)
Now set the trimmer cap off peak a bit and reset T401 for max reading.

---Adjust T401 back in.

This should leave T401 peaked for best response.
You should get two peaks on the cap again.
Sometimes you will have a weak crystal or harmonic of the crystal.

Then you may do this process on that frequency with that trimmer cap to bring the weak 1Mhz band up as best you can. Then retrim all the caps to T401 as adjusted for the poorest crystal in the osc deck.

If the poor crystal will not let you trim it up and get every thing else to pass, then it is time to change that crystal. This process being used to judge when its time to call a crystal bad.

If you have a band that does not peak twice with the trimmer cap, this is a band worth trying to reset T401 for higher output. You may have several crystals that need to have the socket cleaned or the crystal replaced.

Adding small caps to bring a trimmer up to peak twice with T401 can be more work than finding a different crystal that will work. Roger Ruszkowski AI4NI

Date: Wed, 25 Mar 2009 21:06:49 -0400
From: Roy Morgan <k1lky@earthlink.net>
Subject: Re: [R-390] Troubleshooting the R-390A Rf Module

> I have an unusual problem. The best kind!

> ... the 17 MHZ xtal oscillator V207 does not want to turn on. ... a tube extender
>... it starts working.

Oscillators can be the most difficult circuits to make reliable when they are acting up.

> Does it want more/less inductance or capacitance?

Maybe more capacitance (Pause to look at the schematic ...) Notice C324 and C325. They form a voltage divider and feed back path to make the thing oscillate. One of those caps may be bad. Also at pin 6 is the screen bypass cap C326, 5000 pf to ground. An easy test for that one is to put a similar cap in parallel with it. You may be able to wind a parallel cap around the actual tube pin. Of course if the cathode choke is mis behaving, that would cause trouble. If you can measure inductance a tube pin to ground test there would tell you if the choke is shorted.

Date: Wed, 25 Mar 2009 19:37:27 -0600
From: "DW Holtman" <tubestuff@comcast.net>

Subject: Re: [R-390] Troubleshooting the R-390A Rf Module

Thank you for the response. I swapped the tube with V401 from the xtal oscillator sub chassis, which is well used.

I have been thinking about the same thing. I will next pull out the RF module again and while it is out, change out C324, C324 and C326. I have them on hand, and it will not be too tough. Also remove one end of L201 and check it. It is on a very low voltage circuit so an inductance check should work.

Date: Wed, 25 Mar 2009 22:38:59 -0400
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] Troubleshooting the R-390A Rf Module

Try taking a look at R207, the grid leak resistor. The story I remember went something like "The radio only works when the VOM lead is on the grid of the XYZ tube" (from the days when 20,000 ohms/volt was King).

Date: Thu, 26 Mar 2009 16:44:44 -0600
From: "DW Holtman" <tubestuff@comcast.net>
Subject: Re: [R-390] Troubleshooting the R-390A Rf Module

I want to thank everyone for all of the help. While I had the RF Module out, I changed C234 and C235. Both of the caps tested good on a cap checker and showed infinite resistance while cranking 500 volts with a mega-ohmeter. Next, I removed R-207 and it read 113K instead of 120K, so it was replaced. Put everything back together and it now works. I don't know what the problem was, but I was not going to change one piece at a time to find out. Thanks again for all of the help.

Date: Wed, 8 Apr 2009 21:05:00 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Need a RF slug for a R-390A

The spring thingy can also be soldered back together.
Some acid core solder may be needed though.
The adjustment of the triangle should allow for some misalignment in soldering.
The springy thingy can be shorten a thread or two if needed when doing a re

glue to the slug or resolder to the spline screw.

The springy thingy can be extended a bit with the JB weld or Epoxy if needed.
All RF slugas are not the same. The three in any octave of any one IF are the

same.
Some Octaves are the same as the next Octave.
If you need a replacement, Do name the Octave you need.
Octaves are { .500 - .999, 1.000 - 1.99, 2.000 -3.999, 4.000 - 7.999, 8.000 -15.999, and 16.000 - 31.999 }

Probably more than you any one wanted to know.

Roger

Date: Wed, 8 Apr 2009 20:42:43 -0500
From: "Barry" <n4buq@knology.net>
Subject: Re: [R-390] Need a RF slug for a R-390A

Interesting. I thought all the slugs in all octaves were interchangeable. I know they're not interchangeable with the IF slugs, but I thought all RF slugs were interchangeable. I know when I rebuilt at least one of my RF decks, I removed all racks, holders, triangular slug holders, etc., cleaned them all, and re-assembled them in no particular order. I didn't notice any degradation of performance but .....

Date: Wed, 8 Apr 2009 20:50:41 -0600
From: ANTHONY CASORSO <canthony15@msn.com>
Subject: Re: [R-390] Need a RF slug for a R-390A

They are all the same for the 390A, but not for the 390.

Date: Thu, 9 Apr 2009 11:43:31 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Need a RF slug for a R-390A

I think you are right on the R390/A slugs.
There are only two kinds. RF and IF.

We could look in the 35P manual and see how many different part numbers
there are.

Date: Thu, 9 Apr 2009 10:33:15 -0600
From: ANTHONY CASORSO <canthony15@msn.com>
Subject: Re: [R-390] Need a RF slug for a R-390A

It was one of the goals of the R-390a (cost reduction) to reduce cost. It is written up in the engineering report. I quote: "Finally, all RF coils were designed to use this same type of ferrite core. In addition to their higher permeability, these cores also have a higher Q, helping to overcome the

loss of image response resulting from the elimination of one RF stage. The VIF coils have also been redesigned for use of a common core. This core differs from that used in RF coils however because this application called for a lower permeability, higher Q core."

And elsewhere in that document:

" Later work showed that similar results could be obtained using the larger coil diameter with a ferrite core to replace the powdered iron slug. All the RF coils have since been redesigned to use the same ferrite core. These new coils also have a higher Q than those in the current R-390. The variable IF coils have also been redesigned to use a common core. This core however differs from that used in RF coils, because a lower permeability higher Q core was needed. "

Date: Thu, 9 Apr 2009 09:45:25 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] Need a RF slug for a R-390A

Yes, it's in the Cost Reduction Report. The R-390 slugs were individually tweaked; process improvements let them do away with that in the R-390A. There's just the two kinds, RF and IF, and within each category they can be swapped at will. I repaired a broken spring* with JB Weld. It's held up for years.
I tried to position the triangular carriers for minimum spring flexure. In a few cases this required filing the central opening in the rack.

* Technically correct, but unlike most springs, these are always coil-bound.
More like a flexible wire, bendable but constant length. In fact, aren't they literally wires in the R-390?

Date: Sun, 3 May 2009 16:38:38 +1000
From: "Pete Williams" <jupete@bigpond.net.au>
Subject: [R-390] Tech Tip re R-390

G'day list....maybe it's obvious or mentioned in despatches before but if you find during the lower frequency alinement point - i.e 4.6 MHz- one of the slugs has its top level with the rack, suspect the cap within that can Found that today in a R-390/URR in one of the 4 to 8MHZ can-- the 910pf cap.open. I had to parallel a couple to get near that value but alinement OK after the substitution

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Date: Thu, 14 May 2009 17:10:23 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: [R-390] Crystal substitution puzzle

My R390A's Y411 (16MHz) has died. Since it was cheap to try, I bought all the wire-lead 16MHz crystals that Mouser stocks, five in all, and put them in. They run, but every last one of them is 1.5-2.5kHz low, which is 50% out of spec at best. This is five different parts, from Citizen, Fox, ECS, Abracon, and Vishay/Dale, so it's not a bad part or a bad lot. The original crystal, though too weak to mix well, is right on. It's a disappointment, as the new ones are around $.50 each and I hoped to open up an alternate supply for about half of our second-oscillator crystals. I can live with the error, but still - what's up?

Date: Thu, 14 May 2009 20:26:15 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] Crystal substitution puzzle

Fair radio still sells MANY of the crystals used in the R-390A. I suspect that the circuitry exceeds the ability of the "less" expensive alternatives. Bob - NODGN

Date: Thu, 14 May 2009 20:41:08 EDT
From: JRFKE5RI@aol.com
Subject: Re: [R-390] Crystal substitution puzzle

Have you considered the circuit loading parameters of the "cheap" crystals compared to the parameters specified in the R390A circuit? This can certainly account for the difference you are seeing. John

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Date: Thu, 14 May 2009 19:48:36 -0500
From: "Bill Hawkins" <bill@iaxs.net>
Subject: Re: [R-390] Crystal substitution puzzle

Seems to me that crystals have a rated socket capacitance. The newer crystals could be rated for lower capacitance. OTOH, 0.01% seems like a lot of pull for a crystal.

Date: Fri, 15 May 2009 00:27:43 -0400
From: "James A. \(Andy\) Moorer" <jamminpower@earthlink.net>
Subject: Re: [R-390] Crystal substitution puzzle

Usually the problem is the series-versus-parallel rating of crystals - most of the R-390/R-390A crystals are specified in parallel mode, which means they normally have a capacitor in parallel with them which brings down the frequency. Parallel-mode crystals are ground with a free resonant frequency a bit high. If you put a series mode crystal in a socket that expects a parallel mode crystal, the frequency will be low. It can be as

much as 100-200 ppm low. For a 16 MHz crystal, 100 PPM would be 10e-4 * 16 * 10e6 =1600 Hz. We have a smoking gun. When you specify a parallel-mode crystal, you have to tell the provider what the parallel capacitance will be. If it is a trimmer or other variable capacitor, you generally take the mid-point of the range to give you some flexibility to "pull" it up or down a bit. I have been screwed by this particular gotcha more than once . . . and in both directions.

Date: Fri, 15 May 2009 09:47:39 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] Crystal substitution puzzle

A few kHz change in resonance is entirely typical for a 16MHz crystal being loaded differently than specced. So if it was supposed to be series resonant and you put in a parallel resonant crystal, a few kHz shift is expected. The sub-dollar crystals they produce by the bazillions are only out of factory spec by a rate of less than one out of a hundred. I know, because I've bought them by the hundreds and sorted through them for homebrew crystal filters in the past few years, and only once did I see one that was out of spec. Example: Of a lot of 200 14MHz crystals I sorted through, 90% of them had their series resonant frequency matched to +/-70 Hz, which is +/-5ppm. That does not mean they are all identical. Different brands and different lots from the same brand will have non-specified parameters (Q; motional Capacitance; motional Inductance; Series resistance; etc.) that are often completely unspecified (and these in large part determine the pullability aka difference between series and parallel resonance etc.)

Date: Fri, 15 May 2009 09:25:20 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] Crystal substitution puzzle

I expect that this is it. The new part specs that I looked at are kind of sparse. I'll try to find out more and compare them to CR-36/U. Funny thing though. Out on the net there's an analysis of series- vs parallel-mode crystal operation in an oscillator, and his conclusion is that a series-rated crystal operated inductively will run above rating, not below. Of course, everything on the web is right :)

Date: Fri, 15 May 2009 12:56:07 -0400
From: Roy Morgan <k1lky@earthlink.net>
Subject: Re: [R-390] Crystal substitution puzzle

>... there's an analysis of series- vs parallel-mode crystal operation.....
Can you post the URL? Thanks.
> ... a series-rated crystal operated inductively will run above rating, not

below.

I assume that you mean above rated frequency, and inductance in series. It could well be that inductance in series has the opposite effect as capacitance in parallel. The R-390 circuit, we can assume, has more capacitance in parallel with the crystal than the new crystals are meant to have. (No, I have not puzzled this out by analyzing the equivalent circuit of the crystal and all that.)

Date: Fri, 15 May 2009 10:36:44 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] Crystal substitution puzzle

http://www.phy.auckland.ac.nz/Staff/geb/Crystal%20Oscillator.pdf

There are many others. I used microprocessor "crystal oscillator" colpitts pierce as my search string. When I said "operated inductively", I was referring to parallel-resonant mode, where the crystal's equivalent impedance is inductive, as opposed to series-resonant mode where the crystal looks resistive. The Colpitts oscillator (used in the R-390A) utilizes the inductive aspect of the crystal. (Actually, the crystal is not operated right _at_ its antiresonance point, but somewhere between antiresonance and series resonance.)

Date: Fri, 15 May 2009 19:00:55 EDT
From: Flowertime01@wmconnect.com
Subject: [R-390] Crystal substitution puzzle

OK so these stock crystals want a series circuit and the R390's offer a parallel circuit. What do we need to add to the crystal to get it closer to the needed frequency? Or is it still cheaper to just buy the right ones to start with. Who is a good new crystal supplier that we should all glum on to and order from hoping to keep them in business?

Date: Fri, 15 May 2009 19:07:30 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] Crystal substitution puzzle

I don't know of a new supplier personally. I know the price seems ridiculous when compared to what these crystals cost this person - BUT - Fair Radio DOES have the 14MC crystal on their site. It is $12. They are probably the spare parts that Fair bought up when they bought the R-390A parts they have been selling for about 7 to 10 years. I've gotten NIB IF cans from them over the years too.

Date: Fri, 15 May 2009 16:32:16 -0700

From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] Crystal substitution puzzle

It's a hack to save money. These are not CR-36/U. They're not even HC-6/U. They have wire leads, and I made up a little slip of vectorboard the size of an HC-6, soldered the crystal to it, soldered wires to it that worked like pins, and plugged the result in. Some of the tech info talks about adding a coil across the crystal to compensate the holder capacitance; this info always says this increases the frequency. If I get a chance to try it, I'll report back.

Date: Fri, 15 May 2009 21:22:37 -0400
From: Roy Morgan <k1lky@earthlink.net>
Subject: Re: [R-390] Crystal substitution puzzle

Two well respected restorers of Collins gear I know routinely use this company, with excellent results:

>> www.mhelectronics.com. (800 643 9825)
>> Give them a call for your specific requirements - they are very helpful.

Date: Sat, 16 May 2009 18:38:10 -0700
From: Brian Vietri <bvietri@msn.com>
Subject: [R-390] R390A RF Deck slug indentification

Does anyone know of a color code chart for locating slugs in their proper location in Slug Rack Rows? I noticed that at the top of the slugs there is a paint dot or dots, and there seems to be some kind of relation to colors in each slug rack row? (example the three slugs for the 8-16 Mhz row 1st slug has red/white dots, 2nd has red dot, 3rd has red/white dots) I realize this is probably related to permeability of the slugs. However I have not seen anything in black and white?

I also have one slug rack row with 2 straight slotted, and 1 bristol type slug? I have noticed the bristol type slug is almost bottomed to meet reception specs in all three locations in that row? I realize permeability is a huge factor, but again I find nothing in black and white?

Date: Sun, 17 May 2009 15:27:36 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] R390A RF Deck slug indentification

Slugs popped up just last month as a topic. The R390/A has just two types of slugs. One type in all 8 octaves of the RF section 3 x8 = 24. Type two is in the variable IF section of the RF deck. These are 6 each in the IF section behind the 8 octaves of RF cans at the front of the RF deck. The original

R390 had different slugs in the various sections of the 8 Octaves. So all 24 were not the same. But any three in an octave are the same.

R390 and R390/A slug sizes are all the same.
The spring wire can be soldered and or glued back together.
Original slugs were all spline.

If you have a slotted slug bolt it is not likely original.
It may have the original slug under it and it could be a repair.
It could be a late year replacement part. Being easier to put a slotted bolt on the slug than to obtain the spline bolts.

If it operates well let it be.

If the octave will not align and peak as well as the other octaves, then post a request here for one replacement. Several of the fellows have some spare parts and for a reasonable cost and postage will send you a good replacement.

The slugs did have color coded paint dots on them.

There were lots of differences. The color dots were not any assurance the slugs were correct. The only real test was to install a slug. Do the alignment and power measurements. If the receiver worked to spec the slug was acceptable.

You may see different paint dots on the slugs within a given receiver.

Date: Tue, 19 May 2009 10:13:38 -0400
From: Gord Hayward <ghayward@uoguelph.ca>
Subject: Re: [R-390] Crystal substitution puzzle

>.....his conclusion is that a series-rated crystal operated inductively will run above rating, not below. Of course, everything on the web is right :)

The phase curve for a crystal starts at -90 deg at low frequencies then pops up to +90 deg at the series resonance point stays up for about 20 kHz then drops back to -90 deg. With a clean crystal, the rise and drops occur over a couple of Hz but when they are wet the rise is much more gradual and doesn't get to +90 deg. I'm one of the few who run crystals wet, in my case, immersed in homogenized sheep brains. -90 deg is capacitive, so as the frequency rises the crystal goes inductive at the series resonance point. For more information than you probably want, look up 'A transverse shear model of a piezoelectric chemical sensor', G. Hayward and M. Thompson, Journal of Applied Physics, Vol 83, pages 2194-2201 (1998). Yes, the Hayward is me.

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Date: Mon, 3 Aug 2009 10:59:55 -0600
From: ANTHONY CASORSO <canthony15@msn.com>
Subject: Re: [R-390] Need R-390A Iron Core Slug

And from the nit-picking department, the R-390a slugs are not made of powdered iron like the R-390 slugs. They are ferrite, which is a ceramic.

Date: Thu, 13 Aug 2009 14:11:23 -0500
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: [R-390] Frequency Synthesis on the R-390/A using the SBM-1102

I ran across a document explaining the setup of the FFR-41 and how the SBM-1102 would provide precision frequency synthesis to a pair of R-390A's. (document MM03276). It appears that the connections to the receivers would be to the 1st mixer with an external 17 MHz reference, the 2nd mixer with an external 9-17 MHz reference and to the VFO with an external 2.455 - 3.455 MHz oscillator. All of it is locked to a single 1 MHz crystal and there are provisions to support the CV-1597 sideband converter for receiver tuning. It is a neat idea and I can see the application for diversity reception of RTTY where the receivers would have a single frequency reference. This looks sort of 1967'ish and knowing that many list subscribers were in far away, hot, sticky environments at the time I wonder if anyone had experience with this lashup. I would think that the R-390A's would require some modification (additional jacks and cabling) to bring the 1st and 2nd mixers and the VFO connections to the back panel. Has anyone seen a rig modified in this manner? I know that NASA (and probably NoSuchAgency) had R-390A's modified so they could adjust for doppler shift from space vehicles. This was also done with an external reference and the R-390A was rebranded as a different model.

Date: Thu, 13 Aug 2009 20:12:49 -0500
From: Tom Frobase <tfrobase@gmail.com>
Subject: Re: [R-390] Frequency Synthesis on the R-390/A using the SBM-1102

I bought a mid 50's Motorola R-390A recently with these modifications installed. Each of the effected sections have a plug in module housing a relay and cable assembly wired to the back of the radio. This radio was not re-branded. My intent is to restore the radio to its original mode and pass the modules on. I would enjoy reading the document. If anyone is interested I can take a couple of pictures. if you don't mind a very dirty R-390A

Date: Sun, 13 Sep 2009 01:42:08 +0000 (UTC)
From: odyslim@comcast.net
Subject: [R-390] rebuilding RF transformers

I have a transformer that will not stay in alignment. I suspect a bad cap in the transformer. It is T-204. The manual calls for a 7 pf mica and a 36 pf mica. I wonder if there is a specific one that is smaller than others. There is not much room in that can. Any recommendations?

Date: Sun, 13 Sep 2009 11:42:08 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] rebuilding RF transformers

There is nothing magic about the caps per se. They are very small packages. The variable caps are all the same. Then a fixed cap was added to get a mid-range on the variable to make up the circuit. Over an hour or so, temperature in the cans of the RF deck are fairly stable, and the circuit is just band pass, so cap value drift with temperature is not the most critical function of the caps. Any good mica with in tuning range should work. You can go with some longer lead length and use a bit larger package.

You may want to ask for a whole transformer here on the list and just go that route.

You could have a hair line crack in the core giving you problems. So you might ask for a transformer and core. There are only two flavor of cores in the R390/A RF deck (RF and IF) so having a spare core is not bad. And then you would have a spare variable trimmer cap parts also.

Date: Tue, 15 Sep 2009 11:01:24 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] rebuilding RF transformers

>>Any good mica within the tuning range.....

NPO* ceramic is fine too, and usually smaller, cheaper, and easier to get. Beware that in some positions the cap has B+ across it; don't use a 50V part there.

* To tell the truth, since the coils' inductance almost certainly increases with temperature, really the cap should have a negative tempco, like the ubiquitous N750.

Date: Tue, 15 Sep 2009 14:48:28 -0400

From: "Shoppa, Tim" <tshoppa@wmata.com>
Subject: Re: [R-390] rebuilding RF transformers

Many slug-tuned coils end up having a small negative temperature coefficient which is matched well by a mica's slight positive temperature coefficient.

For air and toroid coils, ceramic NPO's are often a better match. N750 is a pretty strong tempco and typically would be used as a small part of the total tank capacitance.

Date: Tue, 15 Sep 2009 12:22:41 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] rebuilding RF transformers

Sorry for the misinformation! Does that net negative tempco come from the slug? Because the coil form always expands, giving air-core coils a positive tempco. Do you have a good source for compact small-value medium-voltage micas?

Date: Tue, 15 Sep 2009 15:40:39 -0400
From: "Shoppa, Tim" <tshoppa@wmata.com>
Subject: Re: [R-390] rebuilding RF transformers

The reason that so many handbooks for so many years pushed silver micas so much, is that the tank inductance in ham gear VFO's was usually a slug tuned coil. I think the amidon tables and the ARRL handbook have some tempcos for typical modern iron powder toroids.

> Do you have a good source for compact small-value medium-voltage micas?

Mouser, digikey have Cornell Dubilier's. I think Allied has a wider selection (more oddball values). For RF deck purposes I'm sure modern ceramic NPO's will do just as well. If you're building or rebuilding a VFO, you have to be very
critical with respect to tempcos.

Date: Tue, 15 Sep 2009 22:48:34 -0400
From: Roy Morgan <k1lky@earthlink.net>
Subject: Re: [R-390] rebuilding RF transformers

> ....a good source for compact small-value medium-voltage micas?

Get good caps at bottom prices from justradios.com in Canada. Good folks, good prices, good caps, (and resistors), quick shipping, order online.

http://www.justradios.com/

Date: Sat, 7 Nov 2009 15:51:13 -0800 (PST)
From: wli <wli98122@yahoo.com>
Subject: [R-390] re; R211

I am in the process of going through the RF deck on my 1952 Collins R390A. The first thing that struck me was the chassis darkening in the subcompartment under HR202. As we know the heater is *on* all the time, cooking the Xtals. All the small components there showed the effects of lots heat with runny wax on the micas and darkened ceramic disc bypasses. One strange finding was R211. There was a 82K resistor, but all the manuals called for a 8.2K resistor. My question is: is this just an innocent error?

Date: Sat, 7 Nov 2009 16:15:05 -0800
From: "Craig C. Heaton" <wd8kdg@worldnet.att.net>
Subject: Re: [R-390] re; R211

<snip>.....re R211, innocent error. Does anyone have one belly up at this time to check the value on another RF deck? In my Amelco R235 was incorrect, must of worked at one time, the QA/QC stickers are still on the top/bottom cover & frame. The crystal calibration was not working when I got the Amelco and a correct R235 didn't help, had to replace all the silver mica's. Great practice getting the RF deck belly side up.

Date: Sat, 7 Nov 2009 18:21:57 -0600
From: "Bill Hawkins" <bill@iaxs.net>
Subject: Re: [R-390] re; R211

Well, you could simulate the circuit with SPICE if you had all of the hardware and software and knowledge required, or you could bridge the 82K resistor with a 10K resistor and see what happened.

Wait - a 1952 A model? Must have been early in the A generation, no? Maybe things changed. I'd give a better answer if I had the manuals at hand, but I've been thinning the collection to avoid the dumpster.

Date: Sat, 7 Nov 2009 20:35:51 EST
From: DJED1@aol.com
Subject: Re: [R-390] re; R211

I did a quick check on a SW chassis I have laying around, and I found an 82K with a quick look. But, when I looked more carefully, I found R211 was indeed an 8.2K, and the 82K was associated with a different tube. Are you sure you're looking at the correct resistor? Because an 82K in the

B+ to the oscillator must have some significant effect on performance. ....
<snip>.....

Date: Sat, 7 Nov 2009 17:44:25 -0800 (PST)
From: wli <wli98122@yahoo.com>
Subject: Re: [R-390] R211

.....<snip>..... The triggering event for this project was failure of the 20:1 end-to-end test which seemed localized to the RF deck, not changed with tube swapping or alignment. When I tested just the IF-AF decks I got a 37:1 ratio (repeated 4x on different days).

Yes, it is good practice getting the RF deck out. Not too bad once you release all 13 green 6-32 screws.

Date: Sat, 7 Nov 2009 18:24:26 -0800 (PST)
From: wli <wli98122@yahoo.com>
Subject: Re: [R-390] R211

Yup, it is the one where 4uV is injected into the antenna jack, and you turn the modulation on and off. Roger posted a detailed setup for this Army field test.

(also duplicated under Power Supply)

Date: Sun, 8 Nov 2009 12:46:28 EST
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] another crystal question

After 50 years we could expect a thermostat switch to go bad and fuse shut. The covers should not be hotter than you would want to touch. The cover should run cooler than the 6AK5 tubes. More like a 5814 tube temp. Just a 40 year old subjective memory. For sure you can clip the wire and run with the oven off. The crystals may be off a few 100 hertz after not warming up to full temp. But the receiver will work and can be aligned to operate with what ever frequency you do get from them.

Roger Ruszkowski AI4NI

Date: Sun, 8 Nov 2009 13:03:58 EST
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] re; R211

The oven may have stuck on some where in life and toasted things in that corner of the deck.

Running the 2 crystal oven without heat would be OK. Not as great as with heat but the receiver will stabilize at some temperature and operate well. You can then align the receiver to whatever the crystals want to operate at without extra heat.

R211 is a plate resistor for V207 first crystal osc. Figure 5 page 21 shows the resistor as 8.2 K. You could be looking at a paint color change on an old resistor. Or a cooked resistor. Or a receiver that was built wrong and you are the first person to ever look at the real problem for its weak performance.

I would go with a 8.2K resistor in the circuit as shown at least twice in the R390A TM and the Y2K manual as derived from the Navy publication. 8.2K is more in line with the mixer resistors than 82K.

I think all the R390A's will show the deck under the crystal heaters to be somewhat toasted.

Other areas that show toasting are likely from a tube that went bad and caused excess current to flow. I would examine the resistors in all the toasted areas to see if any are out of specification. Heaters toasting areas can mask other problems that may have occurred.

Roger Ruszkowski AI4NI

Date: Mon, 9 Nov 2009 10:22:08 -0800 (PST)
From: wli <wli98122@yahoo.com>
Subject: Re: [R-390] R211 and HR202

Roger: Thanks for all of your observations.

RE: R211

I examined that resistor with a magnifying glass, it is indeed coded grey-red-orange, not grey-red-red. It looks like new, so my guess is that someone was in a hurry and did not look real close during assembly. It is not discolored at all... It measures 82K both on my DVM and my VOM. Funny how that passed inspection back in 1952.....

Re: disclorated chassis from heat

In addition to the subcompartment containing HR202, the other ones are that long skinny subcompartment under all 6 back row RF transformers containing NO tubes; AND the area near tube socket V203, AND around V201's socket. This is going to be fun checking out indivdual parts in a crowded zone! Even the 5000pF discs are now dark yellow. I picked the

worst looking bypass disc cap to test, and there was .001uA leakage at 250V and its capacity was bang on at 5000pF. Boy they are tough!
<snip>

Date: Mon, 9 Nov 2009 14:44:04 -0800 (PST)
From: wli <wli98122@yahoo.com>
Subject: Re: [R-390] R211 and HR202

So Barry asked if .001uA was correct.....

>> Even the 5000pF discs are now dark yellow. I picked the worst looking
>> bypass disc cap to test, and there was .001uA leakage at 250V and its
>> capacity was bang on at 5000pF. Boy they are tough!

>0.001uA? Is that correct?

So I repeated my test.. 10M VTVM in series with the disc cap and my bench supply set at 250VDC. VTVM shows 0.3V. Now 10v means 1uA leakage, 1 volt is 0.1uA, and 0.3V means .03uA leakage.

You are right, too many zeros. I got carried away..... It's .03uA leakage.

Sorry for the error

Date: Sun, 22 Nov 2009 05:49:44 +0000 (UTC)
From: odyslim@comcast.net
Subject: [R-390] slug racks

I have a set of slug racks that have serial numbers professionally or commercially stenciled on them. Has anybody ever seen this? They are on a RF deck that was made with no ID anywhere, what so ever. Regards, Scott

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Date: Sun, 2 May 2010 15:53:34 -0600
From: Patrick Nelson <aaptmf@onepost.net>
Subject: [R-390] Having issue with 2nd Crystal Oscillator in R-390

I just joined the group and have both a Motorolla R-390 and an original contract Collins R-390A. I am working on restoring the R-390 and am having a problem with the 2nd Crystal Oscillator. It seems to be oscillating on multiple frequencies on all the higher bands (14Mhz and above). For a picture of the waveform see:

http://www.sunday-special.net/bad_waveform.jpg

This causes multiple images of the signal. In other words, it's possible to

zero beat with the calibration oscillator in two places a few Khz apart. Any ideas what might be causing this?

Date: Sun, 2 May 2010 20:54:57 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Having issue with 2nd Crystal Oscillator in R-390

I agree that the symptoms are what they are. I think you are looking for the problem in the wrong circuit. As the receiver changes the crystal for each MHz in the 2nd crystal oscillator it is not likely that every one of them would have spurs with the same spacing. The wave form looks typical for a 2nd crystal harmonic.

Go to WWV at 15 or 20 MHz or one of the CB frequencies at 27 - 28 Mhz and see if you get images on incoming signals. Or check with a signal generator. If no images that way then think the calibration oscillator has a spur. At higher frequencies images should get further away. Below 14 they may be close and not noticed. Or not have enough power to be apparent.

Possibly the VFO has a spur, Below 14 Mhz the RF filters are sharp enough so the multiple cal tones and signals do not get through the receiver and the receiver sounds as if it is working below 14Mhz.

Once you get the problem isolated a shot gun cleaning is the first step. Deoxit the crystal sockets, tube sockets and connector pins. In the R390 grounds are soldered direct to the module so poor ground lugs are not an issue. Check all the other mounting hard ware for crud that may provide a ground loop in the circuit.

If this fails you could have a flaky cap. You want to be sure what stage is the real problem as inspection is not likely to isolate the problem critter and just changing caps until the problem goes away is tedious especially if you are in the wrong stage.

If you have a signal generator then you can pull a crystal and inject the generator across a cap (for isolation) into the oscillator grid and see what the results are. You may want to go for injection into the mixer with the crystal pulled.

Date: Tue, 4 May 2010 13:50:25 -0600
From: Patrick Nelson <aaptmf@onepost.net>
Subject: [R-390] (no subject)

Thank you for the response. I had pulled the crystal oscillator sub-chassis because the 1st crystal oscillator wasn't oscillating (bad resistor). While I

had it taken apart I decided to look at the waveforms for all positions of the band switch and erroneously assumed this was the cause of the spurious signal I was hearing earlier. I hear the duplicate on WWV, so I can eliminate the calibration oscillator for now. This leaves the VFO or BFO. The radio has lots of issues, so I have yet to delve into the VFO or IF sub-chassis, but doubtlessly they will need other work also when I get to them.

Date: Tue, 4 May 2010 20:08:01 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Oscillation Spurs

I have had some bad thoughts on this problem. You could have a tube in the RF deck with an oscillation at a few kilo hertz and just mixing with every thing. These are 50 year old radios and any thing is possible. Do not let this worry you and number of problems are still solvable. Just things get found in unexpected places. Good that the calibration crystal is out of the mix.

Find some 47 Ohm 1 watt resistors. These plug in across the filament of the series tube strings so you can pull some tubes to break up the chain.

Start with the 3rd mixer. Pull the tube, bridge the filament, use a cap for isolation and inject 455Khz into the plate of the tube socket. Listen to what comes out of the audio. Pull the second mixer and repeat with a frequency that will mix with the VFO and see what you get. Work toward the front end until you get to the bad stage.

Date: Tue, 4 May 2010 19:17:25 -0600
From: Patrick Nelson <aaptmf@onepost.net>
Subject: [R-390] Oscillation Spurs

I happen to have the RF deck out right now checking resistor values and looking for bad caps (that can be checked in circuit).

Like I said, the R-390 is working, but not great. Unfortunately I found the cathode resistor for the 1st RF amp is reading about 250 ohms instead of 100. I'm sure this isn't helping sensitivity any. Unfortunately it is also buried under half a dozen other components as well as the band switch. Not sure what I'm going to do about that at the moment. I like the idea of using signal substitution to find the stage generating the spurious signal. Was thinking of doing that with the oscillators, but didn't think of injecting it as the mixer outputs. Anyway, this receiver is looking to be a big project even though it was already "working" :-)
I'll keep you up to date...

Date: Tue, 04 May 2010 20:44:20 -0500
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Oscillation Spurs

Perhaps just a parallel resistor tacked across the cathode resistor would be an easy way to fix it?

Date: Wed, 5 May 2010 18:54:29 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Oscillation Spurs

Keep working on it.

Not recommended, but you can loosen the band switch clamp and pull the band switch shaft out of the switch assembly. This may or may not give you some room to work on the resistor that needs changing.

You want to pull a tube to open the circuit so you can do a clean injection and thus isolate where the problem starts. Just putting the tube up on an extender does not help you break the chain and get a clean point to start injecting into.

Problem in the R390 is the series filament strings. Often when you pull a tube you lose at least one more in series and it is often the one you would like to be checking on. The 47 ohm resistors in the power supply and audio deck work nice as filament substitutes. Back when these were always in stock because we were burning them out by letting the 6082s run until dead. You could get a couple out of supply when you pulled a 6082 or 26Z5's and no one would even ask why.

Date: Wed, 5 May 2010 19:01:03 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Oscillation Spurs

Right on, No reason to get carried away. Maybe just crunch the original out, bridge the new one in on the leads and then trim the long leads used as handles on the replacement back as best you can. Wire to wire with only solder and no mechanical bond is not state of the art but it sure does work. A lot of Manhattan construction in this world built that way and working just fine.

Date: Wed, 5 May 2010 19:00:22 -0600
From: Patrick Nelson <aaptmf@onepost.net>
Subject: [R-390] Oscillation Spurs

Adding another resistor to parallel the old resistor would be about the

same amount of work as replacing the bad resistor in this case. I wasn't entirely accurate about the resistor being under the band switch. It is under the crystal oscillator drive shaft and I don't know how to remove it. As I recall, it required removal of some roll pins.

I sort of have access to pin 7 of the tube socket, but because of the drive shaft my soldering iron is barely able to touch the very tip of the socket lead. The other side of the resistor is a different story. It is burried under several other components but ultimately connects to a cathode bias circuit for the two RF amplifier stages. I could either remove the other components, or run a new wire over to the rest of the bias circuit. Anyway, still am thinking about how I'm going to do it.

In the mean time, I decided to write up a restoration article on my R-390 (still a work in progress). If you are interested it is here:
http://www.sunday-special.net/r390.htm Thanks, -Patrick

Date: Thu, 6 May 2010 12:52:45 -0500
From: Jim Green <jagreen3@sbcglobal.net>
Subject: [R-390] OT: R-2368A/URR or RF-590 Noise Blanker manual (supplement)

Sorry about the off topic subject, I've tried everything I can to find a place that would be appropriate to find the answer.

I have a Harris R-2368A/URR receiver. I have the complete service manual as well. Alas the receiver does not have the optional noise blanker installed. I live in a noisy neighborhood and would like to build a noise blanker for this receiver. I have collected many online articles and contacts that could help me to do this, but I would prefer to have a more exact, or equivalent circuit that Harris designed for this receiver. As far as I know Harris no longer supports this receiver and even if they did I wouldn't be able to afford even 10% of the $2,000.00 price tag for the optional noise blanker.

The information given in the manual about the optional noise blanker is:

Part = RF-597A
Name = Noise Blanker
Part No. 10215-6800
Description = The Noise Blanker removes impulse type noise from the received signals. Adjusts automatically to received signal level changes.
Publication No. = 10215-0019 (supplement)

Does anyone have or know where I can get a copy of the noise blanker publication? Better yet, does anyone know where I can find an original

Harris RF-597A noise blanker? These were the same in both the R-2368A/URR and the RF-590.

Date: Thu, 6 May 2010 14:08:03 -0400
From: "Shoppa, Tim" <tshoppa@wmata.com>
Subject: Re: [R-390] OT: R-2368A/URR or RF-590 Noise Blanker manual

I cannot help you with the original Harris NB, but some words of wisdom regarding noise blankers:

Most are built to suppress ignition noise or (especially ham rigs of the late 70's) the Russian Woodpecker. The best are surprisingly sophisticated and they have an independent IF chain with "fast" filters, so that the noise pulse can be identified and blanked before the noise even hits the regular IF chain.

This is a fundamentally different kind of noise than the broadband whine generated by poorly designed switching power supplies in computers and flat screen TV's and other modern consumer products.

There are some DSP-type audio chains available (advertised in the ham magazines) that can be surprisingly effective against the broadband whine common today.

A small side point: take a battery operated radio, and listen to the noise while you turn off the master circuit breaker in your house AC panel. If the noise goes away, it was coming from your own house. You'd be surprised. After this you start going around the neighborhood with the battery radio, most especially looking for power poles.

Date: Fri, 21 May 2010 12:37:03 -0600
From: Patrick Nelson <aaptmf@onepost.net>
Subject: [R-390] R-390 Oscillation Spurs Update

Thank you guys for all the help with the R-390. I fixed the oscillation spurs. It turned out to be the solid state voltage regulator for the BFO and VFO filaments. I noticed that the BFO was intermittently not working at first, and then I started having problems with the VFO. I looked at output of the voltage regulator on my scope and it was very ugly ... 120Hz oscillation between +5 volts and +30 volts. After rebuilding the regulator using an LM317 and new capacitors, the BFO and VFO started working perfectly and the oscillation spurs disappeared as well.

I also fixed the bad resistor on the cathode of the 1st RF amplifier, but it required removal of the crystal oscillator drive shaft. Turned out not to be as bad as I thought. It requires removal of two gears in the gear train

assembly (thankfully didn't have to take it totally apart), but it slides right out. After replacing the resistor, the receiver really came to life. It's starting to look like this radio has some potential. Thanks again for all the suggestions!

Date: Thu, 5 Aug 2010 13:34:48 +1000
From: "Pete Williams" <jupete@internode.on.net>
Subject: [R-390] Manual Correction

Greetings.. RE Manual. NAVSHIPS 0967-063-2010... Radio Receiver R390A/URR.
15 April 1970

I don't use it often but recently had reason to look up parts list and check bandswitch alinement. Chapter 6 . para 6.2 .5 .4 has incorrect information at point 4.:

" Connect multimeter AN/PSM -4 between pin 6 of XV 205 and pin D of J208----"

This should be pin 6 of XV 207 and pin D of J208.

Checking the schematic will show 'why is it so' . The Army manuals and Y2K don't have the error. Not being aware makes a real chore out of unloading the RF module to find no problems.

Date: Sat, 21 Aug 2010 16:05:47 -0400
From: Steve Hobensack <stevehobensack@hotmail.com>
Subject: [R-390] Crystal Osc Deck Trimmer Failure

I Just finished repairing my '63 Imperial. I had the 3/20 mhz trimmer cap fail, shorting out B+ to ground. The fault also took out two 3900 ohm resistors within the deck. The 1/8 amp B+ fuse operated. The repair was difficult, mainly because I had to trace out the wire harness with an ohmmeter. I made the repair by kludging in a 0.01 dc blocking cap in front of the bad trimmer. Replacing the trimmer was not an option due to the size of the wires and number of wires that would have to be moved. The bad trimmer peaks up fine, however there is a bad place at a certain setting that will kill the oscillation. Why didn't Collins use a blocking cap? After I put the receiver back together, I realized I could have put the blocking cap at the input to the band switch and blocked B+ from the entire trimmer network. If you have your xtal osc deck out for any reason, it might pay to install a blocking cap as you would the "killer" cap in the IF deck.

Date: Sun, 22 Aug 2010 21:25:35 -0700 (PDT)

From: "Drew P." <drewrailleur807@yahoo.com>
Subject: Re: [R-390] Crystal Osc Deck Trimmer Failure

I would surmise that Collins never anticipated that these radios would still be in service nearly 50 years later, and hadn't considered that in that time the silver plating could slowly migrate through the trimmers' dielectric (at least I think that would be the failure mode).

On installation of a DC blocking capacitor in series with the trimmer or entire group of trimmers via the switch wiper, the DC potential will divide between the seriesed caps in inverse proportion to their capacitance, so the low capacitance trimmer would see almost the entire B+ in comparison to the relatively much higher capacitance blocking cap. To what practical effect? If the failure would otherwise be slow development of leakage in the trimmer which progresses to large leakage and then to short circuit, then such leakage would, in the case of a blocking cap being used, merely keep the trimmer discharged, keeping the trimmer's impressed DC voltage low. And if instead the failure mode would be sudden discharge across weakened trimmer dielectric, the total energy would be limited to that stored in the trimmer and blocking cap, might not be so catastrophic.

And if the trimmers' failure mode would be greatly increased power dissipation at the plating/dielectric interface, resulting in localized overheating and failure of the dielectric, caused by DC conduction via deposits of mouse pee and t*rds, then failure prevention would be best served by thorough cleaning of trimmers, and subsequent deployment of mousetraps.

Any of these possibilities of my conjecture might be avoided by installation of a drain resistor to ground after the blocking cap and before the trimmer(s). After the blocking cap charges on powerup, the DC voltage seen by the trimmer(s) would be essentially zero. A drain resistor of a few meg oughtta do it.

Date: Sun, 26 Sep 2010 16:26:38 -0500
From: <ka9egw@britewerkz.com>
Subject: Re: [R-390] the saga cont. pt 10

I'm sure it's the primary winding is wound in 2 pies over the secondary, right? The inside winding done as a single solenoid has 3 silver mica's on it whose values match the ones on the secondary on the shcematic in TM11-856A and TM-11-5820-358-35.

The wire goes from the pin, to the trimmer, through the frame, a couple turns on one pie, back out, along the frame, back in through the frame, the

other pie, and back to one of the little radial-leaded cylindrical fixed caps [I think that's what it is] thence to the other pin. Seems to me if that center tap is supposed to be grounded, where that wire runs over that frame member is the only place it could be done, but it is apparent neither of them has ever been soldered there. The Teledyne can does show what looks like it might have been fluxed there at one point, but solder, no. Plus it looks like magnet wire [enameled].

Date: Sun, 26 Sep 2010 18:16:28 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] the saga cont. pt 10

I am looking at the schematic in the TM. I do not see any ground points on the coils in the RF deck cans. The effects of the antenna trim will vary from octave to octave. No logic to operation is known YMWV. <snip>

Date: Mon, 27 Sep 2010 08:52:12 -0400
From: "Shoppa, Tim" <tshoppa@wmata.com>
Subject: Re: [R-390] the saga cont. pt 10

Using slug tuning, with DC voltages for bias, AGC, plate, etc., on the coil is a genius move. Trimmers and other variable capacitors are most advantageously mounted if one side is grounded. Otherwise you have to stand them off ground - it's do-able (and in fact done often) but if you're clever you avoid it by grounding one side.

The balanced input in the 390A is not "just to tune out common-mode noise". Balanced antennas and feedline systems are a joy to use, you just have to build your whole station around them :-). The whole move to coax for antennas, post-WWII, was in my opinion misguided. (Yeah I have coax in the shack... but the antenna feed line is ladder line, all the way from the link-coupled balanced tuner to the sky!) These are common themes in radios other than 390A's, too.

Date: Mon, 27 Sep 2010 16:32:59 -0700
From: "Craig C Heaton" <wd8kdg@att.net>
Subject: Re: [R-390] saga cont pt 12

<snip> The silver micas are inside the RF cans.

Date: Thu, 17 Feb 2011 14:35:08 +0000 (UTC)
From: bavarianradio@comcast.net
Subject: [R-390] Fwd: 390 works! was cam pins

Good morning to all in the group. A few hours ago I ran up the variac into the 390 that I've been restoring and got some smoke from the crystal

oscillator assembly. It appears that a cap shorted taking out a 2200 ohm resistor and scorching the tag board it was mounted on. I replaced the moribund parts and continued on, finding the indicator dial way off on the xtal osc unit, I proceeded to sync that up and eventually got signals!! I wasn't expecting that so soon. I don't have any AGC but it works quite well otherwise. <snip>

Date: Mon, 21 Mar 2011 05:07:26 -0700 (PDT)
From: Steve Quinn <squinn12345@yahoo.com>
Subject: [R-390] 3 MHZ issue

My R390A is in good working order, all old caps were replaced, a new PTO, etc., etc., the rig is not a junker. Lately when I tune to 3 MHZ it comes in for about 30 secs then it goes dead ..... I move the Mhz dial but that does not work ..... all other setting up and down the MHZ work just fine .... I am not a repair person but can get around in these old radios.

Any help, suggestions would be helpful ..... I am a bit of a newbie to radio having only gotten back into it after many years away .....great memories of my Navy days in signal intercept, CW etc ..... ah the good old days Picts would be helpful if one has an idea where the problem is located

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Date: Mon, 21 Mar 2011 08:40:11 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] 3 MHZ issue

I'd look at the crystals. The 3Mc crystal "may" be either flaky, OR the socket and pins are cruddy. I'd also look at the trimmer for THAT crystal. Those would be the first things I'd look at. After that, the switch position for 3 Mc, on the Mc switch may be dirty, and need to be cleaned. Just a few ideas.

Date: Tue, 22 Mar 2011 04:19:50 -0700 (PDT)
From: Steve Quinn <squinn12345@yahoo.com>
Subject: [R-390] Update to 3 Mc issue with R390A

An update on the 3Mc issue, I do hear this setting if the AF Gain is turned up to 6-7 while the RF Gain is up all the way. 20Mc is having the same issue.....

Date: Wed, 23 Mar 2011 08:04:40 -0400 (GMT-04:00)
From: Bruce MacLellan <brumac@peoplepc.com>
Subject: Re: [R-390] Update to 3 Mc issue with R390A

I had the same problem with an "A" , but on all frequencies. It turned out to be a resistor at the PTO tube socket that had broken into 2 pieces and

made contact untill it warmed up a bit. Sorry but I don't have my schematic or notes with me to identify it.

Date: Tue, 22 Mar 2011 19:45:15 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Update to 3 Mc issue with R390A

>An update on the 3Mc issue, 20Mc is having the same issue.....

There's your clue. 3 and 20 share a crystal in the 2ND osc deck. When you switch into 3 or 20 the shock bumps the crystal, but the gain is to low to keep it going so it dies a slow 30 second death.

1 clean the crystal socket and crystal pins in the OSC oven.
2 clean the tube socket pins.
3 clean the switch contact.
4 clean the trimmer cap on the OSC deck.

Try to clean the tube socket and crystal sockets as you can do that without
pulling the RF deck. If you do need to pull the RF deck then take the time to do a full clean, polish and lube. Save your self from doing it one band at a time as they fail from crud. If that does not fix it then you will need to get a replacement crystal.

Date: Wed, 23 Mar 2011 17:07:39 +1300
From: Ken Harpur <igloo99nz@yahoo.co.nz>
Subject: Re: [R-390] Update to 3 Mc issue with R390A

I find this very interesting...I have an R-390(non-A) that exhibits the same behaviour in the crystal calibrator module... Turn it on and it's good for about 30seconds or so then indeed dies a slow death. I had initially thought it may have been a cap or resistor that's gone out of spec. The idea of crud getting in there and causing mischief hadn't occured to me.

Date: Thu, 7 Apr 2011 11:40:48 -0700 (PDT)
From: Steve Quinn <squinn12345@yahoo.com>
Subject: [R-390] 3MC issue updated

I posted this a while back, when I shift to 3MC I hear signals then they fade but not all the way out. OR I hear signals for about 30 secs then the band goes dead, dead as a door nail. I have cleaned the xtal and it worked when I put it in my 75S-1 Question: are the R390A xtals different from the other xtals used in other Collins? I have heard from all to clean this or that, well this unit was taken apart and everything was refurbished but the dang 3MC and the related 20MC don't want to play nice

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Date: Thu, 07 Apr 2011 14:56:17 -0400
From: Curt Nixon <cptcurt@flash.net>
Subject: Re: [R-390] 3MC issue updated

To me, this sounds like a bad cap that is only in-circuit for this position. I would be studying the "map" and looking to see where the signal dies. Use a scope or the buzz test...this should localize the area. Crystals don't "fade out"..tubes can but they all work for other positions. A resistor could..possibly, but those don't usually get switched in and out for frequency specific use.

Some freeze spray could also be your friend in finding a problem like this. Don't overlook newly replaced caps or mica, ceramic, also. Perhaps a dirty wiper on one of the inside-can- trimmers also. A micro-drop of Deoxit on every trimmer will help especially if done prior to any alignment--but could help anyway even if you don't subsequently move the trimmer.

Date: Thu, 07 Apr 2011 14:58:25 -0400
From: Curt Nixon <cptcurt@flash.net>
Subject: Re: [R-390] 3MC issue updated

PS..if the signals don't change pitch as they fade, this REALLY narrows down the potential area. Truth table...No freq change + only on 3Mc=?

Date: Thu, 07 Apr 2011 15:08:22 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] 3MC issue updated

Take a step back from the bench.
Thinks about this:

1) The 3MC works then falls off.
2) The 20MC doesn't want to play nice.

You have hit a point where you have identified TWO related frequency zones that have what in common? This is one crystal, BUT it is a function of being mixed to get the 20MC. Somewhere in either the contacts on the MC switch, or possibly a wire, and as Curt touches on- trimmer capacitor. Yes, we KNOW it was completely refurbished. How long ago? Has it sat without use for awhile?

Date: Sun, 10 Apr 2011 21:40:25 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] 3MC issue updated

I second what Don had to say. It sounds as if the crystal is falling out of oscillation. E204 is the grid of the second crystal oscillator test point. With a signal generator and an isolation cap, inject 23 MHz at a low level into the grid test point. As you rock the generator through the exact frequency you should be able to force the crystal back into oscillation and the
band should come alive.

This will be your clue that the crystal is just not up to par for the R390/A circuit.
Lots of times we see the crystal oscillate on the fundamental rather than the second harmonic.

We also see the crystal is oscillating but off frequency. You switch over to 3 or 20 and the crystal starts at more than one frequency (first, second, third, fundamental spur). After 30 seconds if gets a little warmer and the needed frequency is squeezed out as the wrong frequency spur takes over. So they test good in a tester. But unless you have a tuned circuit (for load) and counter on them you do not know where they are oscillating. As Dan pointed out the testers are also more robust so they will put marginal crystals into oscillation.

Nothing real scared about the R390/A crystals. They have a series which is the temperature range. Several different series all have the same can / pin size. You do want a 11.5 second harmonic for the 3 and 20 Mhz bands. If you do not have a crystal on hand you mite as well order the real thing as to mess around with a wrong temperature part. Ask for one on the reflector here and see what offers you get. Old parts are likely to last just as long as some new part. Its a rock already millions of years old.

Date: Sat, 19 Nov 2011 17:39:20 +1100
From: "Pete Williams" <jupete@internode.on.net>
Subject: [R-390] Problem !?

Process of aligning a R-390A...The 1st variable IF calls for 1.2 Mhz to tune cores and 7.6 Mhz to tune trimmers . No matter what combination of core and trimmer settings I use, peaking 1.2 Mhz on L232 always results in the core almost fully in and out of thread .. Have struck this on RF section in past too but it always comes good Why is it so ?

The Diode load voltage is also much higher at that frequency than at the 7.6Mhz end but that may be a function of the sig.gen input which is connected to the balanced antenna input. I maybe suspect the 51 pf cap open below the deck but haven't had the strength of mind-yet- to take the deck out for look. Cores have been changed with no improvement. Suggestions welcomed .

Date: Sat, 19 Nov 2011 05:56:41 -0500 (EST)
From: ToddRoberts2001@aol.com
Subject: Re: [R-390] Problem !?

Sounds like the problem is an open or out of spec cap associated with that coil.

Date: Sat, 19 Nov 2011 09:49:39 -0500
From: Al Parker <anchor@ec.rr.com>
Subject: Re: [R-390] Problem !?

Like Todd says, check related capacitors. I've been muckin with an R-390, off & on, for the last cupla mo.s, after setting it aside 6 yrs ago, and I've found several bad mica caps in the RF deck coil cans, and elsewhere. The cans are easily removable, and, IIRC, you can ck for shorted/leaky caps without even opening it, tho' in some cases you have to open it to decide which of 2 might be bad. (and you'd open it then anyhow.) 50+- yr old micas are going bad with some frequency nowadays.

Date: Tue, 17 Jan 2012 12:22:30 -0700
From: Anthony Casorso <canthony15@msn.com>
Subject: [R-390] R-390 Slugs

I have read some archive material and the Collins engineering report on the 390A. From what I have read I have garnered the fact that the 390a RF deck uses exactly two slug types, one for the VIF and one for the RF transformers. These slugs are made from ferrite. That is indisputable because it is so written in the Collins report. Also written in that report is that the 390 used iron powder slugs. But what I can't tell for a fact from anything is exactly which slugs are unique in the R-390. What is the collective knowledge about the R-390 RF deck slugs? I took a peek at some R-392 slugs last night and it appears that there are several types and they don't look to me like ferrite. Historically speaking, it makes sense to me that the 392 slugs would be more like the 390 slugs.
The questions arise because a post on another forum is asking for replacement slugs for a 390 but he is not sure what he needs (I think the deck was torn down by someone else and some slugs are missing). Do we know for sure which slugs are unique in the 390? Do we know if the 392 slugs are equivalent to the 390 slugs (I have some 392 slugs in my junk box)? Unfortunately I do not own a 390 so I can't do any experiments of my own.

Date: Tue, 17 Jan 2012 14:10:21 -0600
From: "chacuff" <chacuff@cableone.net>
Subject: Re: [R-390] R-390 Slugs

Yes the R-390 slugs are unique...not only to the to the R-390 (as opposed tothe "A") but to the individual slug racks in the RF deck. As I remember there is a colored dot on each slug and it should be noted where that color is positioned in the RF deck upon disassembly. I have one open in the shop and will have to take a look again to verify this or answer any additional questions. <snip>

Date: Tue, 17 Jan 2012 16:14:03 -0700
From: Anthony Casorso <canthony15@msn.com>
Subject: Re: [R-390] R-390 Slugs

Don Heywood dug up an old thread from here that had the dot code info in it and sent it along to me. That thread also mentioned the R-390 engineering report which I had read a few years ago. Unfortunately, my memory doesn't work all that well these days. I went back and read it again and the information is on page 54. The core materials were made by Stackpole carbon (misspelled as Stockpole Carbon in the report) and three variations were used in the R-390. The s100a material was used in the 8-16Mhz and 16-32 Mhz RF transformers as well as the 9-18MHz VIF transformers. The S-62 material was used in the 4-8MHz RF and the 3-2MHz VIF. The S-51 material was used in the .5-1, 1-2, and 2-4MHz IF. The color dot codes would be yellow for the S-51, red for the S-62, and blue for the S-100A. The thread said that the color code may only apply to early production.
Thanks to both of you for the help. Maybe we can get another receiver put back together correctly.

Date: Wed, 18 Jan 2012 17:00:50 -0500
From: frank hughes <fsh396ss@gmail.com>
Subject: [R-390] R-392 slug photos

Very interesting information about the slugs! I was compelled to take a look in the R-392 and here (photos in links) are all the colors. I also wonder if any are compatible with the R-390. But I am too tired to try to get the R-390 out of the cabinet and look tonight.

http://i180.photobucket.com/albums/x257/fish1_07/r392_slugs1.jpg
http://i180.photobucket.com/albums/x257/fish1_07/r392_slugs2.jpg
http://i180.photobucket.com/albums/x257/fish1_07/r392_slugs3.jpg
http://i180.photobucket.com/albums/x257/fish1_07/r392_slugs4.jpg

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Date: Wed, 14 Mar 2012 10:46:00 -0600
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: [R-390] R-390A (digital readout)

"R-9XX The R-9xx is alleged to have contained a small LED digital readout
where the Veeder Root counter exists in the center of the R-390A. No documentation or photographs of this model have surfaced yet."

I could see where something could be cobbled together with a tiny optical encoder, some digital logic and a display. Going into that sort of effort would just show you the desired receive frequency and not the actual frequency. If someone was going to go that far they might as well replace it with a R-390A version of a digital dial where you actually are reading the frequency of the radio. That way you could get around the slightly non-linear performance of a PTO that is not exactly dialed in to the Hz.

Otherwise all you are doing is replacing a mechanical odometer type of display with LED's that are reading the same shaft movements.

It is a marvel in itself to keep all of the knobs, odometer display, cams, PTO, stops and gears all dancing together in synchronicity. That is one of the things that initially attracted me to the R-390A, that is is essentially an 80 pound watch with a really good receiver glued onto the backside (lol).

Date: Wed, 14 Mar 2012 13:27:45 -0400 (EDT)
From: chuck.rippel@cox.net
Subject: Re: [R-390] R-390A (digital readout)

Interesting subject... If the PTO end points are set up correctly so the mixing scheme and tracking pre-selector matches the cam profiles, calibrated to the
nearest 100kc, the mechanical counter is very accurate.

I've seem some accurate to < 100 cycles. Frequency errors usualy mainfest themselves across band to band changes. That is, if a receiver is calibrated to 8.2 mhz and you rotate the MC control up to the next band, most receivers will not "land" on 9.2 mhz. They will have to be re-calibrated. The crystals in the oscillator drift a bit over time.

Remember also, most are hetrodyned twice, some 3 times where the fundamental error may be multiplied.? One could put a counter on the output but still not capture the error caused by the crystals in the 1st oscillator. While it is not made for the R390A, perhaps something like this, programmed to accommodate the mixing scheme of the R390A might be very helpful to some.

http://www.ebay.com/itm/190579917545?ssPageName=STRK:MEWAX:IT&_trksid=p3984.m1438.l2649?

http://www.ebay.com/itm/190579917545?ssPageName=STRK:MEWAX:IT&_trksid=p3984.m1438.l2649 Chuck Rippel

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Date: Wed, 14 Mar 2012 18:53:04 +0000
From: William A Kulze <wak9@CORNELL.EDU>
Subject: Re: [R-390] R-390A (digital readout)

The best I could ever come up with was a "mechanical digital readout, something like the odometer in your car". Didn't know at the time it was called a veeder root counter.

Date: Wed, 14 Mar 2012 14:59:23 -0400
From: "Todd, KA1KAQ" <ka1kaq@gmail.com>
Subject: Re: [R-390] R-390a.net ?

I could swear I saw and possibly even have a photo of said receiver. It was perhaps a decade or more ago on here when a discussion of the R-390B (non-A non-391 non-392 non-non) took place. Cannot remember from who it came,
maybe Prof. Locklear or someone else in the discussion. A couple Xprototype X receivers showed up on eBay sometime later. Maybe it was you, Jeff? Dunno.

Date: Wed, 14 Mar 2012 15:20:27 -0400
From: "jay golden" <jgolden577@rochester.rr.com>
Subject: [R-390] R-9XX

It was I who several years ago wrote about having the R-9XX receiver with the LED display instead of the veeder root counter. It also had a small Bud box hung on the back, probably to house the electronics supporting the LED readout. It was sold to me in th early '80s by Ted Dames whio alleged it was one of twenty-five or so surplused out of the White House Communications Agency. I returned it to him after watching it drift on the display. It was otherwise an R390A.

Date: Wed, 14 Mar 2012 19:33:11 -0400
From: <physicist@cox.net>
Subject: Re: [R-390] R-9XX

I have a manual from the Office of Naval Research for a R390A radio with a LED display, all the theory and trade studies behind it. It is quite a document and engineering report!

Date: Wed, 14 Mar 2012 19:33:18 -0500
From: "chacuff" <chacuff@cableone.net>
Subject: Re: [R-390] R-9XX

If you watched it drift then I would have to guess it was counting the frequency of the mixing scheme and actually displaying the operating frequency. A more simple optical or mechanical encoder design should not drift around. Interesting.

Date: Thu, 15 Mar 2012 10:49:03 -0400
From: "Charles P. Steinmetz" <charles_steinmetz@lavabit.com>
Subject: Re: [R-390] R-9XX

In 1969, the Defense Technical Information Center published a report on a digital readout that monitors the 390A's local oscillators to provide a claimed accuracy of 20 Hz. I once had a copy, but it has gone missing. Google has it listed, but not available for download:
http://books.google.com/books/about/R_390a_urr_digital_frequency_readout_uni.html?id=Nt-8NwAACAAJ

I do not know if this is the same doc that Jeff has. It is possible that one could obtain it by submitting a FOIA request to DTIC.

Date: Thu, 22 Mar 2012 12:52:48 -0400 (EDT)
From: chuck.rippel@cox.net
Subject: [R-390] RF Deck

Remember, the slugs used in the tracking IF are DIFFERENT that those used in the RF section ! I had one that was deaf and it took a couple hours to figure that one out. Wearing grooves into stainless steel by brass is a pretty good trick.....

Date: Fri, 23 Mar 2012 23:40:51 -0400
From: Jeff Adams <physicist@cox.net>
Subject: [R-390] New: R390A Digital Frequency Readout Development Report PDF

ALL: I gave Al TIrevold my scan of the R390A Digital Frequency Readout Development Report, and he has placed it on his website. Thanks Al!

Jeff: I loaded the R-390A digital readout unit .PDF up to the R-390A site. An entry was added to the 'Variants' page - http://r-390a.net/faq-var.htm The document itself is the last entry under U.S. Navy at
http://r-390a.net/faq-refs.htm.

Direct link to the document:
http://r-390a.net/R390A-digital-frequency-readout-final.pdf

Thank you very much for the contribution!

Please announce your contribution to the R-390A mailing list.

Date: Fri, 13 Apr 2012 16:07:39 -0600
From: Anthony Casorso <canthony15@msn.com>
Subject: [R-390] Question about the second crystal oscillator in the R-390a

Does anybody know for sure of the crystal oscillator is designed as an "overtone" oscillator? What I mean is, on the bands that use the second or third multiple of the crystal frequency, is the oscillator oscillating at that frequency or is it oscillating at the crystal frequency and then just tuning T401 to the harmonic they want to use?

Date: Fri, 13 Apr 2012 15:09:39 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] Question about the second crystal oscillator in the R-390a

I'm pretty sure the crystals are operated in fundamental mode, and T401 is tuned to the desired harmonic.

Date: Sat, 14 Apr 2012 13:26:52 -0500
From: Nancy Green <jagreen3@sbcglobal.net>
Subject: [R-390] R-390A with deaf 3Mc band

I have found a nice looking R-390A for a price I can afford. The current owner said it worked well except the 3Mc band was not working. Before I buy, I'd like to know what I'm up against. Any ideas what would cause an R-390A to just drop one band?

Date: Sat, 14 Apr 2012 14:54:10 -0400
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] R-390A with deaf 3Mc band

Most likely a crystal in the 2nd oscillator. An easy fix if that's what it is.

Date: Sat, 14 Apr 2012 14:55:27 -0400
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] R-390A with deaf 3Mc band

... and I havent' checked the schematic, but most (all?) of the crystals do double duty so if the 3Mc band is out, there may be a companion band that isn't working either. If that's the case, then you can pretty much bet on a bad crystal.

Date: Sat, 14 Apr 2012 14:02:48 -0500

From: Randy and Sherry Guttery <comcents@bellsouth.net>
Subject: Re: [R-390] R-390A with deaf 3Mc band

Probably not much - fortunately one band of three eliminates some of the more serious "stuff".

> Any ideas what would cause an R-390A to just drop one band?

First look at the signal path in figure 3-1 (if you don't have a copy of the Y2K manual - download it now. - you can get it here: http://www.r-390a.net/Y2K-R3/index.htm). 3Mhz RF band stage shares components with the 2& 4 Mhz bands as well - so if 2& 4 are working - that eliminates that RF stage. That leaves the converter - notice that 3 is also common with the 20Mhz band - using the same crystal for conversion. If 20 isn't dead - then the crystal may be ok - but I'd check 20 carefully. That crystal could be badly mis-adjusted. If 20 is indeed OK then the contact for the crystal on switches 401/402 would be suspect - or some other associated circuitry around the crystal for 3 (&20)Mhz. There are other things that could be a problem - you would need to either "trace" or inject signals through the chain for those - however - none are likely a serious issue. Look for bad solder joints around Y404 (the 3/20Mhz crystal) and associated components.

Date: Mon, 16 Apr 2012 13:06:25 -0400 (EDT)
From: chuck.rippel@cox.net
Subject: [R-390] R390A Dropping Band

Rats ! My print here at work has a seam right at the crystal number. No matter, 80% chance the crystal for the 3 AND 20 mhz bands has become inactive. Replace that and it'll probably work fine. One caution, the 3 mhz band has an alignment point for the 2 & 3 mhz bands. If that alignment is grossly incorrect, both will suffer. Am still standing by the crystal is the most likely suspect; a quick of the output with a scope at J-415 will tell all.

Date: Tue, 8 May 2012 17:08:50 -0500
From: Jim Green <jagreen3@sbcglobal.net>
Subject: [R-390] I had a working R-390A before I started (sort of)

<snip> Also, My crystal calibrator has gone on the fritz. It sounds very garbled an it drifts all over the place. It worked OK before the IF recap. What do you think it is?

Date: Tue, 8 May 2012 17:29:04 -0500
From: Jim Green <jagreen3@sbcglobal.net>
Subject: [R-390] Crystal Calibrator on the fritz

I think I have an idea about what happened. The TM alignment procedure has you injecting 455kc into E211. I think this is also part of the crystal calibration circuit. I may have blasted the output of the crystal calibrator with too much voltage. Do you think I may be on the right track?

Date: Wed, 9 May 2012 16:02:50 -0400 (EDT)
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] I had a working R-390A before I started (sort of)

Do a guy thing and just jump right into the middle.
Start with 150 UV into the IF deck as follows.
You can divide the problem back to the IF and Audio or RF deck.
Check between MGC and AGC. this may help you isolate a problem.

I will go for a bad mechanical lug mount hard ware on one of the caps.

J Adjust the IF gain R519
___ 01 Set the Line Meter OFF
___ 02 Set the Line gain to 0
___ 03 Set the ANT Trim to 0
___ 04 Set the AGC to MED
___ 05 Set the LIMITER to OFF
___ 06 Set the Band Width to 2KHz
___ 07 Set the BFO Pitch to 0
___ 08 Set the Audio Response to WIDE
___ 09 Set the Breakin OFF
___ 10 Set the Function to MGC
___ 11 Set the BFO to OFF
___ 12 Release the Zero Adjust
___ 13 Release the Dial Lock
___ 14 Set the Local Audio to max
___ 15 Set the RF to max
___ 16 Remove P114 from J514
___ 17 Remove P213 from J513
___ 18 Remove P218 from J518
___ 19 Remove J116 adapter from the back panel if necessary
___ 20 Couple P114 to J513
___ 21 Couple P116 to J116
___ 22 Couple J116 to the signal generator RF output
___ 22 Adjust signal generator for 455 KHz output frequency
___ 24 Adjust signal generator for 150 micro volt RF output
___ 25 Adjust signal generator for 30 % audio tone modulation (400 Hz)
___ 26 Meter diode load output for -7 volts DC
___ 27 Place a 600 ohm load across the local audio output
___ 28 Place a 600 ohm load across the line audio output

___ 29 Meter local audio output for 450 milliwatts, 27 db, or 17.3 Volts AC
___ 30 Adjust the IF gain R519 for -7 V DC on the diode load
___ 31 Observe the local audio output level is greater than 400 milliwatts
___ 32 Local Audio should be 17.3 Volts AC across 600 Ohms 450 mw
___ 33 Line Audio should be 2.45 Volts AC across 600 Ohms 10 mw
___ 34 Phone Audio should be .78 Volts AC across 600 Ohms 1 mw
___ 35 Line Audio at .78 Volts across 600 should be Line Meter Zero VU
___ 36 Set the Line Meter to +10
___ 37 Set the signal generator modulation on
___ 38 The Line Meter should read above 0 VU (10 mw)
___ 39 Set the Line Gain off max until the Line Meter reads 0 VU (10 mw)
___ 40 Set the signal generator modulation off
___ 41 Set the Meter Switch to -10
___ 42 Observe 30 db change (20 db on switch plus 10 db on meter scale)
___ 43 The Line Meter should read less than -10 VU (SN + N > 30 DB)
___ 44 Set the Line Meter to OFF
___ 45 Set the Line Gain to 0

You are really looking for that 30 db change in the IF deck.
If the IF deck will not get past this procedure, there is nothing in the RF deck that will overcome the IF deck's lack of performance.

Do not worry if your signal generator is not calibrated. Set R519 about mid
scale. Adjust the generator for a -7 volts on the DC load. The audio with modulation against the audio without modulation (CW) should be more than 25 db difference on the meter.

If you do not have an AC volt meter with a DB scale find the inspection list on Barry's page. There is an AC volt table to use with a 600 ohm resistor
and you can do the comparsion as AC voltages.

<http://home.comcast.net/~rbethman/inspectionlist_34.doc>

Once you get the IF deck and Audio deck back to par, you can then go on to the RF deck and crystal calibration problems.

Date: Wed, 9 May 2012 16:22:45 -0400 (EDT)
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Crystal Calibrator on the fritz

The crystal calibration goes in way before E211.

Some where along the line something did fall apart.

Start with 150 UV into the IF deck and get that half of the receiver working.
Then you can get 455 into E211 again and set T208.

If you have too, then you can work back through the RF deck mixers using your signal generator.

Do check the mechanical adjustments and the cams before you do a realignment on the RF deck.

I'll vote for cleanliness. Time after time we find a pin on a tube socket or other connector that has oxidized over time and just needs cleaning. The next level is the ground lugs in the decks. You cannot even see the problem. The things check good with an ohmmeter. You pull the bolt, then put the lug and bolt back together and a problem goes away when you get the right one. You get a fresh cup of Java and ask your self, Self what was that all about?

Once you get the IF working, do start back stage by stage. It will take a lot of signal into the stages so do not be miss lead by how much signal it takes as an indication you need to work on a stage.

If you put the signal into a test point and the proper trim caps and proper slugs align and change the output level and then peak up the output, accept
the stage is OK.

Likely as not it will be tubes and alignment.
If you get stuck send us some more mail.
When your all done do tell.

Date: Mon, 21 May 2012 12:10:42 -0500
From: Jim Green <jagreen3@sbcglobal.net>
Subject: [R-390] Making Progress on the EAC R-390A project

I have recapped the IF deck and replaced the 11.5Mc crystal. I have reception on all bands now.

I fried my crystal calibrator whilst performing an alignment. It happened when I put a 455kc signal into E-2110. Also, The procedure instructs one to use AN/URM-25 with CX-2919/U instead of cord W104 and connect the AN/URM-25 to test point E210 & rock it into zero beat.

First, I don't have an AN/URM-25. I have a HP8640. I don't know what the CX-2919/U is I assume it's a probe of some sort. I used a tektronics O-scope probe. I could hear no signal to zero beat. When I was done, My

crystal calibrator no longer worked. What am I doing wrong?

Date: Mon, 21 May 2012 12:19:57 -0500
From: Mike Andrews <mikea@mikea.ath.cx>
Subject: Re: [R-390] Making Progress on the EAC R-390A project

It appears to be a test lead with a .047 (uF?) blocking cap in it.

Date: Mon, 21 May 2012 14:44:59 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] Making Progress on the EAC R-390A project

The failure of the crystal calibrator may very well have nothing to do with what you did. Try swapping V-901 with another 12AU7. The calibrator uses one half of it. It may simply have gone South.

Date: Tue, 22 May 2012 22:22:13 -0400 (EDT)
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] Making Progress on the EAC R-390A project

There are two crystals in the crystal oven. One is 17 mhz for the first mixer. The second is 200 Khz for the crystal cal.

Since the receiver works on the lower 8 MHz. the 17 Mhz crystal is OK.

If the 200 Khz crystal goes out the flip flop will still run and you will get tones but just not at 100 Khz. Around 500, 600, 700 you should find some tones if the flip flop divide by two 5814 is OK.

Likely crud. Oxide in a tube pin. Oxide in the crystal can plug, Oxide on the crystal pins inside the can. A cold solder joint in the calibration oscillator and divide by two circuit. A fried resistor.

Time to pull out the RF deck again, and just do some serious eyeballing. Lots of ohmmeter probing on the resistors.

The only thing in common with the problem starting with your touching E210 is the possible but not established fact, that both events may share the same reality and or universe. However, this is not truly knowable.

If you knew the abuse that has been heaped upon these receivers by experienced repair persons and students wishing to become experienced repair persons, you would not wonder if you have caused any damage.

You have not wired the antenna input across a set of 220 mains so have not inflicted damage on your receiver. It may not work, but that is not

your fault.
Keep working on it until you get it fixed.

Date: Mon, 4 Jun 2012 15:21:24 -0400 (EDT)
From: chuck.rippel@cox.net
Subject: Re: [R-390] R-390 Digest, Vol 98, Issue 2

There are two crystals in that oven, most likely the 200KC calibrator crystal has failed. That problem is fairly common.

While you are in the RF deck, check ALL the 2.2k (Red-Red-Red) resistors and **REPLACE C-327 with a 100pf, 1KV ceramic cap**. Its across the primary
of T-207 and can be easily seen. Another very high failure item.

Date: Mon, 4 Jun 2012 17:16:26 -0400 (EDT)
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] Latest update on the EAC R-390A

You wrote: I get a chirp as I switch to CAL.

Worry not, As you go to cal, you are applying B+ to the cal circuit and it is coming up to speed. It just starts with a some harmonics and birds that you get to hear before the osc settles down. A normal thing
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Date: Tue, 5 Jun 2012 18:03:48 -0500
From: Jim Green <jagreen3@sbcglobal.net>
Subject: Re: [R-390] R-390 Digest, Vol 98, Issue 2

I have checked all 2.2K resistors and found 1 out of spec. (2.53K). I replaced it. I also replaced C327 with a 100pF 1KV ceramic. Much smaller (physically) than the original. Also, I hope I got the correct cap. It went from T-207 to ground. I'll go back and check the schematic before I proceed.

This radio is very clean inside. It looks just like brand new. No sign of rodent technicians of arachnid boatanchorous americonis.

Each soldered connection has a drop if varnish on it. Not a total slap-flap coating.

Date: Wed, 6 Jun 2012 17:55:05 -0500
From: Jim Green <jagreen3@sbcglobal.net>
Subject: Re: [R-390] Latest update on the EAC R-390A

Well folks, I think I found an error in the Y2K. In chapter 6 there is a

photo of the bottom of the RF deck with arrow balloons to label the parts. It turns out the C327 arrow balloon points to C328 & the C328 arrow balloon points to C327.
C327 is a 100pF mica cap. I replaced it with a 100pF 1KV ceramic.
C328 is a .005uF ceramic. When I thought it was C327, I replaced it with a 100pF 1KV ceramic. Now I realize my error, I returned it to a .005uF 1KV ceramic.

All 2.2K resistors are now good. I found only 1 out of spec. The rest are low in spec. around 2.15K. I cleaned everything up pretty well, but didn't do the soak. This radio is very smooth as it is & it looks shiny and new. I put it back together, and everything seems to be working. The Crystal Calibrator chirp is gone. I think I'm ready to move on to the AF deck. Thanks everybody for the help.

Date: Sun, 19 Aug 2012 14:07:20 -0700 (PDT)
From: John Saxon <johnbsaxon@yahoo.com>
Subject: [R-390] R-390A calibrator oscillator

This is John, K5ENQ, in Pearland, TX and I am working on a 390A to sell. It is pretty much ready to go, but the 100KC calibrator has a "raspy" sound rather than a more "pure" sinusoidal sound. This is the first 390A I have worked on, so I am new at this.

First, shouldn't the calibrator sound like a sine wave? Nice clean sound?I have attached a portion of the scope trace at pin 7 of the V205, the input to the cathode follower that delivers the signal to the 1st RF. Should the signal be a pretty much pure square wave? Note the rapid rise to zero at the beginning of the negative cycle. All the resitances and voltages on the chart are fine with only one "funny" reading: pin 7 of V205 on chart is -16.5 volts, I am getting -5.4. Is that off enough to indicate a problem there?

Date: Sun, 19 Aug 2012 17:48:54 -0400
From: "Charles P. Steinmetz" <charles_steinmetz@lavabit.com>
Subject: Re: [R-390] R-390A calibrator oscillator

>.... a "raspy" sound rather than a more "pure" sinusoidal sound.....
>First, shouldn't the calibrator sound like a sine wave? Nice clean sound?

Yes. Does the radio give a nice clean tone on a CW input (say, the carrier of WWV) beat with the BFO, or is that raspy, too? "Raspy" sound could be caused by AM, FM, or spurs on the cal signal, or by AM, FM, or spurs on any of the local oscillators (including the BFO). If only the cal signal sounds raspy, then the modulation is more likely on the cal signal itself.

>I have attached a portion of the scope trace at pin 7 of the V205

The reflector strips attachments, as most reflectors do, so the pic didn't make it. Can you put it on the web and post a link? You will probably find that the voltage at pin 7 changes if you change the tube. Is the voltage at pin 8 correct (0.36 V)? Scope traces of pin 8 and pin 1 would also be helpful.

Date: Mon, 20 Aug 2012 18:01:39 -0400 (EDT)
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] R-390A calibrator oscillator

You are working with a 50 plus year old critter.
Clean the tube socket pins
Change the tube

You may have a pair of tubes that test good in the tester and just are not up to par. We always put the two poorest noise 5814 tubes into the cal oscillator.

So V205 B is a grid leak stage with only 33 ohms in the cathode.

Pin 7 of the cathode follower stage has a 1 meg resistor to the oscillator and divide by two flip flop plate. It is a wonder the pin is not at at 150 volts. The 15 pf cap across the resistor couples in the cal tone harmonics to the grid of the cathode follower.

The tube depends on the plate voltage sucking on the grid with enough potential to leave the pin looking like it has a negative voltage on it. As the tube changes, so the conductance changes, so the voltage on the grid will change.

There is no specification for the cal tones beyond the tone shall be audio able on each 100 KHZ to 31.+000

You are right to expect a nice clean tone.
See the other input from the Fellows and make sure you do in fact have a cal tone problem and not another oscillator problem.

If changing the tube does not clean up the problem, you will need to pull the RF deck and do some inspection. We often find resistors way out of wack in the cal osc tube sections. The crystal oven for the 200KHz and 17 MHZ crystals heats that corner of the deck and over-works everything in that corner of the RF deck.

You could also have a bad cap and parasitic spurs in the cal tone flip flop

and buffer. You could have a bad crystal with spurs.

What ever it is, Its still an R390/A and thus can be fixed.

John, If all the mail does not help you get the receiver fixed, Post us another letter. Do tell us what you tried and what you may or may not have been able to narrow down. There is no reason to not fix the problem. We will share ideas with you for as long as it takes.

Roger 33C4H (68 - 75)

P.S. Fellows this is exactly why one R390 or R390/A is not enough. You need a ready reference at hand.

Date: Tue, 21 Aug 2012 22:14:41 -0700 (PDT)
From: "Drew P." <drewrailleur807@yahoo.com>
Subject: Re: [R-390] R-390A calibrator oscillator

The 100KC calibrator consists of a free running 100KC multivibrator injection locked by a 200KC crystal oscillator, plus a cathode follower. I encountered the same problem once - raspy calibrator note, and drifty calibrator as well. Problem was a bad 200KC crystal - the multivibrator went uncontrolled.

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Date: Sun, 19 May 2013 15:06:08 -0400 (EDT)
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] 17 MHz Crystal

As we do not see a lot of these specific failures, I have to think the self healing process is mostly very successful.

Date: Sun, 19 May 2013 20:33:52 -0400 (EDT)
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] 17 MHz Crystal

I want to agree with you.

I think it is mostly a shock in transport that causes these crystals to

crack and thus fail. Having done some of this testing, I know moving things down the road subjects our toys to a lot more force than we imagine. How the human body survives a ride in an auto every day borders on miraculous.

Date: Tue, 22 Oct 2013 12:15:28 -0500
From: douglas nyman <nyman315b@hotmail.com>
Subject: [R-390] RF Deck C227 Stud mounted .047 ???

I am replacing the 3 or 4 paper caps in the RF Deck. C227 is a stud mounted .047 placed on top of the chassis. It may also have a shielded lead. My question is would it be acceptable to place the new .047 under the chassis?

Date: Wed, 23 Oct 2013 07:42:42 -0700 (PDT)
From: Norman Ryan <nnryann@yahoo.com>
Subject: Re: [R-390] RF Deck C227 Stud mounted .047 ???

These caps usually give no trouble; it's mainly the paper in plastic ones, aka BBOD, that are best replaced. If C227 isn't leaky, it should stay, IMO.

Date: Tue, 22 Oct 2013 21:18:52 -0500
From: douglas nyman <nyman315b@hotmail.com>
Subject: [R-390] C227 cap replacent on RF Feck

Would it be ok to mount a new .047 OD capacitor under the chassis. The original cap is stud mounted on the top side of the chassis. Wonder if there was a reason for mounting the C227 on top?

Date: Fri, 25 Oct 2013 22:34:36 -0700 (PDT)
From: "Drew P." <drewrailleur807@yahoo.com>
Subject: Re: [R-390] R-390 Digest, Vol 114, Issue 31

I had C227 go open in a '67 EAC. Symptom was clicking and popping sounds in the audio as the antenna trimmer control was adjusted - RF amplifier stage unstable. A new film-type cap mounted under chassis fixed it.

Date: Tue, 28 Jan 2014 18:12:00 -0500 (EST)
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] How do we open the R390 crystal oven to change a crystal?

It is a two layer problem. You can get the crystal oven in the R390 open with out removing the RF deck. You need to remove some 6 x32 screws around the cover of the oven . See figure 23 in TM-11-5820-357-35.

You get to reach in at an angle to remove the screws that will let the oven cover come off the subassembly.

Then there is the heater coil around the crystals under the cover.

Then there is an inner cover over the crystals.

The you can get to the crystals to change one or two as your case may be.

Will some one please remind us where the whole set of R390 photos are on the web pages. I have forgotten. Thanks, Roger Ruszkowski

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Date: Tue, 28 Jan 2014 18:39:01 -0600
From: "K3PID" <Ron.K3PID@sbcglobal.net>
Subject: [R-390] SUCCESS - R390 Crystal Oven Issues

OK, Once I knew that there were TWO boxes and the inner one was held on by spring clips, I was able to pull the heater coil box off (wit a little prying around the edges) to expose the crystals. It?s a mess because the black foam insulation sheet has deteriorated and has become goo on top of all the crystals but now I can clean it up and replace the two in question.
THANKS FOR ALL THE HELP AND SUGGESTIONS!

Date: Sun, 16 Feb 2014 13:17:41 -0500 (EST)
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] SW R-390a Second Pass

>I am getting sensitivity variations between bands, ...

Each band has a crystal in the second mixer oscillator deck. Ok so some of the bands are harmonics of a crystal. Which is even less wonderful. Every one of those crystals are going to have a different level of output going into the mixer. Thus a different level of on every band.

Do deOxit the crystal oscillator deck switch and all the crystal sockets.

Getting the trim cap circuit board out of the deck to disassemble the trim caps may be more aggravation than you want to engage in. It can be done if you have to.

As you change bands you bring a different crystal on line. It needs to warm up and stabilize. We usually just dial through the bands and peak the cold crystals and move on to the next band. get it all done it 4 minutes. Not necessarily the best method.

Changing out crystal for better performance can help. Selecting crystals by trial and measurement is a lot like selecting tubes for best signal to noise performance.

If a band you use is down, then by all means try a crystal swap.

But after a while get back to using the receiver as a radio and not an educational device to hone repair skills on.

If you are going to swap caps in the crystal deck you may want to sub in a variable cap and see what the optimum value should be. Then think about the stray capacitance your testing has associated with it. And then put in a new fixed cap with an ideal value. You can measure where you would like to be. Put that value in and see how close you are. Go up or down a bit in value to see if the fixed cap is closer to the peak you found with the variable cap. You will find a difference between the variable cap and the fixed cap values that represent the stray capacitance of the test set up.

If you are adjusting the trim caps on the deck and only get one peak on the trimmer then the trimmer either does not have enough capacitance of has way to much. This will be a clue to you that that cap and crystal needs some changes.

We expect two peaks on the trimmers as they go on each side from max cap to min cap. Ken, keep having fun with your receiver.
Roger.

Date: Tue, 18 Feb 2014 18:59:53 +1000
From: Ken Harpur <igloo99nz@yahoo.co.nz>
Subject: Re: [R-390] Crystal Oscillator Deck

Thanks for the info...it all makes sense. Given the number of bad mica caps in this radio it makes sense to me there's bound to be some bad ones in the Oscillator deck too. I will try swapping Crystals first though and see if that brings the sensitivity in line with the 'good' bands.

I'm not getting a huge variation...it's in the order of 2 to 3 uV and it's only a small number of bands that seem inconsistent, but it's worth looking into.

Yes I have already applied de-oxit to the switch, I did it twice by applying a very small amount to a toothpick and 'dabbed' it into the appropriate places. I didn't apply any to the trimmers so I will do that also next time I'm working on it. I do indeed get two peaks from all the trimmers.

Date: Sat, 15 Mar 2014 10:31:13 -0700 (PDT)
From: Garry Stoklas <jergar@sbcglobal.net>
Subject: Re: [R-390] caps. n trimmers WANTED (Pete Williams)

>Do we have a source for the trimmers <snip>

One source I found is Surplus Sales of Nebraska. They have all three of the trimmers you're looking for as "Authentic tab trimmers as made by Tucsonix for Collins Ham equipment", not inexpensive though, $6.95 for 1, $6.35 in lots of 6 and $5.95 in lots of 25. Don't know if they mix values for quantity discount. They can be found at:
https://www.surplussales.com/Variables/Ceramic/CerCap7.html

Radio Daze (http://www.radiodaze.com/category/419.aspx) carrys them for $1.50 each, but only has 1.5 - 7 and 3 - 12 in stock at this time. Hope this helps.

Date: Sun, 16 Mar 2014 15:08:19 -0400 (EDT)
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] caps. n trimmers WANTED (Pete Williams)

You may give Fair Radio in Ohio a call and ask for some RF cans for the RF deck. It may be easier to just swap out the can than to try and replace the trimmers.

The trimmers do come apart and can be cleaned.

Fair Radio no longer list the parts in the catalog or on line. but do have then on hand. Sale of parts is so low against the cost of keeping up a web page or printing that they do not list everything.

Call and ask. Get a price and send a check with a letter listing what you agreed to buy. You could ask here on the reflector for the cans you would like and see what you get offered.

Again we do no advertise here because the effort to make up list
and post stuff is just not cost effective.

Aggravation exceeds return on investment.

Date: Tue, 18 Mar 2014 16:36:45 -0400
From: Mark Richards <mark.richards@massmicro.com>
Subject: [R-390] Manual question

Now debugging issues in my R-390a crystal oscillator sub-chassis.

Looking at the 21st Century R-390A/URR reference (revision 9: 2000-May 29) on page 6-18, the crystal oscillator subchassis trimmer capacitors are not marked below 8 MHz, yet my unit shows the trimmers for 0-17 1-18 2-19 3-20 4-21 5-22 6-23 7-24 MHz. The procedure for peaking trimmers also says, "Trimmers no. 8 and 9 correspond to frequency-indicators no. 08 and 09. There are no adjustments for bands 00 through 07. Check only for output on these bands."

I've been following this manual for all of my restoration work, and am now a little worried that something else may be incorrect, too. Is there a Y2K manual that has an update covering this difference?

Date: Wed, 19 Mar 2014 13:32:39 -0400
From: Mark Richards <mark.richards@massmicro.com>
Subject: [R-390] Crystal resurrection

As I work through some issues with my R-390A crystal oscillator, two crystals were identified as non-functioning: Y402, 10.5MHz and Y413, 9.5MHz. Considering the cost of replacing these at the only supplier I could find, Fair Radio, I figured that a repair try which saves me $14 each is worth the gamble.

After some digging, I found a fellow traveler:
http://home.earthlink.net/~chestnutl/Helptipspage3.html
The author found in one instance the internal crystal structure was touching the cover which prevented oscillation and, in another crystal, that re-soldering was needed.

Rather than use a torch, I set my soldering iron to around 800 degrees F and after a minute or so managed to carefully wiggle up the cover.

In both crystals there was no obvious alignment problem, so I set about to renew the soldering. But, before that, I cleaned each crystal using isopropyl alcohol applied carefully with a cotton ball. Then, with the soldering iron, touched up each lead, first at the very base where it attaches to the pin, and then carefully moved up to the crystal element, adding a bit of solder. This was done at around 650 Degrees F. Tacking the cover back to allow for re-insertion we have success: each crystal came to life!

Perhaps this is non-preservation-quality, but 30 minutes of careful effort just saved me $28 I didn't have to throw. This R-390A radio is one tough unit!

Date: Wed, 19 Mar 2014 13:45:58 -0400
From: rbethman <rbethman@comcast.net>

Subject: Re: [R-390] Crystal resurrection

Great idea and work! These old girls really can take a beating, yet they come back to life. Your comment: "This R-390A radio is one tough unit!" has never been truer! Effort, patience, and going the extra mile gives surprising results! Keep going. It is worth all the effort and work. Eventually one gets what they desire.

Date: Wed, 19 Mar 2014 13:57:29 -0400
From: Glenn Little <glennmaillist@bellsouth.net>
Subject: Re: [R-390] Crystal resurrection

At what frequency does the repaired crystal oscillate. I would suspect is lower than intended because of the additional mass added to the crystal. The original crystal was probably sealed in an inert atmosphere. I hope that you now have a fully functional crystal.

Date: Wed, 19 Mar 2014 14:07:21 -0400
From: Mark Richards <mark.richards@massmicro.com>
Subject: Re: [R-390] Crystal resurrection

Good point. I measured at the output connector of the oscillator into a high impedance frequency counter with 10db attenuator.

Y401 (1 and 17MHz) yields 20.9804 MHz
Y413 (16 MHz) yields 18.9964 MHz

Measuring all the crystals, I find that the oscillator output frequency trends 1 or 2 KHz low. But the 20Khz difference of Y401 seems to have no impact on performance. Measurement to follow will tell more. If it's awful, I will try to remove excess solder and tinker a bit with the mount...

Question: might corroded solder joints in the case account for weaker crystal output from some? I was about to tinker with changing out mica capacitors, but it looks to be an awful job in tight spaces with great risk of damaging more than might be fixed.

Date: Wed, 19 Mar 2014 14:13:23 -0400 (EDT)
From: Gordon Hayward <ghayward@uoguelph.ca>
Subject: Re: [R-390] Crystal resurrection

Indeed - crystals are tougher units than we think. The clip on the left of the picture looks a touch corroded. The clips that I use on high temperature crystals (running at 200 degrees C) are attached with a silver/polyimide cement (just a dab). I wonder if a dab of silver epoxy cement might work too. The only problem is that if it doesn't, getting it off the connection flag deposited onto the crystal will probably take the

flag right off the crystal.

Date: Wed, 19 Mar 2014 13:39:41 -0500
From: Chris <kc9ieq@yahoo.com>
Subject: Re: [R-390] Crystal resurrection

There was a thread about this last November on another group. One member had an 89% resurrection rate by placing dud HC6 crystals in an oven at 425 degrees for a half hour, and allowing to cool for a half hour before removing. The solder on the can showed signs of having re-flowed (regular 40/60 melts at 370). The soldered shut vent was intact, so it would seem the Inside was not further contaminated from the experiment. All but one of the crystals came back to life, within reasonable tollerance of their original frequency. In the time elapsed since, he has not yet reported a repeat failure. There being so little volume inside one of those cans, it is reasonable to assume the contact fingers also reached a high enough temperature to re-flow whatever fractured solder might be present. Might be worth a shot before physically pulling them apart or donating to the round file in the future.

Date: Wed, 19 Mar 2014 15:26:31 -0400 (EDT)
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] Crystal resurrection

As long as the little variable caps give you two peaks as you dial them around a full turn or so, they have enough range to properly adjust the circuit. There is no need to dive into more effort on them. The peaks may not be the same level do to other distributed capacitance and or crud in the near field so pick better one of the two if they are not equal.

Date: Thu, 26 Jun 2014 14:14:08 -0500
From: weekspat@imonmail.com
Subject: [R-390] new member, R390A, no signal when first powered on, works after 10min but RF cutting in and out

I got a Motorola R390A, signal corps unit last year. Have recapped, and fixed most problems, but I've got one nasty intermittent one. Seems like the RF signal is not getting to the RF AMP and or converter or thru it, so I think I've got no signal to the IF section. Then after some time it starts making some popping sounds and shortly after that "pops" on with normal reception. Happens on all bands. I'm wondering if those mini BNCs are to blame. ?Any hints ? The problem sort of " comes and goes" so its hard to nail down thanks, Pat Weeks

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Date: Thu, 26 Jun 2014 12:49:31 -0700
From: "Craig Heaton" <hamfish@efn.org>

Subject: Re: [R-390] new member, R390A, no signal when first powered on, works after 10min but RF cutting in and out

Seems like time to break out the signal generator and o'scope. Follow the signal thru the stages till it disappears. Darned popping noises can come from many sources, bad grounds on tube sockets, dirty pins on tubes, dirty pins on RF or variable IF cans, etc.

Date: Thu, 26 Jun 2014 15:51:04 -0400 (EDT)
From: djed1--- via R-390 <r-390@mailman.qth.net>
Subject: Re: [R-390] new member, R390A, no signal when first powered on, works after 10min but RF cutting in and out

The first thing I'd try is to bypass the antenna relay. It's possible the contacts have gotten dirty and make intermittent contact. The other easy thing to do is to check all the oscillators at the test points and see if one is dead when the radio is dead. Keep at it-

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Date: Thu, 26 Jun 2014 15:52:33 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] new member, R390A, no signal when first powered on, works after 10min but RF cutting in and out

When it is not working, are you able to monitor the voltages to the various pertinent tube pins? If so, are the voltages reasonably stable when the signal changes?

Date: Thu, 26 Jun 2014 13:57:54 -0600
From: Robert Moses <rhmoses@earthlink.net>
Subject: Re: [R-390] new member, R390A, no signal when first powered on, works after 10min but RF cutting in and out

A chopstick or similar object to tap lightly on suspected problem areas can be helpful in finding loose connections.

Date: Thu, 26 Jun 2014 16:10:38 -0400
From: k2cby <k2cby@optonline.net>
Subject: [R-390] Intermittent problem.

Intermittent problems are the hardest of all to find (solve). I don’t like to pour cold water, but a cable/connector is one of the last places I would look. In normal operation, they don’t move, are not subject to heating & cooling and typically either have continuity or don’t. With an intermittent the first question to ask is whether you can provoke or cure the condition by manipulating any of the controls. If so, dirty switch contacts or a mis-aligned wafer are high on my list. Second question: does

the problem occur at all control settings? Band switch, selectivity? If it is confined to one band or everything below (or above) 7 MHz I'd suspect a crystal. If it is one selectivity setting, suspect a (gulp !) mechanical filter.

When does the problem occur? When doesn't the problem occur? When turning the set on from a cold start? After it has been operating for a while. When the room is cold. When the room it hot. When you drop the front edge of the receiver ? inch onto the bench.

Try to isolate the stage. The quickest check is to feed a 455 kHz signal into the IF deck. Obviously, if the intermittent re-occurs, the problem is in the IF, Audio or power supply. If it never affects a signal originating at the input of the IF deck the problem is in the crystal oscillator, the VFO, or the RF deck.

I assume you have checked/replaced the tubes. By far the best test is substitution of a known good tube. I would be particularly careful about those in the crystal oscillators and the VFO. The R-390 uses triode mixers that need a considerable oscillator signal at the injection points. When an oscillator tube starts to lose its manhood the mixer will sometimes drop out altogether.

Finally, I would offer the somewhat esoteric suggestion of checking whether the antenna changeover relay contacts are dirty or the antenna trimmer assembly is oil-soaked.

Date: Thu, 26 Jun 2014 13:57:37 -0700
From: Scott Overstreet <scott@becklawfirm.com>
Subject: Re: [R-390] new member, R390A, no signal when first powered on, works after 10min but RF cutting in and out

I'll bet on a dirty tube socket.

Take all the tube shields off and turn on the power from a cold start.

Wait 30 seconds or so until the radio would normally come to life and then work each tube in it's socket "round and round" (circular motion) using the tube top tit as a handle. This will move each pin up and down in the socket while you listen for effects. If you find a bad one, keep up the circular motion---eventually the bad connection will cleanup. Don't stop if the radio comes to life as you describe---chances are that wiggling the connection that fixed itself will still ID itself.

I say a tube socket because your time after turn-on is quite short which suggest to me a short thermal path like a tube pin to socket problem----but whatever the problem is, it is thermal warm-up related.

The problem might be a bad solder joint on a tube socket and if so, the move the tubes in their sockets will fined it.

If the above doesn't fine the problem----jiggle everything using a stick where necessary to stay clear of HV.places.

Date: Thu, 26 Jun 2014 17:02:34 -0400 (EDT)
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] new member, R390A, no signal when first powered on, works after 10min but RF cutting in and out

Hopefully you have a signal generator that will put out 455 KHz.

When the receiver Is not working, Look at the voltage regulator tube to be lite.
Measure the 150 volts on the side of the IF deck.
Measure B+ on the fuse caps.

This is to make sure the power supply sections are good.
If these are good you divide the receiver in half.

Inject 455 KHz into the If deck at 150 micro volts.
None of this needs to be exact.

Hopefully your receiver has a short cable from J116 on the back panel to J514 on the IF deck.

Take the RF to IF cables off J518 and J513.
Move the short cable from J514 to J513.
You can then connect a BNC to the back panel and inject 455 into the IF deck.

Rock the signal generator into the IF center.
Work for a peek signal in the .1 band pass.

With the BFO off and the generator set to CW look for -7 volts DC on the diode load at the back panel.
Adjust R519 if you have a known signal generator output level.
Other wise just set the generator to get -7 volts DC on the diode load.

Turn the generator modulation on. about 30 %
You should have about 16 volts AC on the local audio output across 600 ohms.
A pair of 1200 ohm 1/2 watt resistors work nice.

With the band width set a 2 KHz the IF deck and Audio deck should be nice

and stable.

If thing are not wonderful start looking in the IF deck and Audio deck until problem is found.
I will hold out for bad tube or crud in tube socket pins.

If the IF Audio decks are good then its back to the RF deck.

Common on all bands are the antenna relay second mixer and 17 Mhz oscillator. RF AMP 6DC6.

Do y0u have the Y2K manual and the TM 11-5820-358-35 PDF from the R390 web sites? The Y2K manual is a must read for a new R390A owner. Many things you need to know are well explained in the Y2K manual. I only had dialup for years and the Y2K in parts was a God send of nformation. Please post and let us know how things are progressing. Please let us know what the final problems are.

Date: Thu, 26 Jun 2014 17:47:58 -0500
From: Raymond Cote <bluegrassdakine@hotmail.com>
Subject: Re: [R-390] new member, R390A, no signal when first powered on, works after 10min but RF cutting in and out

From long and old guy experience I would bet on a resistor crack near a tube that eats it up a bit. YMmv

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Date: Thu, 26 Jun 2014 18:15:05 -0500
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: Re: [R-390] new member, R390A, no signal when first powered on, works after 10min but RF cutting in and out

It is possible that you have several problems going on at the same time. Popping noises can also be something like a bypass cap that is intermittently shorting out and kicking the B+ in the pants.

Usually I do not suspect something mechanical like a bad connector unless I am manipulating the radio mechanically (tapping, twisting, pushing, etc..) on parts of the radio that can make that intermittent electro-mechanical problem appear or disappear. If you go chasing after the unlikely then you are going to get frustrated and start ignoring or bypassing major portions of what should be a methodical approach to troubleshooting.

I have had radios that I could hear the soft rush of static through the speaker, then I would hear a "POP" and the static disappears and over the next second or so the audio comes back to to the static sounds.. Then 3-5-

10-20 seconds later another POP and the same disappearing and fade returns.

Date: Thu, 26 Jun 2014 17:44:02 -0700
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] new member, R390A, no signal when first powered on, works after 10min but RF cutting in and out

Hi Pat, These are the tough ones.

As I was reading through all the good suggestions, I was thinking that knowing the amount of background noise (if any) you can hear when it is not working correctly can be a very good indicator of which section the problem is in. ?Since it happens on all bands, you can rule out the 1st mixer and its oscillator (17 mc). If you can measure the level of internal noise when its dead, then you can when its working normally, pull out the rf amp, 2nd mixer, 3rd mixer, or disconnect some mini coax to achieve the same noise level. When you match it, the bad stage is right before that.

Is this a 1 fuse or 3 fuse machine? If 3, check to make sure 125 ma is the right value (just in case a cap is shorting). You might want to use a 100 ma until you fix this problem. Did you change the cap in the IF that can wipe out your filters?

Date: Thu, 26 Jun 2014 18:12:43 -0700
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] Too Loud Amelco is Dead: Long Live the Amelco

<snip> But, there's more - mine had a short to ground in the RF deck on one of the secondary antenna xformers thus eliminating agc to the RF amp. I easily determined this by measuring the agc at the antenna trimmer cap shaft gear (not the shaft that sticks through the front panel, the one it mates to). Or at E208, E210, and E211 if your careful about loading. It should measure about 80% of the agc voltage.

Date: Mon, 30 Jun 2014 11:48:06 -0500
From: weekspat@imonmail.com
Subject: Re: [R-390] new member, R390A, no signal when first powered on, works after 10min but RF cutting in and out

Thanks for all the hints, Couple of things I did do: antenna relay check, and power supply checks - I did have previous problems here too but those were fixed. Yes Its time for the signal generator and scope. I got what I wanted from the forum, which is some ideas to try. Hopefully with these hints I'll make more progress, then I will post
back my findings or the soultion if I figure it out. Thanks everybody.

Date: Sun, 6 Jul 2014 10:52:56 +1000
From: Ken Harpur <igloo99nz@yahoo.co.nz>
Subject: [R-390] R-390A Noisy Ant. Trim and Raspy Calibrator

I have two issues I'm trying to resolve. A very scratchy/noisy Antenna trimmer on a Teledyne R-390A. The RF Deck has been completely disassembled and cleaned including the shaft and it's related components that protrudes through the front panel. The noise is mostly audible on the lower bands and it's not a quiet, distant noise, it's very loud. The noise is not audible on bands above 16 Mhz.

So...Is there a way to disassemble/clean the Antenna trimmer to clean it? It looks like the small pin at the top has to come out to remove the cover and gain access to the innards.

My second issue is on an EAC model. The Calibrator is very raspy (dirty) sounding, not the nicer, more sine-wave like sound from the Teledyne. Work in this area has been limited to visual inspection and re-doing potential cold solder joints. The crystal oven has been swapped over from the Teledyne with no difference...still raspy and the EAC crystal oven put in the Teledyne and the note is clean, so I'm sure it is not the Crystal oven. V-205 and V-206 have been replaced...nope, still raspy. Of note is when I wiggle V-205 the pitch of the note changes slightly (this does not happen on the Teledyne) so I re-soldered all tube socket pins...no change. I suspect I have a bad mica in this area. All resistors are within spec and so far no components have been replaced in this deck.

Any ideas or advice would be much appreciated!

Date: Sat, 5 Jul 2014 21:11:20 -0400
From: "Bill Riches" <bill.riches@verizon.net>
Subject: Re: [R-390] R-390A Noisy Ant. Trim and Raspy Calibrator

In the cal crystal circuit there are a few low value mica caps that become leaky and make a racket. Look for the ones going from plate to grid of the osc/mult tube. I do not have a print in front of me. Suggest you change the 3 or 4 that are there. An ohm meter will not measure the leakage but when you put voltage on the cap you can see the leakage. You have to remove the rf deck to do this. Yippee.

Date: Sat, 5 Jul 2014 20:46:04 -0700
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] R-390A Noisy Ant. Trim and Raspy Calibrator

On the trimmer, the gear mounted (pinned) on the top of the trimmer cap

is at agc potential. ?Check to see that it is and the mating gear on the horizontal 6" shaft is also (it should be isolated from the 6" shaft). ?You should measure about 420k ohms from both gears to ground.

On the cal osc, Bill is probably right on the micas. You might have a bad pin contact on one of the two tubes - try wiggling them quite a bit and see if that helps. If not, check the voltages. The cathode follower should smooth off the corners of the square waves from the multivibrator a little via L210. Can you scope the cal output at E208?

Date: Sun, 6 Jul 2014 19:58:55 +1000
From: Ken Harpur <igloo99nz@yahoo.co.nz>
Subject: Re: [R-390] R-390A Noisy Ant. Trim and Raspy Calibrator

Thanks for the suggestions...

First the trimmer...I did an ohms check from the gear to ground and the meter started at around 500k then climbed to around 1100k. That was not moving or touching anything else, just holding the two probes still until everything stabilised. I haven't yet checked AGC voltage on the top of the Cap via the gears as this particular receiver is semi-disassembled undergoing a thorough clean. By next weekend it should be all back together...

Regarding the Calibrator...I found in the circuit diagram C-313 which goes from the plate of V-205A to the grids of V-206 via 22k resistors. That was my first suspect, I don't have any 220pf so I made one by temporarily connecting two 110pf in parallel. This has made a slight improvement so I will order some suitable replacements and do a permanent repair.

Now...I unpacked my Scope and fired it up...please bear with me regarding using a scope because it's a recent purchase and I'm still learning how to use it. Anyway...these checks resulted in a clean sine wave output...the PTO, E-402, E-211 and E-210. However checking E-209 I see a really ugly waveform, I don't know how to describe it but there are two signals there and both waveforms look like they are out of phase with one another? Not at all looking like a sine wave, kind of really dirty looking. At E-208 I cannot get a trace whatsoever...nothing I adjust on the scope or receiver will either produce, or show a waveform at this test point. Yet the calibrator does work. I see that E-209 is in the AGC line and could be a clue why I am getting distortion on strong signals, but that is an issue for another time.

So this takes me back to why I am seeing nothing at E-208 at all. This particular radio does have a number of small issues that I'm slowly

working through. Replacing C-313 has helped somewhat, the raspiness has gone and what I'm hearing now is slight distortion on the calibrator signal. The radio does distort on strong signals as said earlier, so I'm wondering if work on the AGC would help. Thanks once again and kind regards, Ken Harpur

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Date: Sun, 6 Jul 2014 08:08:08 -0700
From: "Craig Heaton" <hamfish@efn.org>
Subject: Re: [R-390] R-390A Noisy Ant. Trim and Raspy Calibrator

One thing to check with the Calibrator is: What frequency? Do you see a 200KC and/or a 100KC note? I had issues with the silver mica caps in my Amelco, the Calibrator liked to oscillate at 151KC until the correct cap was replaced. Due to the fun removing the RF section this could be a shotgun the silver micas time.

Date: Sun, 6 Jul 2014 13:11:43 -0400 (EDT)
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] R-390A Noisy Ant. Trim and Raspy Calibrator

E208 is on the grid of V201.

The test point is 470K or 33 PF off the cal signal that just happens to be 33 ohms off ground.
That cal tone on the grid of V201 is only about 1 micro volt.

Plus you will only see it if you are in the cal mod of operations.
I am not surprised that you do not see any thing on E208 with the scope.

On E209 you would expect to see micro volts of signal from the RF chain.

The double signal you see could be from either the 17 Mhz first crystal oscillator or the cal tones. What is the difference in signal at E209 when you are in MGC and CAL. considering you are switching the cal tones off or on?

I think you are just seeing the first crystal oscillator signal on the grid of V202 at E209 and it looks like nothing as it is being capacitor coupled through a couple different paths with the 6C4 tube and circuits.

These are tough problems to trouble shoot. The signal levels are just to low for most of our scopes. And at these low levels there is so much crud about that has no real meaning to the circuit performance.

Go for clean and deoxit.

Get out the little wrench and Philips screw driver. Open every ground lug bolt and clean the connection. More than one problem has been a 50 plus year old oxide layer in a mechanical connection on a lug.

Date: Sun, 6 Jul 2014 18:05:09 -0700
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] R-390A Noisy Ant. Trim and Raspy Calibrator

<snip> On the cal, on using tp e208, I forgot I used my amp probe on that. But it sounds like you made good progress on it. If the agc is the problem, the distortion should go away when you turn the rf gain down. On my 2 r390a's I get about 35-38 db on the cal signal with rf at max. At max on 1 I do get a little distortion, so I need to work on that, myself. You could try scoping the IF out for the cal signal and then a sig gen signal to see the difference. That should tell you if its the cal signal or somewhere else in the rig.

Date: Thu, 17 Jul 2014 09:45:00 -0700
From: "Chris Kepus" <ckepus@comcast.net>
Subject: [R-390] CU-872A/U RX multicoupler

Do any of you have one of these that is in active duty? I'm curious about its performance, etc. Since Goggle didn't turn up anything in the way of conversations about this unit, it may be that the going price of 6922's caused these to be sacrificed. Many of you frequent the same forums and lists so please excuse the multi-posts. I am casting a wide net hoping to catch a bonafide user to talk with.

Date: Thu, 17 Jul 2014 13:41:24 -0500
From: "Phil Mills" <pmills7@comcast.net>
Subject: Re: [R-390] CU-872A/U RX multicoupler

I have a Westinghouse KM-2 multicoupler which is identical to the CU-872A. I have a stash of 6922's aka 6DJ8's because I scarfed up on old Tek scopes at hamfests a few years ago when they went for $5 to $10 for a humongous sized scope and people were desparate to give them away.

My coupler seems to work well but I can't give you any real measured performance info. My earlier multicoupler was a CU-168 which I sold during a period of stupidity..... Let me know if I can help you with more info.

Date: Thu, 17 Jul 2014 18:08:53 -0400 (EDT)
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] CU-872A/U RX multicoupler

Does any one have a CU872 they would part with?
I would like to own one for my R390's.

Once upon a time 68 -75 I use to take care of whole bunches of these items.

Today we have op amps and digital displays.
We care not about sensitive meter movements.
The CU872 has a 50 micro amp like 1 x 10 -6 meter for self test.

It has 20 6922 tubes dual triodes 10 deep cascode string.
It is 1 RF in 8 RF out. Zero gain. But you spread out to 8 so the gain is 8.
But port to port is zero gain.

Range is 500 KHz to 30 plus mega hertz.
They were used world wide with lots of big antenna farms and many hundred R390 receivers.

We would run then 3 deep to fan one antenna out to 512 receivers.
You could do it. We just never got that many receivers and operators all interested
in the same geographic area a big rhombic antenna covered.
We did run three deep to get out to eight different rooms and then more than 8 receivers in a room.
Maybe 14 receivers on 7 positions in one room all looking at the same region of the world.

The point is we though the reception out of the units for all receivers was as good as a receiver would get if it was just coupled direct to the antenna.
And these test were run often to show the problem was not the antenna, receivers cable or the CU872 couplers.

The noise floor was excellent.

Inside the unit has a filter that cuts out every thing below 2 MHz. This keep the AM broad cast band and cross modulation products out of everyone's receiver.

You can re cable the BNC connectors and by pass this filter if you want to listen to the AM band.

The unit is two identical amplifier pairs. The one input is split and drives two set of 10 tubes to four outputs. So 1/2 input yields 1 output for a real gain of 2.

You can save half of your tubes and just run a 4 output device if you want.

You can re cable the amps into a series for a gain of 4 to four receivers.

You have to think about the impedance matches as you are only driving one amp from the antenna and not two amps in parallel. And you are taking one output back to the second amp where you again have the same mismatch ratio. If you are only work a mega hertz of interest, the transformers should be doable.

The 6922 are just low noise 12AU7 or 12AX7 with a gain of just 33.
The tube is 12 volts only it does not have a center tap filament to run on 6.3 volts. 12AT7's have a gain of 100.

You can repopulate your CU872 with "hot" 12AU7 12AX7 12AT7 type dual triodes. I do not know what will happen to the noise floor or the gain.

We run 6922 24 x 7 for about 2 years and then just changes a whole batch of 20.

We would grab 4 units on a semi annual twice a year basis and just give one of them 20 news tubes and put it back in the rack.

We would then run 80 tubes through the tube tester and select the best 60 to re populate the other 3 units. We sort of chose the top 20 next best 20 and third best 20.

The top 40 would all look good. The last 20 would be the best of 40 and you could tell they were not as conductive as the best tubes.

It was a method to keep every thing running and it worked.

Hundreds of operators had CU872's inserted between their antennas and their receivers and could not hear the difference as you swapped them from one to two or three deep or from port to port or direct to the antenna.

Cu872's were in the world from before my time in 68 and were still going strong through the 70's into the 80's.

For every 4 or 5 receivers in the Julian Creek Massacre there should have been one CU872.

No one knows what they were or why anyone would want one.
Those of who do know have no reason to speak of such things.

If you have one I would like to discuss acquiring one from someone.
One would be a life time supply.

Antenna to one receiver gain is nil.
Antenna to one receiver loss is nil.
Antenna to one receiver noise floor change is nil.
Antenna to one receiver sensitivity change is nil.
Antenna to 8 receivers is like 8 receivers on 8 antennas.

Date: Thu, 17 Jul 2014 17:51:53 -0500
From: "Phil Mills" <pmills7@comcast.net>
Subject: Re: [R-390] CU-872A/U RX multicoupler

That was a very interesting rundown on the use of the multicouplers.

But, one error....the 6922 is NOT a hot 12AU7 or 12AX7. It's most common replacement is the 6DJ8....go here for the specs on the 6922.

http://www.audiomatica.com/tubes/6DJ8.htm

Date: Sun, 20 Jul 2014 19:44:15 +1000
From: Ken Harpur <igloo99nz@yahoo.co.nz>
Subject: [R-390] R-390A Noisy Ant. Trim and Raspy Calibrator revisited

<snip> As far as the Calibrator on the EAC goes. The raspiness issue was resolved by replacing C-313. I believe the issue with the remaining distortion is the AGC and swapping out the IF deck with two others seemed to confirmed this, both with the calibrator signal and listening to on-air broadcasts. With the EAC deck back in...on a strong signal it distorts heavily with the RF gain full up (just like it does if you switch to MGC). If I turn the RF gain down the signal cleans up nicely.

I feel a bit stupid re trying to Scope E-208...I thought I'd see the output from the calibrator there but of course we are talking about micro-volt level signals so it makes perfect sense why I wouldn't see anything. While having another look at E-209 I discovered my probe is faulty which could explain what I was originally seeing, if I wiggle it just right, it works. For fun I had a look at J-221 and I could see the 17 Mhz signal from the first crystal oscillator...nice and clean sine wave. I scoped the IF out for the calibrator signal...a sine wave but a little blurry. I also had a look at the IF out with a normal broadcast station and same result. Unsure of how to interpret what I was seeing, as this is the first scope I've ever owned I went to youtube to learn. I found the blurred waveform was just the sine wave being modulated by the signal. So still tuned to the broadcast station I slowed the timebase way down and could see the modulated audio, just like I was seeing in the videos.

So...I had fun, got a little side-tracked and when I get more time to get

stuck into it again I'll go hunting for the AGC problem. Thanks for the responses, comments and advice...as always I've learned a little more about these radios.

Date: Sun, 3 Aug 2014 16:39:10 -0400
From: Frank Hughes <fsh396ss@gmail.com>
Subject: [R-390] R-390 alignment attempt #1, need advice – Crystal Deck

Hi, I went through the first pass of alignment on the R-390, found some things that need attention, not sure how to proceed.

Section 77 , Chapter 3 "Repairs and Adjustments" in TM 11-5820-357-35. "Alignment of Second Crystal Oscillator"

Some of the crystals won't adjust w/ the trimmer.

Initially did not think this was important, as they are bands I don't use.

But by the time I got to the RF deck alignment, it became clear that I will have to fix them. All the manual says is "If no indication is obtained, check the "Crystal-oscillator bandswitch". If the "Crystal-oscillator bandswitch" is the big wafer switch inside the crystal deck, I might be able to get some Deoxit on the wipers/traces, but WOW, that thing is buried. But could the problem also be a dirty trimmer and/or bad crystal? I have a spare crystal deck to swap parts out of, if needed.

Date: Sun, 3 Aug 2014 16:42:02 -0400
From: Bob Camp <kb8tq@n1k.org>
Subject: Re: [R-390] R-390 alignment attempt #1, need advice - Crystal Deck

Crystals will not adjust or the oscillator is dead on those bands?

Date: Sun, 3 Aug 2014 18:04:24 -0400
From: Doug Massey <dougmassey@masseyradiolabs.com>
Subject: Re: [R-390] R-390 alignment attempt #1, need advice - Crystal Deck

You may need to pull the whole Crystal deck out. Which is probably not what you wanted to do. Take all the trimmers apart clean them and put them back together. Could be those trimmers are just stuck. It is a common problem with those things. While you're in there you want to clean all those wafers as you pointed out with deoxit. Sometimes the same thing happens adjusting any of the ceramic trimmers in the radio. If you have that assembly apart make sure you check all of them before you put it back together. Overlooking those trimmers while module is out of

the radio can sometimes come back to bite you when you do the alignment especially Crystal deck and RF deck Good luck with it. I am sure you will get it going. This is a great group of guys with a lot of experience and great information.

Date: Sun, 3 Aug 2014 18:19:03 -0400 (EDT)
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] R-390 alignment attempt #1, need advice - Crystal Deck

You did not mention if this R390 was new to you.
Or had it worked OK in the past.
Or you just do not know if it has worked in the past.

It is fixable.
But it is an R390.

Getting into the crystal deck of the R390 is more complex than on the R390A.

The crystals come un seated in the oven and the terminals pins of the crystals get oxidized.

And if the receiver was not stored in a heated place and allowed to freeze real good some of the crystals may have given it up.

As long as you have to do this maintenance procedure there is no reason to do only part of it.

Your going to have to pull the RF deck and the crystal oscillator deck as a pair.

You are going to have to open the oven covers (two layers) to get to the crystals. Once you get that far into the receiver you can get to the trimmer caps and the big selector switch.

Pull all the crystals and clean (deoxit) the pins and sockets.
Clean up the caps but not necessary to disassemble them.
Clean up the selector switch contacts.

If the missing ones are hit and miss then its likely crystal need sockets and pins cleaned. If every thing drops out on one end or the other it can be selector switch mechanical alignment.

As long as you have the RF deck out to get to the crystals you should do the whole RF deck cleaning and lubrication maintenance and check the

RF band switch alignment.

Worry not about that green gear thing its way over-rated. But if you have it, use it. If not you will just have to make sure things are aligned as you reinstall the RF deck. Then you can put every thing back together and see how many mega hertz bands you recovered. You can look at the missing mega hertz bands and decide if it a crystal with all of its harmonics missing or a trimmer cap as some of the crystal fundamentals and harmonics are there.

And see what is still missing then you can swap in some crystals from your spare deck. Or ask the fellows for some help with the crystals you think you need. Then you can take it all apart again to install the crystals.

It Is not hard to do. It is just a slow screw job going both ways and takes time.

Moving these receivers down the road takes out more crystals than anything. The crystals just do not like to be bounced around.

Frank if you need some R390 photos put up another post and I will send you some direct from a R390 rebuild I did a couple years ago.

It could be worth your time to bread board up a crystal oscillator that you use to check the fundamental of all the crystals with. Just looking at the output level with a scope.

Trying to match up the stray capacitance to see if they are on frequency will not be of much value. The crystals will oscillate or not oscillate. Once you get a circuit built up that some crystals work in then you can expect that the ones that do not work are bad.

It will be a combination of things. a bad crystal, a dirty trimmer, a loose crystal, an oxidized switch contact.

A good maintenance cleaning will cure every thing except the real bad parts. And the few problems that remain will be easy to diagnose and resolve.

Date: Sun, 03 Aug 2014 18:28:05 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] R-390 alignment attempt #1, need advice - CrystalDeck

Just cleaning and ensuring that the trimmers work, is just the tip of the iceberg! One would be wise to begin examination of the crystals

themselves. Bad or cold solder joint? They can work for more years than you can imagine, then next thing you know, the problem as described bites. The wiring to the switch is just as likely to be an issue. <snip>

Date: Sun, 3 Aug 2014 18:59:48 -0400
From: Frank Hughes <fsh396ss@gmail.com>
Subject: Re: [R-390] R-390 Digest, Vol 124, Issue 3

This R-390 is the same Hamfest "tailgate special" that I have been working on for a while now. When it was repaired enough to receive a signal on 3 megacycles, I started to see how to get the other bands working, as it was "deaf" on many. At the time, I did not know if it was just an alignment issue and/or more defective components, as we found with the power supply and IF deck. I have had the crystal deck out, but lost track of which one is in there now - my spare? the original?

It is not too difficult to get in and out, except for aligning that goofy coupler.

I am going to assume, at the risk of this forum exploding, that using the ultrasonic cleaner on the trimmers is "bad" (running for cover now...)

I do have a video training tape from Chuck that contains an explanation of how to disassemble and clean a trimmer. Looks like there are only about 3472987 of them in the crystal deck.

I would like to be able to test crystals, there is probably some way I can use the spectrum analyzer and signal generator to do it. I have another method that Roy described using the generator and 410C VTVM w/ RF probe, but the scope or the SA/TG would be fun to learn how to do.

Here is what the IF output looks like, I wanted to see if there was a way to adjust Z501 using the SA, but no matter how I changed the trimmer and coil, it did not effect this trace.

http://i180.photobucket.com/albums/x257/fish1_07/R-390/z501-sa_zps56a0c951.jpg

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Date: Sun, 03 Aug 2014 19:13:46 -0400
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] R-390 alignment - Crystal Deck

Roger, I suspect that quite a few folks could benefit from those. Perhaps one or more list members would be willing to host them, if you are willing to have them posted? We all thank you for your huge commitment of time and good cheer to keep these old soldiers going.

Date: Sun, 3 Aug 2014 19:54:31 -0400
From: Bob Camp <kb8tq@n1k.org>
Subject: Re: [R-390] R-390 Digest, Vol 124, Issue 3

First thing is to figure out if the oscillator has stopped oscillating. If the crystal is cracked, or something like that, there's no oscillator to peak. You can adjust all you want and nothing will happen. I've had radios arrive with multiple cracked crystals. My *guess* is that they got dropped on the way to or from here or there. Replace the crystals and all is well.

Date: Mon, 4 Aug 2014 08:31:22 -0400
From: Steve Hobensack <stevehobensack@hotmail.com>
Subject: [R-390] Crystal Deck

I operate a '63 Imperial. I once had trouble with 80 meters being very unstable. The problem was leaky B plus voltage across the ceramic trimmer in the crystal deck. Collins designed great stuff, but why in world was B+ on those trimmers? i corrected the problem with a blocking capacitor and a megohm drain at the trimmer. Could a "master" blocking cap be put at the rotary switch? I should have tried that when the deck was out of the rcvr.

Date: Mon, 4 Aug 2014 08:49:40 -0500
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: Re: [R-390] R-390 alignment attempt #1, need advice

That long, multi section rotary switch beneath the RF deck can be a real challenge to work on. Be very careful not to bend of break any of the contacts if you attempt to clean it.

Remember that those are silver coated so it is not unusual for them to look black. That is silver oxide and it is still conductive. Unless you know that it is a wiper contact issue with a certain wafer I would at the most,spray it down with de-ox-it and leave it alone. Accidentally hooking one of those contacts will take the spring out of the connection and then it will be really intermittent or open.

The trimmer caps near the crystal deck are problematic. I usually make a little cheat sheet of trimmer positions, then turn the deck over and give a concentrated shot of something like de-ox-it (cleaner) with the nozzle tube right into the trimmer. Then while it is still wet I will spin that trimmer capacitor around a bunch of times, and give the trimmer another shot of de-ox-it and set it back to the position it was originally in.

Of course you are going to need to do a complete realignment of the oscillators and you not only want trimmers that get you on frequency but ones that do it without being all jittery and intermittent. Oftentimes it is dirt or contaminants in the trimmer that makes it behave spooky.

The same holds true for crystal sockets and pins, clean them off and re-seat them snugly. I have never tried to disassemble the trimmer capacitor itself. I have enough hangar-queen modules that I will cannibalize for spare parts.

Date: Mon, 4 Aug 2014 12:35:02 -0400 (EDT)
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] R-390 alignment - Crystal Deck

>Hi Roger, I got a bunch of R-390 pix from someone a yr or 3 ago, to put on a
>website for general viewing. Were they from you? Are they still there
>somewhere? (I'm not sure, but I'll look) Would what he's looking for be
>there? 73, Al, W8UT

I think those may have been from me. An R390 front and back plate hanging against the wall. About 300 total photos. Al, we have got to do a better job of educating everyone to your site and the awesome content that is there.

Date: Tue, 5 Aug 2014 12:56:57 -0400
From: Frank Hughes <fsh396ss@gmail.com>
Subject: [R-390] R-390 crystal testing in progress!

Started testing crystals using the setup that Roy K1LKY explained to me, works GREAT!

http://i180.photobucket.com/albums/x257/fish1_07/R-390/crystal_test_setup_zps34d3e719.jpg
http://i180.photobucket.com/albums/x257/fish1_07/R-390/generator_crystsl_test_zps7a9cfd2f.jpg

So far, no bad ones, and all are very close to the frequency stamped on the can. Weird to see manufacture dates on the crystals that correspond to me in diapers..... Cleaning the trimmer caps is next.

Date: Tue, 26 Aug 2014 21:01:39 -0600
From: Transmaster <22hornet@gmail.com>
Subject: [R-390] Electronic digital readout for R390A

* I was cruising through the National Technical Information Service.

This
is a place that if you know exactly what you want and it is not classified you can purchase it. If they still have any in stock you can purchase the TM for a 1939 M5 White Scout Car, I have seen the complete document set for a F-86 Saber jet fighter in a Government repository Library. I put R390A/URR in the search engine and found this. I don't know if there is enough info in the publications to build it but the providence makes it a very interesting, and historical device to build. *

*R-390A/Urr Digital Frequency Readout Unit. (1969) *

AD698190
The design and development of the R-390A/URR Digital Frequency Readout Unit is presented. The history of development including the techniques considered are discussed. Digital pulse subtraction, which was chosen as the most economical technique, is descri...
Author: I. Bicevskis W. Emeny
Year: 1969
Select media and add to Cart to buy this item
<http://www.ntis.gov/search/product.aspx?ABBR=AD698190>

Date: Wed, 27 Aug 2014 01:09:56 -0400
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] Electronic digital readout for R390A

This comes around every now and then. The report has schematics -- they look like full schematics, but I have not checked to verify that. The work seems to have been done by the Syracuse University Research Corporation, Defense Systems Laboratory. Dunno how much NTIS is asking, but this report is available on the internet. 61pp, 10.7 MB. Google is your friend. Maybe it should be added to the Y2K manual, if it hasn't been already.

Date: Wed, 27 Aug 2014 00:30:16 -0600
From: Transmaster <22hornet@gmail.com>
Subject: Re: [R-390] Electronic digital readout for R390A

*Used Google document search and found it *at
http://www.r-390a.net/R390A-digital-frequency-readout-final.pdf
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Date: Wed, 27 Aug 2014 03:17:25 -0400
From: Jeff Adams <physicist@cox.net>
Subject: Re: [R-390] Electronic digital readout for R390A

I scanned that years ago and I think it is on the R390 Addendum CD...

Date: Sat, 20 Sep 2014 14:59:05 -0700
From: Alan Victor <amvictor@ncsu.edu>
Subject: [R-390] R390A 2nd LO subchassis oscillator issues

Good day. Have an R390A with poor sensitivity on some bands and quite fine
on others. Cam alignment and PTO run out look good. 17 MHz xtal running
well with 7-9 V p-p RF output at the injection port to the 1st mixer. However, on 7 MHz, the required 3rd harmonic is way down in level and the 7 MHz sensitivity is hard hit. However, on 15 and 24 MHz poor sensitivity but not nearly what it is on 7 MHz. Meanwhile on 21 MHz, better than 0.15 uV ! So I am suspecting a very aged low activity 9 MHz xtal and probably a dirty bandswitch in the 2nd LO subchassis as well. As far as I can tell the mechancial line up looks reasonable but the RF-electrical issues are clearly more evident. Before I attempt to do any mechnaical alignment, I think it makes sense to fix the OBVIOUS electrical shortcomings, like low LO INJECTION level on the 2nd LO subchassis. Any ideas?

Date: Sat, 20 Sep 2014 19:55:49 -0400
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] R390A 2nd LO subchassis oscillator issues

you wrote: ....poor sensitivity on some bands and quite fine on others..... therefore logically injection levels are fine.

At 7 MHz third harmonic in not relevant. When 7 Mhz third harmonic get relevant a different switch position and trimmer cap will take care of that. 7 Mhz is the top of the 4-7 octave. RF deck needs alignment 15 Mhz is top of 8-15 octave. The next set of RF transformers also need alignment. Alan, it just may be time to give the whole receiver a good general maintenance service. Thus clean up a whole slew of small problems that amount to dirt, oxidation, a few noisy tubes,
a few weak tubes and some general electrical alignment needed from aging parts.

Think about 8 hours on a Saturday and Sunday. Start with a nice where you can
take the receiver outside and give it a bath. Just mix the receiver in with family pets for the bath process. After it dries out in the sun you can reassemble it and get on with the electrical stuff.

Date: Sat, 20 Sep 2014 18:48:11 -0700
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] R390A 2nd LO subchassis oscillator issues

Hi Alan, I think your right about the crystal. Did you try adjusting the 7-24 cap? And, did you try re-seating the crystal? Do you have another you can try?

Date: Sun, 21 Sep 2014 16:54:49 -0400
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: [R-390] Y2K Next Edition Addition

I was looking at my 2000 printed copy of the Y2K manual and I did not see a procedure to align the BAL C201A, C205A, C209A, C231A, C217A and C221A
trimmer caps in the RF deck.

The R390 TM 11 5820 357 35 has a procedure at paragraph 81 section i. through n.

I think there is an error in the procedure as we are looking for maximum through put not minimum through put. But the TM may be correct.

We all were suppose to know that the procedure is missing from the R390A
TM 11 5820 358 35 and bitched about it to no avail.

Did I miss the procedure in the current Y2K manual?
As in it's there but I can not read!

Date: Fri, 26 Sep 2014 17:29:12 -0400
From: Alan Victor <amvictor@ncsu.edu>
Subject: [R-390] Second LO and bad xtals

In an earlier post I noted a bad 9 MHz crystal, off frequency by as much as 15 kHz at injection. Indeed, I found 4 other bad crystals for the 10, 6, 17 and 23 MHz band. In all cases 13-15 KHz error. The net of this, if you see issues in obtaining PTO end points as well sensitivity, check those crystals in the second LO sub chassis. Either the heater or some significant vibration over the years took a number of these units out.

Date: Fri, 26 Sep 2014 17:42:18 -0400
From: Bob Camp <kb8tq@n1k.org>
Subject: Re: [R-390] Second LO and bad xtals

I would add to the list:

1) Somebody dropped the radio
2) Somebody repaired the radio with crystals that were not properly

manufactured for the radio

Of the two, I'd bet on number 2. Usually in a drop case, the crystals are all "don't oscillate".

Date: Fri, 26 Sep 2014 16:00:29 -0700
From: "Craig Heaton" <hamfish@efn.org>
Subject: Re: [R-390] Second LO and bad xtals

Been watching this thread and the AM Forum with interest. Here goes: Test point E402 and the grid leak voltages in the Y2K manual suggest a value between -4 to -11 VDC. Guessing here that those measurements were made with a USM-116 (HP-410 B or C) with an input Z of 100 megohm or so.

Considering most of our newer test equipment is lucky to have an input Z of
10 megohms; would it be better simple to use a frequency counter to check for correct frequencies per setting of MC knob? Perhaps using a pocket size freq counter with a telescoping antenna held next to V401 would be a better indication. Lacking a correct frequency, then check for voltage at the pins of V401 or consider which crystal might be toast?

Date: Fri, 26 Sep 2014 19:17:45 -0400
From: Bob Camp <kb8tq@n1k.org>
Subject: Re: [R-390] Second LO and bad xtals

Actually an "old school'" approach with something like an LM frequency meter works quite well for checking the crystals.

Some math: 10 MHz off by 15 KHz => 1,500 ppm error. At that frequency, a crystal that ages as much as 100 ppm over its life is rare. Shock and vibration on one that meets the specs would be well under 10 ppm. Maximum pull on the same crystal (if the load was off) is likely 400 to 600 ppm. The normal crystals in these locations are not vacuum sealed, a seal break would not cause a significant shift. Something really strange happened to those crystals. Things like cracks in the blank can cause these sort of shifts.

Date: Fri, 26 Sep 2014 18:39:58 -0700
From: Alan Victor <amvictor@ncsu.edu>
Subject: [R-390] 2nd LO xtal frequency

I agree with the shift in frequency about 1000 ppm. I was quite surprised. A simple measurment of course if you believe your PTO and 17 MHz 1st LO are

spot on is look at the error on the kHz dial against WWV. However, I did measure the 2nd LO through a small 10 pF series cap. Yes, I pulled the oscillator a little but the zero beat shift was just 100's of cycles. A better method, form a small close field probe by soldering the center conductor of small coax, i.e. RG174 or better quality if you have it, to its shield. About a 0.5-to-1inch loop is all you need. The pigtail coax has a BNC on the end. I have a 40 dB gain preamplifier and run the preamp output into your counter. Doing a direct count, the 13 MHz xtal (for 10 Mhz Rx) measured 12.986958 MHz. At this point I am searching the junk box and see what I can come up with for these various bands. Then it's on to other problems.

Date: Fri, 26 Sep 2014 21:54:41 -0400
From: Bob Camp <kb8tq@n1k.org>
Subject: Re: [R-390] 2nd LO xtal frequency

I would double check any low level counter measurement with something designed for low level work. Even a spectrum analyzer would work for the offsets you are talking about. I'm not sure it's really worth the effort, the oscillator is running way off by all you have checked.

I'd check with the "usual sources" and see who has the crystals you need. I'd also see if a junker deck (with the crystals in it) would be a cheaper option.

Date: Sat, 27 Sep 2014 14:18:56 -0700
From: Alan Victor <amvictor@ncsu.edu>
Subject: [R-390] 2nd LO xtal measurement

So for completness and maybe secondary information, I measured the bad vs.
the good R-390A 2nd LO xtals. The bad is a 9 MHz unit and some good are 10
and 13 MHz. All are fundamental xtals and I would have to look up their spec but, I assume the correlation C for these xtals is ~ 32 pF. In any case, measure them on a VNA results in the following:

*xtal freq	Z at desired frequency	R at series resonant
9 MHz	500 +j 5000 ohm	45 ohm
10 MHz	7.5 +j 505 ohm	7.5 ohm
13 MHz	9.0 +j553 ohm	9 ohm

If you search for the frequency where the 9 MHz xtal correlates with 32 pF,
its 8.99441 MHz or about 5500 Hz off. Now, I would need to check if 32 pF

is the right number, but this error is about what I saw for this unit when operating on the 7 MHz band, about 15 KHz error. So the xtal is not fractured, its not broken and it functions. That is to say it looks like a xtal, just not a very good one and not usable in the receiver.

Date: Sat, 27 Sep 2014 19:55:44 -0400
From: Bob Camp <kb8tq@n1k.org>
Subject: Re: [R-390] 2nd LO xtal measurement

Assuming that you have done a full circle fit and pulled everything out of the model, the 45 ohms on the 9 MHz crystal is way high. It should be much closer to the resistance of the 10 and 13 MHz crystals. There's something more wrong with that crystal than just the frequency.

Date: Sun, 28 Sep 2014 19:07:15 -0400 (EDT)
From: Gordon Hayward <ghayward@uoguelph.ca>
Subject: Re: [R-390] 2nd LO xtal measurement

I agree. Typical 9 MHz AT crystals are less than 10 Ohms in air at series resonance. Maybe a tiny (really tiny) amount of something gooey leaked in and landed on the crystal surface. The gooey stuff would also push the frequency down a bit. In liquid water the resistance with a really clean crystal (cleaned with chromic acid) is about 135 Ohms and the frequency drops by about 1500 Hz (this is with only 1 side wet. Its about twice that with both sides wet. I'm recalling most of this from memory and sketchy notes. The paper is Hayward and Thompson, J. Appl. Phys, vol 83 page 2194, 1988.

Date: Tue, 18 Nov 2014 21:14:43 -0800
From: Dennis Wade <sacramento.cyclist@gmail.com>
Subject: [R-390] RF Deck B+ short (390A)

I've finally pulled the RF deck out of my Motorola 390a in an attempt to track down a short on the B+ line. My initial resistance measurement suggested a dead short which lead me to C 308. Unfortunately, removing C308 left the short happily intact.

Paying a little closer attention this time, the actual resistance to ground from Pin A, J208 is 60 ohms, not a dead short. This confuses me...I'd think I'd be seeing R212 at 2.2K if C280 was shorted...but the 60 ohms is throwing me. But, its not immediately obvious what else it could be. Could R212 have changed to 60 ohms? (it doesn't look abused).

Date: Wed, 19 Nov 2014 01:01:46 -0600
From: "Bill Hawkins" <bill@iaxs.net>
To: "'R-390 HF Receiver List'" <r-390@mailman.qth.net>

Problems like that are best solved by successively cutting them in half.

Pick a place on the B+ line about halfway along the schematic and unsolder it. Now you only have half the RF deck to search, so you cut that one in half, and so on until you can't miss it.

Date: Wed, 19 Nov 2014 02:21:02 -0500
From: Roy Morgan <k1lky68@gmail.com>
Subject: Re: [R-390] RF Deck B+ short (390A)

There has been circulated a method to isolate a short in the B+ by unplugging the modules in a certain sequence. I seem to remember this from some manual, or maybe it was a post by Roger. In any case, put the ohmmeter on the B+ line and unplug things one at a time.

Date: Wed, 19 Nov 2014 09:47:45 -0800
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] RF Deck B+ short (390A)

At that order of magnitude of resistance, I'd suspect an internal short in a coil.

Date: Wed, 19 Nov 2014 13:07:30 -0500
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] RF Deck B+ short (390A)

Run through the band switch and see if the short exist on all octaves. B+ runs through several of the RF tuning circuits and some times a bit of fuss will get lodged in the RF transformers and give you a short. Also pull all the tubes and check the resistance again.

Measure from the tube plate pins to ground.
You should see the plate resistor value.
If you see more then the short is not in that B+ leg.
If you see less then look for the short between the tube socket plate pin and the plate resistor.
Just some idea on how to probe the circuit and divide the problem down.

Date: Wed, 19 Nov 2014 10:59:27 -0800
From: Dennis Wade <sacramento.cyclist@gmail.com>
Subject: Re: [R-390] RF Deck B+ short (390A)

Thank you all very much. I've already isolated the short to the RF deck with the unplugging modules technique. I will pull the tubes and do the measurements possibly tonight, more likely tomorrow night.

Date: Wed, 19 Nov 2014 21:48:20 +0200
From: Grayson Evans <wa4gvm@gmail.com>
Subject: Re: [R-390] RF Deck B+ short (390A)

I agree, make sure you remove the tubes, there could be an internal short in a tube element.

All the coils are “isolated” from B+ by resistors of fairly high value compared to 60 ohms, but it would not hurt to see if turning the band switch changes anything. When resistors are damaged, they usually go UP in value, so I would not expect a bad R.

I would trace the B+ line from where it comes in on J208 through the chassis and disconnect it someplace in the middle of it?s run to help isolate the low resistance.

This could easily be a pinched B+wire someplace. I am overhauling my RF chassis as well, it happens to be on the bench now. I was replacing some caps and giving it a clean. I will poke around and see what looks like a likely suspect.

Date: Wed, 19 Nov 2014 22:01:14 +0200
From: Grayson Evans <wa4gvm@gmail.com>
Subject: Re: [R-390] RF Deck B+ short (390A)

A little more info for you. My RF deck is on the bench, tubes out, everything disconnected including the coils I measure 125K from pin A to ground. This high value is probably due to the coils being unplugged. It is very hard (for me) to trace the B+ line under all that circuitry, so it might be hard to disconnect someplace convenient.

Notice that L209, the RF choke that is attached to pin A is 25 ohms, so your short is really 60-25 or 35 ohms. With the tubes removed, try measuring from the tube plate pins on the sockets to ground and see if you see anything weird.
You got me interested, so let me/us know what you find.

Date: Wed, 19 Nov 2014 12:01:56 -0800
From: Dennis Wade <sacramento.cyclist@gmail.com>
Subject: Re: [R-390] RF Deck B+ short (390A)

Thanks Grayson. Just a little more background...the receiver was in daily use until one day it just started blowing fused. I had the same impression about resistors which is why having a good C308 made be expect a 2.2K reading (or higher), not 60 ohms.

Date: Wed, 19 Nov 2014 12:03:40 -0800
From: Dennis Wade <sacramento.cyclist@gmail.com>
Subject: Re: [R-390] RF Deck B+ short (390A)

Ah, ok..great info about L209. I'll keep that in mind.
I will certainly keep all informed...but maybe not till Thurs night.

Date: Sat, 29 Nov 2014 17:13:25 -0800
From: Dennis Wade <sacramento.cyclist@gmail.com>
Subject: Re: [R-390] RF Deck B+ short (390A)

Good evening all. I hope everyone had a wonderful holiday. Well it took a little longer to get back to this than I thought, but I did pull the tubes and looked at the resistances from plates to ground. V201 shows a dead short, and the plates of V202, 203 and 204 show about 2.4K ohms to ground instead of the 20K nominal the manual specifies. I get infinite resistance from V205A and B, 206 and 207, but the deck is out of the mainframe. Looking at the schematic, my untrained eye sees that C248 (5000 pf to ground) is a likely suspect, with C254 and C276 being less likely. The 2.4K I'm seeing on the other plates is likely R205. Thoughts? Think I'm getting warm? :)

Date: Sat, 29 Nov 2014 18:04:13 -0800
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] RF Deck B+ short (390A)

Dennis, Looks like good progress. Yes, C248 is a good possibility. If not, your problem is probably in the plate coils for V201 - if any 1 of the coupling caps C249 through C254 short, all bands will be shorted to ground through the coils Z201-1 through Z206-1. An easy way to track down which one would be to use an ohm meter that measures very low resistance fairly accurately and measure each one. If that is not feasible, measure across C248 and pull each tuning assemblies just mentioned one by one. You'll find it.

Date: Sat, 29 Nov 2014 20:45:17 -0600
From: Cecil <chacuff@cableone.net>
Subject: Re: [R-390] RF Deck B+ short (390A)

Sounds like a great candidate for a complete recap...you never know when the next one will let loose...

Date: Sat, 29 Nov 2014 23:34:01 -0600
From: "Bill Hawkins" <bill@iaxs.net>
Subject: Re: [R-390] RF Deck B+ short (390A)

Well, if you feel that way about it, might's well replace all the tubes and all the resistors, because you never know. If you do that, there won't be an original solder joint left, leaving the set in poorer condition than it was. Bite the bullet and prepare to find the next problem, if it happens in your lifetime. Shotgunning is like saying, "Kill them all and let their god sort them out." No flame intended - never liked the shotgun approach. Besides, you won't have to buy mystery novels when you've got the occasional real mystery to solve. It's good mental exercise, right Roger?

Date: Sat, 29 Nov 2014 21:50:43 -0800
From: Dennis Wade <sacramento.cyclist@gmail.com>
Subject: Re: [R-390] RF Deck B+ short (390A)

Well, the winner is.... C248 Dead short. What threw me was it was a cap I replaces about 10 yrs ago when I selectively recapped it. Didn't expect a newer
part to go. So now to button it up and make sure it doesn't blow fuses anymore. As far as I can tell, there's no reason I can't power up the receiver with the panel dropped? I want to be able to apply power with as little reassembly as I can get away with just in case. Thank you all for the advice. It helped a lot.

Date: Thu, 4 Dec 2014 12:42:31 -0600
From: <ngietz@mymts.net>
Subject: [R-390] C227 in R390A

Greetings all... I have a 1963 vintage R390A that I'm going through. Right now, the RF section is getting attention. But I'm wondering whether C227, the stud mounted cap on the RF deck should be replaced. I usually terminate and replace all paper caps without prejudice in vintage electronics, but I believe this one is an oil-filled cap and may be more reliable than the brown beauties and
their waxy cousins. What say you? Use it or lose it?

Date: Thu, 4 Dec 2014 10:46:58 -0800
From: "Craig Heaton" <hamfish@efn.org>
Subject: Re: [R-390] C227 in R390A

So far no problems with that one.
Never cut one open to see if it is oil filled? YMMV

Date: Tue, 09 Dec 2014 05:30:36 -0500
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] C227 in R390A

>C227 is a cathode bypass...so metalized film cap should work fine.

Also note that there is very little possibility of collateral damage if C227 fails, and no indication (IME) that it is prone to failure, so there is no reason to replace it unless it does fail. In all but the earliest radios, C227 is paralleled by a 47 pF capacitor (C257) to improve the RF bypassing of V201's cathode.
Since C227 is an RF bypass capacitor, the best replacement is a ceramic (X7R or COG/NPO). For example, Mouser p/n 810-FK11COG2A473J.

If someone is looking for caps to replace: The cathode of V201 (where C227 is located) goes through a 220 ohm cathode resistor to the "cathode bias line" (Terminal 1 of TB102, "RF Gain"), which is bypassed to ground with C103, a 50 uF electrolytic. C103 is known to fail sometimes, so if you're on a mission to replace as many caps as possible, consider that one. (But again, the chances of collateral damage are very low even if C103 does fail.) I do not replace C103
as a matter of course, but I do look it over for signs of distress and check it with a VTVM on the Rx1 range to make sure (i) it is not shorted and (ii) it appears to charge up at a rate consistent with a 50uF cap.

Date: Sat, 13 Dec 2014 11:30:51 -0700
From: W2xj <w2xj@w2xj.net>
Subject: [R-390] Crystals

Does anyone know who, if anyone, still makes custom crystals?

Date: Sat, 13 Dec 2014 11:09:21 -0800
From: "Craig Heaton" <hamfish@efn.org>
Subject: Re: [R-390] Crystals

International Crystal still does. The package may be different, but the pin diameter and spacing is the same. Pricey!

Date: Sat, 13 Dec 2014 13:52:43 -0700
From: W2xj <w2xj@w2xj.net>
Subject: Re: [R-390] Crystals

Are sure they still do this? Someone on another list says he called and they said they don't do it anymore. Insight?

Date: Sat, 13 Dec 2014 22:42:53 +0000 (UTC)
From: Norman Ryan via R-390 <r-390@mailman.qth.net>
Subject: Re: [R-390] Crystals

Here's a link to a website: http://www.icmfg.com/
Is this what you had in mind?

Date: Sat, 13 Dec 2014 18:33:17 -0500
From: John Vendely <jvendely@cfl.rr.com>
Subject: Re: [R-390] Crystals

I buy custom crystals of a variety of types from International on a pretty regular basis, including some I received just a few weeks ago for a TMC frequency synthesizer. They're very easy to work with. Providing a proper spec for a custom crystal is the primary stumbling block for most folks. If it's for military equipment you can usually provide the crystal's "CR" designator and the oven temp, if applicable, (e.g. CR-27/U at 70deg. C) which greatly simplifies things. International has a full set of military crystal specs and can work from that. They also have crystal specs on hand for a pretty wide variety of commercial
equipment, and may have a spec for R-390A crystals.

Date: Sat, 13 Dec 2014 21:30:06 -0500
From: Bob Camp <kb8tq@n1k.org>
Subject: Re: [R-390] Crystals

If you call and ask for a 200 KHz crystal for an R-390 or a 100 KHz standard crystal for an HQ-XXX you will indeed get a “don’t do that anymore type answer.
It all depends on the crystal you are looking for The normal range AT’s are still being made.

Date: Sat, 13 Dec 2014 19:28:10 -0800
From: "Craig Heaton" <hamfish@efn.org>
Subject: Re: [R-390] Crystals

Give International a Call! Toll free number, worth a few minutes. Digging thru the paper stack: June 2008 I purchased a 200KC crystal for the calibrator R390/A, total price $115.23.....pricey but works. December 2013 I purchased a 7.294MHz crystal for the olde Junkston Viking "500".....price $31.25.....as stated before; different package but same pin diameter & spacing....works just fine. They have a long list of RX's & TX's that they will make a crystal. One of the first question is the capacitance loading. Don't sweat the number.....it is in their files already and will just take a few minutes for them to look.

Date: Sat, 13 Dec 2014 23:54:23 -0600
From: Ron Kolarik <rkolarik@neb.rr.com>
Subject: Re: [R-390] Crystals

You can try Quartslab, may be a bit less than International Crystal.
http://www.quartslab.com/

Date: Sun, 14 Dec 2014 17:05:56 -0600
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: Re: [R-390] Crystals

The "cant get that any more" about crystals is a little humorous. I heard that at a hamfest from a guy who was very bitterly complaining that he cannot order FT-243 crystals.

Now of that, no, you probably cannot get newly made FT-243 crystals but if you are going to be passionate about using those rocks in a radio then you should also know that you can pull out the crystal wafer and either lap it down by hand or move the frequency slightly lower by increasing the mass on the crystal wafer with pencil writing. I probably have 200-300 FT-243 crystals stored in rows by rows in cardboard boxes. Maybe when I retire (in 15 years) I will resort to hand grinding the crystals for custom orders and charge $30 each for them.

With the availability of so many scrapped and scavenged R-390A's on the auction sites you might need to pay $100 to buy an RF deck with the crystals intact. Those socket mounted ones for the calibrator that are in the back corner may be a bit harder to find. Often it seems that the complaints about something being available is either related to a call to a manufacturer when they say "do you make crystals for the R-390A?" Well, their answer is going to be no. You are asking someone to do the leg-work for you to dig up the crystal specs so
they can sell you one crystal (or two or three). There just is not enough margin in it for the inside sales-person to go on a hunt for you. When you call, know exactly what they are going to ask and have it ready. Your success rate will go way up.

Date: Sun, 4 Jan 2015 21:56:39 -0800
From: Dennis Wade <sacramento.cyclist@gmail.com>
Subject: [R-390] IF out cable needed

The coax that normally connects J116 (IF out jack) to the IF deck (J514) has an open center conductor. The only reason I know this is when
swapping cables around to inject 455 to the IF deck for alignment, nothing
happens. Sure enough, the ohm meter confirms open center conductor, likely
at the right angle connector.

Anybody have a spare I can buy? I'm not going to be able to fix this one. If no spares, who can make one?

Date: Mon, 5 Jan 2015 09:09:03 -0500 (EST)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] IF out cable needed

I might have one (not sure if its that specific cable, a cable with just one MBNC on it, or what) but will try to look and let you know. Curious as to why you're not able to repair the one you have? The end connectors are resolderable, etc., so if its in the connector, that should be possible. BTW, congratulations on finding the open filter capacitor connections. That did make the most sense based on what you were reporting.

Date: Mon, 5 Jan 2015 11:10:59 -0500 (EST)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] IF out cable needed

The right-angle connectors are also repairable. There is a disc soldered to the "side" of the connector that will pop out when the solder is melted. Be careful, wear eye protection, etc., as hot solder can splatter easily with this operation.

Once the disc is out, the center conductor repair is pretty easy. There are cut-away drawings of the various connectors in the manuals.

Date: Mon, 5 Jan 2015 11:18:39 -0500 (EST)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] IF out cable needed

I guess to clarify, the disc can be popped out when the solder is melted. I think I made that sound like it will pop out on its own and that's not necessarily the case. Heating the connector and tapping it on the bench should pop the disc out. I'm not sure if there's a small hole where a pointed tool (dental pick, etc.) can be used or not. As I recall, I just heated it and tapped it on the desk and the disc came out. I'll still check on what jumpers I have on hand.

Date: Thu, 8 Jan 2015 13:49:57 -0600
From: <ngietz@mymts.net>
Subject: [R-390] R390A RF deck advice

Hi all, first I want to thank everyone who responded with advice about replacing C227 (I think it was) in a general overhaul of this 1963 Teledyne RF deck.
Now, I have several more questions:

1)How critical are the values of the 27 ohm resistors on some of the grids? A couple are up to 36 or 39 ohms. What effect if any would that

kind of difference have on receiver operation or gain?

2)Some time ago I ordered some replacement slugs for the tuning coils and they came with brass slot head screws rather than the Bristol spline screws I was expecting. The slugs are still coded with the red and white dots. Is there a chance I got incorrect slugs or are the brass screw slugs just a late manufacturing change?

3) Does anyone disconnect the heater line on HR202? Seems to me the crystals and associated components would last longer without all that heat. That corner of the deck has the worst cluster of out-of-spec resistors etc., and I suspect the heat did it. I'd guess there might be a slight effect on stability, but I'm not using it for RTTY. Thanks for all your wisdom!
Nelson Gietz

Date: Thu, 8 Jan 2015 23:49:49 -0500
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] R390A RF deck advice

I seen some of the slot head replacement slugs back in 73 - 74 - 75 days. We thought they were not the right type. But they did align and tracked OK.
Give yours a try if they work then OK.

You will know real quick if they will or will not work. As all the RF and IF slugs in the R390/A are equal, find an octave that works and is up to par in performance. Swap you new slugs into the RF cans and try and get them aligned. The octave will either align as expected or you can believe the slugs are not correct.

27 / 39 is about a 30 % error.
Consider your skill level and all that could go wrong. You may just want to leave it alone.

Do everything else to the receiver and see what your sensitivity level and signal to noise ratio is. If you have a good 25:1 overall noise ratio leave the parts alone. If you are under 25:1 and have the best tubes you can find in the receiver then go back and do some changes. 30:1 is all you can expect 28 29 is likely.

The thought is that the 17MHZ crystal wants to be run at temperature to be on frequency.

Chances are good you can run the receiver with the heater line open. Try it. you can always go back to heating if you find the receiver drifts too much when used under 8 Mhz.

You can zero the cal crystal even if it is run cold. After the receiver warms up a few hours there is not likely to be a big difference in temp inside the oven with or without heaters.

Give it a try and see what you experience.
You cold be happy with how the receiver works for you.
If not it's all reversible. Roger AI4NI

Date: Thu, 8 Jan 2015 23:07:12 -0600
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] R390A RF deck advice

It might be picky of me, but, I think that's about a 44% error, correct?

Date: Fri, 9 Jan 2015 00:39:30 -0800
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] R390A RF deck advice

Hi Roger, Did you mean that the IF slugs are the same as the RF slugs? I thought they were different.

Hi Nelson, I have a couple 390A's and the RF deck doesn't seem to get very hot around the crystal. Maybe the oven in that one is stuck on, so it's over heating.

Date: Fri, 9 Jan 2015 12:37:48 -0500
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] R390A RF deck advice

I did not mean every slug in the whole receiver was the same.
There are just two kinds in the R390A RF deck.
Six each of an IF type and 18 of the RF type.
And your point about the oven being stuck on is a good idea to investigate.

Date: Fri, 9 Jan 2015 12:57:19 -0500
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] R390A RF deck advice

Whatever, 44.44% its enough to consider changing.

The 27 ohm resistors are inline parasitic suppressors.

After 50 plus years I would think they were getting well aged and quieting down.
Why would you want to install new fresh noisy resistors now? You have

just gotten these well seasoned.

Their exact value is not the function of the resistors. First we need to understand the function of the resistor in the circuit. Then we need to understand how it was suppose to provide the features we expected to get from the resistor. Then we need to look at the whole lot of modern resistors and decide which type provide the best performance features in the receivers circuit.

Do the carbon comp resistor get noisier over time and thus we should change them all every 20 years or so? Or do we think they quiet down over time and should be left alone even as the low current DC resistance value drifts up or down? Are very old new stock resistors less noisy than when new?

Date: Fri, 9 Jan 2015 14:43:27 -0500 (EST)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] R390A RF deck advice

The percentage out-of-tolerance was given as one point to consider as to whether to change the resistor(s). Since there is considerable difference between 30% and 44%, I just wanted that clarified. Again, I said that I might be being too picky...

As for whether carbon-comps get better with age, I don't know. So many electronic devices get worse with age but perhaps carbon-comps don't? Again, I don't know.

If noise is the primary consideration, then aren't other resistors a better choice than carbon-comps?

Date: Sat, 10 Jan 2015 02:25:54 -0500
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] R390A RF deck advice

I put some other bad numbers in a post.
The IF deck needs to get us 27 or 28 to 1 for 150 uv at 455.
We will never see a receiver do those numbers end to end.
We would like to see 20 : 1 end to end.
We can get a bit over 20: 1 but you need to really pick tubes to get much over
20:1 end to end for noise.

I will admit, I seen one receiver get 30:1 end to end in 1974 with a lot of work and only on one octave.

We look at these resistors and their values. First off we see a resistor that 44% out of range 27 vs 39. If it was a 100K resistor and 44% over value we would say OMG it needs to be changed.

If was a 27 ohm cathode bias resistor that set the grid bias operating point of the tube stage we would again consider the resistor to far out of range and change it.

But these are just parasitic suppressor resistors. What do we really expect them to do in terms of circuit performance? Is the value critical or would any thing under a 100 ohms work OK?

And I just do not know about carbon resistor noise over the age of the part.
Maybe these things do get quiet over time and should be left alone.

We do find these things 27 ohm resistors read 39 ohms.

Now we need to get smart and know if this is a meaningful observation and have a part that needs to be changed. Or is it not so significant and should just be left alone as changing the part introduces more problems than it solves.

I thought that we should go back to the end to end signal to noise and sensitivity test as a guide. If the receiver will muster up and pass then leave the parts alone. If the receiver will not pass then you need to make sure you are going after real problems and not just grasping at straws. Again the usual suspects (tubes) need to be considered first. After you do all the easy things like clean contacts and get a set of low noise tubes and still do not have the
sensitivity or noise ratio, then go back and visit these out of range resistors.

Fellows come along and find these things.
They ask us if its a problem.
We need to give advice that helps individuals solve problems.

Date: Sat, 10 Jan 2015 04:32:50 -0500
From: Roy Morgan <k1lky68@gmail.com>
Subject: Re: [R-390] R390A RF deck advice

Just checking that I understand the basics:

By: > "The IF deck needs to get us 27 28 to 1 for 150 uv at 455."

You mean:

Put 150 microvolts into the IF deck input at 455 kc
Set the right bandwidth (4 kc?)
AGC off
Turn signal generator modulation on and off (30 percent at 1 kc) and look for 27 to 28 to 1 noise voltage level change at the audio output.

and by > "We would like to see 20 : 1 end to end. ?

You mean
Put the signal into the RF input of the radio
Signal modulated 30 percent 1 kc
20 to 1 modulation on to modulation off, audio tone to noise at the audio output.

I know you've described this noise test before (and I've saved it here somewhere) but I wanted to check the basic ideas. I do have a URM-25F here, but unfortunately no R-390 of any sort to test.

Date: Sat, 10 Jan 2015 14:22:29 -0500
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] R390A RF deck advice

You need some more toys.

Use the 2KC band width on the IF and end to end we would like to be under 10 microvolts sensitivity and likely down around 4 micro volts in the 8 MHz to 32 MHz range. All the ugly long details are on the R390A.net page with more other good words than one can read in a week.

Date: Sat, 10 Jan 2015 16:15:11 -0800
From: Dennis Wade <sacramento.cyclist@gmail.com>
Subject: [R-390] MB connector re use (right angle)

Has anyone successfully pried apart and reused the braid clamp on the right angle MB connector from the IF out jack to the IF deck? I need to repair the center conductor on the rt angle, but the clamp isn't cooperating..even with the petals pried open the coax isn't budging.. Otherwise I'm making the usual calls on Monday to Fair and to The RF Connection...they seemed to have had some in the past.

Date: Sat, 10 Jan 2015 21:58:06 -0600
From: <ngietz@mymts.net>
Subject: [R-390] R390A RF deck advice

Guys, I've been reading your comments with great interest. Roger makes a fair point about considering my skill level, since I'm new in this group.

FWIW, I've been soldering in old radios for more decades than I want to count. On this
R390A, I've been through the resistors and caps on the AF and IF decks so far, and have dismantled, cleaned lubed, reassembled and synced the gear train.

I'm no EE or mathematician, but some online research about the parasitic suppressor resistors suggests that (at least in audio circuits, and I don't see why that wouldn't apply to HF circuits) if the resistor values are too high they can roll off the gain on the higher frequencies where good gain might be most needed. In view of that and after all the other work done, it would be a waste not to finish the job, and replace the over-value suppressor resistors. I have no idea whether carbon comp resistors get quieter with age.

Re the brass-screw RF slugs; I'll do what I probably should have done in the first place and check with Fair Radio on whether these are indeed correct. No big deal to reorder if it gets this radio up to or near spec.

As far as disconnecting the heater of HR202, my reading of the RF Deck Electric section of W. Li's "Pearls" leads me to think it's not a good idea after all, considering the crystals are cut to run on frequency with the heater operational. When I was running the receiver before the RF deck overhaul began, the thermostat seemed to be "tinking" off and on just fine. I guess I was just surprised at how warm to the touch HR202 was.

So, those are my conclusions so far.
Thanks for your observations. Nelson

Date: Sun, 11 Jan 2015 00:49:14 -0500
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] R390A RF deck advice

There is a lot of good stuff in the Pearls. Over the years us fellows have been through most of the problems and hashed the topics over pretty good. So the answers are in the Pearls some where as we have been there and done that all at least once. There are reasons to leave the oven heaters on as you found in the Pearls. If you feel your solder skills are up to it then jump in and replace some parts as you see fit. You have taken the measurements and have reason to change parts. You're just not into it because you feel it needs to be done.

If your slugs come from Fair Radio, I think the guys there would have gotten you the right parts. We just do not know every bit of electronic and part engineering property. So we get to just use our best judgment. Keep working on the receiver and get it back in use.

Date: Sun, 11 Jan 2015 00:57:46 -0500
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] MB connector re use (right angle)

Just many years of gunk in yours. If the coax is long enough, you can cut it off at the connector and then pick, pry and prod the old coax out of the connector one bit at a time. These things are rebuildable and I have done a few myself in the past. One of the fellows made a point last week about wearing your safety glasses as you heat up the solder iron.

Date: Sun, 11 Jan 2015 02:38:32 -0500
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] R390A RF deck advice

>some online research about the parasitic suppressor.....

Correct theory, but missing some particulars. The "grid stoppers" in HF amplifiers are designed to prevent oscillations well into the VHF region (hundreds of MHz). They could increase by 400% or more and still not impair the in-band performance of the stages.

>I have no idea whether carbon comp resistors get quieter with age.....

As a grid stopper, the only noise of concern is the Johnson (thermal) noise, which does not change over time. If there were current through the resistor, its "excess noise" would come into play, and that may change over time. But in the case of grid stoppers, only the vanishingly low grid current flows through the resistors, so the excess noise is completely insignificant. There is no reason to change grid suppressor resistors in a 390 that have increased by 30%, 44%, or even 200%.

Date: Mon, 12 Jan 2015 11:04:12 -0800
From: Dennis Wade <sacramento.cyclist@gmail.com>
Subject: Re: [R-390] MB connector re use (right angle)

Thank you Roger for the encouragement. After some careful attention and a
few choice words, I managed to get the clamp off and repair the connector.

There's mention in the Pearls of different kinds of miniature coax and how well it fits into the MB connector. A white jacketed coax was mentioned as being a tight fit, and the cable I was working on is newer and white jacketed. Sure enough, the clamp wouldn't go over the cable. So I elected to take an appropriate sized drill and gently ream out the clamp. Results...braid folded over the shoulders and trimmed...worked like a

charm.

Date: Fri, 23 Jan 2015 00:37:09 -0600
From: <ngietz@mymts.net>
Subject: [R-390] R390A RF deck resistor and slugs

I've been attacking out-of-spec resistors and caps in this Teledyne RF deck with soldering iron, head magnifier, forceps, and dental picks with pretty good success so far. But I've landed on a mystery in this enigma. In the Cal. Osc. section on V205B, the R228 resistor off anode pin 6 is 56K. (It ohmed out at 62-point-something thousand, so has to come out regardless.) The schematics and all the parts lists I've found specify 5600 ohms, a tenth of what's there. An orange band for red is probably an easy misread on the assembly line. Should I follow my instincts and put in 5600?

Also, an answer to one of my previous questions, about some RF slugs I received with brass slot-head screws instead of the Bristol spline heads. Phil at Fair Radio says these must be for an R388 or R390, so I put it down to a miss-order, and some correct slugs are on their way.

But what's your advice on R228? Nelson Gietz

Date: Fri, 23 Jan 2015 01:17:29 -0800
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] R390A RF deck resistor and slugs

Hi Nelson, That stuff is kind of crammed in there, but I think your looking at the wrong R228. I think your looking at R210 on the 1st crystal osc. Any way, in my Stewart Warmer, both are as the schematic shows (R228 = 56k and R210 = 5.6k). Good news on the tuning slugs.

Date: Fri, 23 Jan 2015 17:04:16 -0600
From: <ngietz@mymts.net>
Subject: [R-390] R390A RF deck resistor and slugs

Larry nailed it. And my face is red... good thing I stopped for the night. The resistor is indeed R210. Thanks to Larry, and to Franco for some interesting observations on plate resistors.

Date: Mon, 26 Jan 2015 22:42:52 -0600
From: <ngietz@mymts.net>
Subject: [R-390] R390A 2nd osc. hot R406, R407

Having gone through this RF deck, I'm hoping you more experienced guys can explain this. The two resistors in the B+ supply line to T401 and V401 were seriously cooked, to the point of darkening the phenolic on the turret board where they were mounted. They each measured about 1K

instead of the spec'd 3.9K. I subbed them, but want to avoid a recurrence.
The grid resistor R404 was high at 137K instead of 120K, and it has been replaced as well. I used a digital meter and then a cap checker to check for leakage to ground from the B+ at 250V. They both show infinite resistance with the band switch rotated through its full range.
The windings of T401 are in spec, and in a visual check look very healthy.
Any thoughts on what might have cooked those two resistors? (I seem to recall seeing something about an overdriven V401 doing that, but how would it be overdriven?) Nelson

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Date: Mon, 26 Jan 2015 21:24:57 -0800
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] R390A 2nd osc. hot R406, R407

Hi Nelson, Are you using SS recs in your rx? If so, the power-on voltage could go higher than the 260 V with tube recs, and if you're turning it on by switching to AGC immediately, you should check C411 at 300 V, otherwise at 275V (even though the max is about 255 V). However, if your line voltage is more than 115 VAC, you should also account for that.

Date: Tue, 27 Jan 2015 02:55:06 -0500
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] R390A 2nd osc. hot R406, R407

>Any thoughts on what might have cooked those two resistors?

Leaky capacitor(s) attached to S402 (C417 through 431E). More likely one or more of the fixed capacitors (C417 through C428), but the variable trimmers are suspect, too.

A note about troubleshooting procedure: Resistors are cooked by higher than normal current flow. In the case of R406 and R407, the current flows from the B+ supply, through these resistors, to the oscillator circuit. So, we are looking for where B+ current could possibly go, *downstream* of R406 and R407. That means C411, T401 (primary could have a short or leakage path to ground), V401 (extremely unlikely), or leakage through one or more of the capacitors mentioned above.

Also note -- there was absolutely no reason to replace R404 -- it was barely out of spec (assuming it was a 10% resistor -- if it was a 20% resistor, it was well within spec). Every bag of 120k, 10% resistors used by the manufacturer on the day the radio was made contained some resistors with values higher than this. Very few resistors in a 390 or 390A (or, for that matter, any tube radio) are critical as to value. In most cases, you would never notice any difference with resistor values +100%

or -50% from nominal value, and in many cases you would never notice any difference with resistor values +200% or -75% from nominal value. There is simply no reason to go through a boatanchor with a DVM looking for resistors to replace. Replace the ones that cause symptoms (i.e., troubleshoot the radio when it is not working properly, and otherwise leave it alone). The exceptions are the well-known troublesome capacitors and a few resistors that run too hot by design.

Date: Tue, 27 Jan 2015 19:05:22 -0500
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] R390A 2nd osc. hot R406, R407

Charles nailed this one for you. So once upon a time V401 went short and the resistors got burnt. The tube got replaced. The receiver worked OK and things were left. You found some parts that had long ago been stressed. As Charles pointed out, these receivers can take a lot of abuse and still work. But as long as you are there, I would replace the seriously cooked parts.

Date: Tue, 27 Jan 2015 20:20:10 -0500
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] R390A 2nd osc. hot R406, R407

>So once upon a time V401 went short and the resistors got burnt.
>The tube got replaced.
>The receiver worked OK
>and things were left.
>
>You found some parts that had long ago been stressed.

I guess I wasn't as clear as I had hoped! I don't think V401 had anything to do with it -- its cathode couldn't boil off electrons fast enough to cook R406 and 407, under any circumstances. I think the problem is one or more leaky capacitors attached to S402. Most likely, one or more of the fixed capacitors C417 through C428, but possibly one or more of the variable trimmers. I suspect the problem cap(s) is (are) still there. Of course, they don't actually draw excessive current until you switch to the band(s) with the bad cap(s). If you're lucky, the oscillator won't work on that band(s) and you'll know something is wrong. But I wouldn't bet on that.

This actually could be one of those rare occasions when it is wise to replace more than just the bad component. If one or more of the S402 caps is bad, it is likely due to environmental conditions -- in which case, they may all be at risk. So, once you find one bad cap attached to S402 (BUT NOT BEFORE -- don't shotgun without troubleshooting), you might want to consider replacing them all.

Date: Tue, 27 Jan 2015 20:41:16 -0600
From: <ngietz@mymts.net>
Subject: [R-390] R390A 2nd osc. hot R406, R407

Larry wrote: Are you using SS recs in your rx? ...

Yes, there are SS rectifiers, with no apparent voltage dropper installed. I plan to deal with that later. Line voltage is a consistent 117 VAC. I did a leakage check up to 450V, no leakage at C411.

Charles wrote: Leaky capacitor(s) attached.....

When I did the leakage test, I connected to the osc. B+ line with the circuit intact, then cycled the band switch. If any of the above was leaking it should have showed up, no?

Charles wrote: Replace the (resistors).....

With the work involved to remove, clean up and replace the RF deck, I simply decided to take care of anything out of spec. on the assumption the designers picked most of those values for a reason. Don't want to do it again for a long time. As far as those resistors that run too hot by design, does anyone have a list of the likely suspects?

Roger wrote: ..... The receiver worked OK and things were left.....

...and, that's pretty much the conclusion I have reached as well.

Date: Tue, 27 Jan 2015 23:18:37 -0500
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] R390A 2nd osc. hot R406, R407

>When I did the leakage test, I connected to the osc. B+ line with
>the circuit intact, then cycled the band-switch. If any of the
>above was leaking it should have showed up, no?.....

Maybe or maybe not. What do you mean by "showed up"? Were you monitoring the B+ current at the time, and looking for relatively small differences? Resistors cooked as you describe were most likely only moderately overloaded, over a long period of time, so it might not be much of a leak as of yet. It also may take a while to develop (minutes or even hours) if there is a bad cap that is only conditionally leaky at this point -- say, after the radio gets hot and/or the cap has had B+ across it for a while. So at this point it
might take careful observation and some time to tell, as opposed to "I

switched through all the positions and the resistors didn't immediately go up in smoke."

I'm still not inclined to think it was V401 drawing too much current (for example, if the tube suffered from grid emission and ran away). I could be wrong about how much cathode current a 6AK5 could draw in extremis, but even so it is extremely unlikely that the tube would suffer a high-current fault (grid emission is the only thing I can think of that could cause it, and I've never seen that in a
small-signal pentode; or physical contact between the grid and the screen, which is even less likely). So, I just don't see V401 as likely to be the fault that caused damage to R406 and 407. Leaky mica capacitors, on the other hand....

Date: Mon, 2 Feb 2015 12:18:20 -0600
From: <ngietz@mymts.net>
Subject: [R-390] R390A 2nd osc. hot R406, R407

.....I think the problem is one or more leaky.....

Yes. I suspect that my cap checker's leakage test may not have been sensitive
enough. I have reinstalled the RF deck because I wanted to confirm it is indeed
generally operable after all the work done, and it is. Badly in need of a full alignment of course. But there are a couple of things to take care of before a
detailed voltage check through the full range of S402 on the V401 B+ circuit.
This might take a week or so to get back to. Thanks for the coaching!

Date: Mon, 02 Feb 2015 14:48:53 -0500
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] R390A 2nd osc. hot R406, R407

>Yes. I suspect that my cap checker's leakage test.....

Fingers crossed, I hope you find a definite answer. You may need to warm the radio up fully, then switch through the bands slowly while monitoring the current through R406 and 407. You can just measure the DC voltage across C411, and if it drops by 30v or more on any band compared to the others, consider the cap(s) associated with that band suspect. (I presume you have satisfied yourself that C411 is not the problem?)

C413 should see a nominal 205v DC from the power supply on the RF/IF B+ Line (note that the V401 screen draws its DC from the 150v regulated

supply -- that current does not flow through R406 and 407). I expect a 6AK5 oscillator to draw about 5mA, so the voltage at the plate (Pin 5) (which should be essentially the same as the voltage on C411) should be about 165v. So, if the C411 voltage drops below, say, 135v, you probably have a fault condition.

Warm the radio up thoroughly, then switch through the bands slowly at first (10 or 15 seconds on each band) to see if there is (are) any band(s) that clearly drop the C411 voltage significantly. If the C411 voltage is too low on all bands, C411 is the likely culprit. If you get through all the bands and the C411 voltage stays around 165v, then you need to switch through the bands even more slowly (say, 30 minutes per band) in order to give incipient leaks a chance to show up. If you do that and the C411 voltage stays around 165 on all bands, then your problem has gone away, at least for now. Possibly an intermittent fault that is in remission, or possibly it really was a bad 5654/6AK5 that was replaced along the way (though I'd still be doubtful of that).

Date: Wed, 11 Mar 2015 10:59:08 -0500
From: <ngietz@mymts.net>
Subject: [R-390] R 390A range of RF gain

Still working on this 1963 Teledyne radio, and since it's my first 390A, I'm not
totally familiar with it. So... how much of a control range should I expect on
the RF gain control? I get nothing until I dial it up to about 6 on the scale. I
tried subbing the original (I believe) with a nice Allen Bradley 5K pot and it
seems to operate about the same. Is this typical? The pot swings the cathode bias measured at the pot from 0V (max gain) to +21.5 (min gain). Does that sound right?

Date: Wed, 11 Mar 2015 13:04:58 -0400
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] R 390A range of RF gain

The behavior you describe is about right. Pretty much the RF gain is run at full gain and you back off the audio as needed. Again the design guys back when were trying to use stock parts already in the logistic support chain to avoid the cost of adding new parts and increase the use of parts in stock to generate demand and thus drive down the expense of production by increasing volume. Many of the receiver parts are not exactly the optimum value, but they work.

If you want to spread your RF gain out, consider padding a 1 K resistor across the 5K pot. The two resistors will be in parallel. The value will always be smaller than 1K . The cathode would then run from 0 volts max gain to maybe + 5 volts minimum gain. If that value does not give you complete cut off then up the padding resistor. I read that back in the days, that small value (500 - 2000) ohm pots did not hold up well. The chemical mix needed for the range of resistance and spread over the available surface area in the pot just did not hold up. We see the poor adjusting performance of the IF gain pot as an example of how non responsive the small value pots are / were.

So your RF is good as is. Placing a small value pot in the RF gain will likely lead to not so smooth RF gain change as the pot is adjusted.

Date: Wed, 11 Mar 2015 10:23:33 -0700
From: "Craig" <hamfish@comcast.net>
Subject: Re: [R-390] R 390A range of RF gain

Check out the Y2K, Chapter 5. Looking at my digital copy; figure 5-6 IF Sub-chassis, Voltage and Resistance Diagram.....If your resistances & voltages are within in spec, chances are the pot in question is good to go. How R-103 controls might also be connected to the IF gain pot, other bugs in the radio. "I get nothing until I dial it up about 6 on the scale."; could be related to how strong the signal is.

Date: Sat, 11 Apr 2015 10:50:36 -0700
From: Dennis Wade <sacramento.cyclist@gmail.com>
Subject: [R-390] Z202-1

Well I've pretty much completed (I thought) the work on my Motorola 390A. Went through a complete alignment, set up the IF deck, rolled back the gain some and took some final sensitivity checks. I was very pleased to see that spot checking all the bands yielded somewhere between 0.4 and 0.6 uv for 10 db S+N/N taken as described by Chuck, and this was without going through any real optimizing of tubes and such. This included the 1-2 mhz band.

(When I adjusted the Z202-1 RF coil, I noticed there was quite a bit of change from the last alignment settings. All the other RF coils were very close to their previous settings).

Then one night I went to listen to a local AM station on 1530 and its signal was way down...less than 20 on the carrier meter when it was usually near 60+. On a hunch I checked Z202-1. Sure enough it wanted to peak back where it was before the alignment, with the slug almost all the way down. Peaking it down that far yields better sensitivity, but not as

good as before.

Anyone have a spare Z202-1 they want to let me try? Or, how re-buildable are they?

Date: Sat, 11 Apr 2015 13:02:46 -0500
From: Les Locklear <leslocklear@hotmail.com>
Subject: Re: [R-390] Z202-1

That is the part that is most likely to break.....the slug gets stuck and then the coil turns breaking the wire. Open it up and fix the break, they usually break in a visible area. Epoxy the coil so it won't move and free up the slug so it can move freely. I would bet Fair is out of them. If they have them, it will be at a premium price. American Trans coil at one point was manufacturing them new for Government orders up until maybe 10 years ago. I'm not sure if their website even exists anymore.

Date: Sat, 11 Apr 2015 11:25:19 -0700
From: "Craig" <hamfish@comcast.net>
Subject: Re: [R-390] Z202-1

I've had in the past the same issues on several of the cans in the RF section. Each time the best peaking was with the slug almost all the way down. At times some of the gain would return by retweeking the slug, only to be gone a few days later. Cure: Replace the silver mica caps in that RF can; (all the silver mica caps in that can)

Date: Sat, 11 Apr 2015 11:43:20 -0700
From: Ryan Scott <n7qj.rs@gmail.com>
Subject: Re: [R-390] Z202-1

I recently acquired 5 of these Z202 1-2MC collins 278-0121-00 coils NOS at
the Puyallup hamfest. They look just like the R390 coils but I don't want to pull my R390 out to be sure. The fed PN is 5950-392-6714. Are these the coils you are speaking of? If so I can probably spare one cheap.

Date: Sat, 11 Apr 2015 15:22:46 -0500
From: "Bill Hawkins" <bill@iaxs.net>
Subject: Re: [R-390] Z202-1

Been cleaning out the shop before moving to smaller quarters. The mention of American Trans-coil reminded me that I have a complete RF deck from them from about 9/2000. Label on side says: R390A Final RF unit, 540 7009 005, Collins S/N 370 Seems complete with tubes and calibration crystal. No longer have anything to test it with. How about

$125 plus shipping for 16 pounds from 55438? Also have a Steve Johnston synchronous detector kit (unbuilt) and book, received 12/26/98. Any interest? Bill Hawkins

PS: American Trans-coil has transformed itself into something else. The sale in 2000 was their going-out-of-business sale for R390 class parts.

PPS: If you're interested in precise frequencies, there's an HP 3335A frequency synthesizer for pure sine waves from 200 Hz to 80 MHz. You get
8 digit settings around 3 MHz, good to one Hz accuracy and precision. You could use that as the VTO and the RF deck to build a hybrid with the best of analog RF and digital technologies. Asking $300 plus shipping for 45 pounds.

Date: Wed, 15 Apr 2015 22:48:00 -0700
From: "Drew P. via R-390" <r-390@mailman.qth.net>
Subject: Re: [R-390] R-390 Digest, Vol 132, Issue 7

Barry Hauser (SK) bought the entire R-390( )-related stock of parts from American Trans-Coil. No one seems to know what became of the parts when Barry died.

Date: Wed, 9 Sep 2015 00:00:55 +0000 (UTC)
From: Larry H <dinlarh@att.net>
Subject: [R-390] R-390A 800 cps tone in cal below 8mh bfo off

Hi all, I'm working on an r390a and just noticed that when I'm using the calibrate signal below 8 mh, I hear about an 800 cycle tone with the bfo OFF. It is weak, but it's not right. This rx now works correctly in every respect xecept for this one little thing. The cal does work normally above 8 mh. The antenna is disconnected, so no feed through there (ant is disconnected in cal anyhow).
I've not dug into this yet and was hoping someone might have seen and fixed this before. I searched the forum and net, but no hits. Any help or suggestions would be greatly appreciated.

Date: Wed, 9 Sep 2015 00:21:30 +0000 (UTC)
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] R-390A 800 cps tone in cal below 8mh bfo off

Hi again, One more interesting aspect - as I turn the kc knob back and forth through the calibrate signal, the mystery tone does not change frequency or strength. There is no tone above 8 mh (as you would expect), unless I turn the bfo on - above 8mh it works normally. The calibrate signal level is about the same on all bands, but does vary from band to

band.

Date: Tue, 8 Sep 2015 22:40:52 -0400
From: Roy Morgan <k1lky68@gmail.com>
Subject: Re: [R-390] R-390A 800 cps tone in cal below 8mh bfo off

I suspect something odd about the 17 mc crystal signal that is used below 8 mc. I doubt it's the BFO or the calibrator. Get another receiver and listen to the 17 mc signal, also listen to the calibrator signal with the other receiver. If you can, listen to the BFO signal with the other receiver. I suspect you will soon find out where that 800 cycle signal is coming from.

Date: Thu, 10 Sep 2015 10:05:19 +0000 (UTC)
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] R-390A 800 cps tone in cal below 8mh bfo off

Thanks for the suggestion, Roy. I used my daily R390A to listen to the 17 mc osc and it is clean. I listened to it at 2 points, J221 and 1st mixer cathode. I listened to the calibrator cathode follower at V205 pin 8. Very interesting results here. I listened to numerous points above and below 8 mh. The results are very clean signals with no modulation on all cal frequencies as long as the 1st crystal osc is off (megacycles set to above 8 mh). As soon as I turn it on (by switching the megacycle to below 8 mh) I hear the 800 cps tone easily on ALL cal frequencies above and below 8 mh.

I've tried 3 different tubes in the 3 related sockets, the 2 calibrator 5814 tubes and the 17 mh osc 6ak5. I tried a different 17 mc crystal. I also substituted the RF amp and the 1st mixer. Unfortunately, the fix is not that simple. One weird thing though, when testing, I installed a socket extender in V205 so as to get easier access to the tube pins, and the problem went away. So I tried a different extender with the same results. Take it out and tone returns. I'm sure it's not a socket contact issue as I've deoxed it and the tubes are tight in the socket and moving the tube around causes no change or static.

Question - how can a 17 mh osc cause an 800 cps tone modulation on every cal frequency? Any suggestions greatly appreciated.

Date: Fri, 11 Sep 2015 07:58:57 +0000 (UTC)
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] R-390A 800 cps tone in cal below 8mh bfo off
Content-Type: text/plain; charset=UTF-8

Roy - Thanks for more additional info. I was able to do some additional testing without pulling the RF deck - perhaps a little mickey-mouse, but I

think it gets me there. I was able to add a bypass cap to the 17 mh osc screen grid pin 6 - no help. I was not able to do the plate supply, C328. I was able to add bypass to the cal cathode follower plate and B+ supply - unfortunately no help there either. After thinking about why the extender had an affect on the tone, I tried adding cap to the cal osc plate cap, 150 pfd C312. I added 100 pfd to it and the tone was gone. I am not clear at all how this did it, but will do the trick til I can pull the deck and do more testing. It does not negatively affect the markers that I can tell. Might be a while, but I will report back.

Date: Fri, 11 Sep 2015 10:29:04 -0400
From: Steve Hobensack <stevehobensack@hotmail.com>
Subject: Re: [R-390] Tone in Calibrate Signal

I have had this forever in my '63 Imperial. This was discussed some years ago. Someone said it was due to old resistors changing value in the multivibrator circuit that follows the 200 kHz crystal? The multivibrator makes 100 kHz out of 200 kHz. Since it is a weak tone, I ignore it.

Date: Tue, 24 Nov 2015 07:52:38 -0800
From: "Craig" <hamfish@comcast.net>
Subject: Re: [R-390] R390A BFO /100kc calibrator not working

Hi 5's on the Motorola, good components were used and will be a fine receiver. First, let's find out what you have there? Start with the BFO, is the ballast tube there & is it working? With a ballast tube, the BFO & PTO tubes should be 6BA6's.

No ballast tube, pins 2 & 7 should be jumpered on the ballast tube socket. 12BA6's are used in this configuration.

Got a 12BY7 in the ballast tube socket, the socket has to be rewired under the IF deck. I think 6BA6's are used in this configuration.

At this time, there is no manual in front of me or skizmatic. On the back of the receiver there is a hole so that one can insert a screwdriver and adjust the trimmer cap for the BFO. Give it a twist or two; any change. Does the BFO oscillate anywhere while rotating the trimmer cap.

I had the same issue with my famous "Too Loud Amelco". Using a small freq
counter, MFJ-888, I put the telescoping antenna next to the two tubes used
for the BFO circuit. Darned thing was oscillating at 151KC; not at the required 200KC.

Then with the help of tube extenders (RF deck is no joy to remove and test live) voltages were checked, no joy. Not wanting to spend a life time removing and replacing the RF deck, all of the silver mica caps were replaced. That fixed it.

Also don't forget the 200KC crystal. They ain't cheap, don't drop them. If you have another from a working R-390A give it a go first.

Let us know how things are moving along.

Date: Tue, 24 Nov 2015 15:37:48 -0800
From: "Craig" <hamfish@comcast.net>
Subject: Re: [R-390] R390A BFO /100kc calibrator not working

Mistake on my part while drinking the morning coffee. That hole on the back
of the receiver is for the 100KC calibrator trimmer!!Repeat it is not for the BFO.
Give it a twist just the same, does the cal oscillator do anything.

Date: Wed, 25 Nov 2015 10:06:09 +0000 (UTC)
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] R390A BFO /100kc calibrator not working

Hi Chuck, Congrats on the R-390A. Have you replaced the filter killer cap (c553), yet? If not, give it your highest priority. Since your AM reception is ok, your BFO filament is also ok. It's in series with the PTO filament. If your poking around the BFO tube, be very careful not to short the filament to ground - bye bye the 3TF7. While working on one of these, I like to put in a 12BY7 temporarily. They work great and the 2 oscillators are stable from 110 vac to 120 vac with it. A 12BH7 is also good. You need the very simple mod, though. To check the BFO output I like to scope pin 6/7 of V506, the detector, I also connect my freq meter there to check for stability. Since I assume you've swapped tubes in the BFO and CAL, try cleaning the contacts with deOxit and exercise the pin contacts a little. You can check that the BFO is getting B+ on a tube extender or 'bfo on/off' switch. Sometimes the cal signal seems undetectable due to RF deck mis-alignment or malfunction. Make sure a 10 ¨µv signal gets through, first. Good luck. Regards, Larry

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Date: Wed, 25 Nov 2015 11:49:43 -0500
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] R390A BFO /100kc calibrator not working

I so hate oscillators that do not oscillate on request and you have two of them.

The BFO could be on and just so far off frequency you can not hear it.
The circuit will tune completely out of the band pass of the IF filters.

If the AM works then the BFO and VFO tube filaments are OK.
The tube was checked and tested good.
We expect the BFO to oscillate when the switch is on.
A quick DC volt meter to the plate pin on the tube socket will determine if the BFO is being switched on and off and there is B+ at the tube socket.
Check the DC screen voltage while you are on the socket.

Next level is clean switches wire harness connectors and tube sockets.
De Oxit.
Looking for cold solder joints and bad parts.

Have you looked at the IF and RF deck caps yet?
Do you have the big brown or black plastic caps still in the decks?
These are known to go bad as they are over 50 years old already.
The other small caps hold up OK.
The carbon resistors are drifting way off and you may need to replace a few.

The ground points in the decks are solder lugs with small bolts to the chassis.
These are starting to oxidize and cause problems. You just have to loosen each bolt clean the joint up and re tighten the bolt.
I do not explain why this works but it is a reported cure.

Use the same process on the calibration oscillator.
The documentation for the R390A is at R390.net
There is the nice Y2K manual , TM 11-5820-358 35 the original military TM and a long inspection list available.
The pearls of wisdom are also there. With whole sections of past experience with the BFO and calibration circuits.

Read all the input you get, lots of Fellows commenting with different good ideas. Just like it was done in the shop back when. Fellows, I have a real problem what do you suggest I check next. Please tell us what you find so your story will make it to the archives.

Roger Ruszkowski AI4NI

Date: Wed, 25 Nov 2015 09:57:55 -0800
From: "Craig" <hamfish@comcast.net>

Subject: Re: [R-390] R390A BFO /100kc calibrator not working

Good comments as usual! The BFO paragraph rings a true bell for me. Don't
know if the following information is included in the Y2K, but Chuck Rippel
has it in his R390A IF Deck Alignment webpage.....
http://web.archive.org/web/20080112212514/http://www.r390a.com/html/if_deck
html

Hope the link works. The last item on his procedure is to get the BFO at 455KC with the BFO dial at Zero. Good stuff for us newbees.

Date: Mon, 30 Nov 2015 20:39:54 -0600
From: "Nelson Gietz" <ngietz@mymts.net>
Subject: [R-390] Pulling crystal frequency in R390A

Going thru the alignment process on this R390A on the bench, I find that crystal Y501 for the narrowest bandwidths is about 80 Hz above the required 455 kHz. In the neutralizing procedure C520 adjusts well, but I can't get L503 to tune low enough to resonate the 1 kHz bandwidth at the same frequency. There is no visible evidence of damage or tinkering in T205. Could the two problems be related? (The crystal resonant frequency is about 455.076 kHz out of circuit.)
Also, has anyone heard of or tried "pulling" that crystal frequency to compensate? How would that work in this circuit?

Date: Tue, 1 Dec 2015 07:47:22 -0500
From: Bob Camp <kb8tq@n1k.org>
Subject: Re: [R-390] Pulling crystal frequency in R390A

Except for the calibrator crystal, pretty much every crystal in the R390A is
in a circuit that does not intentionally tune it. Drift of things like 455 kHz crystals
over the anticipated military life of the radio was not considered an important issue. One wonderful quote on the subject “tuned crystals” Not in the spec and the tuning cost money?

The R390 was hardly unique in this respect. A *lot* of gear that was commonly fielded in the 1960?s and 1970?s shared this trait. In some cases.. crystal swapping parties were the only way to get the gear to operate properly.

Date: Wed, 2 Dec 2015 09:53:51 -0600

From: "Nelson Gietz" <ngietz@mymts.net>
Subject: Re: [R-390] Pulling crystal frequency in R390A

Thanks for the observation. I've pretty much concluded there's nothing I can or should do regarding the crystal frequency itself.

The issue I'm now trying to correct is to get the 1 kHz circuit to peak on that frequency as called for in the filter neutralizing procedure (TM-11-5820-35, P.119). It seems to be too high, out of the range of adjustment of L503. It's beginning to look like C524 may have drifted low over the past 60+ years. My math (?) suggests even a 1 pf change in it could swing the LC circuit by up to 3 kHz. I might try to change some lead dress...

Date: Wed, 2 Dec 2015 17:38:43 -0500
From: Bob Camp <kb8tq@n1k.org>
Subject: Re: [R-390] Pulling crystal frequency in R390A

The crystal its self may have drifted. The same is (unfortunately) true of things
like mechanical filters. Lots of possibilities.

Date: Fri, 4 Dec 2015 00:17:28 -0500
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] Pulling crystal frequency in R390A

You could have a problem in T205 if you can not get a good band pass in the 1KHz bandwidth position. The band does not "peak" you just try to put the center between the filter skirts. Output in the 1 KHz band will be lower than in the 2 KHz band pass. The band width of the 1 KHz filter does not change with adjustment. The circuit was designed and built close enough to specifications.
The adjustment just lets you move the band pass to center on the crystal where ever that may be. At 2 KHz band width the filters are close enough to be over the 455 KHz crystal filter center. 6.2.17 in the Y2K manual give an alignment procedure for L503. C524 in Z501 could be out of range. A change of a few PF could let you bring the circuit back in alignment using L503 as it is.

Date: Fri, 4 Dec 2015 00:37:31 -0600
From: "Bill Hawkins" <bill@iaxs.net>
Subject: Re: [R-390] Pulling crystal frequency in R390A

You are a most respected resource for this list. The younger generation wants close agreement to the specs, using gear that wasn't dreamed of in 1960. Thank you for bringing the proper perspective to the process of measurement and alignment.

Date: Sat, 5 Dec 2015 20:06:30 -0600
From: "Nelson Gietz" <ngietz@mymts.net>
Subject: Re: [R-390] Pulling crystal frequency in R390A

Thanks for your information! I tacked a 5 pf cap across C524, and with that in, was able to move the 1 kHz peak to coincide with the crystal frequency. I'm reluctant to R&R the original C524 because the coil leads may not take much more fiddling. So, I'm good to go for the moment as far as tuning Z501 is concerned, but still a bit dubious about L503 and/or C524. May track down a complete assembly for a spare if nothing else.

Date: Sun, 7 Feb 2016 21:01:36 -0800
From: Jason W6IEE <w6iee.73@gmail.com>
Subject: [R-390] Newb question, slugs

I have recently acquired a bit of a beater (yet operational) R390A, and have so far replaced C553, C559, and that leaky cap in the AF section. About to re-stuff the filter caps.

My receiver was stored in a rather "porous" shed in the desert, probably wrapped with (some) plastic for umpteen years. It's just a little dusty, and a lot better than expected under the circumstances.

Understandably, the grease in the gears has hardened into nothing, and there was a definite metal on metal sound and feel. This evening I started applying what I call "Groil" (somewhat equal parts red light weight wheel bearing grease, non-detergent 30 weight, and Marvel Mystery Oil.) to the gears and cams, and have seemed to have everything smoothed up considerably. (with much application still yet to do.)

However, I noticed that one of the slugs in the back is... in my best attempt to describe this, Offset from its adjusting screw. And flexing, when that slug rack moves. (I can shoot a little video of this, if that would help.)

Is there a section of "piano wire" in between the slug and it's adjusting screw? Are they really supposed to deflect? Or is this thing just threaded brass, which is fatigued and about to snap?

Date: Mon, 8 Feb 2016 05:29:06 +0000 (UTC)
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] Newb question, slugs

Hi Jason, Welcome to the list and congratulations on the R-390A.
The slugs are connected to the adjusting screw with a flexible coil tightly

wound heavy wire. It should only flex a little bit or it will bend and not easy to straighten up. If it is bending at all, it is probably binding in the coil form. Be very careful trying to clean the inside of the form - water and oil will damage it. See doc online on this subject. To see if it binding, remove the 2 small screw holding the adjustment plate on the rack and try to move it up and down by hand. Source of sticking can be 1. foreign material in the form, 2. overheated coil form, 3. who knows. If it's sticking (which is not uncommon) try to remove the slug manually then the rack and then the can so you can see inside it to get a better idea of the problem. Good luck and let us know how you progress.

Date: Mon, 8 Feb 2016 02:15:08 -0500
From: Roy Morgan <k1lky68@gmail.com>
Subject: Re: [R-390] Newb question, slugs

The above suggestion will tell you if the slug is sticking in the coil form as it moves UP and DOWN.

WAs you are tightening the two screws removed from the slug plate, move the plate LEFT and RIGHT and FRONT to BACK to center the adjustment screw over the center of the slug. Then the spring will not be bent and there will be no or minimum flexing of the spring as the slug moves up and down.

This “plate” we are talking about is a more or less triangular plate with rounded corners and the threaded adjustment shaft and two screws that hold it to the slug rack.

Occasionally a spring will break at the slug. A small bead of epoxy will re secure it. (NOT cyanoacrylate super glue - use epoxy such as JB Weld.) Clean the end of the slug and the spring. Let no epoxy extend over the edge of the slug (or remove it if it does) - the slug must be perfectly smooth with no bumps or junk on the outside surface.

> Source of sticking can be 1. foreign material in the form, 2. overheated coil form, 3. who knows.

If the slug is sticking, clean the coil form with Q tips, MAYbe with a bit of Windex or alcohol (just a tiny dampness on the Q tip - not a soaking). Then if you want to go whole hog, apply a bit of car wax or butchers wax to the inside of the coil form and to the outside of the slug. Work on the slug gently so as to not break the spring.

You asked:
> Is there a section of "piano wire" in between the slug and it's adjusting
> screw? Are they really supposed to deflect? Or is this thing just threaded

> brass, which is fatigued and about to snap?

It's very much like piano wire (the thick kind that looks like a spring) but there is no central core of solid steel wire - it is a hollow spring, likely made of phosphor bronze or some similar material. They are supposed to flex slightly if needed but only very slightly. It is not threaded brass. (In AM car radios of old that were slug tuned, and home radios of the same construction, the slugs were moved by relatively thin solid wire just like single strand piano wire. In the great majority of slug tuned IF cans in radios, the slug is moved by a threaded rod, but the slug stays put once adjusted and there's no need for a flexible connection to a separate adjusting screw.)

Carry on - you have good questions.

Date: Mon, 8 Feb 2016 07:28:19 -0800
From: "Craig" <hamfish@comcast.net>
Subject: Re: [R-390] Newb question, slugs

I see you already have several suggestions as how to approach the slug issue. Best to remove the two springs that hold the rack. This will let you lift the entire strip containing all three slugs.

Then unscrew the sticking slug from the rack. Using only your hand, insert
that slug into the coil. Is it free to move up and down? If not, first try a dry q-tip to remove dirt/etc. Any better yet?

If not, don't use oils or anything wet. Trust me, the slug has not swelled and increased in diameter! For whatever reason the paper form inside the coil assembly has swelled and the inside diameter is less.

Going by memory here:

#1: Measure the OD of the slug. You will find it to be the same OD as a common drill bit.
#2: Purchase a new or "unused" drill bit of the same OD.

NO! Do not use the cutting end and drill the inside of the form! There must be "no" nicks or damage to the end which fits into the chuck!

#3: Use the end of the drill bit that fits inside the drill motor chuck. The bit should have a slight tapper on that end. Now slowly push it (by hand) into the coil form with a slight twist. Work it slowly into the entire length of the form.

What you are trying to accomplish is to iron the paper back into its original shape.

The above method has worked for me. YMMV
Good Luck with the new RX,

Date: Wed, 10 Feb 2016 16:45:21 +0000
From: Steve Hobensack <stevehobensack@hotmail.com>
Subject: Re: [R-390] Newb question, slugs

Fair Radio may have a replacement coil. I purchased an antenna coil from them many years ago. I charred the cardboard center by using a linear amp on another antenna. Some people may not know, the coils will unplug from the chassis after removing a phillips screw from the bottom of the cardboard tube. (that held the slug) N8YE

Date: Thu, 11 Feb 2016 17:13:54 +0100
From: gs@oaft.com
Subject: [R-390] R-390/A

Gear cleaned OK , tried to "silence" the SLUG Rack - it is squeaking when turning the Megacycles - but no success. Most probably the slugs are squeaking between Z 203 and T 203. Don't dare to lub the Slugs and would like to avoid dismantling the whole rack.

Date: Thu, 11 Feb 2016 11:21:41 -0500 (EST)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] R-390/A

Each slug has a small plate at the top of the rack that secures it to the rack. The screw holes in those plates allow for a little radial movement. You may find that loosening those screws, allowing the slug to align itself a bit, and then retightening those screws may eliminate the squeak.

I've not tried it, but I think a dry lube like talcum powder may also help.

Date: Thu, 11 Feb 2016 09:42:09 -0800
From: "Craig" <hamfish@comcast.net>
Subject: Re: [R-390] R-390/A

Doubtful slugs can squeak. A little bit of synthetic 30 weight oil on the gears, apply synthetic 90 weight oil on the surfaces that contact the cams.
A drop or two of oil where the megacycle shaft goes through the panel bushing; that should take care of most squeaks.

The slug and fiber core of the transformers will unlikely be the source.

Date: Thu, 11 Feb 2016 22:10:48 +0000 (UTC)
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] R-390/A

Hi Gerd, If the slugs are moving freely in the forms, I don't think they are squeaking. I've not seen 1. To check if they're free, set the rack to a low point and manually raise it up and down. Or, to do an individual one, remove the 2 retainer screws.

It's probably the rack rollers or the rack is pressing too hard on the side of the frame. ?A lot of times the rollers don't turn freely, so you can check for that. ?If the rack is pressing hard on the frame, sometimes adjusting the core retainer positions can help or check the rack for being bent. One other possibility is that someone replaced a spring and it is too strong or weak (imbalanced pull on the rack).

One tool I use to pinpoint squeaks is a stethoscope with the pickup removed. ?Move the hose around to locate it.
These can be tough. Good luck.

Date: Thu, 11 Feb 2016 21:39:03 -0500
From: Roy Morgan <k1lky68@gmail.com>
Subject: Re: [R-390] R-390/A

> gear cleaned OK , tried to "silence" the SLUG Rack - it is squeaking when turning the Megacycles -

Remove the slugs one at a time and apply good car wax to both the slug and the inside of the transformer core. Use the wax VERY sparingly, with a Q-Tip in the core and on a soft rag on the slug.

Date: Wed, 24 Feb 2016 11:08:45 +0100
From: gs@oaft.com
Subject: [R-390] R-390/A

Hello there - reporting some success. Could quiet the slugs inserting carefully the aft end of a 6.5mm drill. The drill was slightly covered (sparingly) with liquid PTFE GunCoating. The geartrain is cleaned and lubed with synth. motor-oil. For the rollers in the rack used GunCoating. After cleaning. started recapping (not all !), but awaiting delivery of some caps with uncommon values.

As S101 (BFO switch) is broken I have to find a replacement.

Date: Fri, 26 Feb 2016 13:27:27 -0500
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] R-390/A

>As S101 (BFO switch) is broken I have to find a replacement.

The BFO switch is a simple one pole rotary switch. It is a low voltage low current. You can adapt many switches to serve the function. Happy to hear you are making progress with the other items.

Date: Sun, 17 Apr 2016 17:41:00 -0700
From: "Craig" <hamfish@comcast.net>
Subject: [R-390] Y501 Update

Not much to report so far. JAN doesn't make anything in a CR-45/U holder,
neither does ICM. I've been away from my abode for a few days and need to get caught up with all those domestic chores.

That leaves using the crystal that ICM sent with the 0.030 inch diameter leads. It doesn't rattle yet! I think the spring holder in Z501 will keep the crystal in place. The leads will pass thru the pin holders and I think keeping the leads short as possible should be the best route. Then adjust Z501 using C520 & L503. Next step will be checking bandwidth at the .1KC & 1KC positions. Odds are having to play with R502 & R503 are great, what fun.

Date: Wed, 29 Jun 2016 21:37:27 -0500
From: wes Bolin <k5apl41@gmail.com>
Subject: [R-390] R392 RF Deck

My RF Deck has a misaligned S20i Bandswitch. The shaft clamp broke and the switch is not lined up for the Mhz Band counter and gears/cams. I have the
T.O. but have had no success in getting it in the correct position. Does somebody have access the the RF deck to take a photo (or Photos) of S201 wafers with a particular front panel Band position? I appreciate any help.

Date: Thu, 30 Jun 2016 10:44:43 -0400
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] R392 RF Deck

The band switch steps. Set this thing by eye ball as you have the deck upside down on the bench.

It is a summary best judgment call in the end. Every switch section wiper

tab needs to have as much contact area in each switch position as possible as the gear train is tuned from end to end in the megahertz gears while tuning both up and down. Six switch sections and six positions. 36 contacts in sets of six. They all need to make good when in use.

It use to work, a simple part broke, alignment was lost, the broken part has been replaced. An eye ball call to select the best alignment relation and a clamp tighten is all that is needed to effect this repair. Do not go poking at switch parts.

Do not try this with meter readings from the top side of the deck.

The switch positions are like the other R390's: 5-999, 1-1999, 2-3999, 4-7999, 8-15999 16-31999

The Geneva gear does the timing for the switch change operations.

If the megahertz is 00 then switch position 1.
If the megahertz is 01 then switch position 2.
If the megahertz is 02 then switch position 3.
If the megahertz is 03 then switch position 3.
If the megahertz is 04 then switch position 4
If the megahertz is 07 then switch position 4
If the megahertz is 08 then switch position 5
If the megahertz is 15 then switch position 5

If the megahertz is 16 then switch position 6
If the megahertz is 31 then switch position 6

Date: Sat, 6 Aug 2016 7:47:55 -0400
From: <wb3fau55@neo.rr.com>
Subject: [R-390] RF deck

Hello gang, my name is Russ. I am working on a nitemare Rf deck from a 390A. Several problems, no receive below 8mc. Found missing cap 100pf at T207. Fried resistor R205- 2.2k Short in fil. supply wiring. This is a Stewart-Warner deck. original is a Motorola. I have 2 other spare parts decks. The Moto is nearly complete, but was missing the intermittent gear- tried and install, but just jammed up. Such fun. 73s Russ.

Date: Sun, 7 Aug 2016 15:27:36 -0400
From: <wb3fau55@neo.rr.com>
Subject: [R-390] Motorola R-390A w/ SW RF deck

Yes, I did check for plate and screen voltage at 1st osc. it is there when @

7mc, and switches off when going to 8mc. When you connect a wire ant. to this, you get a lot of increase in background noise, when on 8mc. No change when on 7mc. No static when connecting antenna at 7mc. No reception at all below 8mc. I can hear a calibration signal [100kc], but it is way low on 7mc.

I would like to build an extender cable for the RF section, but I need the female harness connector. Anyone have one they can part with? I suspect an input short only on the lower bands.

Date: Sun, 7 Aug 2016 20:22:48 +0000 (UTC)
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] Motorola R-390A w/ SW RF deck

Could be the tuning of the output of the 1st mixer, the 1st var IF. If the frequency of the 1st osc is off more than 2 kc or the alignment of 1st mixer is very far off, this is what you will see. At this point, I don't think you can rely on the calibrator for alignment. You need to inject a known frequency.

Date: Thu, 11 Aug 2016 16:55:48 +1000
From: Pete Williams <jupete@internode.on.net>
Subject: [R-390] XTAL Calibrator.

G'day list....Well, this R-390A I'm working on has more issues than some presidential aspirants... The latest failure was the Xtal calibrator but the xtal not at fault. Problem turned out to be the 200kHz injection? capacitor voltage divider C312 and C313 with C 312 very leaky.

However I have a question, and in the process of of selecting a replacement C312 and with the RF module on my test cable so I could monitor changes, found that different value caps obviously will change the injection level to the multivibrator. SO .... would any one have a optimum figure for the injection voltage to get maximum level of 100 kHz harmonics on all bands . I am aware that high value of injection voltage changes
characteristics but what value were the designers looking for at R222 /R223 junction ? Curious !

Date: Wed, 10 Aug 2016 4:58:26 -0400
From: <wb3fau55@neo.rr.com>
Subject: [R-390] RF deck update

So I went back to RF alignment on lower bands. I did get the 1 to 2mc rack peaked up and receiving the strong local signals. Sensitivity is low but they are there! Going then to Z213- the 2nd one shows no peaking.

I tried 2 different cans from other receivers, but no change. So I see a cap right at the terminals of the can, I should be able to measure that....Russ.

Date: Wed, 10 Aug 2016 10:35:42 -0400
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Re: [R-390] RF deck update

May I suggest to check if your Z213s tuning slugs are the right ones ?? The RF slugs (Z201 to Z206) are brownish-gray and have a relative permeability of 10 (which is normal for a maximum tuning ratio of 3:1 and ~2:1 is used in the R390-A). The IF slugs (Z213 and 216) are slate grey, or slightly greenish (depending on origin) and have a relative permeability of 4 (normal for a maximum tuning ratio of 2:1 and ~ 1.5:1 is used in the R390-A).

I had a Motorola '56 RF deck with mixed slugs between RF and IFs, and also slugs bronze in color that measured 7.3 of relative permeability (no good at all
for a R390-A). Mixing of the slugs can give the type of problems you are experiencing.... so it's worth to check that. Measuring the relative permeability of the slugs was easy for me because I have an impedance analyser. I just wound 20 turns of 24 AWG around the slug(s) and measured the resultant inductance. Then by carefully removing the slug, keeping the winding "free standing", I measured the resultant inductance again. The ratio between the two measurements is the relative permeability of the slug. Some could also use a capacitor in parallel with the winding and a grid dip meter to check the resultant frequencies. Let us know 73, Jacques, VE2JFE

Date: Wed, 10 Aug 2016 20:26:34 +0000 (UTC)
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] RF deck update

Hi Russ, Jacques info is right on and important. One diagnostic trick I like to use is to move the 'bad' can to a position of a 'good' can. All 3 of the Z213's are supposed to be the same and are interchangeable. When you swap them check the contacts on the can and on the chassis. A bad connection here can give you funny symptoms. Use a cleaner like Deoxit sparingly, do not spray. ?If the 'bad' can becomes 'good' in a different position, it tells you if its the can or something else like the slug or cap under the chassis. Why they put caps under the chassis for these I'll never know, and they do go bad. Another trick is to simply move the slug in question.

Date: Wed, 10 Aug 2016 16:17:14 -0500
From: Tom Frobase <tfrobase@gmail.com>

Subject: Re: [R-390] RF deck update

I have had several radio's with the same symptom. In each case it was C327
Driving the mixer - checked goo but did not work in the circuit ...
tom,N3LLL

Date: Wed, 10 Aug 2016 19:33:53 -0400
From: <wb3fau55@neo.rr.com>
Subject: [R-390] RF deck update

Guys, problem at Z213-2. Pulled the #2 can and measured capacitance at the terminals, only 10pf. I did a temp install of a 60pf cap inside the can, installed and peaked it- slug works lots more sig getting thru. So problem here. Making progress! Will have to pull the RF deck again! Sent picture- dig the cool white nylon knobs.

Date: Fri, 12 Aug 2016 5:03:05 -0400
From: <wb3fau55@neo.rr.com>
Subject: [R-390] Z-213s slugs- caps

So I am gleaning a good bit of info-thanks guys. Heres what I did. No peaking action at Z213-2, pulled the can measured 10pf at terminals. A lot more at the others. I jumped in a 62 pf cap inside z213-2. Got some peaking.
As pointed out to me, do I have the proper slugs? 2 have green paint on top.
One in question has none. Tried slug from another, does not tune. Are the 68 and 1.5 pf caps bad? Russ.

Date: Sat, 20 Aug 2016 15:29:41 -0400
From: <wb3fau55@neo.rr.com>
Subject: [R-390] Motorola R-390A

Well folks, here I go. I will take the RF deck out again this afternoon. I gave this job a rest for a week. Should be bad caps @ the 17.5 to 25mc variable IF cans. I will replace what is needed and do a lot more testing before it goes back in. Wish me luck...Russ.

Date: Sat, 20 Aug 2016 20:54:37 -0400
From: <wb3fau55@neo.rr.com>
Subject: [R-390] pulled the RF deck...

Well, here we are at it again. Problem in the 1st variable [17.5 to 25mc]. Heres whats up. Z213-2 acting weird- heres why- 1.5pf and 68pf caps missing. Moving on to the other 1.5pf checks good. One of the 51pf cap

checks out good other is open. Get to love when people steal parts and docs as to whats up? Will do replacements and check other caps. Cheap LCR meter shows caps good, using my Heath IT-28 tester shows bad. I think I will trust the Heath, as I have done lots of repairs using the Heathkit. At least we found good reasons for problems. thanks for listening and input

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Date: Mon, 22 Aug 2016 18:07:37 -0400
From: <wb3fau55@neo.rr.com>
Subject: [R-390] parts in RF deck

So a question to our 390A gurus. In the 1st variable IF, the cans-z213-1 -2 -3,
there is a 51pf cap at 213-1. There is 68pf at z213-2, and a 51pf at z213-3.
Why does z213-2 have a 68pf and not a 51PF?
Another question- T207 at the 17mc xtal osc. there was a missing 100pf cap. I replaced it with a 90pf. Will that be OK? thanks folks Russ.

Date: Tue, 23 Aug 2016 09:23:48 -0700
From: Dan Merz <mdmerz@frontier.com>
Subject: Re: [R-390] parts in RF deck

I would GUESS, the center section of the tunable filter is isolated more from adjoining capacitance by the two 1.5 pf coupling caps c281-2 so needs more fixed capacitance to enable tuning with the parallel variable. All three cans are tuned same at same two frequencies using variable cap and slug tweaks. Any adjoining capacitance from B+ to ground probably adds more to the outer cans in the filter than to the more isolated center can. I'm not the guru you were looking for but that's my thoughts.
Regards, Dan

Date: Sun, 28 Aug 2016 03:49:46 +0000 (UTC)
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] parts in RF deck - 1st var IF caps

>In the 1st variable IF, the cans-z213-1 -2 -3, there is a 51pf cap at 213-1. >There is 68pf at z213-2, and a 51pf at z213-3. Why does z213-2 have a 68pf >and not a 51PF? thanks folks Russ.

I know that the 6C4 accounts for 4-5 pf and the stray capacitance for another 1-2 pf, so where does the other 10 pf come from? If you look at the 2nd var IF, you see that all 3 circuits have the same 100 pf cap in each of them and the center one is also isolated with 2 pf caps. Maybe the answer is that the 1st var IF input and output is through a short coax - I guess that would add some more cap.

Date: Fri, 14 Oct 2016 00:34:45 -0500
From: Chuck Collins <chuckcollins@prodigy.net>
Subject: [R-390] RF deck below 8 mhz

Dead below 8 mhz. I fixed about 5 bad parts in this area and it still refuses to work. Could the regulated 150 volt line cause the loss of signal below 8 Have not seen this mentioned anywhere. If I don't have to do that it would save time figuring out where the heck E-607 test point is! -Chuck

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Date: Fri, 14 Oct 2016 08:26:20 +0000 (UTC)
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] RF deck below 8 mhz

Hi Chuck, All 3 conversion oscillators require the reg'd +150v. For the 1st osc it is 'switched' on only below 8 mc by the band switch. That may be where your problem lies. Check alignment of that switch segment with a volt-ohm meter. It could also be a cabling issue. Test point E607 is found on the left side through a hole in the frame as it is in the side of the audio subchassis. I assume since it works above 8mc, that the reg'd +150v is ok, just not getting to the 1st osc.

Date: Fri, 14 Oct 2016 11:25:27 -0700
From: Rick Popovich <RickP@uei.csus.edu>
Subject: [R-390] General question - R-390A

I am beginning troubleshooting on a R-390A and I have the "ovens" switched OFF, but while checking items on the RF Deck I noticed that the crystal oscillator is super hot - is this normal The PTO is cold.

Date: Fri, 14 Oct 2016 15:37:09 -0400
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Re: [R-390] General question - R-390A

Yes because the crystal oven heater is always powered from the 6.3V line.

Date: Fri, 14 Oct 2016 20:26:43 +0000 (UTC)
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] General question - R-390A, 1st crystal osc temp

Hi Rick, As Jaques said, it's always on. I'm concerned that you said it is 'super' hot. They do run a little hot, but sometimes the thermostats stick on and they overheat. That will cause damage after while.

Date: Fri, 14 Oct 2016 16:37:46 -0400
From: Alan Victor <amvictor@ncsu.edu>

Subject: Re: [R-390] General question - R-390A, 1st crystal osc temp

Yep, warm, but not super hot.

Date: Fri, 14 Oct 2016 14:18:36 -0700
From: Rick Popovich <RickP@uei.csus.edu>
Subject: Re: [R-390] General question - R-390A

Thanks to all for your answers and suggestions (yes this is on the rear corner of the RF Deck) - I did the conversion Craig and 75 Degrees C translates to 167 Degrees F. which is about what my calibrated fingers was feeling. Not burning the skin, but not cool enough to hold on to for more than a half second.

And I do hear what may be the thermostat for it clicking on/off but I don't recall it being so warm on my other R-390A so I will dig a little deeper.

With the ovens switch off the only thing energized is HR202. It is located at the rear right hand corner of the receiver, RF deck. HR202 runs at 75 degrees C.
Check the skizmatic and track out the wiring. Regards, Craig

Date: Fri, 14 Oct 2016 18:04:47 -0500
From: Chuck Collins <chuckcollins@prodigy.net>
Subject: [R-390] RF deck below 8 mhz

I have 3+ volts at 17mhz out of the crystal. I will check the cabling on the 150v reg. Thanks, I didn't think of that!-Chuck
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Date: Fri, 14 Oct 2016 19:26:36 -0400
From: <wb3fau55@neo.rr.com>
Subject: [R-390] no receive below 8mc.

So my 1 st question would be- did it ever work for you below 8mc As most of you know I have been there. I will be interested to know what is wrong. Look for missing parts...Russ.

Date: Fri, 14 Oct 2016 23:26:40 -0500
From: Chuck Collins <chuckcollins@prodigy.net>
Subject: [R-390] no receive below 8mc

Yes, this did work below 8mc. It was never moved and one day I turned it on and there was nothing below 8. That was 10 years ago and it still works good above 8. Going to check connections for SW 208 where it sends the signal to the second mixer. It had a bad cap across T-207....no that's not it!

It had a bad 1st osc tube and plate loading resistor.....no that didn't help either!
How about the dropped tuning slug on one of the three tuned circuits
No...that didn't do it either. It had a disconnected wire to the 1st mixer....nope not yet!
I did get 17 mhz into the mixer finally I am going to find this out one way or another.

Date: Fri, 14 Oct 2016 23:29:41 -0500
From: Chuck Collins <chuckcollins@prodigy.net>
Subject: [R-390] no receive below 8mc.

Missing parts is an excellent suggestion. I won't put that past myself.....

Date: Tue, 18 Oct 2016 19:59:42 -0500
From: Chuck Collins <chuckcollins@prodigy.net>
Subject: [R-390] no receive below 8mc.

This receiver is throwing everything at me it can. I would like to get it going as a way to enjoy my parents and grandparents tax dollars! Yes the 17mc is good. Bad 100pf. It started out at 1/2 volt and now I have it up to 10 volts at 17mc spot on. Third time is charm. (Lesson one, buy quality parts of the proper style)
I checked the switching and that is good. Tubes good, switching is proper. Only the faintest signal can be forced through. I am thinking it could be one of the 5 caps and received the 51pf and 65pf but where do you get a 1.5 at 2% tolerance? I can't think it would be anything else but these caps at this point. ----------

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Date: Tue, 18 Oct 2016 22:53:59 -0500
From: Chuck Collins <chuckcollins@prodigy.net>
Subject: Re: [R-390] no receive below 8mc.

The two caps are actually 0.25% not 2% tolerance

1.5pf 500WVDC 0.25% ceramic

Date: Wed, 19 Oct 2016 01:00:19 -0400
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Re: [R-390] no receive below 8mc.

I will be very surprized that the 1.5pF caps had turn bad. There is more chances that the 51 and 68pF ones make trouble, but if there is still no change after using new ones, take a look at the tuning slugs for the Z213-1, 2 and 3.
Only "green" slugs should be fitted there (the ones having a greenish tint).

It happens often that some genius have fitted "brown" slugs there, making alignment impossible and performance catastrophic.
Ask Russ... !

The RF slugs (Z201 to Z206) are brownish-gray and have a relative permeability of 10 (which is normal for a maximum tuning ratio of 3:1 and
~2:1 is used in the R390-A).

The IF slugs (Z213 and 216) are slate grey, or slightly greenish (depending
on origin) and have a relative permeability of 4 (normal for a maximum tuning ratio of 2:1 and ~ 1.5:1 is used in the R390-A).

I had a Moto 56 RF deck with mixed slugs between RF and IFs, and also slugs
bronze in color that measured 7.3 of relative permeability (no good at all for a R390-A).....

Date: Wed, 19 Oct 2016 00:15:55 -0500
From: Chuck Collins <chuckcollins@prodigy.net>
Subject: Re: [R-390] no receive below 8mc.

I will replace the 51pf and 68pf first and then wonder or celebrate!
I can see the greenish slugs but they are not in the Z213's.
I did have it work below 8 at one time and I did not change slugs.
This is starting to go deep!

Date: Wed, 19 Oct 2016 05:48:47 -0400
From: "Jim M." <n4be_jim@yahoo.com>
Subject: Re: [R-390] No receive below 8 Mc

I have found that any mica cap that touches B+ will be suspect. For example the caps across the primaries of RF cans, where the primary is in the plate circuit of a stage. Being exposed to B+ over a lifetime must compromise the dielectrics. And as you probably know, many of these type caps are actually inside the cans, so you have to remove the metal coil covers to replace them. I recently did a shotgun replacement of all primary caps in my SW 390a and noticed an enormous improvement on all bands.

Date: Wed, 19 Oct 2016 12:28:10 -0400
From: Roy Morgan <k1lky68@gmail.com>
Subject: Re: [R-390] No receive below 8 Mc

... I recently did a shotgun replacement of all primary caps in my SW 390a

> and noticed an enormous improvement on all bands.

It would be interesting to know what the enormous improvement was: maybe
you did not have before and after sensitivity measurements, or numbers about the noise floor. Most of us don't do such measurements, or not very often if at all.

I wonder if by "primary caps, where the primary is in the plate circuit of a stage" you mean bypass caps from the B+ side to ground, or if you mean the cap meant to tune the coil, across the primary. And, I wonder how many
caps were found INside the coil cans.

It would seem to me that a cap across a (slug-) tuned transformer would not
see much applied voltage - though there would be B+ from the whole cap to the surrounding vicinity - the case or support wires or the like. BUT, any leakage or reduced insulation resistance in the cap would behave as a shunt resistance across the inductor - and this could affect the RF performance of the circuit.

Note: suggestions of long ago to clip out *resistors* in parallel with tuned circuits in the R-390/URR (and possibly in the R-390A) to "increase
the sensitivity" and make the receiver "a whole lot hotter" were very misguided. If this is found in any of our radios today, re-soldering or replacing those swamping resistors is well advised. (This is not an implied
invitation to start a discussion about the inductance of spiral-cut metal film resistors. Thanks.)

I would expect that mica caps in a coupling mode: that is B+ on one side and low (maybe AGC or ground) voltage on the other side might develop small
or even miniscule leakage with age, with accompanying NOISE.

My preferred source for mica caps is: justradios.com

Date: Wed, 19 Oct 2016 12:38:24 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] No receive below 8 Mc

> ... I recently did a shotgun replacement of all primary caps.....

I took that to mean the caps in the transformers. If that was the case, did

you check before and after performance for each replacement? It would be interesting to know if improved performance was due to more than one replacement.

Date: Wed, 19 Oct 2016 13:55:18 -0400
From: "Jim M." <n4be_jim@yahoo.com>
Subject: Re: [R-390] No receive below 8 Mc

The caps in question are across the primaries of coils that feed B+ to the plate of previous stage. They are subject to full B+ especially before the tubes warm up. I only assumed that these would be failure or drift prone in all stages that feed plates via primary coils.

I did replace all bypass caps earlier which also helped, but replacement of the caps across primaries improved performance as well. No I didn't measure sensitivity or noise floor before and after. Comparison was subjective based on the S-meter using the calibrator and on air. Of course the radio had to be realigned after cap changes.

Noise floor measurements seem to me to be of uncertain value in an RF environment where atmospheric noise in "S-6" and above, and any receiver induced noise is well below.

Date: Wed, 19 Oct 2016 14:18:23 -0400
From: "Jim M." <n4be_jim@yahoo.com>
Subject: Re: [R-390] No receive below 8 Mc

I forgot to answer your other questions. I think if you look at the schematics you will see that the following have fixed tuning caps (usually in combination with a trimmer) INside across primaries:

First mixer Z-213 (these may be outside the cans)
Z-201 through Z-205
Second mixer Z-216 (all)
Third mixer T-208

In the IF module:
AGC amp Z-503
4th IF T-503

To replace caps inside cans, remove slug racks, remove coil covers, clip out the old caps, replace with modern mica caps, and realign. Other stages/cans have the caps outside the cans.

Date: Wed, 19 Oct 2016 21:53:28 +0000 (UTC)
From: Perry Sandeen <sandeenpa@yahoo.com>

Subject: [R-390] No receive below 8 Mc

There are two tools that make servicing the R3XX receivers much easier. First is a DVM. There good ones available that are in the $50 ranged. (If you're really, really, really cheap then Harbor Freight has some usually on sale for $4 or less.)

If one want to do more serious work and O'scope is the only way to go. I got a Tek 2445 for $180 at a hamfest several years ago.There are loads of them on Ebay that are <100 MHz bandwidth. Some have a DVM value that is on the screen. For a bit more ($150 to $200) one can get older 465's with a much higher band width. IMNSHO, if you can afford R3XX receivers, an O'scope is necessity.

Date: Wed, 19 Oct 2016 21:55:59 +0000 (UTC)
From: Perry Sandeen <sandeenpa@yahoo.com>
Subject: [R-390] R390 cap change

>Wrote: ... I recently did a shotgun replacement .....

Vindication at last.

Date: Wed, 19 Oct 2016 18:59:21 -0400
From: <wb3fau55@neo.rr.com>
Subject: [R-390] no receive below 8mc.

Chuck, I had my RF deck out of the radio 3 times before I got it right. Do not be hasty and just do a quick change of parts. Difficult to set up and run the RF deck outside the mainframe. Your problem is not with the ferrite slugs, this did work for you a while back. You do have to slowly step thru it. Let these guys know what you find and they will tell you the next step. When you get frustrated with it, walk away, give it a break. Write down what you have done. It works great when you finally get it! We will keep looking for messages...73s Russ.

Date: Wed, 19 Oct 2016 23:01:54 +0000 (UTC)
From: Perry Sandeen <sandeenpa@yahoo.com>
Subject: [R-390] Receiver noise floor needs

Wrote: "Noise floor measurements seem to me to be of uncertain value in an RFenvironment where atmospheric noise in "S-6" and above, and any receiver induced noise is well below."

That's probably true. And there are some urban areas where HF SW is a total bust. Now for the BUT (A debate that will never end) I spent 18 months on 2nd (Swing 3 pm to 11 PM and 3rd shift (Mids 11 PM to 7 AM

Karmusel Air Station was an intercept base about 100 miles west of Istanbul, Turkey.?Besides radio interception the base was a HF radio link between the eastern boarder of Turkey and ENT AFB (USAFSS) in Colorado Springs, CO. Out send power was DISB with three 30KW SSB linear amps 24x7. Our part of the link was to receive from eastern Turkey to Croughten (SP) AFB in England. They intern re-broadcast HF to Ft. George Mead in Maryland,USA. The 2nd and 3rd shift job was standby maintenance (hardly any) and to maintain reception from the 3 bay Hugh's receiver and the R390A's.

Now to my point - at last.
Mother nature does what she wants, when she wants, and as long as she wants. Most nites, we easily received rock and roll AM pirate radio ships off the English coast and would feed the audio to the intercept operators and of course our receiver site. We had a spare "A" and a rtty converter and teletype printer set up so mainly on the nite shifts we would copy AP, UPI, Reuters, what ever. ?We went through cases and cases of yellow copy paper. On several occasions I could not hear the audio shift side tone of the receiver but the rtty printer kept pumping out plain text. Many nites the bands were so quiet we would easily pick up WWV on 10 and 15 MHz (17KM sky-wave I was told) as well as foreign SW broadcasts all over the place. For this, having a low noise figure was useful. Noise floor numbers aren't the end-all for receivers but they are far easier to measure than IP3, receiver stability drift and audio distortion to name a few. That's why most people will try to measure it. The problem is that unless one has a HP, Fluke (I have both) or other high end signal generators and-even-then, true sub-micro-volt numbers are hard to measure with repeated accuracy. The noise floor "numbers" are averages but omit the fact that ionosphere can and at times much, much quieter.

An indirect proof. Look at all the receiver specs of the modern transceivers on the market. Making the receivers that good costs money. If it didn't add value they wouldn't do it. So one makes choices that are case specific or "How good can I make this sucker, cost be dammed". My personal choice is the latter.
Whatever floats your boat.

Date: Mon, 24 Oct 2016 15:20:32 -0400
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: [R-390] R-390A RF DECK COAX CABLES IMPEDANCE

Does anybody already worked out the impedance of the coaxial cables connecting to the RF deck in a R-390A ? They look very much like 75 ohms Teflon to me... RG-179/U ? Just want to be sure.

Date: Mon, 24 Oct 2016 19:01:11 -0400

From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] R-390A RF DECK COAX CABLES IMPEDANCE

> They look very much like 75 ohms Teflon to me... RG-179/U ?

Or 50 ohm RG-316... Why do you want to know? All of the coax runs in the 390A are too short to support wave propagation modes at the frequencies they are handling, so they are really operating as simple unbalanced shielded cables, not as transmission lines. Note that the source and load impedances of the connected circuits are not matched to the coax's characteristic impedance. Any cable that fits the connectors will work fine. If you are looking to optimize, choose the cable with the most effective shield.

Date: Mon, 24 Oct 2016 19:58:26 -0400
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Re: [R-390] R-390A RF DECK COAX CABLES IMPEDANCE

Thanks for your answers. But I whish to explain why I wanted to know....
"All of the coax runs in the 390A are too short to support wave propagation
modes at the frequencies they are handling, so they are really operating as
simple unbalanced shielded cables, not as transmission lines. "
Agreed, as far as only a pure sine wave signal is traveling thru. I wanted to use a replacement coax that is the closest to the original one, especially regarding the capacitance. " Note that the source and load impedances of the connected circuits are not matched to the coax's characteristic impedance."

OK, so mismatched both sides, then my concern about the capacitance again.
So if the original cables have a determined specific impedance, a replacement one having the same impedance should have a quite close value of capacitance per length, for the same external diameter and dielectric used.

From measurements now: the R-390A original coax cables (at least from my
samples) have a 11 mils solid center conductor and a 57 mils external dimension of the center conductor insulator. This insulator being made of Teflon with a relative permittivity of 2, this computes to 70 ohms of impedance...
I just wanted to know if someone already seen a specific impedance value specified for those cables. I was not even hoping for a RG number. For the shielding, I guess that any good teflon coax with a 95% minimum shield

coverage will be OK.

Date: Mon, 24 Oct 2016 20:52:25 -0400
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] R-390A RF DECK COAX CABLES IMPEDANCE

> I wanted to use a replacement coax that is the closest to the original one,
> especially regarding the capacitance.
> * * *
> a replacement one having the same impedance should have a quite close
> value of capacitance per length

All standard 0.1" (nominal) coax has capacitance values between 23 and 29 pF per foot (75-95 pF per meter). 75 ohm coax will have somewhat lower capacitance than 50 ohm coax, for similar materials and constructions, but there will be no discernable difference between them at the lengths used in the 390A. Again, any coax that will fit the connectors will work fine -- you will not be able to detect any difference between them, aside from shielding effectiveness.
One more thing not to worry about when working on R390s/R390As.

Date: Sat, 24 Feb 2018 13:36:53 -0500
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Re: [R-390] AF/RF Gain Control

Fernando, the R-390A RF Gain pot is a 5K, REVERSE-LOG and the AF (Line Gain and Local Gain ones are 2.5K, LOG (audio taper).
The RF gain pot is the hardest one to find.

Date: Tue, 13 Mar 2018 21:12:52 +0000 (UTC)
From: Garry Stoklas <jergar@sbcglobal.net>
Subject: [R-390] R-390A Crystal Oscilattor Mod

I wanted to add a R-390A crystal oscillator module to my spares and recently purchased one on eBay. It is a Collins unit s/n 144 and is very clean with a complete set of crystals. I failed to notice the miniature BNC connectors on the back and the extra components on the underside of the front section which consists of a relay, a couple of capacitors and a slug tuned coil in the clamp. There is no access to the slug so clearly it was set to whatever and left. The coax from the connectors go to one pin on the coil and the relay. I'll be testing the crystals (which are all in kc and date coded mid 1950s) in my trusty International Crystal oscillator and then figuring out the schematic of this mod. It was done very professionally. I've search through the tons of material on the R-390A that I've accumulated but have found nothing about modifications to the crystal

oscillator module. Pictures of the crystal oscillator module and the modifications can be seen at the following:

www.mumnme.com/pictures/osc1.jpgwww.mumnme.com/pictures/osc2.jpgwww.mumnme.com/pictures/osc3.jpgwww.mumnme.com/pictures/osc4.jpgwww.mumnme.com/pictures/osc5.jpg

Can any of you help identify what the purpose of this modification is/was. If I can't get any information on it, I will remove it.

Date: Tue, 13 Mar 2018 17:18:25 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] R-390A Crystal Oscilattor Mod

This might help.

www.mumnme.com/pictures/osc1.jpg

www.mumnme.com/pictures/osc2.jpg

www.mumnme.com/pictures/osc3.jpg

www.mumnme.com/pictures/osc4.jpg

www.mumnme.com/pictures/osc5.jpg

Date: Tue, 13 Mar 2018 23:21:39 +0000 (UTC)
From: Steve Toth <stoth47@yahoo.com>
Subject: Re: [R-390] R-390A Crystal Oscilattor Mod

My guess: sounds like it might possibly be part of the R-1247 field mod kit for the R390A to enable the R390A to use external high stability oscillators.

Date: Fri, 16 Mar 2018 04:56:03 +0000 (UTC)
From: peter murphy <w6wy@yahoo.com>
Subject: [R-390] R390A antenna relay troubleshooting

I have a nice Chuck Rippel restored R390A that has been working fine for about 18 years. One day recently it stopped receiving as if the antenna was disconnected. No calibrator signal either. Then I noticed the familiar relay "click" was gone as I switched to STANDBY or CAL.

My first inclination is to remove the relay and clean the contacts. Before I do this I wanted to check with you folks and see if I am going down the right path on this. BTW I also have a second R390A that is working FB. Maybe swap the relays and see what happens. I notice there

is a replacement relay on eBay right now, wonder if these are hard to find and if I should snap it up while one is available. $25+ shipping

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Date: Fri, 16 Mar 2018 08:43:02 +0000 (UTC)
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] R390A antenna relay troubleshooting

When the relay is not activated (power not applied to it), it connects the antenna to the RF amp input. So, if the relay is not getting power or the coil is open, it would work as it should in the agc and man positions and receive signals. So, it sounds like it is stuck in the activated position (stndby and cal), but you aren't getting the cal signal. You should get the cal signal in either case.

I'd see if you can manually operate the relay armature.

Date: Fri, 16 Mar 2018 08:57:33 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] R390A antenna relay troubleshooting

You can always disconnect the mini-BNC cable from the relay on the inside and connect the antenna to that cable (or, at least, be able to touch the antenna wire to the center conductor if you don't have the correct connector handy). If you get a signal that way, then the antenna relay is most likely bad.

Date: Fri, 16 Mar 2018 09:25:59 -0400
From: Bob kb8tq <kb8tq@n1k.org>
Subject: Re: [R-390] R390A antenna relay troubleshooting

It?s also quite possible that Mr Spider has moved into the vicinity of the relay and clogged things up. A good visual is the first step ?.

Date: Fri, 16 Mar 2018 16:28:24 +0000
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] R390A antenna relay troubleshooting

Check the selenium bridge rectifier that powers the relay coil. This class of component is characterized by gradual failure. The voltage drop increases. Mine was weak twenty years ago when I bought the radio. In my opinion, there are two reasonable actions. You can replace selenium with silicon, or you can add a reservoir cap to raise the average voltage. I never liked the idea of powering a DC relay with unfiltered rectified AC, especially in a spot where hum can be a problem, so I put in a cap.

Date: Fri, 16 Mar 2018 16:35:59 +0000
From: David Wise <David_Wise@Phoenix.com>

Subject: Re: [R-390] R390A antenna relay troubleshooting

Never mind, I didn't understand that your problem is "stuck picked", not "won't pick". My post below applies to the latter, which is also a frequent problem.

Date: Fri, 16 Mar 2018 12:56:30 -0400
From: Bob kb8tq <kb8tq@n1k.org>
Subject: Re: [R-390] R390A antenna relay troubleshooting

As long as we *are* on the topic of the selenium rectifiers. they are a real stinker when they burn out. I'd vote for the silicon replacement approach.

Date: Tue, 11 Sep 2018 01:24:56 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] L211 same as L201 500uH specifications

Dave, Bummer on the bad inductor. Yes, L201, L208, L209, and L211 are the same.

Date: Fri, 14 Sep 2018 10:46:06 -0400
From: dog <agfa@hughes.net>
Subject: Re: [R-390] L211 same as L201 500uH specifications

The one I'm looking at has 3 open sets of windings next to each other in a row as a radial form if you know what I mean. Typical looking old style RF choke, 7mm dia, 14mm long, each winding is ~3mm long, 7mm dia. Not the molded ones like the filament choke.

Date: Fri, 14 Sep 2018 13:28:05 -0400
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Re: [R-390] L211 same as L201 500uH specifications

I'm not sure that those parts style was the same for every R390-A manufacturer, but I encountered two types so far. One is a 3-pie construction dipped/coated in brown epoxy-like stuff with a green-black-brown coding, the other is completely molded in beige plastic with round ends and also coded with green-black-brown dots.
Both types measures 500uH ±10% and have 10 to 12 ohms winding resistance. I have few to spare, so let me know.

Date: Fri, 14 Sep 2018 14:57:56 -0400
From: dog <agfa@hughes.net>
Subject: Re: [R-390] L211 same as L201 500uH specifications

Those look like transmitting chokes and there are a couple 500uH in there but much larger than mine. Jacques,

Yes, mine is the 3 pie coated one with the grn/blk/brn markings. Do you know where to get one or can I get one from you? Or if you know the current spec on it, I could order a few from Mouser, they seem to have the molded plastic ones. I'm sure it's not critical as long as it meets current spec and self resonance, and who's to know that without measuring one? I can do that with my AA600, but not a bad one.
I'm sure different productions had different parts too. Dave

Date: Sat, 6 Oct 2018 15:33:26 -0400
From: dog <agfa@hughes.net>
Subject: [R-390] Calibration Osc issues

So I've replaced that bad choke in the filament circuit to V205 which is right next to HR202/Y201/Y203. Then the B+ choke L211 to V205/V206 was open. Got a replacement for that. Still no work. So I pull out another
RF section to test/compare and just looking at the one I just pulled out and it has not been disturbed, there is a 1000pf mica from V205-1 to pin 8 (the 200KHz crystal) on the octal socket of HR202, part of the calib. osc. circuit, just like the schematic. But on the one I repaired, there is no mica cap and it looks like nothing has ever been soldered to pin 8 of the octal socket. Now I have replaced the two 0.1uf, C256/C309 with those huge orange drop caps. I'm thinking about getting some different 0.1uF caps for them, another issue.

But why does it look like there's never been a 1000pf connected to pin 1 of the octal socket, that circuit would not work without that and I don't remember the calibration oscillator not working and I can't believe I never tried it? That's not to say that I ever did try it, my memory fails me at the moment. The one without the mica cap is EAC #337X, hard to read and the other one is EAC #146. The earlier one also has R235, 47?. I guess next thing is to try the early RF section in the RX I'm working on. Both of these worked at one point and pretty sure the calib osc did too.

Any ideas? I'm going to let it rest for a bit, I've been working on these all day. I need a Jameson's but I don't have any.

Date: Sat, 6 Oct 2018 18:45:12 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] Calibration Osc issues

Hi Dave, Yes, that would call for a Jameson's moment.

You are right - no way did that cal osc work without that cap. But, the multivibrator generating the markers (free running) probably would (although most likely a little low in frequency (and it must be low for proper op)). Check frequency and then add the cap and see what's going on.

Date: Sun, 7 Oct 2018 19:09:46 -0400
From: dog <agfa@hughes.net>
Subject: [R-390] Dial off 50KHz?

I put the original RF section back in after finding the cap I left out that makes the calib osc work. So now the calib osc works. But I'm not sure what I did, other than I put the other RF section I had in, it didn't work, so I removed it and after I fixed the cap in the old RF section, now the dial is off by 50KHz reading low. Actual 10.1 reads 10.05 so the 10M band shows up below 10.1. I always turn the PTO and dial to far left like the book says and I'm wondering if I got it off somehow? Should I try to turn the PTO maybe 1/2 a turn, I'm not sure what 50KHz is in relation to a half turn on the PTO? I guess I could figure it out. At least the calibrator is working now. Maybe I can get rid of this thing.

I've found it easiest to turn the RX upside down to get the Oldham coupler and spring back in. And loosen up the PTO. I can get the RF section in and out in about a half hour now with all the cables and screws.

Date: Sun, 7 Oct 2018 17:31:25 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] Dial off 50KHz?

Since the frequency discrepancy is also above 8 MH, that rules out the 1st osc. I assume you are using the same 2nd xtal osc, so it must be caused by the PTO shaft moving a little. 50kc is exactly a half turn.

Date: Mon, 8 Oct 2018 20:32:46 -0400
From: dog <agfa@hughes.net>
Subject: Re: [R-390] Dial off 50KHz?

I turned the PTO a half a turn and it's back to normal. I should have noticed when I took it apart the spring on the Oldham coupler was on the top and I put it on the bottom when I put it back together. I must have somehow turned the PTO. Anyhow all is good and the RX is working good on 10MC WWV at the moment with the original RF section, calibration osc working and all.

Date: Mon, 15 Oct 2018 16:24:27 +0000 (UTC)

From: Gary Geissinger <geissingergary@yahoo.com>
Subject: [R-390] Source for crystals now that International Crystal is Gone

I have a number of vintage radios that need crystals. I used to call Marie at International Crystals; she would find the index card for the crystal and make me one.? Well, Marie is retired and International Crystal is gone. Where can I go to get "custom" crystals made to repair my older radios? Yeah, they are going to cost real money, but the radios are worth it. Most are in the HC6/U case.

Date: Mon, 15 Oct 2018 14:54:47 -0400
From: Bob kb8tq <kb8tq@n1k.org>
Subject: Re: [R-390] Source for crystals now that International Crystal is Gone

Last quotes I saw from other outfits were up past $150 a crystal?. I went back to looking in bins at hamfests.

Date: Mon, 15 Oct 2018 22:46:52 +0200
From: Bob Ackx <rca448@yahoo.com>
Subject: [R-390] xtals

I got some xtals from: www.andyquarz.de <http://www.andyquarz.de/>

I know it is not from 'next door's shop' but maybe you will find the xtals you need there.

Date: Tue, 16 Oct 2018 02:39:16 +0000
From: Raymond Cote <bluegrassdakine@hotmail.com>
Subject: Re: [R-390] Source for crystals now that International Crystal is Gone

List your needs here! Folks all have a junk box with things in them.

Date: Tue, 16 Oct 2018 14:55:23 +0000 (UTC)
From: Gary Geissinger <geissingergary@yahoo.com>
Subject: [R-390] Source of Crystals: Thank You

Thank you for your responses. They were all helpful and will kept for reference and use. Parts are getting harder and harder to find.
This is a favorite reflector; my R-390A is working okay at the moment, but I know where to get help. I wish I had kept my R-390; it's on a mental list of equipment that I regret getting rid of. I just need more room!

Date: Sun, 17 Jun 2018 11:30:27 -0400

From: dog <agfa@hughes.net>
Subject: [R-390] RF Gain control

Think I've got one of my IF modules set up pretty good, but a couple questions. I notice the RF Gain control has glitch at the CW end (10) of the control. That is when I advance it all the way up there you can hear a sort of thump when it goes from the resistive part of the control to the short. I've opened up the control on both radios I have and they're both the same and they both seem to operate the same. Is this just the way they are I notice on an ohmmeter there is resistance until the wiper just all of a sudden jumps to the short on the CW end, not a smooth transition.

Also, I notice that AM broadcast in the 4K position sounds a bit distorted, but in 8/16K it sounds fine. Is this typical I put a 10 turn pot in this IF for the Carrier Control and boy is that much better.

Date: Sun, 17 Jun 2018 15:41:39 -0400
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] RF Gain control

The 4 K is still to narrow for standard broadcast AM. Normal operation.

The RF gain pot is also a normal. Not what we expect. But the real world there is a wide contact that averages a few ohms of resistance under the contact area. Current limitations in the resistance of the control suddenly go to a closer zero resistance and things thump. The AGC mode may have more thump than the manual mode. In the real world these receivers set on frequency weeks at a time doing RTTY receive with no human listening to any audio. No one cared if the RF gain pot caused an audio thump as the circuit was adjusted from time to time.

The 10 turn IF carrier control does improve the maintenance procedures. The ten turn resolution is 10 times easier to dial the resistor to its desired performance setting.

I will listen to an R390 or A over any cell phone anyday.

How are you doing for noise to signal plus noise in IF and audio deck. Are the tubes up to the 28 29 30 to 1 meter performance the receivers are easily capable of

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Date: Sun, 17 Jun 2018 16:24:32 -0400
From: dog <agfa@hughes.net>
Subject: [R-390] RF Gain control

Thanks Roger, I sort of expected that about the RF pot, having taken it apart and carefully inspected them. Just wanted to check. Yeah, I sort of know they were mostly just sitting there listening to RTTY where I saw them. I never got to a Morse intercept station, so I don't know how the CW guys used them. They probably rode the gain pot in MGC Maybe not being on a typewriter.

I've done the S/N test with 30% AM modulation and both seem to be below 1uV, even to the balanced input. Don't really have any way to measure NF, but I can do MDS, I have a good calibrated generator. They both seem sensitive enough. I'll try to do an audio distortion test too, my service monitor has that function.

I've been taking the audio from the diode load to an external SS AF amp, so I haven't messed with the audio sections yet, but the line level meter works fine and I replaced a lot of audio caps and other stuff so they hopefully are good. I was listening to an Argentinian AM station today and the AGC seems to be working fine. AGC voltage runs around -9V
with a strong station. AF sections will be right behind why the 14MHz band is not working, crystal no doubt. Luckily I've got two R390A's so I can swap things around. Yeah, cell phone, ha. They actually sound lots better than my TS2000, but it's not even got 5K BW in AM. More like 4.5, heavy roll off above 3K.

The 2K mechanical filter I repaired for one of the IF's developed a short to ground in the input side so I need to pull it apart and see if I can fix it. It's got 50 on one side and gnd on the other so the coil is still good. I replaced the original innards with am FA type plastic filter, but it met spec when I sealed it. I've already got the filter out, just need to get set up to pull it apart.

One radio had SS replacements in the PS (and crushed sockets), so I got new tube sockets and re-did all the wiring and someone sent me some rectifier tubes quite a while ago but I haven't tested it yet. It worked with the SS, I just don't like the high B+ and the instant surge from the SS mod. I tried the thermister or whatever it was and it put out way too much heat for my liking, and still too much B+.

Date: Mon, 18 Jun 2018 13:53:18 +0000 (UTC)
Subject: [R-390] Rf gain control

I don't notice a thump with my RF gain, but the Audio gain pot is sorta weird. When I turn the audio gain from 0-5 things are normal as soon I go past 5 there's mild thump with a slight jump in audio gain.

Date: Mon, 18 Jun 2018 10:00:19 -0400
From: Radio AI2Q <ai2q@roadrunner.com>
Subject: Re: [R-390] Rf gain control

Sounds like worn, dirty pots.

Date: Mon, 18 Jun 2018 10:40:36 -0400
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Re: [R-390] Rf gain control

A "thump" in the RF gain when turning the pot may indicate a worn-out track inside. I have one such misbehaving one, which measures 10k ohms end-to-end instead of the stamped 5K value of the housing. When opened, the damaged carbon track can be seen. If anyone search for replacement, remember that a reverse-log taper is needed there (not easy to find). Same comment for the audio pots: if ever they measures higher than 3k ohms end to end, suspect a worn-out track inside also. These pots are also a part of the biasing network for V601B, so detraction from the design value change the V601B operating condition. And they have to be log (audio) taper if any replacement is contemplated.

Date: Mon, 18 Jun 2018 10:53:09 -0400
From: "Jerry O. Stern" <jsternmd@att.net>
Subject: Re: [R-390] Rf gain control

What is the power rating for the RF and Audio pots Is a 1/10 W OK

Date: Mon, 18 Jun 2018 11:00:21 -0400
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Re: [R-390] Rf gain control

The spec is 2W.

Date: Tue, 19 Jun 2018 01:21:43 +0000 (UTC)
From: Dave Kirk <w6mqi@yahoo.com>
Subject: [R-390] Antenna trim repair

Has anyone had any luck getting into the antenna trim can to clean the cap The antenna trim on my 390a is intermittent as the knob is turned it acts like the capacitor contacts need a cleaning real bad. The gear on the capacitor shaft is pinned on I'm not quite sure how to remove the pin, maybe drill out the pin ouch! Why the heck did they pin this gear on seems like two set screws with loctite would have worked just fine.

Date: Mon, 18 Jun 2018 21:56:24 -0500
From: Cecil Acuff <chacuff@cableone.net>

Subject: Re: [R-390] Antenna trim repair

I've not disassembled and cleaned the cap but the capacitor shaft has high voltage on it and if the insulator through the chassis gets contaminated with oil and metal particles it will cause some of the same problems. It needs to be really clean and dry. Beyond that I have heard of folks drilling a hole in the cover to allow cleaner to be sprayed in.

Date: Mon, 18 Jun 2018 22:04:06 -0500
From: Stan Gammons <s_gammons@charter.net>
Subject: Re: [R-390] Antenna trim repair

I had one that was like that. I tried to remove the pin with a drift punch but was never able to remove it. Ended up replacing the entire assembly with a part from another RF deck. In the end that RF deck turned out to have other odd problems, so I replaced it.

Date: Tue, 19 Jun 2018 14:13:25 +0000 (UTC)
From: Dave Kirk <w6mqi@yahoo.com>
Subject: Re: [R-390] Antenna trim repair

Not sure drilling is an option that pin is probably harden steel I'll end up breaking drill bits trying to drill out the pin CRAP! Now what Sounds like I either live with it or try and find a replacement.

Date: Tue, 19 Jun 2018 21:31:29 +0700
From: Martin Sole <hs0zed@gmail.com>
Subject: Re: [R-390] Antenna trim repair

Just a thought but are these pins perhaps slightly tapered and as such will only drift out in one direction

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Date: Tue, 19 Jun 2018 14:36:41 +0000 (UTC)
From: Dave Kirk <w6mqi@yahoo.com>
Subject: [R-390] antenna trim repair

The pin appears to be a roll pin; can't say I've ever seen a tapered roll pin. I might be wrong though.

Date: Tue, 19 Jun 2018 11:03:09 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Antenna trim repair

I may be wrong, but isn't that just a roll pin that can be pressed/punched out I seem to recall having this same problem but don't remember if I ever removed that pin but I _think_ I did...

Date: Tue, 19 Jun 2018 11:22:08 -0400
From: Bob kb8tq <kb8tq@n1k.org>
Subject: Re: [R-390] Antenna trim repair

The gotcha is the material of the roll pin vs what it's pressed into. Put two different metals next to each other and you can get corrosion due to the electro chemical differences in them. That corrosion will quite effectively weld something like a pin in place.

Date: Tue, 19 Jun 2018 08:31:16 -0700
From: Manfred Antar <manfredantar@gmail.com>
Subject: Re: [R-390] Antenna trim repair

Try a drop or two of Kroil , leave to penetrate overnight. Then try to push out. Kroil is amazing on stuck nuts and bolts, stuck pins and such.

Date: Tue, 19 Jun 2018 13:33:12 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] Antenna trim repair

It looks like a rolled pin to me and so probably not tapered. I like the idea of using penetrating oil on it. If you had a tool to press it out, that would be better than driving it out (which would cause lots of shock damage to tubes and crystals, if still in). The shaft is insulated from frame with a fiber bushing and washer, so they will be damaged easily. This is a tough one. Best of luck.

Date: Tue, 19 Jun 2018 18:33:25 -0400
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] Antenna trim repair

Will some-one slide off and read Wei Li's Pearls of wisdom on this subject. R-390a.net. Like every other problem with these receivers many talented people by virtue of opportunity have already been here and done that. 425 pages of just the RF deck mechanical things. Gears and shafts and stuff. The truth is in the files. It is not a mystery, I just do not remember what the real apparent pin problem is. Once we understood what the assembly parts were, some one devised an elegant process to "rebuild" the antenna trim assembly. We have been here before and the notes are imbedded in Wei Li's Pearls.

In my day were taught better in school and did not get this thing screwed up. However there are details in your trusty R390 34 manual that are needed for your R390A knowledge.

Say what

Go read the Pearls with the step by step disassembly process and where to get things to replace things known to be wanting replacement.
And how to get the assembly clean, lubed, and back together. Flat rate 4 hours depot bench. 1 hour RF deck out. 20 minute open and close the antenna trim cover. 1 hour RF deck back in. 2 hour performance test, remediation, and adjustment to best performance.

If you are intelligent enough to own an R390 receiver and know what it is and how to make use of it as a receiver, you are intelligent enough to complete any standard repair. (some Fellows are rewinding mechanical filter coils and stuffing new caps into umpucky space.) Now your manual dexterity to get it done yourself is something you have to access for yourself. If you have it use it. If you can, then take this opportunity to enjoy some other aspects of Amateur Radio.

Date: Tue, 19 Jun 2018 17:51:10 -0500
From: Phil <pmills7@comcast.net>
Subject: Re: [R-390] Antenna trim repair

Geez, I swear that, from a lot of practice, I can get the front panel off and RF deck out in about 15 minutes...assuming no messed up screws. Reverse is just the same. Okay, first time or two, maybe an hour at worst case.

That one hour must be an auto shop estimate at the $100+ bucks an hour or whatever it is these days :-)

BTW, the gear train disassembly pics are priceless...thanks to whoever did those!! thanks, 73, Phil W5BVB

Date: Tue, 19 Jun 2018 23:23:11 +0000 (UTC)
From: Perry Sandeen <sandeenpa@yahoo.com>
Subject: [R-390] RF Gain Pot rating

Wrote: The spec is 2W.
That is accurate for its power rating however that doesn't tell one how much power is passing through. One would have to measure both current and voltage to determine how much power is actually being dissipated.
BTW, the 2 watt rating for carbon comp pots goes back to before WWII and became a defacto standard. It wasn't until the SS era that smaller wattage pots were introduced.

Date: Wed, 20 Jun 2018 06:49:26 +0700
From: Martin Sole <hs0zed@gmail.com>
Subject: Re: [R-390] Antenna trim repair

Very apt :) On 6/20/2018, Roger Ruszkowski wrote: <clip>

Date: Wed, 20 Jun 2018 01:28:34 +0000 (UTC)
From: Dave Kirk <w6mqi@yahoo.com>
Subject: [R-390] antenna trim repair

Okay.... sounds like I hit a raw nerve here with my question I will refrain myself from asking anymore questions in the future.

Date: Tue, 19 Jun 2018 20:48:59 -0500
From: Don Reaves <donreaves@gmail.com>
Subject: Re: [R-390] antenna trim repair

Au contraire, Dave. Your question sparked some lively discussion in an otherwise very quiet list, which is usually the case during the summer doldrums. No doubt you had several members scurrying off to look at that pin in their tuning caps. I did, EAC serial # 6170. The pin looks like a roll pin, with a flare on one end so it can only be driven out in one direction. You need an appropriately sized roll pin punch which has a dimple on the business end of the punch to keep it centered and not damage the pin. Roll pin punches are used extensively in gunsmithing. Sometimes they are referred to as spring pin punches. So, don't give up, let us know if you find a solution to the intermittent. Did you try bathing the control in IPA Maybe its just dirty with oil or grime.

Date: Wed, 20 Jun 2018 02:03:35 +0000 (UTC)
From: Dave Kirk <w6mqi@yahoo.com>
Subject: [R-390] antenna trim repair

Did I bath the control in IPA No but I'm thinking of getting a 12oz IPA from the frig, sitting down and contemplating my next move. I do have and idea for a homemade tool to press the pin out if all goes well I will report back.

Date: Wed, 20 Jun 2018 04:21:12 +0000 (UTC)
From: wli <wli98122@yahoo.com>
Subject: Re: [R-390] antenna trimmer

Appreciate Roger referencing "Pearls" as a source of earlier discussions. However, he is partially correct pointing out that previous posts on the antenna trimmer are contained in "RF_deck_mechanical". There are other posts referencing this subject in "Antennas" as well.

Date: Wed, 20 Jun 2018 04:10:47 -0400
From: Roger Ruszkowski <flowertime01@wmconnect.com>

Subject: Re: [R-390] antenna trim repair

Thank you Dave for this segue way opportunity to stay on topic. Sorry to see you moving away. Dave, you are not the problem and the Fellows know they have let you down. With over 20 years of wisdom on line as background resources, none of the reflector responses have answered your question yet. Much creative thought in many different minds has occurred over the time span of this thread. This was a very good thing to happen.

Dave, you asked the Fellows here on the R390 reflector what is the step by step procedure to open can A. The gear atop can A was problematic prior to ever getting into production. Some contract builds have parts that are obvious and these antenna cans disassemble nicely. Rumor was that on some contracts the pin was set under sudden hydraulic force that effectively produced a forge weld between gear, shaft, and rivet. The minimum repairable part in the parts manual was the entire can assembly with a gear on top and a bottom end that looks like one of Ripley's aliens.

Back when if an antenna trim can got soaked in the teletype degreaser big parts washer and failed then a can was replaced. What in a green pickle suit do you imagine can follow directions carefully enough to undo the damage with a pin extractor tool and one end only cotton swabs. Things are different today and the kids are serving pizza across what was the parts room counter in Okinawa. Now we do need to open the can and remediate the effects of age that is catching up with many of the receivers today. Extra science and notes not found in the original manual are collected and readable. Ask Ray Kurzweil for a reader and it sound just like mp3 in your ears. Audio books from NPR.

Dave, you still are asking and I have not yet seen the clean explanation of what is and how to get on with the repair now knowing what is real metal. The warm up responses were all good, relevant, on topic and contributing with imagination. Three days later and we all still do not know how to get the can open and parts inside fixed. Not one thought, "let me go browsing and come back awesome". And the good answer is shared with every one here on the reflector once again as a refresher on the topic.
I, Roger have no raw nerves. I poisoned them all back at age 20. Not necessarily the best physical behavior or solution. But I have empirical evidence to support my assertions that one does not need to live life with raw nerves about the body. I am not permitted to practice medicine without a license. I am no longer allowed to service equipment while it has power applied. The list of things Mother will not let me do here in her home has just gotten longer over the years. The current out of the

compound privileges (yard) to the PX are on Mon, Wed, Fri from 1 - 4 PM. While I have lived life like this before and suffered many weed killer overspray events while doing so this is not my life style preference. This restricted employment opportunity will pass and I will then really be off the deep end and on the road again. A jobs a job and when you ask God, that his will in heaven be made so here on earth and you let his son Jesus provide some error correction, then truly, the mome
nt of some of the daily tasks do suck. The independent memory of the job can still be joy for eternity. It is not easy, but if you have the chance step up and receive some soul transforming love as you care for another human.

The R390 Fellows, humor a number of humans with special needs. I am one of the special needs cases and the Fellows have been very gracious to me as I have grown up some in the last 25 years while I was re-introduced to an item of history I never though I could afford to ever own before 1985. The R390 's were ferrite tuned not capacitor tuned. The band pass skirts of the ferrite tuned filter is better than capacitor tuned filter skirts. The VFO and the RF deck filters are still best of HF receiver design. Some are as good but none are noteworthy of being a better receiver. For the dollar investment and expected enjoyment the R-390 and R-390A while long out of production are still winning on the RF decks selective performance. The 455 IF output can be interfaced to the new modes of communication. Still best ever DX CW receiver in many books. I do not teach this receiver in school anymore. We have no need to know from who ever may still be working. There are over 475 pages of notes on just the RF deck mechanical bolts, nuts, clamps, gears, springs, pins, planetary gears, and the OMG all important antenna trim can, no one has gone to read the solution. Real time writing skills to assigned questions. The topic and question pool is copy right free and what ever you drop in the mail here is by extension of the topic also military surplus and free of copy right. Bring the text back, plagiarize the best of it into a coherent narrative and share it with us. My library and toys have been rotting in storage for the last two years, I just can not respond with reference to any question with out my paper copy memory. The Anal retentive want to be sociopath under studying with Brain every night and doing correspondence classes from Natasha had a PTSD overload on the college professor compartment and applied productive system repair time. I hope my over modulation distortion is not way out of band.

Dave's original question needs an exact procedure to satisfy the request. We Fellow's have not honored his request. And demonstrated our ability to actually guide a Fellow Amature and like mined hardware owner by looking into our archives and bringing a few pages back. More skill to those who trim the redundancy from the thread narrative. Twas a time 20 years go before the big Y2K crippled the planets Internet services

when Barry, Nolan, Barry, Tish, Perry, Cecil, Barry, Wei Li, and many more humorist lead a reflector readership of over 300 active readers. Humor won and some social behaviors were adopted. Aspiring writers with an interest in the R-390 receivers have a forum here. We are not alone mailman.qth.net offers reflectors from a directory of topics. The mode is text only size did matter.

Some times some one drops in long enough to get help with a problem. A minimum of six responses is expected on the reflector. Hello, welcome, I see your question or needs. You are indeed swapping mail with a group of like minded fellows who profess to know it all by virtue of done it our selves. And the answers you seek are as follows. Rest assured 200 plus readers are following this thread. This is not a vacuum environment. Some real smart people look at the written responses that appear in public. No mercy shown fulfills some needs and humor is the only solvent of any use when a tar baby goes stick wicket.

Aspiring writers, can you lay down a 100 words in under an hour. Read the questions presented to us want-to-bees, look up the topic in the on-line Pearls of Wisdom. Copy out 25 -30 pages of raw mail Wei Li was sorting into the oyster shells and building a pearl of knowledge around a point of irritation. The Y2K team produced the Y2K manual for the receiver. Still the best reading theory sections and some new art images that are still best available on the planet today.

All great stuff so let us remember it is there and go look at it ourself now and then to make another fellows day brighter and produce a better work of business correspondence. Stake holder to stake holder we need all of us on each others radar.

Date: Wed, 20 Jun 2018 04:20:00 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] antenna trim repair

Dave, I found this in the Pearls antennas section:

>Date: Tue, 30 Jan 2001 07:50:20 -0800
>From: "Roger L Ruszkowski"
>Subject: Re: [R-390] Accessing Antenna Trimmer Cap.

>Use a small 3" C clamp for force. Cut a small pin for the punch. Use a nut
>or bushing on the anvil side so the pin can slide into it as it comes out
>of the shaft and gear. We had a small clamp that had the anvil ground
>down and a hole drilled through it in line with the clamp screw. The
>clamp screw had been turned down to a smaller dia. than the pin. I think
>the clamp screw was a replacement section of thread stock and it had a

>nice knob on it. I think, I took one apart once. The problem was not in the >can. Now after 50 years, there could be things in there that need service.

I like the idea of the modified C clamp.

Date: Wed, 20 Jun 2018 07:57:44 -0500
From: chacuff <chacuff@cableone.net>
Subject: Re: [R-390] antenna trim repair

There are no raw nerve's here...that I know of...if some have developed they should get them treated cause there is no place for them here. Your question is a valid one and until you have been successful in achieving your goal we haven't done our jobs as members of this community. A big thanks to Roger as always...a great resource. Hope you can get back to your stuff in due time. We like hearing from you.

Date: Wed, 20 Jun 2018 13:34:52 -0500
From: Richard <prof1705@cableone.net>
Subject: Re: [R-390] antenna trimmer repair

I looked in my tool box and I think my roll pin removal/install tool was "borrowed by my son". I did find link for something similar. https://www.matcotools.com/catalog/product/ppt13/roll-pin-removal-tool/

Boat-anchor radios and firearm maintenance/repair have a synergistic relationship. And if you get really miffed at a boat-anchor you can take it out and use it for target practice.

Date: Sat, 9 Mar 2019 16:35:56 -0500
From: dog <agfa@hughes.net>
Subject: [R-390] J208/P108

Since I repaired the filament circuit in the RF section from the short, now I seem to have lost the HV on V205 pin 6, the calib osc. I can see the HV at the switch pin 4 rear of S102 and I can trace it to a pin on P108 with the ohmmeter but it doesn't seem to be getting to the plate of V205. I'm assuming there's something wrong in J208/P108 or L211 and I'm trying to stick with the original stuff, but the pin outs in my Navships book looks nothing like the J208/P108 pin layout in my radios (both of them and they look the same). Were there different P and J items for those? I guess I'm going to have to pull out the RF section again to see what's going on with that, I already have the other radio nearly completely apart so I can compare. I know I didn't get the J208 back in the same orientation as originally, but that shouldn't make any diff

since it looks like it can only plug in one way, and the filaments work as well as the RF section. I'm just curious, I'm sure I'll find the issue one way or the other, it's either a miswire or bad component. Luckily nothing is smoking, yet.

Date: Sat, 9 Mar 2019 14:03:01 -0800
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] J208/P108

Dave, The wiring should should be the same for all 390As. Where did you get the Navships book from?

Date: Sun, 10 Mar 2019 11:56:50 -0400
From: dog <agfa@hughes.net>
Subject: Re: [R-390] J208/P108

Larry, I don't know where I got the book, but it looks legit. Bureau of Ships and Navy Department on the bottom Technical Manual Vol III of III. The pin that is used for the switched HV to the calib osc is the right one, 'J' in the book where it shows the pin locations, it looks nothing like the pin locations on my P and J's. Page 179 in the fold out section for P108/J1208 and page 173 fold out page item 30 for P108 also where it shows the wire colors. They both show circular outside pins and a center pin, but both my units have a distinctive pattern to the pins, not circular at all. Luckily the pins are labeled on the plug.

But that's become sort of a moot point. I was counting the pin numbers wrong on the tube, I have switched 154VDC on the plate of V205B and actually, I'm getting a 0.2Vp-p dirty 0.5KHz (2uS) wave at the output of pin 8 of V205, so the osc is working, it's just not getting to the RX somehow, RX goes blank when I switch to CAL. I'll have to trace that out. Adventure continues.

Date: Sun, 10 Mar 2019 13:35:31 -0400
From: dog <agfa@hughes.net>
Subject: Re: [R-390] J208/P108

Now it's working. I'm not sure what I did. Maybe the whole thing is just 'static between the earphones'. I get pretty confused easily these days.
<snip>

Date: Thu, 14 Mar 2019 04:37:51 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] J208/P108

Dave, I looked at a lot of doc online and my printed book and they are all

the same. You are right. The representation for the pin placements for J709/P109 and J208/P108 are not very good.

Date: Sat, 6 Apr 2019 17:51:12 +0000 (UTC)
From: Perry Sandeen <sandeenpa@yahoo.com>
Subject: [R-390] 17 MHz AGC pulling problem

A challenging problem for solving by those with cold logic and a hot soldering iron.

One of the puzzling mysteries of the a is the 17 crystal oscillator drift caused by the application of AGC to the first mixer. This can be 300 - 450 Hz from the findings of Chuck Felton. Collins went to the trouble of putting the crystal in an oven so why not solve this problem. Best guess. They knew about it BUT it wasn't in the required stringent spec's so engineering, knowing the cost of solving the problem, just kept quiet. Now for causal AM listening Chuck noted that it probably wouldn't make any difference. However we are interested in listening to the continuous sound of the 100 watt station in flea fart from Fiji, or something similar. But for us true believers in getting the ultimate performance from our beloved A's this intolerable technical gaffe must be remedied, if not, we'll become the laughing stock of those heathen rice box lovers.

I started to investigating methods for solving the drift. The major difficulty is that the oscillator is located on the RF chassis making simple access impossible. Also finding a 17 MHz crystal or a harmonically related prove futile except for SMD. Ugh

An outboard metal box approach using a SS method led to using a 10 MHz and a 27 MHz 1/2 crystal can oscillators feeding a Minicircit passive DBM then using a tuned 17 MHz LC circuit. This would be fed through a very good .01uF/1KV ceramic cap into to pin 5 of the 6AK5 oscillator tube V207 after removing B+ resistor feed R211. OOPS! pin 5 goes to tuned circuit T207. Square wave into LC circuit, not a good idea. Feed the new 17 MHz through P221? Perhaps. Plan two was to remove the 17 MHz crystal, make a new oscillator circuit then feed it into the grid pin 1 of V207 utilizing it as a buffer. Would this work? I don't know. This is just a starting point for others as I will never be able to pursue this. Good luck to any who will even try (and post their results on the list).

Date: Sun, 7 Apr 2019 17:26:51 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] 17 MHz AGC pulling problem

I was curious about the 17 MH oscillator pull, so I did a simple (but I believe adequate) test last night for this. I let my R-390A and sig gen

warm up to the point where both had essentially no drift. I fed a 10.9 mh signal with no modulation into the A (above 8 mh so the 17 mh osc would not be used) and measured the audio beat tone at different input signal levels from 5 uv to 5,000 uv in steps. I then did the same test using 3.9 mh, so the 17 mh osc would be used. Here's a table showing my results:

uv bal input:	5	50	500	5,000
agc volts:	1.2	4.2	6.9	8.8
c/l db reading:	10	35	58	70
10.9 mh bfo tone:	60	58	56	54
3.9 mh bfo tone:	50	54	59	62

As can be seen, the 10.9 mh test shows a 6 cycle downward 'pull' and the 3.9 mh test shows a 12 cycle upward 'pull'. I'm not sure how Chuck Felton obtained his numbers, but I don't think what I see would cause me to try to
fix this problem.

Date: Tue, 9 Apr 2019 15:44:51 +0000 (UTC)
From: Perry Sandeen <sandeenpa@yahoo.com>
Subject: Re: [R-390] 17 MHz AGC pulling problem

Good test! I don't know either how Chuck came up with those numbers. My memory may have been mistaken. I'll have to go back and re-check my ER article. I agree with that small amount of change I wouldn't bother either.

Date: Sat, 13 Apr 2019 09:00:58 +0100
From: jm <josemic@gmail.com>
Subject: Re: [R-390] R-390 Digest, Vol 180, Issue 14

I use a frequency meter with my tube receivers. Every set has its peculiarity but until now I have managed with the HQ-180, Transoceanic (transistors) and Hallicrafters SX-99. The trick is to locate the oscillator signal, offset the IF and the thing works. But... what about the 390? variable IF, lots of crystals. I have to confess that I'm lost.

Is there an easy way to connect the frequency meter in a point in which the oscillator signal could be found for all MHz positions?. What would be the IF value to offset ? I know that the challenge in this receiver is to obtain the maximun sensitivity and precision via calibration but that's not my league yet and meanwhile I think that a good solution is the frequency meter. Regards and sorry for a beginner's question.

Date: Sat, 13 Apr 2019 01:37:10 -0700
From: John <jlkolb@jlkolb.cts.com>

Subject: Re: [R-390] R-390 Digest, Vol 180, Issue 14

There's a government document which tells how to design a frequency counter for the R-390.
https://www.r-390a.net/R390A-digital-frequency-readout-final.pdf

Basically you would have to read 3 or 4 different freqs, the 17 MHz crystal if below 8 MHz, the 11-34 MHz 2nd oscillator from the MC bandswitch, the 3.455-2.455 MHz signal from the KC VFO, and either the actual 455 kHz IF signal or the BFO freq. If you were to only read the 3.455-2.455 MHz VFO freq and assume the other freqs were exact, you could be 3 or 4 kHz off, less accurate than the receiver dial. To get the dial reading more accurate, build a 25 kHz calibrator, connect it to the antenna, and calibrate the dial at the 25 kHz marker closest to the station you are trying to measure. Back in the dark ages, I built and sold the KRS brand of freq-counter add-ons for shortwave receivers.

Date: Sat, 13 Apr 2019 01:58:29 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] R-390 digital readout

Jose, the R390's are dual or triple conversion depending on the received frequency and therefore are a big challenge for a designer of a digital readout system. There is no one point where one composite oscillator signal could be obtained for what you want. Someone made one a few years ago, but have not seen it lately. You might search the R390 archives for info.

Regards, Larry

PS: The subject line of your original post is meaningless - please fix.

Date: Sat, 13 Apr 2019 10:29:50 +0100
From: jm <josemic@gmail.com>
Subject: [R-390] frequency counter

I use a frequency meter with my tube receivers. Every set has its peculiarity but until now I have managed with the HQ-180, Transoceanic (transistors) and Hallicrafters sx99. The trick is to locate the oscillator signal, offset the IF and the thing works. But... what about the 390? variable IF, lots of crystals. I have to confess that I'm lost. Is there an easy way to connect the frequency meter in a point in which the oscillator signal could be found for all MHz positions? What would be the IF value to offset? I know that the challenge in this receiver is to obtain the maximum sensitivity and precision via calibration but that's not my league yet and meanwhile I think that a good solution is the frequency

meter. Regards and sorry for a beginner's question.

Date: Sat, 13 Apr 2019 03:56:53 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] R-390 digital readout

Jose, The R390A uses a 17 mh 1st oscillator for below 8 mh. The 2nd crystal oscillator is always used and generates 24 different frequencies for each of the 32 bands. The VFO (3rd osc) generates a frequency between 2.455 and 3.455 mh, depending where the rx is tuned at in each 1 mh band. Have fun.

Date: Sat, 13 Apr 2019 11:16:43 -0600 (MDT)
From: Gary Biasini <gary.biasini@shaw.ca>
Subject: Re: [R-390] R-390 Digest, Vol 180, Issue 14

You may wish to surf on over to
http://www.dashdist.com/1u2u/R-390A/LCD/LCD.php for some hints.

Date: Sat, 13 Apr 2019 13:41:15 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] R-390 digital readout

Thanks Gary, that is the LCD display I was thinking about.

Date: Sat, 13 Apr 2019 21:22:24 +0000
From: Gordon Hayward <ghayward@uoguelph.ca>
Subject: Re: [R-390] R-390 digital readout

Hi all, I've done the offset frequency counter in hardware with an old RCAF receiver but now would use the Propeller microcontroller. I've used these for accurate frequency counters in my crystal biosensor work. It can do 4 counters independently at upto 20 MHz (good to 1Hz depending on its crystal timebase) and then put the frequencies together in software for the R390A receive frequency display. I haven't done this yet but its on my list of fun things to do. The only gotcha is how to bring the frequency signals out of tghe R390A without drilling and blasting.

Date: Sat, 13 Apr 2019 22:33:39 +0000 (UTC)
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] Counting oscillators

Fellows. Jose EA8DCP ask,Is there an easy way to connect the frequency meter in a point in which the oscillator signal could be found for all mhz positions . What would be the IF value to offset I know that the challenge in this receiver is to obtain the maximum sensitivity and

precision via calibration but that's not my league yet and meanwhile I think that a good solution is the frequency meter.
Jose
EA8DCP

Yes there is an easy way to get a digital readout of the center frequency the receiver is tuned to. The military used 4 each 19 inch racks for 1 R300/A, a nixie tube read out, 8K of ferrite core memory, a hand wired mother board and discrete integrated circuits to make up the processor pre 1968. You could look across the bay and know where the receiver was tuned to. The radio frequency scanner program was loaded from punch tape after a 16 instruction manual memory load to boot the machine after a power interuption. Every mega hertz has a different 2nd oscillator crystal. The VFO runs 3.455 to 2.455. Below 8 the 17 MHz crystal is also in the mix. Patch the signal generator into your antenna lead in. Count the signal generator. Zero the generator against your station. Un patch the signal generator when you have spotted your signal. You read the AN/URM25' s on the high level output and use the micro volt attenuated signal to couple into your receive system. Yes you will radiate 4 or 5 Uv of CW signal right in the middle of the RF spectrum. So spot your self and uncouple the generator from the antenna and receiver system. Give the generator a dummy load to soak up the energy. This zero beat is not dependent of the IF center frequency of the receiver. If you only need to work a small frequency segment of the spectrum you can count your 2nd mixer once and track the VFO doing the math by hand for your final number. The R390 receivers are frequency meters. Tune the signal to zero beat and read the front panel to within 100 hertz. 60 hertz is a hum. 1948 Leading Earth best of science on the planet. You can zero to one cycle in ten seconds or better watching the line load meter. You can center the signal through the 100 hertz wide crystal filter in the IF deck front end and know flip flop down the way can do no better at naming that frequency than you can. Your R390/A was worlds best machine. Any child can be taught to watch the meter move. Read your maintenance manual. It says inject some thing through the IF deck crystal filter. Tune the injected something through the IF deck to the diode load to peak the diode load voltage value. The input is 455,000 hertz +2 or -2 because of the manufactured crystal filter part. Crystal filters at 455,000 do not oscillate at 455,000 so you do not have a 455,000 power source. The filter is a frequency reference notch (of theoretical infinite depth) that is filtered against. Daily production was zero to under 4 cycles off the assembly line. You must judge signal fade against filter skirts to discern your measured value. The crystals in the receivers are all within 20 hertz of where we expect them to be. If you need to get more exact than your R390/A will read from the front panel ask Tisha about on air radiation to measure the frequency of an external signal source. Counting the oscillators in the R390 receiver is just not the way to measure frequency

today. Is there an easy way to connect the frequency meter. Get the super glue and single strand lacquer coated copper wire.Pull the 5654 and 5759 oscillator tubes out of the receiver. Neatly wind 20 or 30 turns of wire around the tube envelope and secure with glue.Leave long leads on the sensor coil you just assembled around your oscillator tube. Another solution was to use short 7 pin tube extenders with modifications.A small hole is drilled into the side of the plastic tube extender barrel.So a small diameter coax cable can be inserted through the hole.Tie the coax shield to a grounded tube pin conductor. Use a 100 pf or smaller mica cap to tie the coax center conductor to the oscillator plate tube pin conductor. Re assemble your modified tube extender with a take off coax tap.The 5654 oscillators and 5749 both have the plate on pin 5 and pin 2 is the screen returned to ground. One adapter works in all the right places. These adapters will cause tubes to extend out of the chassis and for the VFO this needs to be considered in daily operations. If you use the coax and connector from a dead VFO the connector will couple to the rear panel 455KHz out put feed through adapter to a standard BNC connector. One military project punched three new holes in the back panel. Inserted the stock feed through connectors in the back panel. Used a short 1 inch high tube extender with the cap and coax addition. The coax exited high enough on the side of the extender to clear the tube socket shield ring. First osc, second osc, VFO, and BFO on the original jack. Today you ask your micro processor to gate and count each of the signals just doing a running total to display. Every five seconds each oscillator is counted to the hertz and tallied for the final display value. You can pull the dial counter out. install a display, tape the micro process to the 2nd Osc deck, make up DC from the dial light power for the micro processor and digitize your receiver readout. Back in 1968 a simple ring counter went tick on the second and each operation stepped off in order. Update display, preset counter to 455000, tally on VFO for 1 second, tally on 2nd oscillator for 1 second, if under 8 switch then tally on 1st oscillator for 1 sec and call for time check. This was discrete transistors assembled into logic gate modules. Plug in modules before IC chip devices. Clever programming will do long counts on the crystals and store counts of well sampled inputs. So the VFO is one second to settle on the display. And after 20 seconds has a good averaged count. Sub routines spawn off, get a long count, scale the value and update the memory value. On sudden frequency change flush and update and re build resolution. The tube extender adapter has been used in real military applications. Performance was acceptable and the receivers all worked with or with out the adapter in place. Our system had its set of adapters and we considered the adapters as pure unobtainium. Not many were made and none were expected to remain when the system was scrapped. The only thing between the thermite on the shelf over the receiver was the paper in the bay expected to be under the thermite when humans left the room vacant. If you make up the adapters they will work to bring the oscillator signal out of the receiver for other uses.

Respectfully, Roger

Date: Sun, 14 Apr 2019 09:17:29 +0100
From: jm <josemic@gmail.com>
Subject: [R-390] counting oscillators

It is a work for an experienced amateur, not for beginners like me. I'll give a try with the coils over the tubes. Many thanks for such a technical contribution and regards, Jose

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Date: Tue, 16 Apr 2019 14:35:10 -0500
From: Ed Rafferty <dktedr@gmail.com>
Subject: [R-390] R390-A Cal tone

I have a Motorola R390-A which has recently begun to offer up its resident cal tone when the BFO is switched to on and the function switch is set to Cal. no matter what frequency is selected.. that is, the cal tone remains constant and does not zero beat at the usual 100 kc intervals. could this be tarnished/ dirty contacts on the function switch plates? or elsewhere? I haven't discovered a thread that might relate to this issue noted in the archives.

Date: Tue, 16 Apr 2019 13:28:59 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] R390-A Cal tone

It's probably not the function switch. I don't recall a thread on this before. Try replacing the two 5814's in the cal generator in the back right of the RF chassis. If not, pull the RF amp and see if it goes away. It should. Does the BFO work normally in the AGC position?

Date: Wed, 17 Apr 2019 05:38:35 +0000 (UTC)
From: Perry Sandeen <sandeenpa@yahoo.com>
Subject: [R-390] Digital readout for the SP 600

There are two choices for digital readouts for the SP 600. There's an article in ER magazine where a cheap chicom frequency counter that had IF offset capability could be used when doing single conversion. Cheap. About $15-$20 but you needed a low voltage power supply. I bought a far more elegant professional unit from Electronics Specialty Products. It is the DD101H. It has a LCD display and cost $110 with shipping. It automatically switches when double conversion is used. It's only limitation is that it doesn't work on 6 meters with the SP 600, which wasn't a problem for me. As for me, I rather pay the $190 for the A or $110 for the SP 600 readout that to even try to roll-my-own.

Date: Fri, 19 Apr 2019 12:21:13 +0200
From: fdigio1 <fdigio1@gmail.com>
Subject: [R-390] R-390A Signal Monitor mod.
CEI-SM-8512-R390x-mods.pdf

Hi guys, I have found this document.

Date: Fri, 19 Apr 2019 04:49:09 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] R-390A Signal Monitor mod.
CEI-SM-8512-R390x-mods.pdf

Nice find, Francesco. Although the signal level out on an R390 will be low, it will be even lower on the 390A because of only 1 rf stage in the A.

Date: Fri, 19 Apr 2019 16:10:52 +0200
From: <fdigio1@gmail.com>
Subject: [R-390] R: R-390A Signal Monitor mod.
CEI-SM-8512-R390x-mods.pdf

I connected the output of the R-390A to my AirSpy HF+. The signal is indeed low, but still usable. The issue is the IF bandwidth of the stock R390A. It is too sharp to be useful as a signal monitor. You see only the tuned signal, or little more. I will try to make the mod?

Date: Thu, 25 Apr 2019 23:19:06 -0500
From: Ed Rafferty <dktedr@gmail.com>
Subject: [R-390] R-390A R390 Stuck Micro Switch

My Motorola R=390A had the dreaded micro switch issue where it would not shut off when switched from Stand by to Off. The previous care taker of this marvelous radio had purchased the replacement switch but had not installed it when I acquired it. So I've had the part in my parts drawer for a few years now, Waiting for the opportune time to perform the surgery.

Today, while reading the"Approaches to the Dead Receiver" compilation, I read the post from Mark Huss 12/30/2006 describing the (do not attempt this at home ,professionals only) procedure of deploying the fine alignment tool technique" to the targeted area of the ascribed "FUNCTION" label to release the stuck microswitch. One "calibrated" whack later, My 390A is now performing beautifully, as advertised , the function switch is now back to normal. My spare switch remains... spare. I used a wood block and a 8 oz ball peen to administer the corrective inertia. As a former Navy Avionics Technician, I have been trained in the benefits of the

technique described, and it worked for me today.
Thanks to Mr. Huss for his Post,

Date: Fri, 26 Apr 2019 10:49:53 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] R-390A R390 Stuck Micro Switch

I had that problem with one of my R390As. I removed the switch and merely exercised it several times (maybe applying a little contact/switch cleaning solution to the plunger at the same time). Pressing it down (with a screwdriver, fingernail, etc.) and then letting it pop up several times allowed the plunger to start working properly. If I'm not mistaken, the plunger simply gets gunked up over time with, well, gunk and won't allow it to pop back into position.

A little less risky than the "fine alignment tool" method but glad that worked out for you.

Date: Fri, 26 Apr 2019 16:46:57 +0000
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] R-390A R390 Stuck Micro Switch

The switch contacts like to weld. If I understand correctly, it's a two-step process. First, the spark from opening the switch degrades the contacts. Second, when the now-damaged contacts close, that spark welds them together. You can slow down this process by adding an RC snubber network across the switch. Sized correctly, it minimizes the opening spark. (And maybe the closing spark - I can't predict it and don't remember the case studies.) An inrush limiter will limit the closing spark energy and help prevent welding. My radio has a snubber and a limiter.

Date: Fri, 26 Apr 2019 13:52:18 -0500
From: Tom Frobase <tfrobase@gmail.com>
Subject: Re: [R-390] R-390A R390 Stuck Micro Switch

Same here, I never have had to replace one ... tom, N3LLL

Date: Sat, 4 May 2019 09:28:10 -0400
From: <jgedde@optonline.net>
Subject: [R-390] RF Gain Pot Taper

I need to replace my RF Gain pot. I'm thinking it needs to be a logarithmic taper pot since the linear one I replaced it with gives me all of the action between 8 and 10 on the knob. Can anyone confirm or deny it's a log taper pot?

Date: Sat, 4 May 2019 06:32:00 -0700
From: <hamfish@comcast.net>
Subject: Re: [R-390] RF Gain Pot Taper

The RF gain pot is a reverse log taper.

Date: Sat, 4 May 2019 09:41:05 -0400
From: <jgedde@optonline.net>
Subject: Re: [R-390] RF Gain Pot Taper

Thanks Craig. Now I need to source one. The reverse log taper ones are scarce... Ugh.

Date: Sat, 4 May 2019 10:04:21 -0400
From: <jgedde@optonline.net>
Subject: Re: [R-390] RF Gain Pot Taper

I hooked my decade box across it and found that putting 1.2k in parallel gives me better range than the original one. So, I'm gonna stick with the linear RF gain pot with the resistor in parallel....

Date: Sat, 4 May 2019 14:07:10 -0400
From: <jgedde@optonline.net>
Subject: [R-390] Calibrator Problems

I had my RF deck out yesterday to replace a few more bad resistors. After I put it all back together, I noted some strange behavior with the calibrator. It used to be when I engaged the calibrator, it would swamp out anything being received and I'd get clear calibration signals all over. Now, they seem feeble and are often overcome by stations being received or even noise. With the antenna disconnected, I can hear them loud and clear.

I'm a bit puzzled about the output from the calibrator's cathode follower. I captured some oscilloscope waveforms which I've attached, and the calibrator output is rather small compared to what's on the grid... What do you think? The grid and the multivibrator were captured with a vertical scale of 50V/div. The output at pin 8 was captured at 500 mV/division. Small in comparison. I can't help to think it should be bigger since it's coupled through a 1 pF cap into the RF amp.

Date: Sat, 4 May 2019 18:13:01 +0000 (UTC)
From: Steve Toth <stoth47@yahoo.com>
Subject: Re: [R-390] RF Gain Pot Taper

You can connect a resistor between the wiper arm and one end of a linear

taper pot to mimic a log pot or inverse log pot. Check out the attached: “Use a Linear Potentiometer to Create a Nonlinear Transfer Function for Audio Volume Control - Tutorial – Maxim”

Use a Linear Potentiometer to Create a Nonlinear Transfer Function for Audio Volume Control - Tutorial - Maxim

This article describes how to take a linear digital potentiometer (pot) and create a nonlinear response (logarit...)
Makes availability a whole lot better.

Date: Sat, 4 May 2019 14:15:45 -0400
From: <jgedde@optonline.net>
Subject: Re: [R-390] RF Gain Pot Taper

Thanks Steve! That’s exactly what I ended up doing. Adding a 1.2k across the linear pot did the trick nicely. Works better than stock.

Date: Sat, 4 May 2019 13:13:56 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] Calibrator Problems

John, the antenna relay should ground the antenna in the Cal position. The cal signal should be about 10 to 20 db. If the antenna is not grounded, the cal signal can be covered over.

Date: Sat, 4 May 2019 18:01:29 -0400
From: <jgedde@optonline.net>
Subject: Re: [R-390] Calibrator Problems

Thanks Larry! That’s exactly what the problem was. A broken wire to the relay coil.

Date: Sat, 4 May 2019 21:51:08 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] zero adjust knob

Hi Jose, You're scenario is very perplexing. It's not unusual for the 'zero adj' to change frequency as you turn it in the CAL position, but not as you describe your problem. I'm not sure what's going on there, but I can't think of why it's different in CAL and AGC. Are you using CAL in the same band as when you are using the known station? How strong of a station is it?

Date: Sun, 5 May 2019 09:07:29 +0100
From: jm <josemic@gmail.com>

Subject: Re: [R-390] zero adjust knob

I have just repeated the test. First I have calibrated on 700 KC's (CAL position). When the knob returns to the counter clockwise position, the signal (70db) is maintained. Position to AGC and station tuned 747 kcs. Disangaged the zero knob, maximun reading 70 db. After that, when the knob is returned to its position, the signal becomes weaker (50 db). The new strongest signal occurs at 746 kcs.

The second test was on 17700KC's. Calibrated at the CAL position there was a 60db signal. Used a station in 17680 kcs. with 60 db signal too. When returning the zero adj knob to the position, every thing is ok this time. The signal remains steady at 60 db.

Very strange, isn't it?

I realised that when calibrating on 700 KC's, and tuning after the station at 747, the signal strongest point is at 748. Perhaps there is some kind of misalignment in the 0.5-1 Mc band? It is not apparently a problem with the clutch (?) Many thanks for your help. Jose EA8DCP

Date: Sat, 11 May 2019 20:56:23 -0400
From: <jgedde@optonline.net>
Subject: [R-390] "Sync Xtal Osc"

There's a hole in my rear panel marked" SYNC XTAL OSC." Visible through the hole is a flat screwdriver plug in the xtal oscillator deck. What is this for? I just noticed it today.

Date: Sat, 11 May 2019 21:42:17 -0400
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Re: [R-390] "Sync Xtal Osc"

For both the R-390 and R-390A, it is to "synchronise" which crystal is used in the 2nd Cristal Oscillator with the band in use. This is a part of the adjustment procedure for both models.

Date: Sun, 12 May 2019 08:36:45 -0400
From: <jgedde@optonline.net>
Subject: Re: [R-390] "Sync Xtal Osc"

To make sure I understand... so it's a mechanical adjustment for the crystal switching?

Date: Sun, 12 May 2019 11:30:59 -0400
From: Bob Weiss <bobweiss1967@gmail.com>

Subject: Re: [R-390] "Sync Xtal Osc"

Yes. It is used to adjust which crystal is switched into the circuit at which bandswitch position. To use it, you loosen the clamp on the 2nd oscillator switch shaft, and rotate the shaft through the hole on the rear panel using a long screwdriver until the switch is in the proper position.

Date: Mon, 20 May 2019 12:52:38 +0200
From: atfu <atfu@gmx.de>
Subject: [R-390] deaf below 8MHz (R-390A)

I am the proud owner of a recently bought R-390A (Capehart) with an excellent history: From late 60s to early 90s in the labs of the German Aviation and Space Agency (with regular servicing); thereafter taken home by one of the employees. I bought the RX from the estate of that employee, so couldn't put any questions to the former owner. Compared to other radios I saw, this one is of an exceptionally sound and clean appearance, in and out.

When taken to my shack it came well to life on all bands, though, perhaps, not up to the legendary sensitivity that it is capable of in principle. (Carrier meter was definitely reacting low: about 20 dB on strong cal signal, even lower on strong signals from ANT.)

First steps taken: Clean all contacts and retire paper caps in AF and IF as a preventive measure. First AF. All went well and the result was an audible improvement. (BTW all caps I found, mostly yellow Aerovox, were within specs on my LC-meter.) Calibration signal and reception on all bands. (Still low carrier meter.)

Next IF. Replaced all but C533, C536 (both under BFO shaft), C549 (a bit tough), and C551 (in alloy cap). Checked and re-checked and re-checked for proper values and connections -- ok. (I did this one by one so as to rule out connection errors.) Result was a definite improvement on all bands above and including 8 MHz, below that -- NIL, including no cal signal. Carrier meter appears pretty dead now, also on the upper bands.

So troubleshooting is called for. I started with the flow chart from the Cryotology Class and procedures according to the Y2K manual.

1. Although I didn't mess with the mechanics, I first checked the mechanical alignment (according to Y2K). All fine. V207/Pin 6 to J208/Pin D gave 56K: so I suppose no field change 7 was made and the value is thus spot on for R210.

2. V202, V207, V201 warm up. I don't have equipment to check them beyond that though.

So here is my question: How should I proceed from here? In particular, what may impede the cal signal to be heard below 8 MHz? My test equipment includes a working AN/URM-25(H) (hooked up to a modern freq counter), but no tubes tester. Hope someone may be able to help!

Date: Mon, 20 May 2019 04:42:07 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] deaf below 8MHz (R-390A)

Andre, Welcome to the r390 group. I know that you will enjoy the R-390A. Sounds like you've done some good things to it already.

The 1st mixer is not used above 8.0 mh, so is probably the 1st place to look at. A common problem is the switch segment S208 is not lined up correctly, removing B+ to the 1st osc screen below 8 mh. Another problem is a bad contact on the crystal, it's housing, the osc tube or mixer tube. And don't forget about the 1st var IFs, see if their movement is working correctly. Have fun.

Date: Tue, 21 May 2019 00:45:43 +0200
From: atfu <atfu@gmx.de>
Subject: Re: [R-390] deaf below 8MHz (R-390A)

Many thanks, Larry, for the swift response. Looking at the signal path, it really ought to be a 1st mixer problem. Naturally, as I still have to warm up to the radio, I am hesitant to remove the RF-module. So I follow your suggestions in the order of least invasiveness.

1. I turned the three var caps C283-x in the 1st var IF a couple of times to resolve possible contact problems. No effect.

2. I took a good look at the contacts of the mixer and osc tubes, V202 and V207. Cleaned everything again. No effect.

3. Tomorrow I'll look at the Y201 crystal in HR-202. I'll report.

4. Then S208 will be next on the list. Don't even want to think about that yet
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Date: Mon, 20 May 2019 17:19:23 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] deaf below 8MHz (R-390A)

Andre, OK - good progress, it's all about the process of elimination. Checking the alignment of the RF deck band switch can be checked a few different ways. With power off, meter resistance from pin 6 V207 to pin D on J208 (see book on band switch alignment). With power on - check voltage on pin 6 and rotate the megacycle knob from lowest through 8 mh and watch the voltage in each band. Or - remove shield from v207 and wrap some turns of wire around it and feed to different rx, freq counter, or scope, looking for 17 mhz, while moving MC knob from lowest to 8 mhz. No need to remove the RF deck, yet.

Date: Wed, 22 May 2019 14:06:23 +0000
From: wb3fau55@neo.rr.com
Subject: [R-390] freq jump and no rx below 8mc

Folks- freq. jump is due to broken ferrite rod in PTO. No RX below 8mc is caused by no function of 17mc mixer osc. must 1st check this xtal in octal can. Could be MIA? You have no tube tester?- Need known good spares for this area. Check see if this var. IF moves properly with freq change. You could be as unlucky as me, someone removed small value caps from my project in this stage. i had to remove RF deck 3 times before i got it right! i will stay posted for followups
73 Russ wb3fau

Date: Thu, 23 May 2019 09:28:01 +0100
From: jm <josemic@gmail.com>
Subject: [R-390] lost reception 1-2 mhz

I have a strange problem. There is no reception in the 1 Mhz segment. There is no static and when cal is on it is only a weak tone what I hear. Apparently, the problem affects only to that band. Can you help me?

Date: Thu, 23 May 2019 01:49:15 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] lost reception 1-2 mhz

Hi Jose, The most likely items to look at are the 3 rf cans on the rf deck. Remove them 1 at a time and make sure the pins and plugs are ok. Perhaps 1st check the 10.5 mh crystal in the 2nd crystal osc deck (in the 1mc position, check for osc output at tp E210 while in 'stand by').

Date: Thu, 23 May 2019 14:00:50 +0100
From: jm <josemic@gmail.com>
Subject: [R-390] signal returned

I managed to have signal in the 1 Mhz band . It was a loose crystal. Tighted it and 390a working again!. Many thanks Larry for your

guidance.

Date: Fri, 24 May 2019 04:08:21 -0700
From: Larry H <larry41gm@gmail.com>
Subject: [R-390] R-390A Effects of oscillators low output levels

I just finished a document about what I found in the formal R-390A documents and the Pearls about low or high oscillator output on all 3 conversion oscillators. I also did some testing and measuring about low output and documented it for you to see. I think you might be surprised about what I found. It's attached. Let me know what you think.
---------- next part ----------
A non-text attachment was scrubbed...
Name: R390A Oscillator Output Level Affects.pdf
Type: application/pdf
Size: 84721 bytes
Desc: not available
URL: <http://mailman.qth.net/pipermail/r-390/attachments/20190524/6d5e6a04/attachment.pdf>

Date: Fri, 24 May 2019 07:54:24 -0400
From: <jgedde@optonline.net>
Subject: Re: [R-390] R-390A Effects of oscillators low output levels

I just quickly ran through the paper you wrote and my experiments with my 220k R390A (converted back to 56k) confirms your results. I'll read in more in depth later sine I have to run off to work. At 200k in the 17 MHz oscillator and the PTO, I found some tubes (new ones) wouldn't even oscillate. At 56k all tubes work more or less the same and give me strong outputs. Thanks for taking the time to do those tests and write up the excellent paper.

Date: Fri, 24 May 2019 15:23:46 +0200
From: atfu <atfu@gmx.de>
Subject: Re: [R-390] deaf below 8MHz (R-390A)

Hi Larry, weekend = radio time ;-) So I studied the signal path and made a plan (see below). As I went along, starting to follow your suggestions, I got completely stumped at the results of A and Z (below). At E209 I get a voltage of practically 0 and at E607 a reading well below the required 150 VDC. (I used a good analog multimeter grounded to the chassis.) That doesn't look good at all. The voltage at E607 was OK before I changed the caps in AF and IF. What could have gone wrong? (And how these findings relate to the "deaf below 8"-problem, I do not even begin to understand.) Please be so kind as to help me on the right track! Best! Andre
%<==========

Trouble ... fb >= 8 MHz > nil

... shooting (along signal path)

(Signal < 8 Mhz gets routed by S206 thru Z201-Z203 to S207 into 1st mixer/1st xtal, then via Z213-1,2,3 and S208 to 2nd mixer.)

A. S207
Connection to 1st mixer ok?
Probe testpoint E209. Should be ca. -4 to -6.8 VDC (in stand-by)
X [Done: Is -0.3 V!]

B. V202 (first mixer tube, 6C4)
Tube ok?
Exchange with V203 or V204 (2nd resp. 3rd mixer).
If now deaf above 8 MHz, then V202 faulty; otherwise ok.

C. 1st xtal osc
...
C1. P221/J221 ok?
(How will I discover a fault?)

C2. Crystal Y201 (17MHz).
Contact ok?
Take out, clean, put in. [Done. No difference]
Working?
(a) Exchange with Y412. (What effect to expect?)
(b) See C4(c).

C3. V207 (osc tube 6AK5)
Tube ok?
Exchange with V401 (2nd osc)
If now deaf above 8 MHz, then V207 faulty; otherwise ok.

C4. S208 (rear)
Alignment and contact ok?
(a) (Cold) Measure R from V207/6 to J208/D.
Should be 56K (no FC7) below 8MHz, inf above.
[Done: ok.]
(b) (Hot) Observe voltage on V207/6 while rotating Mc-know up to and incl. 8 MHz.
(c) (Hot) Read out freq at V207. Pull shielding can and ind. couple a wire to bulb.
Should be 17MHz.
[Tried with my cheapo China Counter but didn't get a coupling.]

Contact J208/P108 ok?
Pull and look/clean [Done: Looks ok]
VDC at P108/?
See (b) above.

D. Z213-1,2,3 with C 283-1,2,3
(How check?)

E. S208 (front)
Alignment and contact ok?
Pull RF deck and have a look!

F. Probe test point E210
Should be -3 to -8 VDC (in stand-by).
X [Done: 0 V!, irrespective of Mc-position]

Z. Other tests made
Power supply E607. Should be ca. 150 VDC.
(Was 150 VDC before changing caps in AF and IF.)
X [Done: Now 70 with MGC, 115 in stand-by!]

Date: Fri, 24 May 2019 09:27:41 -0400
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Re: [R-390] R-390A Effects of oscillators low output levels

Larry, you beat me to the finish line... I was writing a small paper on the same subject, following a request from Perry. My approach was different: the FC7 "Navy" mod (http://www.r-390a.net/NAVSEA-0967-LP-063-2120.pdf) reduces the bias on the PTO and 1st Xtal oscillators, then reducing the PTO and Xtal outputs at the same time, as you found. But this is not the only effect: that also impacts the 1st and 3rd mixers output. Because the CONVERSION GAIN of those mixers is DIRECTLY DEPENDENT on the input voltages, the end effect will be a reduction of the whole receiver Maximum Available Gain (MAG). With the FC7 mod, someone tried to reduce the oscillators leakage "in supplementary radio spaces" but applying the change (the 220k resistors for R210 and R702) kills the receiver MAG at the same time... you bet that it reduces the "internally generated interfering signals" but... at the end of the day, all the R-390A in which R210 and R702 were changed to 220k have to be reverted to the 56k original design value, period !

Date: Fri, 24 May 2019 16:32:49 +0200
From: atfu <atfu@gmx.de>
Subject: Re: [R-390] deaf below 8MHz (R-390A)

Further info: before recapping AF and IF, E607, F102, F103 had good

values. Now I checked again. E607 dramatically down, F102 = 170 VDC, F103 = 0 VDC. I also recall that when I put back the recapped AF deck and switched the radio on, there was a louder than usual hum for 2 or 3 secs. But then everything looked normal. Well, perhaps ist wasn't really back to normal :-(If something in the AF module is playing up, that would explain, why E607 is down and the radio is deaf below 8: V207/6 gets its voltage
directly from V606 via P119/J619, right?

Date: Fri, 24 May 2019 15:34:32 -0400
From: dog <agfa@hughes.net>
Subject: Re: [R-390] R-390A Effects of oscillators low output levels

Thanks for that work Larry. I've always wondered about that and it's about time someone came up with a thorough study. Not to see if I can do anything about it?

Date: Fri, 24 May 2019 17:58:05 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] deaf below 8MHz (R-390A)

Hi Andre, You might have a short in the rf/if B+ line causing f103 to blow (I assume it's blown) and that short damaged 1 of the 2 rectifiers. You might have shorted something in the IF deck. It's a really good idea to bring up the power slowly with a Variac after a recap to look for shorts. You could uncable the IF deck power cable and try to find a short with your ohmmeter. Same with the RF deck, uncable it. Before that you could try measuring f103 on the IF deck side, it should be above 25k ohms, I think. Sometimes a short can happen in the connectors as the wiring is a little tight in there. Do as much testing with ohmmeter before reapplying power. When you do, measure current through F103 CAREFULLY. It's probably very high.

Date: Sat, 25 May 2019 09:28:24 +0200
From: atfu <atfu@gmx.de>
Subject: Re: [R-390] deaf below 8MHz (R-390A)

Hi Larry. Thanks agn. The fuses F102 and F103 are _not_ blown. Can that be compatible with there being a short in B+? I'll be away until Sunday and then will resume testing. Unfortunately don't have a Variac.

> Date: Sat, 25 May 2019 01:59:42 -0700
> From: Larry H <larry41gm@gmail.com>
> Subject: Re: [R-390] deaf below 8MHz (R-390A)

Andre, I'm quite surprised that there is 0 volts on F103 and it is not open.

It should be a 1/8 amp fuse, so you should check to see that it is not larger. Yes, it points to a short - possibly C606B in the audio deck. It sounds like it already damaged the power supply, so be careful that all shorts are fixed before powering it up again. The resistance to gnd at F103 should be 20k or more. If it's less, you could try uncabling the IF and RF decks. If that cap is shorted, then F102 should have blown. Verify it is 1/4 amp.

Date: Sat, 25 May 2019 14:22:46 +0000
From: wb3fau55@neo.rr.com
Subject: [R-390] 17mc osc. working?

Well, folks we still do not have a definitive answer as to if the 17mc osc IS working. Tests done do not give that answer. You could trade the 17 mc xtal from the xtal osc section. Mine had a different problem- some traded the ferrite slugs with type used in the RF section, as most of you know, these have a different permeabiity. Looking at the slugs in the 17mc section, they have a green tint to them and you may find a green dot on the top. In the RF section, they are grey and you will find a red and white dots on top. The slugs are mechanically interchangeable. So, did this ever work properly? Rule out each section for working properly before digging elsewhere. 73s

Russ.

Date: Sun, 9 Jun 2019 20:14:11 -0400
From: <jgedde@optonline.net>
Subject: Re: [R-390] R390/URR Gear train

Thanks! One thing I forgot to write... It's all back together and guess what... It STILL crackles on 0 MHz. It's hard to pin down because it comes and goes. I get into it with the test equipment and it always stops whilst I'm trying to debug. Whatever it is, it's early in the RF deck chain. But I can now have the rf deck in and out in 30 minutes or less now that I've done it a few times - if I need to get it out again.

From: Alan Victor <amvictor@ncsu.edu>
To: jgedde@optonline.net
Subject: Re: [R-390] R390/URR Gear train

Silver mica "disease"... metal migration may not require any applied voltage to occur and its affect is the noise bursts you describe. A possibility? Alan

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Date: Mon, 10 Jun 2019 10:16:46 -0400
From: <jgedde@optonline.net>
Subject: Re: [R-390] R390/URR Gear train

Good call Alan. It was the 390 pF cap in the second RF can. Hit the can down one of the screw holes with freeze spray and the radio went nuts! It's replaced and the radio is quiet now. She's "Cracklin? Rosie" no more.

Date: Mon, 10 Jun 2019 11:40:20 -0700
From: Alan Victor <amvictor@ncsu.edu>
Subject: Re: [R-390] R390/URR Gear train

John, glad you found the bad C in the 390. This is an issue in some of the Hammarlund receivers and reported from users. Not sure how often this was found in the Collins devices.

Date: Mon, 10 Jun 2019 15:55:14 +0000
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] R390/URR Gear train

I second what Don Heywood says. Be suspicious of the molded mica cap that tunes the transformer secondary. Today they are on the rising end of the bathtub curve. Moisture contaminates the dielectric and the crimp contacts, and they go intermittent when the stress on the leads changes slightly. Transients, such as applying a test probe, can temporarily break through the corrosion and make the part appear healed - for a while. They also go leaky, especially if there's voltage across them. There's been plenty of time for electromigration of ionic contaminants. Sometimes this is intermittent too.

Date: Fri, 14 Jun 2019 01:59:19 -0700
From: Larry H <larry41gm@gmail.com>
Subject: [R-390]: R-390A Effects of oscillators low output levels

Al put this document out on the R390 disk so everybody does not need to keep a copy. Here's a link to it:

http://r390a.net/R390A%20Oscillator%20Output%20Level%20Affects.pdf

It's in the Tutorials section. Regards, Larry

Date: Fri, 12 Jul 2019 14:12:34 -0400
From: dog <agfa@hughes.net>
Subject: [R-390] First Xtal osc low voltage

I'm finally getting around to checking the Xtal oscilators in the RF section. The 390A doesn't exhibit any sensitivity issues. But the first xtal osc is only giving me -0.9VDC on E209. Tried a 6AK5, V207, out of another RF section as well as a 6C4, V202. Now I don't know about the

56K or 220K resistors, not sure I want to pull it apart to look. Larry's article says not to worry near as I can tell if only one osc is low, but this is pretty low from -5.5VDC. The others are E210=-4.2VDC and E211=-3.5VDC. Any suggestions other than taking it apart? I've got some tube extensions.

Date: Fri, 12 Jul 2019 14:15:09 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] First Xtal osc low voltage

Dave, You could try a different Y201 17 mh crystal. Or perhaps it has a bad contact. Does T207 peak correctly? Make sure connector J221 is making good connection. Measure resistance at V207 pins 5 and 6. Try measuring output at J221 with scope (it should be loaded with about a 1k res).

Date: Sat, 13 Jul 2019 11:20:54 -0400
From: dog <agfa@hughes.net>
Subject: Re: [R-390] First Xtal osc low voltage

OK, I forgot that the first mixer osc only works below 8MHz, first thing I noticed when going through the testing, well, I put the MC to 7 and low and behold, the voltage whacks up to -20VDC at E209. Sounds a bit excessive to me but then there's the 'or more' caveat? I'm not finding an adjustment procedure for that 1st mixer in any books I have but it adjusts fine with T207. I don't ever remember adjusting that 1st mixer osc. It probably never needed it. At least I'm glad I have enough, it seems in the past when I messed with these oscillators, there was never enough, but then I probably had the radio in AGC instead of STBY.

Date: Sat, 13 Jul 2019 18:15:57 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] First Xtal osc low voltage

Hi Dave, Glad that's all it was. The problem with too high of injection voltage is possible increased noise and distortion. I would not worry at 15, but 20 I don't know.

Date: Tue, 16 Jul 2019 13:46:03 -0400
From: dog <agfa@hughes.net>
Subject: [R-390] Procedure for setting T401

Since the voltage on E209 is so hot in my 390A (-30VDC), I've been looking for a procedure to set T401. I don't seem to be able to find anything. Any ideas? I thought maybe I'd stick a high Z probe in E209 and look at it on the spectrum analyzer and set it for the best 17MHz

signal. Don't know if there's any harmonics or glitches that are making it so high but maybe the SA would tell me something. I haven't looked at my other 390A, it's all apart right now, I should start putting it back together before I start losing parts.

Date: Tue, 16 Jul 2019 14:37:42 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Procedure for setting T401

Isn't there an axiom that says if an R390A is taken apart, then parts are already lost?

Corollary: Lost parts are always irreplacible and usually are a springy/bouncy thing.

Date: Tue, 16 Jul 2019 13:38:52 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] Procedure for setting T401

Hi Dave, I know that my 390As says T401 on the T207 can, so I assume you meant T207. It should be adjusted for maximum 17 mh signal while monitoring it with a scope on V202 pin 7. You should only see a nice clean 17 mhz signal with it in AGC mode and no input, if there's something else in there, that's a problem.

Date: Tue, 16 Jul 2019 18:15:09 -0400
From: dog <agfa@hughes.net>
Subject: Re: [R-390] Procedure for setting T401

Yeah, I thought about that T401 after I sent the message. I'll take a look with a scope and also with the SA. I got the RF, PS, Audio and PTO back in the other one so far and no missing green screws, Oldham coupler or spring. But I've got a couple new meters I want to put in the front panel, so I'm working on that. The IF is ready, but I repaired the filters and I don't think they've aged well. This one, the front panel is not in great looking shape, but almost acceptable. I still wish there were an acceptable IF replacement.

Date: Wed, 17 Jul 2019 22:23:18 -0400
From: dog <agfa@hughes.net>
Subject: [R-390] The second 390A

I got the second RX put back together today, new meters, all the stuff soldered back in place, all the modules installed, new re-wired PS with the tubes, turn it on and it plays, noise from the headphone jack, BW, BFO, Meters, etc seem to work. Check the osc voltages and E209 is

-9.4VDC, E210 is -2.2VDC, E211 is -2.65VDC, (not too bad) but E402 is 0. Test the #1 390A which is working and the E402 is also 0VDC. What is going on here? I haven't put RF into the newly fixed input yet.

I also need one of those BNC to mini BNC adapters (J116) for the IF module. Stole it out of the other RX for now to test stuff. I don't think I every got a DC voltage reading on E402 in the past, I'm wondering what that is about, especially when the fixed RX works?

Got a lot done today getting the old one back together without too much missing.

Date: Wed, 17 Jul 2019 20:53:40 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] The second 390A

Dave, Good news on the 390A.

The DC voltage on the E402 is oscillator grid leak and is sometimes tricky to measure. It gets loaded down very easily. Try putting a 100k res in series with meter probe to isolate it or a different vtvm with less loading. Since you can measure that oscillators effectiveness at E210, you may not need to measure it. You can get a different reading on each 1 mh band from 8mh up. Do each of the bands trimmers peak correctly on the 2nd xtal osc? T401 should be adjusted so that all bands will peak. This is a sensitive adjustment, but if it can not be done, then there might be a problem in that osc.

Date: Thu, 18 Jul 2019 08:02:56 -0400 (EDT)
From: Barry <n4buq@knology.net>
To: R-390 Forum <r-390@mailman.qth.net>

Larry raises a good point about metering. What are you using to measure that voltage on E402?

Date: Thu, 18 Jul 2019 09:50:15 -0400
From: dog <agfa@hughes.net>
Subject: Re: [R-390] The second 390A

I've been using a Fluke 189 or an old HP427A FETVM, both 10M_ or more input. I'll have to do some further inspections and also get the SA/sig gen going. A bit of signal tracing back from the IF input should be easy enough to do. Not sure how much I'll get done today, but maybe I can get the first one looked at about the high voltage on E209 also.

The power cord was so old on #2 the innards were so brittle it just fell

apart. Luckily I found it right away. I'd like to find that mod for the new AC filter input.

This was the first trial in a long time of the PS on #2, it originally had the diodes installed and the tube sockets crimped shut. I replaced the sockets, re-wired everything and someone sent me a couple new rectifier tubes. It fired up just fine. The radio had been sitting around for maybe 20 years here and I was swapping modules out of it with #1 to get all the mods done I wanted. Mostly just the pertinent black beauties and coupling caps plus re-capping the audio/PS sections with filter caps under the deck. Also on #2 I had to rebuild all the mechanical filters. That took a year or more.

I've been thinking about re-painting the front panel on #2, it's got some holes drilled in it for the DB meter adjust that I removed. Looks like I may need a few small knobs too, like the ant trim. But get it working first, I kinda remember it worked to some degree 20 years ago when I got it. I think I gave maybe $50-80 for it at one of the local hamfests. I had 3 of them but loaned one out (the best one) and never got it back. I don't think I ever gave more than $80 for any of them. Why I needed 3 is beyond anyone's imagination.

Date: Thu, 18 Jul 2019 10:08:14 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] The second 390A

A VTVM like the HP 410B, etc, typically has an input impedance much higher (the 410B is spec'd at 122M). Since you're not seeing voltage at that point on either radio but they both seem to work, I'm guessing the meter is loading the circuit due to too low of an input impedance.

Date: Thu, 18 Jul 2019 14:08:50 +0000
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] The second 390A

That 10M_ is at DC, but there's significant RF at the test point, and the stray capacitance of the usual kind of DMM probe will short it right out. Heed Larry's suggestion to splice a 100K resistor into the probe tip to decouple the probe from the test point. This is a useful trick anytime you're looking for DC amid RF. The resistor will reduce the reading slightly, but you can fudge it out with the voltage divider equations.

These test points show DC because the mixer grid and cathode act as diode detectors. (Acting in shunt with the signal.) What you read on the meter is the mathematical average value of the half-wave-rectified RF. Obviously if you short out the RF there won't be much DC left.

Date: Thu, 18 Jul 2019 19:01:49 -0400
From: dog <agfa@hughes.net>
Subject: Re: [R-390] The second 390A

OK, I've got an old HP410B that I can drag out of the back of the shop. I did something to fix it last year. I think the diode tube is still good in it too. I've also got a Boonton RF mVmeter, but it's really got a Moto label on it I think it's got about a 2pf load. Between all that I should be able to detect something. As I remember I just used to wrap a wire around V401 and feed it into the spectrum analyzer. But I do notice I'm not getting noise difference rotating the ant trim on #2, so something's not working right in the RF section somewhere. The IF works just like the other one at the input of J513 so I think the IF and audio sections are OK. I need to measure the B+ at some point though, I haven't done that yet. I've just been sorta letting it warm up and keeping an eye on it while I'm in the shop.

Date: Fri, 19 Jul 2019 11:37:56 -0400
From: dog <agfa@hughes.net>
Subject: Re: [R-390] The second 390A

For the most part the thing is now working. I stopped getting obsessed with measuring all the oscillators and just plugged the sig gen in the balanced port and I have signal except at 28MHz. Not sure what that's about since all the 2nd xtal oscillators work. I need to tighten up the spring on the Oldham coupler and I'm sure it's still not as sensitive as it should be but I also notice while changing the MC knob, the volume goes up and down, not always on the detent. Might need to pull the RF and clean and register that bandswitch. It may need a good RF alignment also. I just can't remember what I've done to this thing because it's been apart for so long. The mechanical filters are sort of a kludge too, repairing them was not completely successful. Starting at 4KC and lower, the signal decreases noticeably but they do have the correct BW. I did also find a bad RG58 cable I've been using, it produces a lot of noise in the RX when plugged into the antenna. The BNC connectors are probably loose or there's a break in the cable somewhere.

I have a mod on the carrier level meter adjustment using the original pot and want to try that. I did install a 10 turn pot in the other one. So there's plenty to do, as well as start mowing the 20 acre field in this heat. I better get started before it gets too? hot.

Date: Fri, 19 Jul 2019 15:10:47 -0400
From: dog <agfa@hughes.net>
Subject: [R-390] Missing 15.5MHz xtal

I was wrong about the 2nd mix osc, it's missing the 15.5MC crystal. Now where would I find one of those? It seems like the 2nd mix osc is cleaning itself off, it may just need a bit of use, I hate to take the RF out just for that but if it doesn't clear up it's not that hard, I've gotten pretty used to it by now. This one may be alright, I've had the balanced input down to 2uV or less and can still easily hear the CW signal in 8KC BW.

Date: Sat, 20 Jul 2019 15:34:43 -0400
From: dog <agfa@hughes.net>
Subject: Re: [R-390] The second 390A

Most things seem to be working. Went through the RF alignment today, a few of them were way off. Gain over the range is now more consistent. The meters I have for it are aftermarket and I need to make some adjustments for the Carrier meter. The VU meter I had was not working so I stuck an old one I had in. It seems like all I need now is the 15.5MC xtal and to see if I can get the osc levels a little higher on #2 and look into the high level on #1. Prolly tubes will do some of that. Line/local level is working fine. Then I'll see about that carrier pot adjustment mod. They are both picking up WWV on 10MC the same now but there's a lot of static. #1 seems to have more static than #2, might be a noisy tube in it.

Date: Sat, 20 Jul 2019 14:25:46 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] The second 390A

Hi Dave, Thanks for the report. You might want to try a new tube for the high 1st osc, also. I have a 15.5 crystal that is 1.1 kc high that I would sell you for $10 + shipping. On the one I'm working on, I have finished sanding and priming all the black work and painted most of it. The meters, readout cover, and large black knobs turned out very good. I've replaced all the mini coax in the RF deck - oh what fun.

Date: Mon, 22 Jul 2019 21:28:47 -0400
From: dog <agfa@hughes.net>
Subject: [R-390] 2nd osc again

I went through 7 6AK5 tubes today in the 2nd osc. They varied from -2V to maybe -4V. Then I tuned T401, things came up a bit. Then I found the ant trim didn't peak at 0 any more. Back to the RF alignment. Found a few that were off a tiny bit and one that was way off, one of the slugs. I ended up going back and forth on the 8MC and 15MC until they didn't interact. Then the individual frequencies were off on the 2nd osc.
Readjusted them. I think I went through the T401, RF alignment and the 2nd osc xtals about 3 times. The funny thing is most of the 6AK5 tubes

seem to work fine in the 1st osc, about 10V worth. But the 2nd osc I get anywhere from less than 3V at 8MC to nearly 10V at 31MC. The PTO is slightly low on the low end, but I'm not messing with that, I haven't tried swapping tubes on the PTO yet. Does this sound about normal or do some of the 2nd osc crystals get weak as time goes on, especially the low freq ones? There doesn't seem to be any balancing of the T401 to adjust for the xtals low to high. The MC bandswitch seems to be stable between bands now. This is on the Dittamore RX, #2. But all the modules are EAC. At least now I'm getting noise peak on the antenna trim which I didn't before.

Date: Mon, 22 Jul 2019 19:13:04 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] 2nd osc again

Nice report Dave. Glad the 2nd osc came up. Yes, the variance in readings from 1mc band to another band is normal, although ideally it would not be that much. The variance is usually caused by a less active crystal or a trimmer not peaking correctly. I'm not sure if the lower frequency crystals get weaker over time or not. T401 should be adjusted so that all the trimmers will peak correctly. Remember, when T401 is changed all trimmers need to be adjusted. Good work Dave.

Date: Tue, 23 Jul 2019 05:57:27 +0000 (UTC)
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] 2nd osc again with T401

Dave, Larry pointed out T401 should be adjusted so that all the trimmers will peak correctly. Remember, when T401 is changed all trimmers need to be adjusted." The science has not changed and the statement is still true. The 70 year old manuals offer a tuning procedure for T401 that is now a 70 year old procedure. Ops someone let age loose on reality. T401 is usually just peaked against the crystal calibration tones on each megahertz.

This makes everything relative and you can not compare output of crystal A to crystal B because the circuits are not the same.You re tuned the RF deck when you twisted the megahertz change knob.If the cap for the megahertz has two peaks then, T401 is in range. The cap has sufficient change to cross the peak coupling on both sides. The cap is not set to max. The cap is not set to minimum. The cap has range to peak the circuit. The crystal, cap, transformer are all good to go.

In step one of peaking the second crystal oscillator deck for each megahertz tune up and down the whole 31 Megahertz of choices. Remember the poorest 5 megahertz. Check the poor five for use on more

than one crystal harmonic. If one of the poor 5 is used on more than one megahertz then each of its harmonics must also be checked. So you may have your 5 poorest crystals serving on 15 different megahertz. Not like likely, but it could happen.

No it can not, there are only 15 crystals in the deck. Do not try and start this recovery process by peaking T401 to the sorriest crystal in the deck and working back to the optimum performance your receiver will yield. This step is a gut feel. Know what you want to hear. Of your poorest 5 megahertz which one do you have the most interest in listing to. On that megahertz, you are going to run a series of tests. Spin T401 down two turns. {I said spin down CW to some, this is a screw job not a frequency change or tune.} Spin the cap for the megahertz and peak. If T401 is in range the cap will have two peaks points. The peak points may not be equal so remember which side is up. If T401 will peak on the two points this is not the crystal you are currently seeking. Just move on to the next candidate of 5 megahertz to inspect at this point in the process sequence steps.

If T401 is not in range, adjust T401 1/2 turn CCW.Spin the cap for the megahertz and peak. If T401 is in range the cap will have two peaks points. The peak points may not be equal so remember which side is up. You are going to repeat this search step on each of the 5 megahertz bands you rated as the receivers poorest 5 megahertz bands. T401 will keep coming up and crystals will each peak twice. Do not look back at this time. By the time you reach the bottom with the poorest megahertz the receiver will have 1 of 3 conditions.

Condition 1: Good news T401 is setting at some slug position. Bolt length means nothing because we can not see the ferrite core hanging in a field. Ferrite core density way not be as uniform or random as it was years ago. Now just spin the receiver across the megahertz bands and peak the caps. I liked to spin the Kilohertz to 500 KHz. You get a feel for how far each megahertz is off at mid band.If the cap on each megahertz peaked twice and you left the cap tweaked to the best of the two peaks, the second oscillator deck is good to go. On those megahertz where you align an RF octave, then use that test setup and get the cap on peakwith the best meter in use. On the other megahertz, take the time and use the generatorrather than just the calibration tone to peak the second crystal oscillator deck.

Condition 2 Almost Good News.There will be one or two megahertz where the cap did not offer two clear peaks. Once you get to testing with a signal generator you may find the megahertz cap has two points very close together. This indicates this cap is at the end of its min or max range. The receiver is OK on this point. Condition 3 More work ahead.There will be

one or two megahertz where the cap did not offer two clear peaks. Once you get to testing with a signal generator you may find the megahertz cap still does not have two peaks. This indicates this cap is at the end of its min or max range. The receiver is NOT OK on this point. T401 is where T401 is because a broad band alignment procedure found it a place to be. We settled one of two variable in the equation.(Using a shot in the dark process that has served well over time and not worth reinventing.)We peaked the second of two variables against the first variable.1 of 15 crystals just barely accepts T401 where it is.13 of 15 crystals will accept T401 where it is.1 of 15 crystals is still standing off. If you looked back in this process, you keep finding the outlier and never let T401 settle,you are testing against your last change. Whatever the megahertz where T401 was last twisted is one end of the range for T401.One (or more) caps just will not peak up with the preferred double peak. The problem can go three ways here also. Adjust it correctly up, Adjust it correctly down, Isolate a specific problem.Remember where T401 is currently adjusted to.Set up the failing megahertz for test and peak the cap. Move the cap ever so slightly off peak. Run T401 1 turn up and 1 turn down. If T401 peaked clean some where in that range, you have your second limit. The first setting of T401 is one limit goal in bounds. The current setting of T401 is the second limit goal in bounds. T401 is an impedance transform between a plate and a cathode. Hope fully there is a L some where in T401 that will let the cap for each megahertz peak the circuit up somewhere within the range of the cap C for each crystal frequency. We know C is in range because the mechanical design of C has two points of theoretical equal value. Which we find not to be exactly true in the real world. The circuit peak is simple the best impedance match . With the input at the antenna, and meter on the diode load, thetest is not close to impinging on the dynamics of T401. You arrived here with 14 of 15 happy crystal circuits.number 15 is not that far out of range. Number 15 may in fact be working on its other harmonic ('s). So the general setting of T401 was not close enough for every megahertz. But you have two limits for T401.You know which two specific harmonics on which megahertz are on the opposite ends. Can you find a place on T401 where you can remove the technician and resume normal receiving. Now finish the alignment procedure on the entire receiver. Just because a specific megahertz cap has only a sort of soft peaky point almost kind of is not necessarily the long pole in the tent. The signal to noise on the megahertz may be excellent even as we know the oscillator alignment was not all that crisp. The flip side is you do not have a good clean 20 : 1 all across the megahertz and you know the second oscillator deck has the weak peak then you know some serious additional work is ahead. In the last quarter century we have on

yet observed any failure patterns in the crystals. Moving a receiver and cracking the plating to the quartz from a mechanical shock is the normal loss. Mice and weather corrosion are more mechanical and repairable.

Over the years in my tear down for the picnic table bathing I have found loose bolts in the oscillator chassis. I have had to take more than one deck further apart than I wanted (required soldering) to tighten up ground lugs. I had one loose bolt that shorted B+ to where else, ground.

Dave, The 6AK5 experience and the antenna trim are normal. Here again with the tubes pick the one that gives you the best end to end signal to noise ratio.The first oscillator hums 17 megahertz with out switching wires. The second oscillator has 15 choices and additional wires. 6AK5's prefer 31 Megahertz. The first oscillator was engineered to keep a 6AK5 humming at 17 Megahertz with a more measurable voltage transform (less sensitive to measurement). Cherry-picking tubes for signal-to-noise is what brings these receivers from well aligned to very well aligned somewhere over 20 : 1. Tune the receiver to 31 Mhz. Swap the 6AK5's into the second oscillator where you can get your fingers on the little things. Pick the best one for signal to noise ratio and install it into the first oscillator.Pick the second best one for the second oscillator. Mark choice 3 as spare #1. Why do signal to noise on the 6AK5 oscillator tubes at the high end of the receiver Because Dave, reminds us by test and experience, as frequency goes up the 6AK5's usable output goes up. Engineering tells us noise goes with efficiency. If the tube is low noise at 31 MHz it will be quite below that frequency.A quiet 6AK5 at 17 MHz may not be as quiet at its second harmonic on 31 MHz This is a cherry picking exercise with tubes. Part of the pick is knowing where to pick. T401 is knowing where to pick a point where all capacitors cross. Complete an analog solution in two adjustments. I agree with Larry, Thank you Dave for the report. Respectfully, Roger AI4NI

Date: Tue, 23 Jul 2019 09:23:57 -0700
From: Alan Victor <amvictor@ncsu.edu>
Subject: Re: [R-390] 2nd osc again

On the R390A I had 3 low frequency xtals age to the extent that the series
resonate frequency shifted nearly 15 kHz! Measurement of the xtal on a VNA at the "stamped" frequency indicated the equivalent series R of the xtal was in excess of several hundred ohms. The LO would never run on its intended frequency.

Date: Tue, 23 Jul 2019 10:15:05 -0400
From: dog <agfa@hughes.net>
Subject: Re: [R-390] 2nd osc again

Thanks guys. I did check for 2 max tuning points on the osc caps, I knew that much from other experience. Not sure I checked them all, but the majority of them have 2 peaks and they are not right next to each other

so I don't think there's an issue there. I was surprised that tuning T401 resulted in such a difference in some of the RF tuning though. I'll go through all the xtals and make sure there's no outliers. Other thing I can do which I did on the other RX is pull each xtal out, clean the pins and sockets and give them a bit of de-ox. May or may not help. But I think I'm getting close, but I wish I had some better 6AK5's. I don't think any of the tubes will come up to the -4.5VDC as a minimum across all the bands but like I said there are also some -10V in there too. At least the majority of the RF was not mis-tuned to a large degree. Only 1 or 2 of the RF slugs were way off.

Date: Wed, 24 Jul 2019 05:51:34 +0000 (UTC)
From: Perry Sandeen <sandeenpa@yahoo.com>
Subject: [R-390] Xtal oscillator module - Possible Mod

First thanks to Rodger and all on the tuning details. I never new it could be so complicated to tune up. I guess I should hold onto my Western Electric 6AK5. So here is my questions for those with more information than I.

1. The 6AK5 has a gain of 5,100 uMhos. It appears from the reflector observations that it is just marginal. Could it be replaced by a cascade circuit of J309 Fets which have a gain of 9,000 (I don't know if that's uMho's or not) or something similar. What I see as an advantage is that gain would remain constant. Or if one was so inclined could the 6AK5 be replaced with a higher gain sharp cut-off pentode.

2. I've seen these DDS synthesizer boards (which I know almost nothing) on ebay. Could something like this be used. I do now that when one gets way, way down to the nitty gritty the frequency has minute frequency variations but I believe that they are so small that in our intended use, it would be irrelevant. I noticed one small detail when reading the tube manual. The gain went from 5,000 to 5,100 uMhos when the plate voltage went from 120 to 180V. Might a low plate voltage be causing marginal operation. Have the receivers with these problems had all their problem caps replaced as well as the Chuck Ripple note on changing the voltage rating of one small ceramic cap from 500 to 1Kv. This is all just speculation on my part and wish that those who have more expertese would enlighten your humble servant.

Date: Wed, 24 Jul 2019 07:25:54 -0400
From: "John Gedde" <jgedde@optonline.net>
Subject: Re: [R-390] Xtal oscillator module - Possible Mod

I can't comment on the FET idea, but I did some experimentation with the use of DDS sources in my R390. Phase noise is a killer. The S/N of the

radio worsened dramatically when the DDS source was used.

Date: Wed, 24 Jul 2019 18:24:19 -0700
From: Alan Victor <amvictor@ncsu.edu>
Subject: Re: [R-390] Xtal oscillator module - Possible Mod

DDS Noise killer... That's no surprise.

On the xtal module and gm. In my opinion and what I found was a significant rise in the equivalent series R of the xtal's which needed replaced in the 390A I worked on. They were so far off (measured them on a hp VNA) that it was impossible to get the PTO end points to align properly. The increase in xtal series R, will require a corresponding increase in gm in any oscillator to get it to start. If you want to get a real boost in gm, go with a bipolar device or a modern FET like GaN!!! A bip will give you 40K micro mhos at 1 mA and GaN will give you mhos of gm!

But, check out the xtal issue first before pointing fingers at the poor tube. It would be interesting to calculate the minimum gm necessary to get
the Collins xtal oscillators in the module to start as a function of xtal Rs. At 4 or 5000 micro mhos with the feedback ratio used in those circuits, I suspect the design is not going to tolerate much of a rise in the xtal Rs or lack of xtal activity.

Date: Wed, 24 Jul 2019 22:13:05 -0700
From: Larry H <larry41gm@gmail.com>
Subject: [R-390] R-390A Conversion Oscillator Low output

Sometimes our conversion oscillators will produce low or high output and we would like to correct the situation. The approach I take is to find the failing component and repair it. I certainly do know from past experience that this can seem like a daunting and hopeless situation. When I was in the service, I worked on a surface search radar transmitter for 8 days. The thing is that it was located in a very small tight 'closet' with minimum A/C and it was 110 degrees. After replacing all of the parts twice, it still did not work. This lead to a major part replacement - the 103 foot 2" coax from the transmitter to the antenna. Well, that did fix it. I guess what I'm getting at is you just need to figure out what part is bad and get a good replacement.

Now I know that it seems like modifying the circuit seems like a good answer, but this usually leads to other issues and sometimes serious ones. There are cases where a mod is justified, but I think this is where the science shows that the circuit was not designed correctly in the first place. I *don't* think this is the case with the conversion oscillators in

the R-390A.

The reason that it is important to find the bad component and replace it is that since it is causing incorrect operation, it will most likely continue to get worse. This is where the 'R390 list' or friends come in, we will help you find the bad component or problem in the circuit. I know that most of the R-390A users are excellent technicians, so will not need any assistance.

So, for the 2nd crystal oscillator, any component can cause low output. Sometimes measuring components, voltages or scoping the wave forms will divulge the culprit, but not always. However, I think replacing the 'easy' to replace parts should be the first step. And don't forget to check the tube and crystal connections. This quickly gets us to the crystals - IMHO the only way to test a crystal is to put it into a known good 2nd crystal oscillator and see what it does. Now in the case where most of the 1 mhz bands output is low from the oscillator, it's most likely that the crystals are not the problem. I could see up to 7 going bad, but not likely. Alternatively, put a know good crystal in the problem oscillator and see what it does. This test will help you decide if crystals are the problem or not. Once you determine that the tube and crystals are good, then you can do the measurements and switch testing and ground checking. I think the next step is to check the 2 bypass caps, C410 and C411. If they are OK, replace caps C408 and C409. Or you could check the switch for chemical contamination first. A resistance check might give you the answer, but it might act differently at RF. If you get to this point, there's not much left, the mini coax and T401. I think I'd inspect the coax and measure it and see. You might try sending a signal through the coax from a generator.

Date: Thu, 25 Jul 2019 09:13:25 -0700
From: Alan Victor <amvictor@ncsu.edu>
Subject: Re: [R-390] R-390A Conversion Oscillator Low output

Another approach in lieu of replacing the crystal, particularly if you do not have one on hand. Replace the xtal with its equivalent Z value at its operating frequency. For series resonate xtals about 20 ohms R where the xtal was located. A blocking C may be required depending on the circuit configuration. The LO should run and at least you can get a sense that the xtal is the culprit or not. I have done this with overtone as well parallel mode xtal oscillators. It would be nice to find the Collins spec on the xtals used in the R390A and non A units.

Date: Thu, 25 Jul 2019 09:43:56 -0400
From: dog <agfa@hughes.net>
To: r-390@mailman.qth.net

Subject: Re: [R-390] R-390A Conversion Oscillator Low output
Message-ID: <c3cba222-2ad3-389c-a7e2-28b9c2e7f144@hughes.net>
Content-Type: text/plain; charset=utf-8; format=flowed

Good points Larry. What my plan is, is to get the other 390A going and measure the 2nd osc in that one and compare/swap xtals from one to the other. That may help define the xtals. I went through #2 and I had outputs ranging from a low of 2.6 @ 8MC to a high of 9.8 @31MC. But the trend was from lower at the low end to high at the higher end with some variations in there, like 2.7 at 27 and 5.3 at 18. Without known good components (crystals/transformers) the only place to go is the bypass and coupling caps as well as any resistors. Not discounting the tube. I haven't dug into the 30V on #1 yet, that sure seems like an anomaly.

Date: Fri, 26 Jul 2019 17:59:35 -0400
From: dog <agfa@hughes.net>
Subject: [R-390] Testing the 2nd osc, swapping xtals

Today I turned on #1 RX and started swapping crystals, but first a tube that produced -XVDC in RX2 produced more volts in RX1, so that is something. But I started swapping xtals, especially the ones that were quite different between the 2 RX's of which there were only a few. There was only one position that swapping a crystal made a significant difference and that was at 31MC. The 2nd osc went from 4.5 to 7.5V. But notice that the same crystal is used at 14MC. It made no difference there so WTF? In general I would have to say that swapping crystals is a crap shoot at best and not worth it in my RXs. I'm not sure if it's components in the output circuit of the xtal osc, the osc circuit itself or what. I'm about to just go and shotgun the worst 2nd osc (#2) starting with the tube circuit itself. Not sure how hard it is to get into the output circuits with the tuned caps. I'll see when I take it off.

Also there was a general tendency in RX1 to have lower voltages at 8MC or lower freqs and higher outputs at higher freqs, just like RX2. But I did have one that was 2V at 24MC and swapping the crystal made no difference. All tuned circuits had 2 max points and they were not exactly opposite. I wonder if I can see underneath where max and min would be on these var caps so I can tell easier from the top what they're doing.

I wonder if it was a progression of building receivers that someone came up with this mixing scheme or if it was laid out from the design of the thing. It reminds me of when I used to work for the PO on the letter sorting machines, they could put letters in the 'delivery point' sorting machine and in 3 passes have all the letters in order for a delivery point on each road and the letters sorted up and down the street so the

delivery guy didn't even have to sort stuff. He just had a box of letters for each street, presorted, and had to go up one side of the street and down the other. What magician figured that out?

I haven't addressed the 20V that's still on the 1st osc in RX1. I may first do some 2nd osc tube voltage/ohms measurements before I get too far. Is this exciting or what? Maybe this says something for swapping out all the mica, coupling and bypass caps and measuring the R's from the start while it's apart.

Date: Fri, 26 Jul 2019 18:26:15 -0400
From: Bob kb8tq <kb8tq@n1k.org>
Subject: Re: [R-390] Testing the 2nd osc, swapping xtals
Hi

I have seen R390's (A and not A) with damaged crystals in them. The 'problem radios' had multiple issues. Tearing the problem parts open showed that the blanks had cracked. My guess is that the radios got treated very roughly at some point.

Date: Sat, 27 Jul 2019 00:50:41 -0700
From: Alan Victor <amvictor@ncsu.edu>
Subject: Re: [R-390] Testing the 2nd osc, swapping xtals

I understand your frustration. I am looking at the Y2K manual, July 2009. I don't know if the latest Y2K corresponds, but the schematic is Page 5-42 Fig 5-21. The capacitors C408, 12 pF and C409 150 pF control the feedback in this oscillator. The oscillator is a Colpitts with the crystal running above series resonance, that is where the xtal appears INDUCTIVE. Obviously for all the xtals to to run properly, these 2 caps need to be proper. Assuming they are, we still do not know if we are dealing with healthy xtals or a feedback oscillator with marginal components, S402 with band contacts (the band switch) which would play havoc with the plate load tuned circuit, T401//all those tuning C's adjusted for each band!

In any case, one suggestion to help put the xtal issue to rest, is to substitute a discreet inductor with a blocking series cap into the xtal socket in question. The inductor value is chosen to resonate with ~ 12 pF at the desired xtal frequency. If you see a significant peaking in the xtal LO output swing that may point to the xtal problem. Otherwise, no change, not likely a xtal issue.

Also note, C410 screen bypass cap, 5000pF, better be a good cap. As well C411 plate tank bypass, another 5000 pF.

Date: Sat, 27 Jul 2019 01:37:01 -0700
From: Alan Victor <amvictor@ncsu.edu>
Subject: Re: [R-390] Testing the 2nd osc, swapping xtals

Forgot, we need to add in with the 12 pF the control grid to cathode C and the holder C of the xtal. So that inductor you calculate will be somewhat less. That's 4 pF from the 6AK5 and estimate the holder C at 6 pF so were looking at finding an L to resonate where the xtal would be in use as 22 pF inductive.

Date: Sat, 27 Jul 2019 09:19:09 -0400
From: dog <agfa@hughes.net>
Subject: Re: [R-390] Testing the 2nd osc, swapping xtals

Thanks for taking a look at the circuit for me. Right now the discrete component exchange of the xtals sounds like a project, except maybe in the case of the few where I have really low voltage. It would be a project to do them all but maybe substituting one or 2 may be viable. I have a good supply of newer dipped mica caps and may be able to replace the feedback caps for the osc and also the 5000pf bypass caps and maybe any other thing that seems obvious. I bought a lot of 4700pf 1KV quite a while ago thinking of replacing a lot of them but never got around to it, there's a lot of them, especially in the IF. I did notice yesterday after the rx warmed up good, the voltages wandered around a bit. About an hour into it, the osc voltage dropped down significantly (maybe 5 to 4 V) and then as it warmed up it slowly increased again, but not to the peak I had at about an hour into it. Not sure if that's the tube or components, but it also may be worth investigating. I've got about 5 tubes I can substitute, plus the 2 in the 1st osc position for both rx.? Right now both of them seem to be operating about the same 2nd osc voltage wise but of course there are distinct variations per MC. I'll also attempt to de-ox the bandswitch after a bit of cleaning, but it doesn't seem noisy or erratic at all. Right now both RXs seem to vary from a low of less than 2V to a max of 8. I wonder what they were when new.

I don't know why I'm doing this in the middle of mowing season, I should have been working on this either in last week's heat or last winter. Evasion I suppose. Dave N3DT

Date: Sat, 27 Jul 2019 13:24:35 -0700
From: Alan Victor <amvictor@ncsu.edu>
Subject: Re: [R-390] Testing the 2nd osc, swapping xtals

I understand that Dave. Once you get into one of these projects, it hard to shake it off! The fundamental oscillator circuit is pretty straight forward.

However, all the mechanics particularly the tuning capacitor band through the switch can cause irritation! Assuming its solid and not so temperature sensitive, I would also concentrate on the oscillator components. Even something as simple as a poor intermittent ground return of one of those 5000 pF caps, is going to create an issue. If you have a scope and a FET probe to prevent loading, boy that would go a long way to pointing to what is going on. The idea of taking the xtal out and replacing it with its inductive equivalent is pretty straightforward. I would do it on only ONE select xtal freq. The one that appears to be most troublesome. I wish I knew the Collins spec on those xtals. It could be they are simply correlated to 32 pF which is an industry standard. The 22 pF I mentioned earlier is pretty close. The 32 pF correlation C simply translates to an inductor whose reactance is equivalent to 32 pF at the xtal frequency. Anyway, its worth a check. Again, you will have to block the inductor say with one of those 4700 pF C's. As it hangs on the tube grid. You would simply plug the two leads of the series L-C into the xtal socket.

Date: Sat, 27 Jul 2019 13:44:31 -0400
From: dog <agfa@hughes.net>
Subject: Re: [R-390] Testing the 2nd osc, swapping xtals

Thanks again Alan, this morning I messed with it and found two 5654s that are way better than the others. So I ordered 4 NOS from Antique Electronic Supply. They were only $3 each. I've gotten some good tubes from them in the past. So now nearly all the MCs come up to spec except for a few strange ones. One of them is 24MC on #1 and swapping the #2 crystal doesn't make a whit of difference. But that MC is also low in #2. So it's still not telling me if its the xtal or components. I'll hold off until I get these NOS tubes and see what they do before I get all involved in the circuit. Those 5654s are also the last tube in the IF and I noticed some of them weren't very good either. Maybe in the meantime I'll see if I can cool off that 1st osc in #1.

Date: Tue, 6 Aug 2019 15:41:03 -0400
From: dog <agfa@hughes.net>
Subject: Re: [R-390] Testing the 2nd osc, swapping xtals

Got the new 5654W tubes today. 3 of the 4 are much better, they appear to be GE. One is crap. In the EAC, it makes spec everywhere, 8MC is worst at -4.5V. But in the Dittamore the tubes didn't do anything. So it looks like that RF section needs to come out and replace the bypass and feedback micas and anything else that strikes my fancy. Haven't worked on the high voltage 1st osc in the EAC yet. That tube is really hard to get to.

It's almost like in both RXs the same frequencies in the 2nd osc are low, it appears to be a pattern. 8, 15, 17, 23 and 24 are low, and the very high freqs, 25 and above, are high, over -7V. It would be interesting to know what the voltages were when new.

I didn't notice that swapping xtals did anything at all. But I also haven't tried just an LC circuit in place of the xtal.

Date: Tue, 6 Aug 2019 17:59:57 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] Testing the 2nd osc, swapping xtals

Dave, Good deal on most of the new tubes working better. One problem solved. I know that getting that 1st osc tube out is a pain. I have a forceps style tube puller that I use for that one and many others. It makes it quite easy to get them out. I have an extra one if you'd like to have it at my cost, $15. I'm not focused on doing the rest of my knobs right now, the VFO started binding periodically so I'm getting into that right now. It's the Progresitron style, the name has been removed. Looks very clean inside and the core end nut is just right tight on the shaft -
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Date: Mon, 16 Sep 2019 13:59:46 +0000
From: wb3fau55@neo.rr.com
Subject: [R-390] spare parts -Les

Les, i see a lot of RF section failures. Who were the contractors for these I have seen several bad RF sections in Capehart contracts.

Date: Mon, 16 Sep 2019 14:23:38 +0000
From: Les Locklear <leslocklear@hotmail.com>
Subject: Re: [R-390] spare parts -Les

All of the manufacturers made their own RF decks. I have not seen any information that shows any other manufacturers other than the R-390A contractors built them for spares. Of course, they were all interchangeable, it would be hard to track just which contractors RF decks had a worse reputation than others. Capehart only had the one contract, but they were connected with Clavier Corporation that manufactured spare parts, they "might" have manufactured RF decks, but they did manufacture various other parts. In the end, Fowler sprang out of Clavier which was Capehart in the beginning. As most people know, Capehart also manufactured Hi Fi equipment.

Date: Tue, 8 Oct 2019 19:41:05 -0400
From: "John Gedde" <jgedde@optonline.net>
Subject: [R-390] R390 Receiver. Crystal bank access?

How do you access the crystal bank and the bandswitch in an R390? The crystal case seems to be riveted shut. Am I missing something? The bandswitch is flaky at times and could likely use a cleaning.

Date: Tue, 8 Oct 2019 21:40:24 -0400
From: dog <agfa@hughes.net>
Subject: Re: [R-390] R390 Receiver. Crystal bank access?

The crystal bank has screws on the back and one in the front by the tube. It just lifts off after removing those screws. There's a couple variations, some have screws in the top of the box, but it's the same idea. There's an oven inside with insulation.

You have to remove the whole RF section to get at the bandswitch. Sometimes a bit of de-ox will help. Sometimes just using it a lot helps. Sometimes it need re-registering. It's all in the book and not magic, but detailed work. Be careful if you mess with the switch contacts, they're fragile.

Date: Tue, 8 Oct 2019 21:41:36 -0400
From: dog <agfa@hughes.net>
Subject: Re: [R-390] R390 Receiver. Crystal bank access?

Or I may be mistaken meaning the R390A, not sure about the 390.

Date: Wed, 9 Oct 2019 09:08:24 -0400
From: "John Gedde" <jgedde@optonline.net>
Subject: Re: [R-390] R390 Receiver. Crystal bank access?

Yes, the R390 is completely different than the R390-A. In the R390, the crystals are in the rear right hand portion of the chassis.

Date: Wed, 09 Oct 2019 18:42:18 +0200
From: fdigio1 <fdigio1@gmail.com>
Subject: [R-390] Crystal Unit Adhesive Numbers

Hi fellows, do you know where can I obtain the adhesive strip for the megacycle wheel on the Crystal Unit?

Date: Wed, 30 Oct 2019 01:47:01 -0700
From: Larry H <larry41gm@gmail.com>
Subject: [R-390] R-390A frequency stability

It was finally time to check the frequency stability of the R-390A that I am working on and not that it is bad, but was disheartened to find that it

took 6 hours to stabilize. I was checking the frequency stability against the 5 MH WWV, so was using all 3 converters and found that it had drifted about 300 hertz. Although this is the allowable limit, I decided to see what's going on. What I saw was all 3 oscillators were about equally responsible.

The problem with the 1st osc was that the oven was not working. I replaced it with a functional one and within 7 minutes it had stabilized to a 10 hertz range (controlled by the thermostat). It was easy to tell that it was not working as it was chassis temperature, not the 75 degrees centigrade on the label.

Now the 2nd crystal oscillator situation becomes a little more of a problem. It has the same symptoms as the 1st oscillator - as one would expect, it took a very long time to stabilize (about 5 hours). So, I did a little test - I disconnected the heater oven from the VFO (the 2nd crystal oscillator and the VFO's heater are on the same line) and turned the 'oven' switch on the back to on. Of course, I measured the circuit first to be sure there would not be any big surprises. Well, it seems to be working as desired - 10 hertz stability after 7 minutes. The oven heats up to about 75 degrees centigrade and stays there.

I plan to improve the VFO stability with an appropriate NTC cap, as I have done this in the past. I expect to end up with a fairly stable VFO without using it's oven (as that is too risky). I'll let you know how it all turns out.

What do you think about turning on the oven for the 2nd crystal oscillator deck?

Date: Sat, 2 Nov 2019 05:23:27 +0000 (UTC)
From: Perry Sandeen <sandeenpa@yahoo.com>
Subject: [R-390] 2nd xtal osc temp control

The thermostats used for the VFO and 2nd xtal osc circuits are commercial ones that can be adjusted over quite a wide range. 75C is 167F and is not good for longevity of any circuits. Try adjusting it down to a much lower temperature. All the xtal box needs is a temperature just a bit higher that the receiver chassis gets during normal operation for stability. If that doesn't work one could consider a simple thermistor proportional heater circuit if you are a Heretic like me.

Date: Sat, 2 Nov 2019 04:43:06 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] 2nd xtal osc temp control

Perry, Good point on the temperature of the ovens and I agree with you. I found an ovenaire 55 degree 2 crystal plug in one that I'm using, but I don't see how to adjust the 2nd osc temp. How is that done?

Date: Sat, 2 Nov 2019 11:33:54 -0400
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Re: [R-390] 2nd xtal osc temp control

I am sorry, but it is not as simple as that. When Xtals are made to be used in an oven, the cut angle in the raw crystal have to be selected to minimise the drift around the oven temperature, not around the ambient or any other temperature. If the R-390/390A crystals were originally made to have a "flat" temperature characteristic around 75C, moving the oven operating point by re-calibrating the thermostat may not yield to the best results... 73, Jacques, VE2JFE

Date: Sat, 2 Nov 2019 18:12:01 +0000 (UTC)
From: Perry Sandeen <sandeenpa@yahoo.com>
Subject: Re: [R-390] VFO end point off 17 KHz

Mouser sells a variety of crystal configurations and some are the HC-6U(?) physical package. 15 MHz will (likely) be a 3rd overtone. They are cheap enough if the one you'd buy won't work on all the overtones needed another one might.

Date: Sat, 2 Nov 2019 17:19:33 -0400
From: comcast <kg2bz@comcast.net>
Subject: Re: [R-390] VFO end point off 17 KHz

Dave, try Surplus Sales of Nebraska. I see in their online catalog they have a 15 MHz HC6U for $20. jeff kg2bz
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Date: Sat, 2 Nov 2019 14:52:45 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] VFO end point off 17 KHz

Dave, Since 27 MHz is for the CB band, do you care how close in frequency it is? I have one that is 800 hz low I will sell you for $8 + shipping.

Date: Sat, 2 Nov 2019 21:53:57 +0000
From: David Olean <k1whs@metrocast.net>
Subject: Re: [R-390] VFO end point off 17 KHz

I also just found that Surplus in Nebraska has them also and thanks for your efforts too. I asked my brother if he has a 15 MHz crystal. He might, so he will look tonight and let me know.? He is KOZK and is a

QRPer with a huge junque box. I showed the R-390A to him today and he was impressed with the looks. I painted the white lines on the knobs while he was here. That came out great, so this evening is set for either re aligning the thing or finding out why the carrier meter is NG and the RF gain control seems slightly messed up. I might have broken something when I had the front panel off. Thanks again for everybody's help.

Date: Sat, 2 Nov 2019 15:10:40 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] VFO end point off 17 KHz

Good deal, Dave. Be careful measuring the resistance of the cl meter, as a VOM can damage it. Also be careful measuring the circuit while it's hooked up. Have you replaced C553, yet? If not, do before next power up. And yes, pulling the front panel can cause some wires to break off and cause funny symptoms. Have fun.

Date: Sat, 2 Nov 2019 15:24:59 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] 2nd xtal osc temp control

You are absolutely correct, Jacques. The only thing is that the normal mode of operation is with the oven switch off and that turns off the 2nd crystal osc oven, also. Unless the circuit has been modified. I'd say that the usual temp of it after warm up is about 30 degrees C, that is not any where close to the correct temp for those crystals. My experience with the 17 MHz 1st osc running at 55 degrees C is that it is the same stability as running it at the prescribed 75 degrees. Perhaps the temp curve has changed with age as the crystals frequency has. I have not tested for that and not sure I can.

Date: Sat, 8 Aug 2020 10:26:44 -0500
From: Phil <pmills7@comcast.net>
Subject: [R-390] Need C-974/FRR-33 selection console

I know this is a long shot for sure but I am looking for the C-974 selection console. It is part of the FRR-33 diversity receiver setup. This setup consists of a CU-286 antenna coupler (preselector), two R-391 receivers, the selection console, a remote selection console, a power supply for the autotune motors, and a afsk device to keep things in sync.

I recently got the CU-286 coupler and the remote console when I bought an R-391 locally. I have fond hopes of getting the auto selection part of it working....that is selecting the channel of the R-391 and tuning the antenna coupler. Unfortunately, the remote coupler I have only attaches

to the C-974 so that is the missing piece I need as I believe I can fabricate cables. In case anyone wants to see this in action, there is a 20 second video on YouTube than can be found by searching for FRR-33.
Any help or leads greatly appreciated.

Date: Sat, 8 Aug 2020 18:26:19 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] R390A rf slug id help needed

Phil, The RF deck slugs should have a red and white dot on them. Sometimes one or the other or both are missing. The test if they are correct or not is if it will align correctly or not. You can move a good slug to a questionable place to see and vice versa.

Date: Sun, 9 Aug 2020 10:58:36 -0400
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Re: [R-390] R390A rf slug id help needed

For what is worth, the RF slugs material looks gray and they have a relative permeability of 10. The IF slugs are more greenish in color and have a relative permeability of 3. Both relative permeability values were determined by measurement on a HP 4192A.

Date: Sun, 9 Aug 2020 22:42:13 -0400
From: Roy Morgan <k1lky68@gmail.com>
Subject: Re: [R-390] R-390A rf slug needed, also clamp.

This email from Roger in 2009 has good information:
From: Flowertime01@wmconnect.com
Date: May 17, 2009 3:27:36 PM EDT
Subject: Re: [R-390] R390A RF Deck slug indentification

Brian, slugs popped up just last month as a topic. The R390/A has just two types of slugs. One type in all 8 octaves of the RF section 3 x8 = 24. Type two is in the variable IF section of the RF deck. These are 6 each in the IF section behind the 8 octaves of RF cans at the front of the RF deck. The original R390 had different slugs in the various sections of the 8 octaves. So all 24 were not the same. But any three in an octave are the same. R390 and R390/A slug sizes are all the same. The spring wire can be soldered and or glued back together. Original slugs were all spline.

If you have a slotted slug bolt it is not likely original. It may have the original slug under it and it could be a repair. It could be a late year replacement part. Being easier to put a slotted bolt on the slug than to obtain the spline bolts.

If it operates well let it be.

If the octave will not align and peak as well as the other octaves, then post a request here for one replacement. Several of the Fellows have some spare parts and for a reasonable cost and postage will send you a good replacement. The slugs did have color coded paint dots on them. There were lots of differences. The color dots were not any assurance the slugs were correct. The only real test was to install a slug. Do the alignment and power measurements. If the receiver worked to spec the slug was acceptable. You may see different paint dots on the slugs within a given receiver. Roger AI4NI

Date: Mon, 10 Aug 2020 13:16:11 -0000
From: "Fred Moore" <fred_moore@usa.net>
Subject: Re: [R-390] R-390A rf slug needed, also clamp.

Oh, Yes! That's perfect. That is why I was remembering that the slugs were not all the same -- they weren't on the R-390. There, too, is the test -- does the receiver align and work on that octave? Thanks, Roger, and Roy, for finding that. -Fred

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Date: Tue, 1 Sep 2020 12:19:54 +0000 (UTC)
From: Thomas Hoyer <thoyer1@verizon.net>
Subject: [R-390] R390A Hissing RF Deck

Working on a 390A. Have not had this issue in the past with my other 390A's, it's an odd one (at least for me). This 390A is very clean and shows no evidence of past work, even the green screws have no chipped paint making me think that the modules may not have been removed very much if ever. As typical, I go through each module an check for / replace

any out of spec parts including the caps around the filters. I also check the tubes on my Hickok. I rebuild the electrolytics on the AF module too. This one powered up ok but no received signal just a lot of hissing. Working backwards from the AF through the IF all seemed good. Once I got to the RF I was not able to get a signal through T208 at either 455 or 3 mhz. Resistance checks of T208 show the secondary at 15 ohms - not good. Removed T208 and bench verified that it wasn't passing much of a signal. Found a donor T208, bench tested much better, installed it and now the hissing sound is louder! Checked the parts (R's and C's) around T208 and the 2.2k resistor was measuring 3.3k so I replaced that.? Removing the PTO connection from the RF deck lowers the hiss but it is still there. At this point I decided to shut down last night. Looking for suggestions. Thinking of removing tubes one at a time to try to isolate a section. Thoughts from those more experienced then I?

Date: Tue, 1 Sep 2020 06:09:19 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] R390A Hissing RF Deck

Hi Tom, Good work. It sure looks like the 3rd mixer is the culprit. Try a different 6C4 and if that's not it, try wiggling the MB connector from the VFO - some times the connection is poor and the mixer cathode has too much resistance. Try measuring the voltages on the plate, screen, and cathode using a tube extender. You need to be able to inject 455 khz into the control grid and have it get through. Have fun.

Date: Wed, 2 Sep 2020 11:17:57 -0400
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Questions about R103 (RF gain) and R104 and 105.

I began restoring a newly-acquired EAC R-390A. Sadly, this unit have been severely "modified" by unknown people and the RF gain and AF gain controls are not either original or of the right value. I believe that R103 have to be a 5K, 2W, reverse-log taper is it right ? For the R104 and 105, they have to be 2.5K, 2W, log taper ? Where I can find some (if not the original ones) The only ones I was able to find are linear-taper...

Date: Wed, 2 Sep 2020 15:21:24 +0000
From: David Wise <David_Wise@Phoenix.com>
Subject: Questions about R103 (RF gain) and about R104 and R105.

I seem to recall that you can turn a linear into an approximation of log or reverse log by adding a fixed resistor from slider to one end. There is discussion on the web somewhere.

Date: Wed, 2 Sep 2020 11:23:52 -0700

From: <hamfish@comcast.net>
Subject: Re:Questions about R103 (RF gain) and about R104 and105.

You are correct in values for R103,R104, & R105. They are scarce like hen's teeth. In my notes R103 part # is RV4SAYSD502E. R104 &R105 the # is as listed in the Y2K. Sad to say, getting late in the game to repair point to point wiring, tube radios.

Date: Wed, 2 Sep 2020 14:39:22 -0500
From: Cecil <chacuff@cableone.net>
Subject: Re: Questions about R103 (RF gain) and about R104 and105.

Should be able to find them at Fair Radio Sales off of a scrap harness. There are tons of parts out there it?s just a matter of finding someone willing to look and sell!

Date: Wed, 02 Sep 2020 23:46:35 +0000
From: wb3fau55@neo.rr.com
Subject: Re: [R-390] R-390 Digest, Vol 197, Issue 3

Jacques try Fair Radio Sales for your 390 pots.

Date: Wed, 2 Sep 2020 12:04:17 -0400
From: dog <agfa@hughes.net>
Subject: Re: [R-390] Collins hardware request

I've had luck looking on ebay, amazon and the boltdepot.com for small amount hardware, you may have to keep looking, they may eventually turn up. Fastenall has a good selection also.

Date: Wed, 2 Sep 2020 22:44:53 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: Re: Questions about R103 (RF gain) and about R104 and105.

I wonder if this is the same type of pot:
https://www.ebay.com/itm/283633130019

Date: Fri, 10 Sep 2021 05:57:54 +0000
From: Kevin Schuchmann <kschuchmann@protonmail.com>
Subject: [R-390] R-390 RF Gain Control

Having only one R-390 around here I have nothing to compare with so I'm curious how your R-390's compare. My RF gain control works but pretty much even the strongest signal is gone by "9" in AGC mode and by "8" in MGC mode. Is this about normal or should I go looking for a problem?

Date: Fri, 10 Sep 2021 11:17:16 -0400
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Re: [R-390] R-390 RF Gain Control

I believe that your RF gain control have been replaced and that the wrong taper type was used. The RF gain original control R123 in a R-390 is a 5K end to end with a REVERSE-LOG taper, made by Allen-Bradley. With the knob set at the center of it's travel, you should measure about 500 ohms between the center contact and the CW side one (seen from the shaft side) and about 4500 ohms from the center contact to the CCW one.
If ever the two measured values are about equal, (? 2.5K) what you have is a LINEAR taper control and only that suffice to explain why the "control range" of your RF gain is so small. I have also encountered another defect related to the R-390/390A controls: due to their constant use by some operators, the resistive track was completely worn out. I still have some 5K RF gain controls measuring in excess of 12K end to end and AF gain controls in excess of 6K ohms (they have to be 2.5K. LOG taper, btw)
The problem now is to find replacement parts... I tried very hard to find new ones, but the only source I found is from Fair Radio Sales selling parts of "cannibalized" R-390As. Even there, be sure that they measure properly before using them.

Date: Fri, 10 Sep 2021 17:02:53 +0000
From: Kevin Schuchmann <kschuchmann@protonmail.com>
Subject: Re: [R-390] R-390 RF Gain Control

Well you solved the problem on the first try. It is a Allen-Bradley 5K pot and it is clear that it has been replaced at some time and it is linear.
So the hunt is on now for the correct part, I will check with Fair Radio Sales.

Date: Sat, 11 Sep 2021 13:25:59 -0400
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] R-390 RF Gain Control

New reverse log pots are not impossible to find. A very quick internet search turned up the following:

https://www.amazon.com/dp/B07SVMC3VK

The pots in that kit are not the same form factor as the original, but they do claim to include 2 pieces of 5k reverse log taper pots, and some creativity could probably adapt them to the 390. There is a guy in England on ebay who sells them individually for about 5 euros. I'm sure a more thorough search would turn up other possibilities.

Date: Sat, 11 Sep 2021 23:01:03 -0400

From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Re: [R-390] R-390 RF Gain Control

With all due respect, I do not agree that anything made in the far east and sold on Amaz... can be up to the task. The RF gain control, and especially in a R-390, have to handle the cathode current of many RF + IF stages and this is why a 2W rating part was originally specified. The El Cheapo variety that can be found on the web sites is usually rated for 500mW, then in theory unfit for the purpose, or not expected to last very long. The parts distributors, like DigiKey, are actually listing the right replacement part (see attached). But they have none in stock. A couple of years ago, I went as far as contacting the manufacturer (PEC = Precision Electronics Components) directly, just to get the answer that the MOQ (Minimum Orderable Quantity) was 1000 pieces. And that the price was around $25 USD EACH. Ha... If there is 1000 owners of R-390 or R-390A that are willing to invest ~25 USD in that project, I can handle it. Otherwise.... The only remaining alternative is to order "cannibalised" parts from Fair Radio, but they can be worn already when you receive those. Meaning, I do not believe that they are tested for anything before they are shipped to you. I believe you can figure how I know...

Date: Sun, 12 Sep 2021 05:10:50 +0000
From: Kevin Schuchmann <kschuchmann@protonmail.com>
Subject: Re: [R-390] R-390 RF Gain Control

Hunting around I found this on Ebay and I have ordered one.
https://www.ebay.com/itm/164923700436
I can't find the original specs but several sites list the type 320 as 2 watts, I will report back if it is the correct one once I receive it.

Date: Sun, 12 Sep 2021 11:08:29 -0400
From: Roy Morgan <k1lky68@gmail.com>
Subject: Re: [R-390] R-390 RF Gain Control

To the creative among us, Some clever person among us likely can design a replacement circuit to function well as the hard to find reverse log taper original gain pots. Maybe a pot with the right resistance curve but lower dissipation rating combined with a FET or opto-isolator.

Date: Sun, 12 Sep 2021 21:26:12 +0000
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] R-390 RF Gain Control

I seem to recall that a fixed resistor from linear wiper to one end can approximate a log taper, probably well enough for this application.

Date: Sun, 12 Sep 2021 16:28:14 -0700
From: Renee K6FSB <k6fsb.1@gmail.com>
Subject: Re: [R-390] R-390 RF Gain Control

Seems like one needs a 50K lin pot and a 6K fixed .. IIRC

Date: Mon, 13 Sep 2021 02:25:16 +0000 (UTC)
From: Steve Toth <stoth47@yahoo.com>
Subject: Re: [R-390] R-390 RF Gain Control

Good call - I have done this in repairing an automobile radio from the sixties. It works.

Date: Sun, 12 Sep 2021 22:26:41 -0400
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Re: [R-390] R-390 RF Gain Control

Dave, I'm sorry but... prove me that with a linear potentiometer of any value, plus the number of fixed value resistors you want, that you could make an arrangement giving 500 ohms when the potentiometer is at mid-travel, and 5000 ohms when the potentiometer is completely CCW.

Date: Sun, 12 Sep 2021 22:29:21 -0400
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Re: [R-390] R-390 RF Gain Control

Renée, I'm sorry but... check what that gives at mid-travel and CCW positions. Reverse-log ? Not really, I believe.

Date: Mon, 13 Sep 2021 02:49:55 +0000 (UTC)
From: Steve Toth <stoth47@yahoo.com>
Subject: Re: [R-390] R-390 RF Gain Control

Try a 2 watt 5k pot with a 620 ohm resistor connected between the wiper and the TOP end of the pot (ungrounded) with the wiper at the same end that the resistor is connected to (the TOP end) the value is 5k. mid sweep of the wiper the value is 496.79 ohms (pretty close to 500 ohms).
Formula: Rt = R1 x R2 / R1 + R2

PS: It was the balance control on a '65 Oldsmobile radio

Date: Sun, 12 Sep 2021 23:10:26 -0400
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Re: [R-390] R-390 RF Gain Control

Steve, in the case of a volume control, I agree that this can be done.

That will work only if the amplifier stage preceding the volume control is strong enough to drive the "mocked logarithmic potentiometer". Say, if you have a 500k ohms linear pot with a 50k resistor connected between the slider and the CCW end, the Vo vs Vin function will be logarithmic, or at least close to: ~10% output at mid-travel, 100% output at full CW position. But, in the case of the R-390/390A RF gain control, we need a RESISTOR that behave as having 500 ohms when the control shaft is at mid-travel and 5000 ohms when it is at the CCW position. I know that it can be hard to figure, but there is no free lunch here.

Some other solutions can be used:
1- A multiturn LINEAR 5000 ohms potentiometer.
Better behavior than a 300 deg. Linear potentiometer, but it's a multiturn, so...
2- A 10 or 12 position switch with logarithmically scaled resistors: this has been used in some WWII receivers, like the Canadian Marconi CSR-5A. But there is no intermediate "gain" position between the steps...

Replacing a REVERSE-LOG potentiometer with any given arrangement of a linear potentiometer combined with fixed values resistors. I do not want to hurt anyone, but I do not believe that this is possible.

Date: Sun, 12 Sep 2021 23:26:10 -0400
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Re: [R-390] R-390 RF Gain Control

Ok for that, but there is a condition you do not meet: with the control shaft fully CW, the total resistance have to be ZERO. That's what I wrote before: no free lunch.....

Date: Mon, 13 Sep 2021 19:51:04 +0000
From: Kevin Schuchmann <kschuchmann@protonmail.com>
Subject: Re: [R-390] R-390 RF Gain Control

Well it arrived today and it is linear taper, lol so much for "original" stock. The search contiues...

Date: Tue, 14 Sep 2021 01:55:25 +0000 (UTC)
From: Steve Toth <stoth47@yahoo.com>
Subject: Re: [R-390] R-390 RF Gain Control
Message-ID: <241000534.2800308.1631584525794@mail.yahoo.com>

One possibility at a reasonable price:
https://fairradio.com/product/r390a-rf-gain/

Date: Mon, 13 Sep 2021 23:23:34 -0700

From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] R-390 RF Gain Control

I can see that adding a fixed res on one side of a linear pot would some what simulate a log pattern in some circuits. However, I don't think it can be done in this one. Kevin, If a pot from Fair Radio isn't good, they will probably exchange it for you. Or you may need to resort to repairing the resistor land track in one. It can be done. Take a look at this article: Repairing old potentiometers (radiomuseum.org) <https://www.radiomuseum.org/forum/repairing_old_potentiometers.html>

Date: Tue, 14 Sep 2021 06:40:22 -0500
From: "Les Locklear" <leslocklear@hotmail.com>
Subject: Re: [R-390] R-390 RF Gain Control

Just contact Mark Oppat at Old Radio Parts.
https://www.oldradioparts.net/

He can make you whatever kind of pot you need. I needed a dual pot with on-off switch and he came through.

Date: Tue, 14 Sep 2021 14:43:12 -0400
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Re: [R-390] R-390 RF Gain Control

Despite that it can be done to modify the TRANSFER FUNCTION (Vout vs Vin) of a linear potentiometer with the use of a fixed value resistor, nothing can be done to change the behavior of a linear RHEOSTAT (variable resistor with 2 connections) by using any arrangement of fixed-value resistors connected to it.

The fundamental reason why a REVERSE-LOG rheostat is needed in a R-390/390A is the fact that the RF gain control is connected in the ground return line of the RF and IF stages, varying their bias to the control the stages gain, and in AGC mode this runs in parallel with the AGC within the receiver. Because that the relationship between the RF-IF stages gain and their common bias line is non-linear, this is why a REVERSE-LOG control is needed. This is the same in many other receivers: the HRO series are another example. In MGC mode, the AGC line is grounded (or fixed in voltage in some receivers) and the RF gain do it's job alone.

Why this "compound" gain control scheme was chosen for the R-390/390A have to do with the SQUELCH function that is present in the R-390 (and can be "activated" in the R-390A) for which the RF gain act as the SQUELCH TRESHOLD control. Some other receiver architectures uses

a LINEAR potentiometer and a negative DC source to take control of the AGC line in "manual gain" mode.

I have already suggested that if no REVERSE-LOG, 2W rating pot can be found, (one day, the Fair Radio stock will be exhausted..) that a 5K ohms, 2W multi-turn can be used. Another trick (please don't kill the messenger) is to use a 5K ohms LOGARITHMIC potentiometer but, in this case, the RF gain will work in reverse from the original design intent, meaning maximum gain a Zero, minimum gain at "10". Search for KA5021S28-ND on Digi-Key for ex.: 106 parts available vs zero for the KB5021S28-ND, which is the "true" replacement. However, in both cases, the control range will be wider than the one obtainable with a one-turn LINEAR potentiometer. 73, Jacques, VE2JFE

Date: Tue, 14 Sep 2021 13:54:15 -0500
From: jwkoest <jwkoest@charter.net>
Subject: [R-390] FW: Re: R-390 RF Gain Control

Your thoughts on this?
-------- Original message --------From: Jacques Fortin

Date: Tue, 14 Sep 2021 21:09:32 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] R-390 RF Gain Control

Hi All, I believe I have found a very close replacement by Precision Electronics Corporation <https://www.digikey.com/en/supplier-centers/precision-electronic-components>,
number KB5021S28, desc 5K OHM 2W CARBON R-LOG. Digikey and Heisener has it listed. I've requested a price from the latter. Since quantity will make a difference in price, take a look and let me know if you are interested in ordering some.

Date: Wed, 15 Sep 2021 04:47:14 +0000
From: Kevin Schuchmann <kschuchmann@protonmail.com>
Subject: Re: [R-390] R-390 RF Gain Control

I was given a part number of a pot similar to the original, 5K reverse log 2W part number RV4SAYSD502E and tedss.com has them in stock. The only bad thing was the price, $54. I have one coming and should be here by Friday, but I will be curious what you get quoted for the one you have found.

Date: Sat, 18 Sep 2021 20:45:15 +0000
From: Kevin Schuchmann <kschuchmann@protonmail.com>
Subject: Re: [R-390] R-390 RF Gain Control End of story

Just a FYI the new pot just arrived, made in Canada, looks like the one I took out except for the rubber o-ring. I removed the rubber o-ring as not needed, pot fit perfectly including the locking tab dropping into the hole on the backside of the panel. I now have a usable RF control, WWV right now is booming in and it takes turning the control to 3 or 4 before it disappears, much better than gone at 9. Thanks to everyone for their suggestions and help.

Date: Sat, 18 Sep 2021 18:51:01 -0500
From: Don Cunningam <donc@martineer.net>
Subject: Re: [R-390] R-390 RF Gain Control End of story

Was this control the one you got from K5SVC or somewhere else? I have gotten confused about which one was correct, not just linear.

Date: Sun, 19 Sep 2021 00:07:14 +0000
From: Kevin Schuchmann <kschuchmann@protonmail.com>
Subject: Re: [R-390] R-390 RF Gain Control End of story

Don, The one from K5SVC was linear, the one I got today is a RV4SAYSD502E from tedss.com but pricey at $54. Jacques found a couple more at tedss that are cheaper at $39 if you do not mind cutting the shaft to length.
https://www.tedss.com/Potentiometers/Browse/rotary?resistance=5000.00&power=2.000&taper=reverse%20logarithmic

And Larry found Precision Electronics Corporation had some, part number KB5021S28 but is waiting back on a quote for pricing.

Date: Sun, 19 Sep 2021 02:07:49 +0000 (UTC)
From: Mike Bracey <mikebracey@att.net>
Subject: Re: [R-390] R-390 RF Gain Control End of story

I bought a good used original from Fair Radio for $10. It's still working fine.

Date: Sun, 19 Sep 2021 13:56:20 +0000 (UTC)
From: B Riches <bill.riches@verizon.net>
Subject: [R-390] Misrepresented RF gain Pot on E-Bay

K5svc is advertising 5 k pots as used in our R-390A receivers on Ebay. Beware.

Date: Sun, 19 Sep 2021 14:36:20 +0000 (UTC)
From: B Riches <bill.riches@verizon.net>

Subject: Re: [R-390] Misrepresented RF gain Pot on E-Bay

I just had a pleasant conversation with Frank K5SVC and talked to him about his 5 k pots. He did not know that they were not reverse log. I told him that two resistors can make the pot think it is reverse log. When I find out what the value is I will let him know. He has a few hundred of them! He is pulling the ad until he knows. What value were they?

Date: Sun, 19 Sep 2021 17:45:12 -0400
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: [R-390] TR: Misrepresented RF gain Pot on E-Bay

As I mentioned before, nothing can be done to make a 5K linear potentiometer behave as a 5K reverse-log one. To K5SVC defense, it is not specified, or not easily found, that the RF Gain control on a R-390/390A have to be a reverse-log taper one, other than few obsolete military stock numbers. I learn it the hard way... two of my R-390A came with linear pots mounted in (as replacements for the original ones) and the RF Gain control operation was very far from satisfactory. I explained why in my previous postings.

Date: Sun, 19 Sep 2021 22:53:42 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] R-390 RF Gain Control

Hi All, Jacques found 2 suitable pots on tedss.com with long shafts, I think for $39 ea. I found the same one on ebay Clarostat - P/N: JA1N200P502BA and they are indeed reverse taper. See ebay item: https://www.ebay.com/itm/124482521194 <https://www.ebay.com/itm/164923700436> . It's listed for $14.50 and free shipping. It is the long shaft, though. I think they only have 1 available.

Date: Mon, 20 Sep 2021 04:42:06 -0500
From: "Les Locklear" <leslocklear@hotmail.com>
Subject: Re: [R-390] R-390 RF Gain Control

Use a tubing cutter. It makes for a nice clean cut.

Date: Mon, 20 Sep 2021 04:58:45 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] R-390 RF Gain Control

Sorry, I forgot to mention that if someone would like to get it, please do. If not, I'll probably get it in a few days.

Date: Tue, 28 Sep 2021 20:55:15 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] New R-390 RF Gain Control Purchasing

I've heard back from 2 vendors. This 1st one is the correct replacement . The final quote from *BD Electronics Ltd. *is $175/piece for 20 pieces. Seems a little high to me.

The second quote is the correct replacement (except the shaft is too long). The final quote from R&J Components Corp. is $33.25/piece for 10 pieces.

ItemDescriptionQuantityDeliveryUnit PriceExt. Price
0 *JA1N200P502BA* | MFG: CLAROSTAT | BULK 10 Stock 33.2500 $332.50
Total: $332.50

When I 1st let you know I was looking for a source for new RF pots, a few of you expressed an interest. So, if anyone would like to purchase a new one for $33.25 + $4 shipping, let me know how many. The quote expires in a week, so let me know asap. Remember, these have the long shaft on them.

PS: There's an RV4SAYSD502E on ebay right now for $54 + shipping.

Date: Mon, 20 Sep 2021 13:40:50 -0600
From: "Jordan Arndt" <Outposter30@shaw.ca>
Subject: [R-390] R-390A Replacing HR202 Capacitors

Is there a preferred type of cap to replace the 0.1uF 200v paper caps C256 and C309 in the heater circuit for HR202, the 17Mc and 200Khz crystal oven..? I originally replaced them with .1uF @ 400v film caps and wondered if film caps are appropriate for shunting the noise from the thermal switching. I'm hearing some "crashing" sounds when I tap the area around HR202, which worsens when I tap directly on the top of the oven assembly itself. Could it be noise from the make and break of the thermal switch itself when the oven is tapped like that...?

I've got the RF deck out right now and I'm trying to eliminate any remaining issues before I button it all back up...

Date: Mon, 20 Sep 2021 17:40:57 -0400
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Re: [R-390] R-390A Replacing HR202 Capacitors

I used the 0.1?F, 630V, polypropylenes I used everywhere else.

However, for C256 and C309, a 100V rating should suffice.
If there is 400V film units there, they are OK.
Crashing sound you hear:
_ Does the Calibrator is on ? (Function switch in CAL)
_ Does it happens on the 7MHz band and below, and not on 8MHz and up ?
_ If the HR202 is removed as a whole,
  does the crashing sound still present on the 8MHz and + bands ??

There is a way to check the HR202 operation out of the RF deck, but it will require a DC power supply that can be adjusted at 6.3V and something to monitor the current drawn by the oven element when it is "on". A "normal" HR202 will draw about 800mA with 6.3V applied. You will be able to feel the heat quite rapidly. There should not be current variations when the case is tapped, as this indicates bad contacts in the thermostat within. When the 75C internal temperature will be reached, the current will drop to zero and the current drawn will began to cycle, at about 4 sec. on, 6 sec. off. The current drawn have to read the same each time, proving that the thermostat contacts are not dirty. If you see current variations just after the "on" or just before the "off", you should search for another HR202 in better shape.

Date: Thu, 11 Nov 2021 14:38:42 -0500 (EST)
From: brianpepperdine brianpepperdine <brianpepperdine@sympatico.ca>
Subject: [R-390] no signals below 8 mhz, crystal oven removal for xtal testing etc

It was suggested that I bring my question to this List, so I have joined up... here goes... my R-390A lost reception below 8 mhz. This is the triple-conversion operation of the receiver, thus I have turned my attention to the first mixer area etc., which includes the 17 mhz injection via the crystal oven. I swapped out the 6C4 and another 6C4 in the mixer chain (interchanged) and it runs still OK above 8 mhz in Double Conversion mode, so the 6C4 is fine I think. V207 (5654) tube is bit hard to get at... so the other issue to be looked at is the 17 mhz crystal in the HR202 crystal oven. If I take out the oven in theory I can swap in (temporary) a 17 mhz xtal from elsewhere in the receiver xtal bank. Based on a suggestion, I do not see 17 mhz at the P221 jack as per my frequency counter.

However, the xtal oven seems resistant to being pulled out... the Y2K390A manual talks about a spring retainer on top of HR202 (I have none). It seems to me that HR202 is sort of in a tube socket kind of thing (as per diagram) but with any gentle tube removing kind of movement (gentle rocking and pulling) it does not seem to budge. I don't want to really 'wrench' on it. It IS in a socket arrangement, right? Not hard wired....? In any case, having the xtal swapped in would help diagnosis or fix.. but even so its lack of presence would also help me in getting my fingers into the

tight space to remove V207 5654 tube out to test it (it does glow, but what does that really mean in the Grand scheme sometimes).

Anyhow any opinions on the xtal oven removal would be appreciated... or ideas on loss below 8 mhz reception. I hope its not a transformer (one other possibility) because then we are getting way beyond my level of competence (and obvious lack of spare parts).

Date: Thu, 11 Nov 2021 14:52:57 -0500 (EST)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] no signals below 8 mhz, crystal oven removal for xtal testing etc

I'm going on very fuzzy memory, but I think that symptom can be linked to faulty mechanical alignment of the band switches. I don't recall exactly which one, but I think there's a mechanism that can be just slightly out of alignment and it will cause the switch contacts not to close for the 8MHz and under bands. Loose/slipping geartrain clamps can cause this. Of course, it could just be the 17MHz oscillator as well.

Date: Thu, 11 Nov 2021 13:19:55 -0700
From: "Jordan Arndt" <Outposter30@shaw.ca>
Subject: Re: [R-390] no signals below 8 mhz, crystal oven removal for xtal testing etc

The crystal oven is octal based, and can sometimes be hard to remove, as are many of the tubes..! If you're not seeing the 17.000xxx signal, that would explain why the bottom 8 bands are dead, as they rely on that signal for conversion and mixing. I'd just continue to rock and pull on the oven and it will eventually break free so you can extract the oven plug-in. Worst case, you might end up pulling the outer cover off the base due to your efforts, which also can happen. If that happens, it will expose the "cover" over the two xtals installed in the oven chamber. That cover can be removed I hope this helps... 73..Jordan VE6ZT

Date: Thu, 11 Nov 2021 14:41:34 -0600
From: Tom Frobase <tfrobase@gmail.com>
Subject: Re: [R-390] no signals below 8 mhz, crystal oven removal for xtal testing etc

There is a 100 pf capacitor in the 17 MHz mixer circuit that is notorious for going bad, it is located in the RF deck. As I recall it is C286 . ...

Date: Thu, 11 Nov 2021 16:02:24 -0500
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Re: [R-390] no signals below 8 mhz, crystal oven removal for

xtal testing etc

You should mean C327 ! If C286 gets leaky (or short) it disturbs the AGC line, but the 17 Mhz oscillator should still works..

Date: Wed, 8 Dec 2021 22:46:31 -0500
From: "Robert P. Meadows" <rpmeadow@bellsouth.net>
Subject: Re: [R-390] The 'Parts Sources' list is added to website

I still have some ORIGINAL COLLINS P/N 380 0589 00 RF GAIN POTS that are for both the R390 and R390A. The pots are new in original wrapper. The 380 0589 00 is/was the correct COLLINS spec part before the part was "standardized" to a generic P/N beginning with RV4.
The pots are $25.00 each plus about $9.50 USPS shipping-- a small flat rate box.

Date: Thu, 6 Jan 2022 19:06:46 -0800
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] Pulling tubes, troubleshooting RF deck

Hi Bill, Looks like you've narrowed your problem down to the vfo not getting to the 3rd mixer. My suggestions would be to verify the filament is getting voltage, a contact on the tube or socket is not bad, tube is good, and connection to mixer is good.

Date: Tue, 5 Jul 2022 11:43:33 -0400 (EDT)
From: brianpepperdine brianpepperdine <brianpepperdine@sympatico.ca>
Subject: Re: [R-390] SSB Adapters and Treetop Circuits

<snip> Sadly, my 390A stopped working below 8 Mhz... I have looked into it somewhat but as I am recovering from abdominal surgery it will be sometime yet before I hefting a 390A around and about. I might hand it off to my ham friend to look into fixing it.... he knows them... but still face the issue of getting the radio out of the house. Maybe my brother in law can be enlisted as brute force mechanism..... but I really should look into it first just in case its a bad cap in that part of the IF deck.....

Date: Tue, 5 Jul 2022 17:11:25 -0400
From: Roy Morgan <k1lky68@gmail.com>
Subject: Re: [R-390] SSB Adapters and Treetop Circuits

I have a Collins 75A-2 (two) with an SSB adapter I think from treetop circuits. Glad to send further info when I can (now at library away from computer that has all that stuff).

Suggestions: KEEP the CV571's, both. The "silent below 8 mc" situation is

well understood: failure of the 17 kc crystal/oscillator in the little octal plug-in oven. (Take that thing apart and remove/reseat the crystal, replace the tube that oscillates at the 27 mc frequency, clean band switch.) See R-390 Pearls of Wisdom.

Date: Tue, 5 Jul 2022 22:23:31 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] SSB Adapters and Treetop Circuits

Hi Brian, Good luck with your 390A problem. Roy is right. But if that doesn't fix it, look at the 1st mixer, V202, and the MB coax plug P221 that feeds the 17 mh signal to it. It's contact gets a little poor sometimes. Let us know what you find.

Date: Wed, 24 Aug 2022 00:24:46 -0700
From: Larry H <larry41gm@gmail.com>
Subject: Re: [R-390] Nick's awesome 1970 Navy tech ref pdf

Hi all, When I was helping a fellow 390A enthusiast, I found a problem in the 1970 Navy tech ref manual schematics Nick put on his website in Oct, 2021. It's in the 1st mixer section (and therefore, also on page 1 of my schematic PDF that is also on his website). **The error is that there are two C280's on the schematic right next to each other. The one on the left (that goes to gnd) is correct. The one to the right should not be there as it blocks the mixer plate voltage from getting to the inductor (Z213-1) and then to the plate**. I will send him a corrected copy and let you know when it is out on his website.

Date: Thu, 27 Jun 2024 15:10:55 -0600
From: "Jordan Arndt" <Outposter30@shaw.ca>
Subject: Re: [R-390] Update on R390A, open question regarding scope and options fir lubrication

John, do not replace the 100pF cap, C327, across T-207 with a ceramic cap. I just went through doing that and after a great deal of advice, I used a silver mica cap which solved the problem created by a ceramic cap in that location. Tuned ckts of this sort require a high "Q" cap to function properly...

Date: Thu, 27 Jun 2024 23:13:58 +0000
From: David Wise <d44617665@hotmail.com>
Subject: Re: [R-390] Update on R390A, open question regarding scope and options fir lubrication

Discussion about two months ago: For high-Q tuned circuits, mica is still the king, don't substitute ceramic especially Type II.

Back when I was sorting my R390A, I warmed the IF deck with B+ applied. Next morning a couple of the color-striped Sprague "Prokar" caps (plastic-impregnated paper) had shorted. They had measured great for leakage when cold.

Date: Fri, 28 Jun 2024 02:13:47 +0000 (UTC)
From: jkharvie <jkharvie@verizon.net>
Subject: Re: [R-390] Update on R390A, open question regarding scope and options fir lubrication

Field and Deport maintenance Manual indicates this is:
"CAPACITOR, FIXED, MICA DIELECTRIC: 100 pF, ? 2%, 500Vdcw, MIL type CM15D1016" Is product CDV16FF101J03F the proper to use?

See https://www.cde.com/resources/catalogs/CD-CDV16.pdf

I am swapping this capacitor based upon the groups maintenance recommendation to remove and replace the existing capacitor rated at 500 Vdcw with a capacitor rated at 1,000Vdcw. Additional space does appear to be available under the RF deck above of the primary. Would like to go ahead and take care this this while the RF deck is on the workbench.

I do see that a 500 volt product is listed at
https://www.tubesandmore.com/products/capacitor-cde-500v-silver-mica-radial-lead-5

I do have some of these 500 volt parts in my NOS parts collection for the R390A, however if the 1,000 is the way forward I will order this.

Date: Fri, 28 Jun 2024 00:00:41 -0400
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Re: [R-390] Update on R390A, open question regarding scope and options fir lubrication

John, the original capacitor is prone to fail not because of it's voltage rating, but because of it's encapsulation. The original capacitors were molded in phenolic which let the oxygen slowly came in, helping internal silver migration and capacitor failure. Any modern epoxy-encapsulated part will last longer than the original one. A 5% tolerance will be fine, and a 500V rating is also OK, but indeed, a 1kV rating will be better.

Date: Fri, 28 Jun 2024 05:17:11 -0600
From: "Jordan Arndt" <Outposter30@shaw.ca>
Subject: Re: [R-390] Update on R390A, open question regarding scope and options fir lubrication

Yes, I would use one of the 500V rated 100pF silver micas caps you already have...Personally, I don't see any need to replace the 500V silver mica caps with 1000V SM caps...

Date: Fri, 28 Jun 2024 11:20:25 +0000 (UTC)
From: jkharvie <jkharvie@verizon.net>
Subject: Re: [R-390] Update on R390A, open question regarding scope and options fir lubrication

Thank you for your expertise and explanation.The capacitor being replaced is of a greenish plastic, rectangular form factor. I count in the underside of the RF sub chassis, 18 of this type installed. See picture where improper type was installed, it is a bright blue. This will be changed out for the proper component.I have purchased a 100pf, 1000 volt mica type replacement to place across the primary of this RF ransformer. Passive leakage assessments conducted on these capacitors show no signs of leakage, bulging of case, or out of tolerance capacitance.? Under voltage testing not conducted, i understand this is the proof of performance Is the consensus recommendation to also swap out all of these?

Date: Fri, 28 Jun 2024 11:12:42 -0400
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Re: [R-390] Update on R390A, open question regarding scope and options fir lubrication

The mica caps in green plastic shown in your picture were made by Micamold. I also have few of those in the spare IF modules I have.
But I never found a single one failing up to now. The mica caps in the C327 position that were reported failing (which seemingly generated the recommendation to change those on sight) were made by Cornell-Dubilier and are older than your "green ones". IMHO, it is not necessary to replace them all, and maybe the originally used one at the C327 position was perfectly good initially. Which is very bad in the C327 case is to use a ceramic capacitor which is not a NPO (COG) one. And even there, some will not fill the bill, having a ESR value higher than a mica one. Using a high ESR capacitor in a parallel resonant circuit kills the Q of the circuit and the gain of the related stage.

Date: Fri, 28 Jun 2024 10:51:12 -0500
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: Re: [R-390] Update on R390A, open question regarding scope and options for lubrication

Gears/cams maintenance became much easier once I purchased an ultrasonic cleaner. I haven't had to pull apart the geartrain on my two R-

390A's in about ten years. I slightly touch up any obvious wear-points/corrosion/ galling with a fine crocus cloth and then put it all in the ultrasonic with Simple Green aviation mix. Give everything a final rinse with boiling distilled water and just a few drops of a light synthetic sewing machine oil.

One of the biggest messes was when a previous restorer decided that the slug inductor bores in the RF deck all needed a liberal dosing of oil and grease. That was a PITA to clean up as I had to suspend the deck upside down and shoot contact cleaner upwards and in to the bores to flush out that trash. All those might 'ever' need is a slight dusting with talc if you have a draggy slug.

The wear surfaces (edges) on the cams really benefit from a little bit of polishing. So much of the friction/stiction when tuning is caused by imperfections in those surfaces.

R-390's are easy when compared to the plate that is inside of a Hammarlund SP-600. That is nearly impossible to clean.

I sold off my Central Electronics and Gonset radios a few years ago and mostly work on Harris stuff these days but my two 390A's are keepers.

Ms. Tisha Hayes, AA4HA

Date: Fri, 28 Jun 2024 16:35:37 +0000 (UTC)
From: jkharvie <jkharvie@verizon.net>
Subject: Re: [R-390] Update on R390A, open question regarding scope and options fir lubrication

OK,thanks for this good input...!
I do have an option to place a Micamold cap back into the RF circuit or I can use a new 1000 volt high Q mica cap that I purchased that will arrive in 2 days. The new capacitor is a quality RF high Q unit also made by Cornell-Dubilier. Also - maybe we need to update the recommended procedures advice page on when to swap out capacitors in the receiver...

Date: Fri, 28 Jun 2024 13:44:22 -0400
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Re: [R-390] Update on R390A, open question regarding scope and options fir lubrication

John, unless that you are equipped to test the Micamold cap with 300Vdc applied (their manufacturing voltage rating) to confirm that they have less than 10nA of leakage, wait for the new manufacture 1kV one.

I believe that the recommendation to change C327 was made because of the trouble involved with the RF deck removal to change any of the parts within. Since then, many original mica caps inside the IF transformers were reported to fail (the thunderstorm noise problem). But here also, they will not ALL exhibit failures, as this is just a probability. Failure of the early type "postage stamp" mica caps is essentially due to their long-term casing permeability. Some mica caps were made to never fail, like the Corning Glass Works (CGW) ones that have a glass encapsulation. But as with any electronic equipment ever made, all depended on the cost vs reliability criteria.

Date: Fri, 28 Jun 2024 16:07:33 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Update on R390A, open question regarding scope and options fir lubrication

I just opened the Y2K-R3 document and on page 6-47, Figure 6-21 shows a picture of C327 which appears to be a ceramic disc. Is that a mistake in the Y2K documentation? Apologies if this has already been discussed but I found it odd in light of all this recent conversation regarding C327.

Date: Fri, 28 Jun 2024 14:22:30 -0600
From: "Jordan Arndt" <Outposter30@shaw.ca>
Subject: Re: [R-390] Update on R390A, open question regarding scope and options fir lubrication

It appears that C327 and C328 have been cross labelled in the Y2K manual...

Date: Fri, 28 Jun 2024 16:32:44 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Update on R390A, open question regarding scope and options fir lubrication
Content-Type: text/plain; charset=utf-8

I think I replaced C327 in one of my R390As years ago but I didn't remember exactly how it looked in the chassis so wasn't sure if there was a labeling error. All I have now is an R390 so nothing really to compare it to. Thanks for the clarification.

Date: Fri, 28 Jun 2024 16:32:42 -0400
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Re: [R-390] Update on R390A, open question regarding scope and options fir lubrication

Seems to me that the person who "made" the figure mixed C327 and C328

The C327 pointed in the picture is a .005?F anyways: no hope to tune L230 at 17MHz...

Date: Fri, 28 Jun 2024 20:33:04 +0000
From: David Wise <d44617665@hotmail.com>
Subject: Re: [R-390] Update on R390A, open question regarding scope and options fir lubrication

ERRATA TIME! **In Figure 6-21, the annotations for C327 and C328 are swapped.** C328 is a 5nF ceramic disk bypass, while C327 is 100pF mica forming a tuned circuit. Jacques, did you typo? Figure 6-21 is on page 6-59, not 6-47, at least in my file which says Revision 10, 2006-March-17.

Dave Wise

From: r-390-bounces@mailman.qth.net <r-390-bounces@mailman.qth.net> on behalf of Barry <n4buq@knology.net>
Sent: Friday, June 28, 2024 1:07 PM
Subject: Re: [R-390] Update on R390A, open question regarding scope and options fir lubrication

I just opened the Y2K-R3 document and on page 6-47, Figure 6-21 shows a picture of C327 which appears to be a ceramic disc. Is that a mistake in the Y2K documentation? Apologies if this has already been discussed but I found it odd in light of all this recent conversation regarding C327.

Date: Fri, 28 Jun 2024 16:42:24 -0400 (EDT)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Update on R390A, open question regarding scope and options fir lubrication

It's on page 6-47 of the Rev 3 document which is what I was looking at. Yes, there's just a bit of difference between 5000pF and 100pF. Actually, I wasn't paying that much attention to the capacitance, just the fact that it was not a Silver Mica cap.

Date: Fri, 28 Jun 2024 20:47:53 +0000 (UTC)
From: jkharvie <jkharvie@verizon.net>
Subject: Re: [R-390] Update on R390A, open question regarding scope and options fir lubrication

Barry,Spot on! Yes - you have spotted an error for the call-out on this drawing, looks like C328 and C327 are in error and switched. C327 is across primary of T207 per schematic See attached picture for the location of the capacitor located on the primary of the Transformer I would like to update the graphics and labeling of the components within

the manual, anybody else up for this? This photo taken of my receiver, the three brown capacitors have been changed out since this photo was taken.
---------- next part ----------
A non-text attachment was scrubbed...
Name: 1719607625941blob.jpg
Type: image/png
Size: 5449933 bytes
Desc: not available
URL: <http://mailman.qth.net/pipermail/r-390/attachments/20240628/c0fd5066/attachment.png>

Date: Fri, 28 Jun 2024 21:05:07 +0000 (UTC)
From: jkharvie <jkharvie@verizon.net>
Subject: Re: [R-390] Update on R390A, open question regarding scope and options fir lubrication

I will wait and install the new capacitor and give this a try. I will also keep the old unit if it isneeded. I will look to see how the performance curves look for the new and old capacitors. Measuring down to 10nA is not acurrent capability (no pun intended). >From the information you areproviding, it sounds like the "older style mica caps within the IFtransformers that are not the newer Micamold style should be replaced with theMicamold style or a new high Q mica cap. I will review each of the internal components to assess what type ofcapacitor is located within each unit. I extend a thank you for sharing this rather interesting information, as it helps advance my understanding of care for this receiver. This RF sub chassis is from TeledyneSystems Corporation, serial 7099 within a receiver by Imperial Electronics, Serial2901.

Date: Thu, 4 Jul 2024 19:13:14 +0000 (UTC)
From: jkharvie <jkharvie@verizon.net>
Subject: [R-390] To swap or not to swap those aging "reddish" rectangular mica caps

Guided discovery continues as I make progress on the RF sub chassis.I received C327 replacement for "high Q" 100pf, 1,000 volt mica capacitor to install on the primary output of T207.I received group input that the green mica mold caps provides acceptable operational service with very low failure rates, and the "reddish" color caps are older generation and appear to have a statistically higher failure rate, and should be replaced with new high q mica caps.Two examples in the receiver, (1) with all reddish mica capacitors, and (2) 1 out of 2 reddish capacitors.My course of action is to keep the green, replace the reddish capacitors.
Or does the group make the case that while the patient out and ready for surgery to replace both capacitors while opportunity is good?
Thanks in advance to your vast repository of deep informed knowledge as

I work my first end to end refurbishment on this magnificent receiver.Happy 4th of July, celebrate independence day.
---------- next part ----------
A non-text attachment was scrubbed...
Name: PXL_20240704_183203056.RAW-01.COVER.jpg
Type: image/jpeg
Size: 1820154 bytes
Desc: not available
URL: <http://mailman.qth.net/pipermail/r-390/attachments/20240704/bdf8165d/attachment.jpg>
---------- next part ----------
A non-text attachment was scrubbed...
Name: PXL_20240704_175536332.RAW-01.COVER.jpg
Type: image/jpeg
Size: 1971594 bytes
Desc: not available
URL: <http://mailman.qth.net/pipermail/r-390/attachments/20240704/bdf8165d/attachment-0001.jpg>

Date: Thu, 4 Jul 2024 13:45:48 -0600
From: "Jordan Arndt" <Outposter30@shaw.ca>
Subject: Re: [R-390] To swap or not to swap those aging "reddish" rectangularmica caps

I once managed to connect a C227 replacement cap to the tube base pin successfully, but I wouldn't go through that process ever again. It's not necessary to replace all the caps in the topside cans, but what you can and should do is inspect them internally, make sure the variable caps are not frozen (they can be repaired), clean the pins and spray some contact cleaner on the pivot point of the variable while turning it. The real test of the components inside the RF cans will be in alignment and testing, where you might see poor tracking, cores that won't tune or tune only at the extremes of insertion depth, etc... I hope this info helps...Good luck..!

Date: Thu, 4 Jul 2024 15:51:24 -0400
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Re: [R-390] To swap or not to swap those aging "reddish" rectangular mica caps

John, I never suggested that all the "red" ones HAVE TO be changed. The warning was just that due to their age, they CAN fail, but not all... If you want to completely rebuild a R-390A, go for it, but...! IMHO, the only capacitors that NEED to be changed are the Sprague "bumblebees" paper ones if you find any inside your modules. Otherwise, wait for the failures to happen, if any! All depend also of the "running time" you expect for

your R-390A. My own are OFF most of the time, so I do not expect a high number of mica cap failures...

Date: Thu, 4 Jul 2024 13:53:36 -0600
From: "Jordan Arndt" <Outposter30@shaw.ca>
Subject: Re: [R-390] To swap or not to swap those aging "reddish"

P.S. : You can dissasemble the variable caps and clean them internally, but it can be a rather delicate operation. It's much easier after you've done a few. I don't have a link right now, but there are illustrated articles on how to restore/rebuild those variables...

Date: Thu, 4 Jul 2024 20:53:07 +0000 (UTC)
From: jkharvie <jkharvie@verizon.net>
Subject: Re: [R-390] To swap or not to swap those aging "reddish"
  rectangular mica caps

Jacques,I apologize if in any way I implied that you suggested that all the "red" capacitors HAVE TO? BE CHANGED. I did not mean that and certainly you did not provide this input. I looked at the new old stock of parts I have, and see all the red ones have packaging/ production codes dating back to the 1950's and early 1960's, and that all the green ones I have date appear to be from early 70's.I also have a bunch of of the trim caps to service those that may need it. I have not (yet) located any cracked ceramic wafers or failed neoprene elastomeric washers associated with these variable capacitors.Your quite correct. One option is to get the receiver going, await for the next failure, fix it, and move forward. I do like the idea of leveraging group experience. If the members have experienced a statistically higher failure rate on the red caps, maybe go ahead and replace these.

Date: Thu, 4 Jul 2024 21:06:10 +0000 (UTC)
From: jkharvie <jkharvie@verizon.net>
Subject: [R-390] Paper on failure modes of mica capacitors
  (historical)

As attached, cheers John N3JKE
---------- next part ----------
A non-text attachment was scrubbed...
Name: 1959 article on failure mechanisms of mica dielectric capacitors.pdf
Type: application/pdf
Size: 1454812 bytes
Desc: not available
URL: <http://mailman.qth.net/pipermail/r-390/attachments/20240704/bca45b82/attachment-0001.pdf>

Date: Thu, 4 Jul 2024 21:12:03 +0000 (UTC)
From: jkharvie <jkharvie@verizon.net>
Subject: Re: [R-390] To swap or not to swap those aging "reddish" rectangularmica caps

Jordan, Thank you for these excellent suggestions. I now have these on my check list! I will let you know how it goes. Looking forward to checking the check list off as I make progress.

Date: Thu, 4 Jul 2024 21:12:03 +0000 (UTC)
From: jkharvie <jkharvie@verizon.net>
Subject: Re: [R-390] To swap or not to swap those aging "reddish" rectangularmica caps

Jordan, Thank you for these excellent suggestions. I now have these on my check list! I will let you know how it goes. Looking forward to checking the check list off as I make progress.

Date: Fri, 5 Jul 2024 02:37:30 -0700
From: Larry Haney <larry41gm2@gmail.com>
Subject: Re: [R-390] To swap or not to swap those aging "reddish" rectangularmica caps

Hi John, One of the known problems with some silver micas is 'silver migration' that can cause changing values and shorts. One of the circuit conditions that exacerbates this problem is when high voltage is applied to one, such as C249 - C254, C281 and C289. It seems like I have replaced 1 or 2 of these in most of the RF decks I've worked on.

Date: Fri, 5 Jul 2024 15:44:44 +0000
From: David Wise <d44617665@hotmail.com>
Subject: Re: [R-390] To swap or not to swap those aging "reddish" rectangularmica caps

At least in my R-390A, C227 is hermetically sealed. Those are the longest-lived paper caps, and 99% are still fine today. I would not replace it unless it was proven bad. Not to mention that it will never see more than a few tens of volts, and usually just a few volts, period. If an immortal monitored a radio over the centuries, C227 would be the last to go.

Date: Tue, 9 Jul 2024 00:34:05 +0000 (UTC)
From: jkharvie <jkharvie@verizon.net>
Subject: Re: [R-390] To swap or not to swap those aging "reddish" rectangular mica caps

Dave and Larry, thank you for your thoughts and recomendations regarding capacitors that enable highly resonant tuning circuits, including those within the intermediate frequency plug-in ("cans") assemblies located on the Radio Frequency subchassis. I received and have replaced the one capacitor (C227) unit with a new "high Q" cap, and will save the old part just in case this new part does not work out so well.
I have completed detailed inspection, and cleaning of the inside of all the "cans" on the RF deck.? Quite a bit from many years of grime, dust and grit.? All cans had green caps except for 5 cans mounted with red capacitors.? Each of the multiple variable caps have been carefully cleaned, silver contacts are now clean, and the cans appear to be ready for operation.? I wrote down which cans have the red caps to remind myself when we enter electrical alignment.   making steady steps forward
best regards

Date: Wed, 10 Jul 2024 17:45:43 +0000 (UTC)
From: jkharvie <jkharvie@verizon.net>
Subject: [R-390] Guided discovery on the RF deck

While in the RF-subschassis process of cleaning and reassembly I noted that only 2 of three pins are plugged in and active on
Z201-1Z202-1Z203-1Z204-1Z205-1Z206-1

as per the electrical schematic, but something I never specifically noted or thought much about previously. This got me thinking that the non-used pins might serve as a source of spare pins if/when needed. Attached graphic shows top view of the RF subchassis awaiting cleaning, a three pin "can" of which two pins are used, a bottom view showing mounted cans with no connection to the one pin in highlighted red box, and the RF subschassis schematic showing all of this. One of the "tools" I made was drilling out the end of a bamboo chopstick with a #35 drill (0.110") to hold 1/2 of cotton tip applicator swab.
---------- next part ----------
A non-text attachment was scrubbed...
Name: 2024 June R390A no connections to Z201-1 Z202-1 Z203-1 Z204-1 Z205-1 Z206-1 pins.jpg
Type: image/jpeg
Size: 2164218 bytes
Desc: not available
URL: <http://mailman.qth.net/pipermail/r-390/attachments/20240710/3a925ddf/attachment.jpg>

Date: Wed, 10 Jul 2024 18:13:03 +0000 (UTC)
From: Jim Whartenby <old_radio@aol.com>
Subject: Re: [R-390] Guided discovery on the RF deck

JohnI like the chopstick idea but I have never seen any failure in the Teflon pins or socket connector on L/C cans on any equipment that uses them.

Date: Wed, 10 Jul 2024 15:09:57 -0400
From: "Jacques Fortin" <jacques.f@videotron.ca>
Subject: Re: [R-390] Guided discovery on the RF deck

>From the picture you sent, I see three "bumblebee coded" PIO caps in >there. Did you plan to change those ? All the ones I had were found >leaky....

John, these non-used pins are linked to the fact that the Z201-1 and Z201-2 are identical, and etc. for the other Zxxx. These are non-used pins when they are in position "1" but used when they are in position "2".

Date: Wed, 10 Jul 2024 19:59:11 +0000 (UTC)
From: jkharvie <jkharvie@verizon.net>
Subject: Re: [R-390] Guided discovery on the RF deck

Jacques, perhaps this was a manufacturing efficiency, such that the "identical" assembly could be interchanged between position "1, and position "2" during assembly. I was surprised to discover this detail on the non-used pins.

Yes - I have now completed replacing all "bumblebee coded" leaky caps (these measured >1% leakage), the picture was before component level work started. I have also completed the resistor drift change out, and I have installed the new "high-Q" dipped silvered mica capacitor (C327) across the primary of T207 (retaining the old just in case). Making progress!
