IF DECK TIPS

R390A IF Deck Alignment (Chuck Rippel)

R390's made after 1954 and those with mod 2 stamped on the IF chassis have a field change installed to the mechanical filters. Filter input and output trimmer capacitors have been added. The 4 input trimmer capacitors are found by removing the 2 square can on top of the IF chassis using the single nut in the top. The 4 output trimmer capacitors are located behind 4 holes in the left hand side of the IF deck. The IF chassis will need to be loose but still electrically connected to complete these procedures.

An accurate counter, analog VTVM and a signal generator capable of outputting 455.00 KC, is required for these alignments.

Connect the VTVM to the Diode Load bus on the rear and configure it to read a negative voltage of approximately -7vdc. Set the receiver FUNCTION control to MGC, BFO to OFF and the LOCAL GAIN control to a comfortable level. Lift and tilt the IF deck resting the front captive (green) screw over the front panel. You should be able to gain access to the mechanical filter trimmer capacitors through the large ventilation holes in the main chassis.

Locate the cable running from the rear of the IF deck to the *IF OUT* BNC connector in the rear panel, upper left side. Unplug the cable from the IF deck only. Also unplug J-513 and the one next to it. Plug the cable running from the rear IF Out jack into J-513 on the IF deck. Connect the output of your 455.000 kc generator.

Mechanical Filter Alignment-

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

IF Transformer Alignment-

- Select the 16KC filter
- Set the generator frequency to 467kc.
  Note: The generator output should be increased until the VTVM indicates approximately -2vdc.

Do not be alarmed if that level is over 0.1 volts.

- Adjust the top slug (secondary) of T-501 for a peak reading on the VTVM
- Adjust the bottom slug (primary) of T-502 for a peak reading on the VTVM
- Set the generator frequency to 443kc. Note: The generator output should be increased until the VTVM indicates approximately -2vdc. Again, do not be surprised if that level is over 0.1 volts.
- Adjust the bottom slug (primary) of T-501 for a peak reading on the VTVM
- Adjust the top slug (secondary) of T-502 for a peak reading on the VTVM
- Decrease the generator output and adjust the frequency to 455kc Note: The generator output should be decreased until the VTVM indicates approximately -3vdc.
- Select the 4kc filter then peak top and bottom of T-503 only

AGC Alignment-

- Verify the generator is still outputting 455.00kc. Set the FUNCTIONswitch to AGC and connect the VTVM between the AGC bus on TB-102 3 & 4 located on the rear panel & ground.
- Adjust the generator output for a reading of approximately -5vdc on the VTVM. Peak Z-503.

BFO Alignment-

- Verify that generator is still at 455.00kc
- Turn on the BFO and exactly zero beat it against the 455.00 generator frequency.
- Loosen the bristo spline socket on the BFO shaft coupler,
- Verify that you still have exact zero beat.
- Set the BFO Pitch control to indicate exactly 0.
- Then, tighten the bristol socket on the non-mar clamp on the BFO shaft coupler
- The filters have been aligned to 455 kc.

(When a station broadcasting in AM is zero beat, the carrier will be in the center of the filter selected).

- Re-install the IF chassis in the receiver.

Setting the IF Gain Control for best performance

The most common single item responsible for holding an R390A back is not lack of sensitivity. Rather it is internally generated IF deck noise. In an otherwise properly operating R390A, the cause of this excessive noise is IF gain control being set to high. Even the mfg spec of setting the IF deck gain such that -7vdc at the diode load when fed by 150uv @455kc into J-513 is far too hot.

Here is a recently refined procedure to set the IF deck gain control. Anyone can perform the procedure whether they have access to a signal generator or not.

Procedure to set R390A IF Gain-

Once the receiver has been fully mechanically and electrically aligned, the final procedure to perform before buttoning it up is to set the IF gain control. Many otherwise very sensitive R390A's are thought not to be due to weak signals being covered by noise generated by excess IF deck gain.

Allow the receiver to warm up for at least 1 hour then:

- Disconnect the antenna
- Set receiver for 15.2 mHz
- Set the FUNCTION control to MGC
- Select the 4kc filter with the BANDWIDTH
- Set RF GAIN control to 10 or maximum
- Peak the ANTENNA TRIM for maximum noise as indicated on the LINE LEVEL meter
- Set Line Meter switch to -10db scale
- Set Line Gain control to full CW or 10.
- Adjust IF gain control, R-519 to cause Line Level meter to indicate between -4 to -7 db.
- Re-zero the carrier meter control, R-523
- Set controls above for normal operation and reconnect the antenna

Discussion:

This will yield the best compromise on all bands. I usually poll those bands which I normally spec out. Then, using an HP signal generator set for internal modulation of 800 hz @ 30%, massage the gain setting and even specific signal path tube selections for the best overall performance.

Contribution by Chuck Rippel, WA4HHG

RF Deck Test-

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.
3-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 Rippel

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From: "Chuck Rippel" <crippel@...>
Date: Thu, 23 Oct 1997 09:01:39 +0500
Subject: [R-390] R390A AGC Problem

Now, I too am wrestling with an R390A AGC problem.

The basic symptom is: the receiver overloads for lack of AGC voltage. I develop only about 2.2v v/s about 7.5v on a known working radio at the rear AGC jumper for a 60db signal on the Carrier Meter. The time constants seem to be ok, just does not produce enough voltage. I replaced the 82K, 1W R549 which has drifted up to about 103K (seen it before) and had 82K 2W spares around.

Changing the IF deck out with a known working unit has no effect. The problem stays with the radio.

I removed the RF deck and proved out the AGC bus checking both continuity and to-ground resistances as compared with another deck. To ground resistance was about 1.9M so its hard to believe that the RF deck is loading the bus down yet, the AGC bus goes no where else.

Tonight, I plan to swap RF decks just to further isolate the problem. Assuming its in the RF deck, my plan is to read the current at the AGC bus and compare it with a known, good radio. Maybe someting is breaking down?? If it's in the RF deck, the problem should be mentally easy to locate by just breaking the AGC bus within the deck and watching for the voltage drop.

This is a I have not seen before and would appreciate some input if anyone has a thought on it.

Date: Thu, 23 Oct 1997 23:10:02 +0500
From: "Chuck Rippel" <crippel@...>
Subject: [R-390] R390A AGC Problem Solved

Reference my earlier post about the AGC problem I was having with an R390A. Essentially, there was not AGC as the control voltage measured at the AGC jumber to ground was only -2v. It would rise when the RF deck was unplugged.

Tonight, after doing my usual routine on restoring an RF deck, I installed another in the radio for test purposes. The test deck worked just fine. I made some note on the operating parameters of the working deck with respect to AGC. I left my millivolt meter which had been set up to read current across the rear panel AGC bus. I had removed the jumper between terminals 3&4 on TB-102 in configured the meter to read current between those two points. Since I already knew the IF deck was good, any anomoly would be caused by the AGC bus in the RF deck. The current across the AGC bus was typically 4ua with an off air signal that nominally measured 70 on the carrier meter. Did not use a signal generator because I felt that actual program material would reveal the resulting distortion from a no AGC caused overload quicker.

I reinstalled the defective deck and tested it. Same problem and the current measured was >150ua. I then physically removed the deck from the main chassis, connected it electrically and powered up the radio. Same input signal except the AGC voltage was normal. What gives?

Looking across the bottom of the deck, I found that a .005 capacitor (no number in my print) that was connected to pin 4 of V202 was pushing on C-273 causing the hot end to ground (under a wiring harness so the potential problem was hidden from sight/visual inspection), thus killing the AGC to V202 and V201. Thus, the overload. I re-positioned the component and the AGC problem is fixed.

This failure looks like it has been that way since mfg. There were 3 RF deck installation screws missing so I expect that someone had done some digging looking for this problem. This radio is a Capeheart but in nearly new in appearance and both electrical and mechanical operation. It now has a very hot RF deck which easily peaks on its own noise (and that's not very much) when the Antenna Trim control is rotated with no antennas attached.

The person that is getting this radio is getting an exceptional R390A. This radio is no mongrel. thus far, all the Capheart modules match the main chassis.

R390A AGC Specs:

70 db as measured on the Carrier Meter results in:
(All measured at Terminals 3 and 4 of TB-102)

(-6) to (-7) Volts
4ua current between terminals 3&4, bus connector removed

Use an analogue VTVM as the dynamic nature of the changing voltage
would make measurement with a DVM very difficult.

Date: Tue, 28 Oct 1997 08:59:34 -0800
From: "James M. Toney, Jr." <tcltd@...>
Subject: Re: [R-390] (R-390) Why filters go bad - viz. bad caps

> ……what kills the mechanical filters in relation to (what) capacitors go bad.
> This probably relates to the compilation that I think was going on on the
> BA List a few weeks back, just before the establishment of the 390 mailing
> list I think - a record was being compiled of bad components……

Brien, there is a capacitor in the input side of the mechical filter circuit, it is a 200V cap (I think); the other side of the filters are grounded; if cap shorts filter killing voltage goes thru filters to ground. Fix is to replace 200V cap with a 1KV and isolate ground with a 1KV cap in series between filters and ground. Jim

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Date: Sun, 09 Nov 1997 21:28:49 -0600
From: Tom Norris <badger@...>
Subject: [R-390] Re: More on Electronic Assistance Corp./Hammarlund

At 10:14 PM 11/9/97 EST, you wrote:
>We have recently had a correspondent on the R-390 list server who *has*
>such a radio -- still with the ceramic filters! This may be one of the
>rarest R-390As around !!! He is correct in pointing out that the audio
>quality would be better than had the mechanical filters been installed.
>For the military, however, there was a practical degradation in intermod
>suppression in the harsh RF environment of a ship with multiple HF transmitters.

Indeed, the audio is much better on AM with the ceramic filter deck! The AM audio is "fuller" and hasn't the ringing of the "real" filters. I swept the deck at one point, and the skirts are just a tad less steep. This deck is part of SN 127 EAC contract 23137-PC-60. It is not a good a performer on crowded bands though, so at the moment I have a 1954 Motorola deck installed.....

From: John Kolb <jlkolb@...>
Date: Wed Dec 17, 1997 9:38 pm
Subject: Re: [R-390] More 4KC filter wierdness

<snip>... Let me describe Older Collins filters from a few I've opened. There are a number (7 - 11) of metal alloy disks, typ 1/2" diameter, 1/8" thick in a row with equal sized gaps, held together with a bonding wire welded to each disk. attached to the two end disks is a fine wire, 1/2" long, about 36 gauge diameter. A set of solonoid coils at each end surround these wires. The electrical signal is applied to the coil at one end, which creates a magnetic field, causing the wire to vibrate the first disk. The disks are like tuning forks, resonant at freqs near the IF freq of the filter. If the applied signal is close in freq to the resonant freq of one of the disks, it will be passed on to the end wire, which vibrates, inducing an electrical signal in the other coil. If the freqs are too far from the resonant freq of any of the disks they won't pass. There's also a small magnet at each end, parallel to the transducer wire, creating a fixed magnetic bias on the transducer wire.

Most of the filters I've seen had custom rubber cushions supporting the transducer assemblies at each end. Not much chance for change here. I've heard that some of the older filters used a standard rubber grommet to hold the works and that would fall apart with great age, causing the works to rattle around and break the wires between the coil and terminals, if you were lucky; if you are unlucky, the works would be bent beyond repair by the rattling around.

If the transducer wire were to break off, you get a very high insersion loss, but that wouldn't recover. It may be that a speck of dust or flake of rosin flux got into the filter and jammed between the coil bobbin and transducer wire. If so, operation may cause vibration which would eventually change it's position.

Collins filter data sheets may have limits on the applied signal voltage or DC voltage or current through the filter (You generally should not let plate current flow through the filter) but they do not spec a maximum number of operating hours or vibrations. Haven't heard of any filters dieing of old age other than the ones noted above. I have opened and repaired a few filters where the coil wire was broken between the coil and the terminal (wire fatigue??) or one case of no solder on the terminal.

From: crippel@...
Date: Thu Dec 18, 1997 2:01 am
Subject: Re: [R-390] More 4KC filter wierdness

I have seen this happen before. Take the square filter cover off and wiggle the wires going to the 4KC filter (its the one in the far rear). They are hard to solder and I have seen them be soldered cold or even break loose.

From: "Chuck Rippel" <crippel@...>
Date: Sun Jan 25, 1998 1:51 pm
Subject: Re: [R-390] R-390a Repair

> Hello all, It is time to ask for help in repairing my first R-390A. I > have a Stewart Warner >S/N 1831. On all bands 7Mhz and below, the sensitivity seems to be down maybe 20DB or so. >The calibrator shows the same weakness >in signal level. V202 tests fine, replaced anyway. >The 17Mhz osc signal is present at V202 cathode. All voltages and resistance's at V202 check >fine. Z213-1 thru 3 tune and are peaking. I have removed the RF unit and inspected for >problems. Wafer switches and contacts have ohmed out. Any ideas?

Check for a leaking/shorted capacitor inside the IF cans, Z-216-1, 2 or 3. Also, one of those IF transformers could be bad.

From: Colin Thompson <burkec@...>
Date: Sat Jan 31, 1998 8:57 pm
Subject: [R-390] AGC settings

In the past there has been some talk about the appropriate AGC settings. I would encourage all of you to try the Med or Slow settings, espcially for stronger broadcast quality signals. The increase in fidelity is startling. For those of use used to SSB and faster time constants, this may seem contrary. At one point when considering modifying the AGC for better SSB, Chuck Rippel reminded me that the R-390A is an AM reciever. The faster AGC mods would be a compromise in the AM mode. The more I use these great recievers, the more I come to know them and understand this. I have had some email dialog with John Thorpe; Lowe HF225, HF150 and AOR7030 designer. All superior sounding recievers. JT was famous for his slower AGC constants. He also restored a R-390A to use as bench mark for designing the AOR7030. Slower AGC settings? Food for thought.

From: trinit69@... (Tom Marcotte N5OFF)
Date: Sun Feb 1, 1998 7:22 am
Subject: [R-390] 390A cap fail/fix

Another data point for the common failure list.
I had to replace C-523 and R-551.

C-523 is a .005 uF bypass cap in the IF deck. It would short out at line voltages over 90V. At that point, B+ was shorted through R-551 causing it to let the smoke out of itself. I had the IF deck running external to this new rig, and thus could witness the

failure.

Replaced the cap and resistor.

Date: Sat, 27 Feb 1999 08:20:55 -0600
From: Dallas Lankford <dallas@bayou.com>
Subject: Q-spoiling resistors in the IF cans: purpose

I have also seen cut (but not cut off) Q-spoiling resistors in an R-390A IF deck and all those IF transformers peaked to 455 kHz. Since this is clearly not how the IF deck came off the production line, I did not mention it previously. The worst case of this I have ever seen was with Q-spoiling resistors cut so that you could not see the cuts without very close inspection (= magnification). I finally found these "invisibly cut" Q-spoiling resistors because of intermittent jumps and drops of signal levels of about 10 dB per the carrier meter. Heating and vibration apparently caused enough movement of one of the cut resistor leads to open and close the cut intermittently.

And yes, I will echo what Chuck said. An R-390A works much better with the Q-spoiling resistors not cut , and the IF transformers stagger tuned (not all aligned to 455 kHz as some people are going to do regardless of the correct way to do it). I never cease to be amazed at some people thinking they know better than the Collins engineers who designed, tested, redesigned, and retested the R-390A.

For those who think they know better, I would suggest a reeducation program, beginning with reading "Final Engineering Report On Radio Receivers R-389()/URR And R-390()/URR," September 15, 1953, A Publication Of The Research And Development Laboratories, Collins Radio Company, Cedar Rapids, Iowa (as required background reading for learning about the R-390A), and Cost Reduction Program For Radio Receivers, R-390/391x/URR, Final Progress Report," A Publication Of The Research And Development Laboratories, Collins Radio Company, Cedar Rapids, Iowa (which is the story of the development of the R-390A). Though stagger tuning is not specifically mentioned in this report (to the best of my knowledge), we do find on page 15," New interstage coupling transformers were designed to give the required flat top over a wide frequency range." What do you think this means? And your first two guesses don't count.

Chuck Rippel wrote:

> Just as an FYI... the stagger tuning of the T501/T502 accomodates
> the bandwidths of the 8 (really 11) and 16kc filters. When I perform
> that procedure, I select the 16kc filter then perform the stagger tune
> alignment on T501/T502.
>
> The tuning of T501 and T502 will appear somewhat more broad than
> you might otherwise expect due in part to the Q-spoiling resistors
> installed in the transformers. I have seen receivers where those have
> been incorrectly cut out and the transformers all tuned to 455 kc.
> Needless to say, the R-390A works much better if that is not done.
>
> > From TM 11-5820-358-35 (8 Dec 1961), pages 3 & 4, para 2(c) "Equipment

> > Modification Chart": "IF transformers T502 through T503 stagger-tuned at the factory". Per the chart and its notes, this stagger-tuning applied as Mod
> > 1 on all Order No. 363-Phila-54 receivers, and also to Order No. 08719-Phila-55 (serial numbers 600 and higher only, no Mod # indicated).
> >
> > 73, Jerry W5KP

Date: Sat, 5 Jun 1999 12:35:57 EDT
From: JCStott@aol.com
Subject: Re: [R-390] Dirty but not so quick total setup

According to T.O. 31R1-2URR-452 (USAF Field and Depot Maintenance Manual), page 4, Modification Table it states: "IF transformers T502 through T503 stagger tuned at factory on Order No. 363-Phila-54, IF chassis MOD number 1....." with a sub note stating: "This was also done to receivers on Order No. 08719-Phila-55 with serial numbers 600 and higher." The T.O. that I have is dated 8-12-1961 with change 12 dated 7-15-1975 I realize that this does not cover everything but it is one piece of the information being discussed.

Z-503 AGC TRANSFORMER REPLACEMENT

Date: Sat, 27 Feb 1999 21:29:48 -0500
From: "Chuck Rippel" <crippel@erols.com>
Subject: [R-390] Re: Z-503 Replacement

As a suggestion to you and for the further edification of the list.

Z-503 is the AGC transformer. It can open but more often than not, the core binds in the form. If it is forced during alignment, the core can break of the form will come loose, rotate and break the feed wires. Before aligning it, put a >very, very< small shot of WD-40 into the coil form and wait overnight. For some reason, Z-503 cores can badly bind to the forms. I have found the WD-40 breaks loose whatever the binding agent is allowing for easy alignment without breakage. I have also yet to see any ill effects resulting from frugal introduction of WD-40 into the coil.

If yours is open or the form is broken and not repairable, I think I have may have a very Z-503 few >coils only< from American Trans-Coil and you can have one for the asking. This assembly consists of the plastic (?) coil form with the coil installed and two tinned wires only. I had a Z-503 open up and was able to replace it without removing the entire coil assembly from the IF chassis (which is difficult, just look underneath). I simply dissassembled
Z503 and replaced the open coil as follows:

Remove the 2 nuts holding the sheet metal cover from Z-503

Remove the 2 nuts holding the top insulator (with the tuning tool opening in it).

Carefully work the insulator off the coil while unsoldering the coil feed wires that pass through it.

Closely cut or better, unsolder the 2 small wires which feed Z-503 and are attached to the vertical feed wires in the coil form.

Carefully twist and pull on the Z-503 coil assembly lifiting it clear of the coil mount.

At this point, its not a bad idea to check the internal, fixed value capacitor by taking one lead loose and putting a megger on it. These have been known to leak. Replace if required or simply re-attach the lead if it checks ok.

To install the new coil:

Put a small amount of epoxy glue on the bottom of the new coil form and install it in the bottom insulator of the coil assembly.

Resolder the two Z-503 feed wires to the vertical wires in the coil form reattaching them as closely to where the old ones were as possible.

Put a small amount of epoxy on the top of the coil form and reinstall the top insulator being careful to make sure the vertical feed wires go through the top grommets. Solder the vertical feed wires in the top grommets.

Reinstall the 2 nuts which secure the insulator to the coil base assy.

Reinstall the coil cover and hold down nuts.

Put a very small shot of WD-40 into the coil form to loosen the core and provide for easy tuning.

Allow the glue to cure overnight.

After the glue is cured, realign the coil by injecting a 455.0 kc signal into J-513 on the IF deck at about 300uv.... (of course, the rx is already warmed up and operating, the Function switch set to AGC and your VTVM attached to the rear agc bus and ground) . Simply tune the transformer for a peak on the VTVM.

You are done. Chuck Rippel, WA4HHG R390A List Co-Administrator

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Date: Tue, 5 Oct 1999 09:58:02 -0700 (PDT)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] Mech filter query

> I'm refurbing a spare R-390A IF unit - had a bad 8kc filter that was hacked
> out before I got it. Just so happens that the one and only spare part in my
> tons of junque box goodies is.... an 8kc filter !
>
> Anywho - does the in/out phasing of the filters matter?
>
> If the answer is yes, then I guess I get to stare at it some more. Also, if
> yes then I wud assume that the lead connections on the top and bottom of the
> filter are layed out physically to match the winding phasing.?.

>

Doesn't matter if the inputs are on the top or the bottom - the filter is symmetrical. You would want the same arrangement as the other filters in that IF section to have uniform wiring, and less chance of paths for RF to sneak around the filter.

Before wiring the filter, it's a good idea to check the winding between the terminals to make sure the coil is not open, and to check between the terminals and case to make sure the filter is not shorted to gnd.

Don't forget that while in the IF section, there's a plate coupling cap which should be replaced with a high quality unit. If it shorts, B+ goes through the filters to ground destroying them.

Date: Tue, 05 Oct 1999 08:57 -0700 (PDT)
From: rlruszkowski@west.raytheon.com
Subject: Re:[R-390] Mech filter query

The two IF units I have are very different vintages - working one is w/o the in/out trimmers, refurb is with trimmers. Plus there is a mix of filter lead arrangements. Add to this my tired eyeballs and the tight spaces under there.

I do not remember phasing being a problem. The filters were replaced and best fit used on the wiring. If your new unit has the trimmer caps then use then. They do give a better impedance match, which is why they got added in later unit coming off the assembly lines. Some filters have two terminals. Some filters have three terminals. That third terminal was a ground lug. The mechanical connection were suspect and a soldered ground wire was an improvement. If your filter has a ground lug then solder a lead between it and the chassis. Some units will have a bare wire between all four filters and then to a ground point.

Date: Sat, 13 Nov 1999 10:57:57 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] I F Module

Fred, I think the AGC action IS being changed by a leaky AGC bypass or time constant capacitor or a bad IF tube. Because looking at the AGC IF stage it has only a resistor to ground from grid 1. The only way grid voltage changes is because its being driven into grid current by an excessive signal. Pin2 (on the A) was hooked to the developed AGC voltage when got large at -24 volts indicating the signal level was extra large.

This lack of AGC control can also be caused by an AGC controlled stage with excessive grid emission that makes the grid go positive and to have a grid current that counteracts the applied AGC voltage.

Since the changes happen after the radio has been on a while, it looks more like grid emission than a capacitor, though a capacitor's leakage can be temperature dependent.

So I'd check the AGC line at various places with a VTVM to see if was going positive or zero when the radio was hot, and then look for the tube with grid emission by trying to localize which one was back driving the AGC line, or else I'd get out my grid emission tester and check the tubes that way (after I rebuilt it). There usually are AGC isolation resistors for each stage to minimize feedback through the AGC line and those will have high enough value (>100K) to let you find the tube with the grid emission by finding the most positive grid.

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

Having finally buttoned up a St Julians creek disaster after almost a year of piddling away and some help from this group, I would like to say the hours weren't worth it but the "experience" was everything! I really learned a lot.

To begin, as a matter or principle, I am not one who favors mods unless they get me to the end of being able to use something better. Specifically, I like listening to some of the military freq's such as 11.175 usb. Admittedly, I also have a couple of R1051B's that will do the job quite nicely. However, given that this unit was sort of an experiment to see if I could ever get it running, I felt it might be worth the time to do a little experimenting. So I first disassembled the unit down to the module level and removed the rf deck, took all the cans and racks out, removed the front panel to refinish, and started by getting the modules except the rf deck working in another 390A chassis. As far as cleaning, an aerosol degreaser was used just prior to a hot water washer to clean up everything, especially the rf deck. I covered the cans that couldn't be removed with duct tape. Then I final rinsed with a gallon of distilled water and then put them in the attic during the summer for a week to dry out. So, finally this fall, it was time to start the reassembly.

Mostly, I wanted to make sure everything was working before I started "jacking" with it. My first attempt was to do the IF mods on the unit per the suggestions of the Electric radio series in #26 using 6jh6's and adding a diode and removing a couple of resistors. My ear told me that this wasn't reallly satisfactory. (Fortunately, I had not cut the swamping resistors in T501,2,3) So basically, I removed/reversed that suggestion to the Lankford way. This is really simple, remove one resistor add two capacitors and add two 1N4148 diodes. Dr Langford suggested changing C551 to 1.22uf for the slow AGC and adding a .47uf to lug 9 of S107 after lifting the white wire to ground for the medium agc. I did this and found that I only used the medium position so I undid the 1.22 part and only left the .47uf attached to lug 9 of the s107. I just used a dab of clear silicone rubber to glue the cap to the inside of the front panel and the next day it was firmly attached and yet still removeable. Bottom line: I can barely tell the difference between the 1051B and the 390A. However, I did try the trick of changing R541 from 270 ohms to 1000 suggested in the Electric radio series. I felt that I just didn't have quite enough AGC and changing this resistor made a big difference. My feeling was that because I have that "repaired" Z503 using a fixed inductor and cap that maybe it isn't quite at resonance but this seemed to get around the problem. I would sure hate to change Z503, boy would that be a job even if one could find it! The last couple of things involved adding a 47pf cap in parallel with the BFO injection cap per the Lankford way. And..... that ballast tube bothered me. I just

hate to spend $17 when there is less expensive ways that aren't degrading. The first thought was to go 12BA6's and jumper the ballast socket. I really didn't like the look of that hollow spot. So, for another twist on the ballast tube alternative, I used a "pulled" 15DQ8 TV type tube and moved the wires to # 3 and 4. This is so minor and given that I had to remove the BFO shaft to change the injection cap anyway, it seemed a simple and cheap way to go. I tried to use some 12v tubes but found that the low side voltage was a tad high. The 15DQ8 put almost exactly 12.6 volts on the low side headed to the PTO and BFO tubes. I know this sounds significant, but when all was said and done, I had an IF deck that really handled the SSB and still made the BBC sound nice.

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.

In summary, I would highly recommend the IF deck mods suggested by Dallas Lankford. They are simple and easily reversable. There are no holes or drills and they allow a fantastic engineering marvel to copy SSB which was just coming on line during early life and development. Primarily used for copying the fleet/unit broadcast in it's 8 and 16 mhz bandwidth, R390A didn't see a lot of SSB until the end of it's life when the 1051 series came
to replace it in the Navy at least.

The final touch was putting on Tom Marcotte's replacement tag. When the choice is no tag or a $9 almost authentic one, it isn't really a hard decision. I really take my hat off to Tom for taking the time to develope them and to Dan Arney for the covers. Those two guys deserve a lot of credit for the labor of love to make available the replacement parts. Sorry this ran so long.

Date: Tue, 28 Dec 1999 12:36:10 -0700
From: Wally Gibbons <rockwall@sourceoneinternet.com>
Subject: [R-390] AGC woes!

Decided to use the holiday time for BA repair fun. My 390A is sick, overloading on strong signals. I'm hoping someone has seen this and can say "replace this capacitor, or tube"!

I'm listening to the audio, capacitor coupled off the diode load jumper and feeding an external audio amp, by the way.

The diode load dc voltage will go to -40 volts on about any signal... AGC jumper is at -12.5 on the local AM station I use as a test signal. I've watched the IF output jack on a scope and the RF envelope doesn't appear to be clipping even though the audio out on the diode load is.

By turning down the RF gain I can reduce the clipping but here's the strange thing. With RF gain full up the audio clips on negative peaks. With it turned down the clipping goes away for a while, then starts clipping on positive peaks.

As a frame of reference I looked at the diode load on my none-A 390 and it hardly ever exceeds -8 volts, and doesn't clip on the local am signal either. Sounds great.

Any clues? I'm going to jump in and search away, but hope someone as been there and done that.

Date: Tue, 28 Dec 1999 14:48:23 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] AGC woes!

Controlled tubes with grid emission bucking AGC. Leaky AGC bypass capacitors. The AGC circuit impedance is megohms so it takes very little leakage in the AGC bypass capacitors (too low to measure with any ohmmeter) to kill the AGC voltage. Trace the AGC voltage towards the tube grids with a VTVM. Somewhere you will find it zero (leakage) or going positive (grid emission).

Date: Thu, 30 Dec 1999 22:17:12 -0600
From: Nolan Lee <nlee@gs.verio.net>
Subject: Re: [R-390] AGC woes!

>Decided to use the holiday time for BA repair fun. My 390A is sick,
>overloading on strong signals. I'm hoping someone has seen this and can
>say "replace this capacitor, or tube"!

There's a good chance it's a leaky cap in the AGC circuit in the IF deck. It's little recurring problems like this that are a pain to track down that lead to my policy of simply replacing all of the under chassis paper caps in the receiver. ESPECIALLY, the IF deck. It'll cost you about eight or ten dollars in parts and a few hours of your time to go thru the IF deck and recap it. It's time and money well spent in the long run. I'll post my R390A capacitor list to the list in my next message.

Date: Mon, 10 Jan 2000 08:35:15 -0600
From: pbigelow@us.ibm.com
Subject: [R-390] Distortion / IF alignment

After checking/replacing capacitors and resistors, cleaning, and aligning (again) my R-390a was STILL having distortion problems with strong signals. Stagger tuning or peaking the IF at 455 did not help. Throwing my own beliefs about the problem out the window (RF overload on the front end), I decided to pursue the problem as an AGC problem.

These strong stations, S9+30db or S9+50db (on AM BCB band) distort some on speech but distort rather badly on music. One station plays a lot of R&B with lots of bass notes and is particularly prone to distortion, but is "weaker" from a STRONG signal perspective -- S9+30db, or thereabouts.

Using that station as a guide, I measured the AGC - about -10.7v - not bad right? Other, stronger, stations measured -12.1v. Well, assuming that for whatever reason the AGC voltage was not enough, this morning
(very quickly) I did the following:

1. Using the .1 and 1kc filters CAREFULLY turned the R&B station for max strengh
2. Monitored the station through headphones
3. Set the AGC for fast
4. Placed the VM on the AGC line
5. Slowly adjusted the T501,T502,T503, and Z503 for maximum AGC voltage / lowest distortion

Guess what? The distortion was reduced dramatically to virtually non-existent and the signal strength of the station on the R-390a was still at 100db and the AGC voltage was increased to about -11.6v. I used Chuck Rippel's IF gain method and ensured that the gain level was kept within his recommendations.

What does this tell me?

1. My previous alignments were incorrect every time?
2. The peak frequency of the coils is not 455kc?
3. Stations overmodulate causing a need to "touch up" the alignment based n hearing / distortion meter?
4. I am masking some other problem?

To me this seems a bit nuts but is alignment based on maximum AGC voltage a valid alignment method? Or, would the idea be:

First, use a stagger tuned or 455kc peak IF alignment method
Second, touch up by maximizing the AGC with a STRONG station
This will be investigated further but I would like comments.

Date: Mon, 10 Jan 2000 10:39:04 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] Distortion / IF alignment

Aligning the AGC stages for maximum AGC voltage is appropriate. Aligning the variable bandwidth stages for maximum AGC may easily destroy the predicted bandwidth.

Date: Sat, 22 Jan 2000 10:23:08 EST
From: PABigelow@aol.com
Subject: [R-390] E208-E211 Test Points

Thanks Nolan, Walter, and everyone for suggestions and help. What brings about the discussion for the DVM vs VTVM are my measurements at E208-E211 on the RF deck. The Radio Shack DVM measures wildly different voltages at these test points, but something else is happening... As reference: Using the CAL signal and adjusting RF GAIN the AGC point on back panel measures at -5.0v

*E208 -2.041v E209 -4.60v *E210 +.28 mv *E211 -1v

These test points should measure about the same. Is that correct?

*In the case of E208,E210, and E211 touching the probe to the test point causes the carrier level to change noticeably. So, either capacitance or load of the DVM is affecting the AGC voltage. Correct? The measured resistance from ground to these points are (tubes in place, power off):

E208 .505 M E209 1.416 M E210 1.406 M E211 .840 M

Ideas or suggestions? Turning off the auto range feature on the DVM does not help. Maybe the VTVM is a necessity? Probes a problem perhaps?

Date: Sat, 22 Jan 2000 11:04:41 -0500
From: "Walter Wilson" <wewilson@knology.net>
Subject: Re: [R-390] E208-E211 Test Points

The resistance measurements with the function switch in AGC and the radio turned off should be pretty close to:

E208 1M E209 1.6M E210 1.6M E211 1M

(see page 116 of TM 11-856A)

You listed: E208 .505 M > E209 1.416 M > E210 1.406 M > E211 .840 M

You should see much closer to 1M from E208 to ground. You should easure about 500K from the AGC test point to ground (220K + 180K + 100K), and 500K (470K + 22K) from the AGC test point to E208. Look at Figure 104 on page 183 in the TM 11-856A.

Sat, 22 Jan 2000 11:31:27 -0500
From: "Walter Wilson" <wewilson@knology.net>
Subject: Re: [R-390] E208-E211 Test Points

I said in an earlier post that E208 should be closer to 1M. But I see a discrepancy between the AGC schematic (figure 104, page 183) and the schematic of the RF amplifier. One of these is in error. These schematics show test point E208 on different sides of the 470K resistor feeding AGC voltage to the grid of V201. The final answer is to measure the resistance between pin 1 of V201 and ground. That should be close to 1M.

I hope the updated manual folks are working on correct this error.

Date: Sat, 22 Jan 2000 11:31:37 EST
From: PABigelow@aol.com
Subject: Re: [R-390] E208-E211 Test Points

Allright, with the receiver not plugged in AND the switch to the AGC position -- measurements are: E208 .505 M, E209 1.419 M, E210 1.409 M, E211 .843 M

Little change from the OFF position.

AGC (on back panel) to GND: .377 M
AGC to E208 .245 M

I have the TM 11-5820-358-35 copy from Fair Radio

Nevertheless, the AGC to GND result should have me check R545, R546, R547 or maybe a short in C547,or C548?

Date: Sat, 22 Jan 2000 11:36:51 EST
From: PABigelow@aol.com
Subject: Re: [R-390] E208-E211 Test Points

Pin 1 on V201 measures .993 M so that would appear OK.

Date: Sat, 22 Jan 2000 11:15:53 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] E208-E211 Test Points

First try putting a megohm in series with the test probe at each test point to isolate the DVM. The DVM may be affecting AGC voltage.

There are series isolation resistors in the AGC circuit. Having lower voltages at different test points comes from leaky AGC capacitors or tubes with grid emission. Or a voltage divider to reduce the application of AGC to the RF stage. I don't have the circuit in front of me to see if there's any way that the DVM should otherwise affect those voltages. A grid voltage test point with a positive bias is a sure sign of grid emission, not capacitive leakage.

You might pull the RF and IF tubes and apply DC from a 9 volt battery (positive to ground) to the AGC line and see what the voltage distribution sans tubes is. Won't need power for that.

Date: Sat, 22 Jan 2000 14:37:02 -0500
From: "Walter Wilson" <wewilson@knology.net>
Subject: Re: [R-390] E208-E211 Test Points

Since pin1 to ground measures almost 1M, and E208 to ground measures much less, it seems to confirm that placement of E208 is correct in the RF deck schematic and incorrect in the AGC schematic (figure 104 of TM 11-856A). All would seem OK since pin1 of V201 to ground measures close to 1M.

> AGC (on back panel) to GND: .377 M I've done some of the Dallas Lankford SSB mods, so my readings are irrelevant for comparison AGC to E208 .245 M mine was . 240M

I couldn't resolve the measurements from AGC to E208 with the AGC schematic. But I found it has ANOTHER error. It shows R201 as 22K, but the detailed schematic confirms this resistor is 270K. So all is well once again.

> Nevertheless, the AGC to GND result should have me check R545, R546, R547 or maybe a short in C547,or C548?

Agreed that AGC to ground should measure 500K; that is IF you have not done any SSB mods in this area. Just to rule out C551, measure from the AGC test point to ground while swapping the AGC switch from fast to medium. Should be no change unless C551 is leaking badly. If no mods have been done, this area would be worth checking for bad caps.

<snipped from another message:>
> The measurements I made with the AGC test point had the jumper in place for NORMAL not Diversity.
> I'm thinking that with the measurements I should remove the jumper.

Leave the jumper in place for NORMAL.

Summary:
I'd keep looking at the tubes, based on the readings you've quoted so far. Even with the AGC to ground resistance reading, that does not explain why you're not getting the AGC voltage to the grids of the RF amp and mixers. Your resistance measurements look OK on the RF deck to the AGC jumper. So any voltage more positive that the applied AGC voltage leads me to still want to try swaping tubes around. For a test, you could take your best mixer tube which appears to be at V202, and swap it with the tube in V203 (or V204). If the -4.5 volts grid bias moves with the tube, you've found your problem.

Date: Sun, 23 Jan 2000 15:57:38 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] R-390a distortion and measurements.

Last night I pulled the paper capacitors from a Heathkit audio VTVM to rebuild it. I'd already bought new capacitors, but after it was working, I checked them. None showed up lower than 20 Megohms on my DVM. When I put them on my capacitor tester none showed up passing the leakage test and most showed a significant power factor 5 to 10%. When I gave them my tough leakage test in its least sensitive mode, the best leaked 1 microamp at 450 volts, the worst leaked 80 microamps at 200 volts. That last one was a 2 mf molded (not black beauty) that had never had more than a couple volts applied all its life. So its leakage was just the result of age.

Have you REPLACED the AGC and other black beauties yet, or are you wasting time trying to prove they don't need replacement? That means in the RF section too. Poor AGC action says AGC bypass capacitors or tubes or AGC IF alignment and gain.

Date: Wed, 02 Feb 2000 17:26:57 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>

Subject: Re: [R-390] VTVM and E208, E209, E210, E211

Paul, your Senior VoltOhmyst has a megohm or so of resistor in the tip of the probe? Then it should look like about 11 megohms input Z?

Then if you find a lower voltage at the test point out front that means either the VTVM is loading the circuit, e.g. at the point where the VTVM reads -2.5 volts the series Z to that point in the receiver is 11 megohms (truly bad solder connection or resistor), or leaky AGC bypass capacitors are loading down the voltage, or there's a tube or two with a lot of grid emission producing a positive bias to counter the negative bias from the AGC detector.

As a test, find a matched set of 1 megohm resistors and solder one to each test point and see if the VTVM still changes the signal level meter. It shouldn't.

This is solvable.

Another test. Turn the radio off and let the tubes cool, or pull them. Apply -9 volts from a transistor radio battery (positive to ground) to the AGC jumper on the back panel. See if the voltage is the same at the test points. If it isn't then there's R or C problems. If it is the same with the tubes missing or cold, there's a tube with bad grid emission. I've run into that at about 4 year intervals on my 75S3B so I KNOW it happens. Watching the voltage change as you plug the tubes back one at a time (at several minute intervals) will dramatically SHOW which tubes are contributing grid current from grid emission. 73, Jerry, K0CQ

Date: Wed, 02 Feb 2000 17:33:29 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] VTVM and E208, E209, E210, E211

Hmmm... could Paul have an RF stage oscillating at a couple hundred MHz?

Date: Wed, 02 Feb 2000 21:57:23 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] VTVM and E208, E209, E210, E211

And if they did, it would drive the grid circuit negative, NOT POSITIVE! The only things that can be failing or tubes with grid emission, leaky AGC bypass capacitors or open series resistors. I stick by my prescribed tests with the 9 volt battery, then if that proves the resistors and capacitors are good it has to be tubes with grid emission which will show up by heating up one tube at a time.

Date: Thu, 03 Feb 2000 02:18:03 -0600
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] VTVM and E208, E209, E210, E211

Even if a generator was driving watts into the RF stage that wouldn't make the DC grid voltage go positive! It would make it go negative. The original and persistent complaint is distortion on strong signals. And the VTVM tests show reduced AGC on the RF deck compared to the AGC voltage on the AGC jumper. And the VTVM tests

indicate putting the probe on the test points changes the signal level meter, e.g. the AGC voltage. That shouldn't be if those test points are DC and the VTVM truly is 12.5 Megohm input Z. Unless there's a near open series impedance in the AGC, or a lot of leakage in AGC bypasses, or a tube or more than one tube with grid emission. Its the grid emission that can drive the AGC voltage towards positive, e.g. less negative. At least that's what it does to my 75S3B... 73, Jerry, K0CQ

Date: Tue, 15 Feb 2000 11:05:19 -0600
From: Nolan Lee <nlee@gs.verio.net>
Subject: [R-390] 390A **Bandwidth Switch Replacement ..**

>Hi I am still looking for the section of the bandwidth switch that comes
>throught the front of the IF deck bushing...

I can't believe that no one has replied to you about this. Rather than of scrapping an IF deck for the part, fix it. It's easy enough. I've explained two different methods below. It's kind of like the "good news, bad news" thing. One takes some work. The other is easy. The hard one is first. <grin> :-)

First, I've never seen one that the shaft was broken off on. I've seen a couple where one leg of the copper detent spring had cracked and allowed the detent ball to fall out. I've replace several of these springs and detent balls.

If you're handy with tools, you should be able to make a replacement shaft easy enough though. The groove looks to be about .025 wide. You can determine the depth from your old shaft. You might have to juggle the width and depth of the groove depending on the dimensions of the external snap ring used as a replacement for the original C clip. I just dug a couple of the detent assemblies out and measured the length of the part of the shaft that you're missing. From the face of the threaded panel bushing to the end of the shaft extends .897 on one and .901 on the other.

>the IF deck I have is 2 pieces that are joined with a shaft coupler...

Correct. The short shaft that extends thru the detent portion is brass and the rear section that extends thru the wafers is aluminum.

>the front section on my deck has been cut at the "C" ring groove, and I need the part that connects to the Knob shaft coupling and goes through the Deck bushing and connects to the switch shaft...

It looks easy enough to make a replacement if you're handy with hand tools. All you'd really need is a a piece of 1/4 brass or aluminum (brass preferred) shaft, an external snap ring and snap ring pliers, a hacksaw, a file, a small sharp cold chisel, and a 4 oz or so ballpeen hammer. The tedious part will be filing the flats on the shaft for the detent plate and spring. The only tricky part will be restaking the detent spring on the new shaft. You'll want that chisel sharp when you do.

Cutting the groove is easy enough. Chuck the shaft in an drill press or an electric, verify that the directions it's spinning is into the teeth and put the hack saw to it. If you have to, you can vary the width of the groove. A well worn fine tooth (32T) blade will

cut a narrower groove than a new coarse (18T) blade. I've modified blade thicknesses in the past for cutting soft materials like brass by thinning a section of the blade with either a grinder or a sanding drum.

It looks like the only measurement that you'd want to be careful with would the distance between the groove and the end of the two flats where the detent stop plate sits. Cut the groove first than file the flats.

The "easy" option would be to cut up and modify the detent part of an old rotary switch. Looking at the detent assembly, it's got a total of twelve detent positions, only six of which are used. That would mean that each of the detent positions are 30 degrees apart for a total of 150 degrees of shaft rotation for the six positions.

If you've got an old multi sectional wafer switch with 30 degree detent spacing (pretty common) and a shaft that extents at least .9 inches past the panel bushing you should be able modify and use it. Or you might just want to use just the shaft out of it and modify it to fit your existing panel bushing.

I just took a look at some switches I have and it appears that the shaft design and detent mechanism is a common design used on a lot of rotary switches. It looks like plated steel and aluminum are a lot more common that the stainless steel used in the R390A though. Thanks to the coupling that it uses to attach to the rear shaft, the relationship of the flats on the shaft to the detents is unimportant. If you use a switch that's already setup for less than six positions, opening up the stops is pretty easy. Adding a stop if you only have something like a seven position switch is more work. ;-)

If you do cut down a switch, cut the back end of the shaft about 5/16 of an inch or so longer than the original and remove that amount from the second long shaft where it's tapered. It'll clamp a lot nicer in the coupling and is more reliable.

If you've got a decently stocked junk box, you have the parts you need to fix your radio.

>I have seen mentions of this part, but I am not sure of the exact
>name for this piece... Is it normal for the shaft to be 2 sections???

I'd guess that "bandwidth switch detent assembly" would be a good description. :-)

>someone mentioned that I would have to remove all the switch wafers
>to perform the repair, but it is not the case... the front section
>with the detent is easily removed from the EAC deck, and the shaft
>can be removed entirely through the rear opening in the deck...

Yep. It's a handy feature. Sliding the shaft out makes it a hell of a lot easier to replace some of the capacitors in the IF deck. Ditto if you need to change one of the mechanical filters. I wish that the rear shaft was a little longer though. I don't care for the tapered end where the shaft coupling goes. ;-)

Date: Thu, 16 Mar 2000 17:38 -0800 (PST)

From: rlruszkowski@west.raytheon.com
Subject: [R-390] BFO Adjustment

Can you find WWV at 5.000 10.000 or 20.000 MHz?

Set the dial to 10.000 in AGC or MGC center WWV as best you can down to the 100 hertz crystal filter in the IF deck. Get out your trusty spline tool and loosen the BFO clamp on the BFO
extension shaft. The BFO is an inductor and has some good 3 turn range to it. Grab the shaft with a pair of pliers and rotate it to zero beat on WWV.
Hold the knob on the front panel at zero. Retighten the clamp. Repeat this process until you get the knob on zero, WWV center in the filter pass and the BFO zero beated. This will get your BFO within a 100 hertz of 455KC. Switch the receiver to cal. Adjust the cal trim on the back panel to zero the crystal calibrator to zero beat. Try to do this at 20.000 Mhz for better
adjustment than at 5 or 10. That what you can get. This will get your dial, PTO, BFO, and crystal calibrator in alignment. Go down 1 Mhz and roll the PTO to +000 this will give you an Idea of what you PTO band spread is. (good is under 1KZ. 1-3 ok more than 3 is a candidate for alignment.) You should be able to predict where CHU (7335) will zero beat on your dial. Knowing your PTO spread and zeroing against your aligned cal tone at 7.300 you should be able to hit CHU right on at 7.335. The BFO should zero and give all your stations and cal tones very nice zeros and sweep on both sides of zero.

There is also a BFO neutralize cap on the side of the receiver. It has some range to it. Hang a volt meter on the diode load. Tune to dead air space. Turn the BFO on. Adjust the trimmer cap to find a range of minimum output on the meter. Set the cap to mid range of the minimum. This just helps to reduce the BFO injection noise.

To tune single side band, Calibrate your receiver to a Cal tone. Roll the receiver down 2Khz. Turn the BFO to the plus side to zero the tone. Mark that spot on the front panel. For micro dial guys try a value of 16. Start hunting your SSB with that setting. Once you get one you can get a better offset.

Chris, Your receivers prior owner may have off set the BFO knob. Cal tone zero may be at -2 and SSB be at 0. try this once before you make any adjustments.
<snip>

Date: Mon, 10 Apr 2000 19:15:23 -0400
From: "Dan Martin" <dmartin@visuallink.com>
Subject: Re: [R-390] AGC Voltage

I seem to recall Chuck keeps some helpful AGC troubleshooting experiences on his web site. Suggest you try http://www.avslvb.com/R390A/ html/Commonfail.htm and see what you can find.

There is a pin on the big jack on the IF deck that is the IF AGC line. It should test to infinity with an ohmmeter. Anything less could suggest a leaky cap or something. I've found it to be a good quick check of the "height" above ground for the IF AGC line. You mention "diode load" in your checks below. Perhaps you mean the AGC jumper

on the back panel. I think somewhere between -8 to -11 V or so is typical of my '67 EAC with a strong signal. The TM may speak to this but I don't have it near me.

Date: Wed, 12 Apr 2000 15:42 -0700 (PDT)
From: rlruszkowski@west.raytheon.com
Subject: Re:[R-390] Torque on the BFO

Sun, You have a problem. Yes these things can feel the way you describe. It can be cured. Are you up to open heart surgery on a baby? Proceed at your own risk. Ignore all warning labels. Unsolder the three leads across the front and haul that BFO can out of the chassis. Open it up and be carefully. Clean the front shaft bearing up. Check the slug alignment down through the coil for drag. re lube, reassemble and enjoy. They should run pretty smooth. There is a fair amount of drag. You should be able turn the shaft with your fingers. It should feel about the same as the ant. trim knob. Whole assemblies dragging from the front panel is mostly alignment of the shafts through the front panel and IF deck bushings. Bad micro dials will also add drag.

Date: Tue, 18 Apr 2000 08:24:17 -0400
From: "Randall C. Stout" <rcs1@sprintmail.com>
Subject: [R-390] 1ST IF ?

I am plowing through my Collins blue striper and made my first run through on alignment last night. I had one development that leaves me puzzled.

While aligning the 1st variable IF stage, using the freq and hookup that Chuck recomends, I found that I had to screw the slugs almost all the way out(the adjuster sticking way up out of the rack.) The caps, esp. on the rearemost can, took a lot of adjusting too. I went over it 4-5 times, and kept getting the same result. I thought perhaps my cam was out of time, or not lifting the rack enough, but I checked it against another rig, and the rack lifts exactly the same amount, but the slugs are probably 10 mm further out of the coils. The second variable IF slugs are at a more typical mid position.

This rig has a replacement set of cans for this rack. They aren't marked on the top as most I have seen, but have Z213 on the side of the can. I think they might be the type used on Teledynes. The only marking I could see other than the Z213 was TSC in a circle inked on the top.

Does this ring a bell with anyone? The radio had been very deaf below 2khz, only picking up the loudest broadcast stations, but now it is pretty sharp, with stations all over the band. I not trying to argue with success, but I wonder why these slugs are so far out.

Are the three coils different from each other? The three cans just say Z213, not Z213-1 ,Z213-2, etc. The Collins cans have that kind of marking on them.

Date: Tue, 18 Apr 2000 08:29:19 -0400
From: "Randall C. Stout" <rcs1@sprintmail.com>
Subject: [R-390] T503 ?

While going through the blue striper Collins, I also noticed that T503 was acting odd. When I tried to adjust the coils, it acted like there was an intemittant open in the can, where the diode reading would drop way down, then spring back up, even with just the slightest twisting of the adjusters. I thought that this adjustment usually showed a very broad peak, not very sensitive. The rig seems to be working however, and I don't hear anything different in the way the filters sound. What happens to the sound when T503 goes bad? Thanks - puzzling through the Collins

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Date: Tue, 18 Apr 2000 10:07:16 -0400
From: "Ronald Reams" <wa4mjf@worldnet.att.net>
Subject: Re: [R-390] Questions

As for alignment, you would need:

Signal Generator (AN/URM-25 or similar) Multimeter (TS-505/U or similar)
Audio Oscillator (TS-382/U or similar) Electronic Voltmeter (ME-30/U or similar)
Oscilloscope (OS-8/U or similar) Output Meter (TS-585/U or similar)

Date: Tue, 18 Apr 2000 07:59 -0700 (PDT)
From: rlruszkowski@west.raytheon.com
Subject: Re:[R-390] T503 ?

I just hit this last week end in T502. Off with the cover and resolder all the joints in there. Check the ones on the bottom side also. If just bumping things gets you a jump, go solder.

Date: Tue, 25 Apr 2000 13:24:55 -0500
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: [R-390] Crystal Oscillator questions

Okay, time for one easy question and one bone-headed one.

Easy: Can someone tell me where to look on the schematic for L402? It is a choke mounted on TB402 in the crystal oscillator deck. I can find L401, but not L402.

Bone-Headeded: I hooked up the crystal oscillator deck last night and did some preliminary tests. Hooking the output to the frequency counter showed each position to be within 200 - 300cps which I assume is okay. However, looking at the output on the scope, I have a VERY weak signal, along the lines of 50mV or less (much less on the higher frequencies). The tube checked good. Also, I noticed that I have only 45mV on the grid (E401).

I ASSUME the reason I get such a small grid voltage is there is very little grid current. Furthermore, I ASSUME this is a result of little (or no) plate current. If I'm on the right track, I should be able to measure the drop across R406 or R407 to determine this. Also, do I need to terminate J415 into a proper Z to see the output voltage correctly?

Date: Wed, 26 Apr 2000 08:36 -0700 (PDT)

From: rlruszkowski@west.raytheon.com
Subject: Re:[R-390] Crystal Oscillator Problem(s)

>.....An additional note, while looking at the control grid voltage on the >scope, if I go to 50mV/Div, AC mode, the signal bounces all over the place. It appears to have a very small rf signal (5 or 10mV), but it moves at random up >and down on the scope, +/- 50mV or more. I tried two tubes with no change. >Any ideas at all?? Thanks, Barry

Barry, You are going to stuff that signal into a mixer tube that has less that 20uv of signal. 20mv of mixer is more than OK. Change in output level on the same crystal is no problem. Your in a test setup and stray cap on the bench is getting you. Adjust the deck can coil and the band cap for best output on the weakest crystal frequency. Then trim all the other caps for their band. If you have a real weak crystal, swap a couple crystals in their sockets and look at them on the scope. If the weakness stays with the socket and band go looking for a cap problem. If the weakness moves with the crystal find a replacement crystal. You can take every thing out of the chassis and disassemble those little caps and clean them up. We use to order the RF deck cans and use the trimmer parts out of them for the top adjuster and the retainer clip. The range value is amount of silver area on the other section of the cap. You can clean these all up. Some times, some thing conductive gets smeared into the cap. This changes its value. A good cleaning fixes that. I hated to do a major clean job on a crystal osc. chassis. It took a whole damn shift. But maybe once again after this many years would be in order. If you have a blue striper I would take the time. It would be a once in your life time event. If you booboo you can ask fair radio for a RF can to get parts. get the DeOxit to clean up the little silver retainers on the bottom side.
Roger KC6TRU

Date: Fri, 28 Apr 2000 22:20:11 -0400
From: "Patrick Rady" <haenck@mediaone.net>
Subject: [R-390] Filter *Cap* Confusion

Many thanks to those who responded to my message about identifying filters. I am convinced now that I have the right replacement and now know where it needs to go. I really appreciate your expertise here.

Now, at the risk of opening a can of worms... I have another question. I tried searching the archives for the answer but to no avail... In another functioning IF deck of my acquaintance I was dismayed to find a lowly disk capacitor sitting atop one the filters instead of the red Mica capacitor that looks not unlike a domino. Worse, the solder joint was history and the lead slides up and down on the wire it is supposedly connected to. Not good. Before I whip out the soldering iron... is a Ceramic Disk cap a worthy replacement for the red rectangular Micas [?] that I usually see in this location? If not, what is?

Date: Fri, 28 Apr 2000 23:02:11 -0400 (EDT)
From: Norman Ryan <nryan@duke.edu>
Subject: Re: [R-390] Filter *Cap* Confusion

> ... is a Ceramic Disk cap a worthy replacement for the red rectangular Micas

A dipped silver mica is the way to go. Get one with a 500VDC rating. Are you replacing the two B+ caps also? C549 and C553. Failure of the latter is death to mechanical filters. I go overboard with orange drops here-- 0.01 mF @600VDC.

Date: Fri, 28 Apr 2000 21:18:26 -0500
From: "Dr. Gerald N. Johnson" <geraldj@ames.net>
Subject: Re: [R-390] Filter *Cap* Confusion

For that tuning application an NPO ceramic might be adequate though the silver mica would be a bit more stable. Any ceramic other than NPO or Nxxx temperature compensating will not stay within any reasonable range of the value required to tune the filter. A modern dipped silver mica would be the optimum replacement in a fixed capacitor, though a gang of ceramic trimmers to tweak the filter resonance might improve the flatness of some filter passbands. I learned that the hard way once trying to build a miniature tube IF strip and where I used some small dogbone shaped tuning capacitors. I found they wouldn't stay resonated because the tube heat change the capacitance more than 25%. I put one of the offending capacitors on a bridge and heating it up to soldering temperature the C went from 180 down to about 40 pf. Far more variation than tolerable for a tuning capacitor.

Date: Wed, 31 May 2000 09:18:00 -0500
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: [R-390] Z201 problem

I have been having problems with the 0.5-1mc band. I noticed I could not get a peak with the slug or the cap on Z201-2. I pulled it out and checked continuity across the coil - infinity. Opened the case and saw the problem - - a broken wire. Not just any old broken wire, but the wire from the top of the coil to the capacitor clip.

At some point, I remember snapping the clip off one of the caps to check something. It turns out it was on this coil. When I pushed the clip back, there wasn't enough slack in the (Litz?) wire to the clip and it broke. The wire is so small that I didn't even notice it.

To make it worse, this end of the coil is the part that's wound first meaning the lead goes underneath the rest of the coil. If it were the other end, I might could unwind one turn and have something to work with. As it is, my only solution is to attempt to splice it. I tried to position the wires just so they would touch so I could determine if it would align properly, but this turned out to be like nailing Jello to a tree - I couldn't do it.

Is this tiny, stranded, coated wire solderable? It is going to be a real pain to do this, but I can't think of any other alternative.

I thought I would mention this as a warning to others. Be careful if you decide to pop the top off these caps. If there isn't enough slack in the lead wire, you could break it as I did.

Other than "Keep your hands out of that radio before you completely destroy it!", any

other suggestions?

Date: Wed, 31 May 2000 10:22:03 -0500
From: "Dr. Gerald N. Johnson" <geraldj@ames.net>
Subject: Re: [R-390] Z201 problem

Since each strand of litz wire is enameled separately and those sub hair diameter strands are fragile its a pain to strip. Either a chemical enamel stripper like Strip-eze or an open flame are effective. If all you have exposed is the broken end and can't get some added wire to get more solder area, any patch is going to be very fragile.

I've not tried it but IF you can get contact by mechanical positioning, maybe some conductive epoxy may make a repair. Its good for tiny microwave parts and might make a stronger connection because the epoxy should stick to insulation as well as bare copper.

Date: Wed, 31 May 2000 14:40:38 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Z201 problem

... When I pushed the clip back, there wasn't enough slack in the (Litz?) wire to the clip and it broke.....

Litz wire is very delicate. You can put the end in a flame from a candle and it may burn off the insulation. You should get EVERY of the (probably) 7 strands connected for best results. I use a very sharp scalpel and work very carefully to mechanically strip the varnish coating from the strands. You have to support the wire so you don't break it again. Solder a piece of solid wire to the terminal long enough to go over near the free end of the litz wire where you solder the two together. And leave a bit of slack in the litz so it won't get stressed and break again.

"Litz" is from the German word litzendraft which means drawn very lightly, or drawn out to be very light. Most litz wire is seven strands of no. 40 wire. The largest Litz wire I ever saw was in the Navy VLF transmitter at NSS, Annapolis MD. It was about 5 inches in diameter, was composed of perhaps 19 bundles wound on a hemp core, each bundle with 200+ strands of #32 wire. The thing carried 800 kilowatts of rf power at 17 kc. IF all fails for you, Fair Radio Sales has replacement R-390A transformers for moderate prices.

Date: Wed, 31 May 2000 14:48:18 EDT
From: Bobdsmith@aol.com
Subject: Re: [R-390] Z201 problem

Barry, you didn't say how much wire is still sticking out of the coil but I think all you may need is an asprin. No I am not kidding. Take an asprin tablet and place it under the litz wire. Get a ball of solder on a hot soldering iron and use it to press the litz wire into the asprin tablet. The wire will be stripped and tinned all in one operation. Then you should be able to easily solder another wire to it. Do this in a well ventelated area as the fumes are very unpleasent if they go up your nose. --- Good

Luck----

Date: Wed, 31 May 2000 20:02:25 -0400
From: "Tetrode" <tetrode@sprynet.com>
Subject: [R-390] non A Resistor R554 --- IF module schematic error?

Is there an error on the R390 schematic for resistor R554 in the IF module? It shows it as a 2200 ohm (to Z503), but in the deck I'm working on and in another I checked there is a 470 ohm 1 watt there. Didn't see anything mentioned in the MOD table about it either.

Date: Wed, 12 Jul 2000 19:52:49 -0400 (EDT)
From: Norman Ryan <nryan@duke.edu>
Subject: Re: [R-390] Panel Metering

You're getting warm, sorta. Front jack is the diode load. AGC line is what you're interested in. Just to be sure it isn't a B+ blocking cap (C553) that's studying eating up your filters, power down until you pull the rig and check it out. Got your manual?

Date: Wed, 12 Jul 2000 20:01:57 -0400
From: "Ronald Reams" <wa4mjf@worldnet.att.net>
Subject: Re: [R-390] Panel Metering

Yep, there is a disk cap on FL502 that not on schematic. Also, that the markings on FL-502 are really different than the other three. Is that something Rick adds. I note he put a resistor in place of ballast.

Date: Wed, 12 Jul 2000 22:14:25 -0400 (EDT)
From: Norman Ryan <nryan@duke.edu>
Subject: Re: [R-390] Panel Metering

Is that disk cap inside the filter cover? That would be C512 on the schematic. Could be FL502 is a replacement. It should have Collins part number something like 522-9163-002. (Last digit sometimes varies.)

Date: Thu, 13 Jul 2000 02:56:36 -0400 (EDT)
From: Norman Ryan <nryan@duke.edu>
Subject: Re: [R-390] Got it out of console and cabinet

> 1 J512-6 to gnd infinity passed
> 2. I/O FL-502 short same-same FL-503 and FL-504 FL-505 65 ohms UH-OH
> 3. Terminals of FL-502 to gnd infinity passed

Did you make the tests while turning the BANDSWITCH knob (or shaft)? Step 1 resistance reading should be infinity at any position. Otherwise, one or another filter may be shorting or resistive to ground. I THINK, but don't know for sure, that step 2 should short unless BANDSWITCH is set at the filter under test. Consider disconnecting one lead from each end of the 2 KC filter and measuring resistance. It's most likely suspicious. You're getting closer... While the deck is on the bench, this would be a good time to replace all paper caps outright and any resistors over

ten percent out of spec. The oil cap can usually is OK, but check for excessive leakeage. (This is for the slow AGC setting and has no bearing on the above problem.)

Date: Thu, 13 Jul 2000 11:05:54 -0400
From: "Ronald Reams" <wa4mjf@worldnet.att.net>
Subject: [R-390] Moving Along

Found pin 2 of J512 pin 2 62 K instead of infinite. Looks as if Rick did not replace C-553 gonna look in junk box for one now

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Date: Thu, 13 Jul 2000 14:43:59 -0400 (EDT)
From: Norman Ryan <nryan@duke.edu>
Subject: Re: Fw: [R-390] C-553

J512-2 should read 50K to ground. 62K not serious problem-- could be one or more out of spec resistors. Is 62K consistent at each setting of BANDSWITCH? What shape are C510 and C513 in? (Silver micas across FL502 terminals.) Trimmer caps OK? anything different about FL502? Does its part number jibe?

Here are the resistances for J512:

1. Inf (not used)
2. 50K Switched RF-IF B+ line
3. 54K Limiter circuit7
4. 500K AGC rectifier output
5. Inf Diode load
6. Inf AGC line
7. Inf Audio output to AF deck
8. Inf Ballast tube
9. Inf Limiter circuit
10. 440K Limiter circuit
11. Inf BFO B+
12. 27 Carrier meter -
13. Inf AGC switch
14. 0 to 20 Carrier meter +
15. 132K AGC switch
16. 100K Cathode bias line
17. 0 Chassis ground
18. 0 " "
19. Inf Ballast tube
20. .5 Filaments

Don't give up.

Date: Thu, 13 Jul 2000 18:08:51 -0400
From: "Ronald Reams" <wa4mjf@worldnet.att.net>
Subject: [R-390] Fuses blowing

Took out filaments of the 26Z5s, Replaced and with IF deck out of circuit all B+ normal and 150 VDC reg OK.

Date: Thu, 13 Jul 2000 19:10:22 -0400
From: "Ronald Reams" <wa4mjf@worldnet.att.net>
Subject: Re: [R-390] Fuses blowing

Don't know, Joe. Everything was FB until I decided to work on the filter problem. I have a 68 K gnd on pin 2 of IF deck. -35 sez should be infinite. Norman sez 55k. Everything does OK with out IF deck so gonna be sure it OK, even if it has to go to Chuck. 26Z5s getting harder to find than hen's teeth.

Date: Thu, 13 Jul 2000 21:08:57 -0400
From: twleiper@juno.com
Subject: Re: [R-390] Fuses blowing

> Don't know, Joe. Everything was FB until I decided to work on the filter problem.

Watch your handling and retrace your steps. I took an IF deck out once to replace C553, and after I put it back I had no AGC action. Took the jumper off the back panel and saw that the the AGC line was showing short to ground which opened the moment I unplugged the IF deck. Turned out I had pressed the ground side lead of a disk cap against the AGC line at a solder post while handling the deck... By the way, I think it is crazy to swap those filters too. If it were me I think I would remove the filter and clip in a couple open ended test leads, then twist them together as a gimmick capacitor, just to get some signal to pass through (tighter twist, greater passband) and see if things behave logically in the three narrow positions...what you need is more data, and, by now, perhaps some rest.

Date: Fri, 14 Jul 2000 03:55:01 -0400 (EDT)
From: Norman Ryan <nryan@duke.edu>
Subject: Re: Fw: [R-390] C-553

First thought I had after reading your post was "Gak!! Not another brain fart!" Have made mistakes before in earlier posts and have resolved to improve-- there's no going back to edit the r-390 archive, after all.

Hurried over to my TM 11-5820-358-35 which I keep in the climate controlled bullet-proof glass cabinet along with the Gutenberg Bible and saw that lo, your reference to para 41 is correct-- infinity on J512-2. Heck of it is I got my reference from para 56c, page 98-- 50K on J512-2. So which is right? Checked my FB newly restored IF deck and got 52.4K in all positions of the BANDWIDTH switch. Wonder what sayeth the Y2K manual? Anyone caught that one?

Date: Fri, 14 Jul 2000 19:13:41 -0400
From: Al Tirevold <tirevold@mindspring.com>
Subject: Re: Fw: [R-390] C-553

R390A-Y2k sayeth "50k" in Table 5-7, paragraph 5.5.7, Page5-34 of the 2000-May-29 vintage.....the 52.4k you found is close enough....

Date: Fri, 14 Jul 2000 19:34:34 -0400
From: "Ronald Reams" <wa4mjf@worldnet.att.net>

Subject: Re: Fw: [R-390] C-553

my -35 sez J512-2 Infinite.

Date: Sun, 20 Aug 2000 11:07:50 -0700 (PDT)
From: Tom Marcotte <courir26@yahoo.com>
Subject: [R-390] Z-503 Woes . . Repairs In Situ?

I've got a nice EAC on the bench that is very good shape, except that the pesky Z-503 is open (of course, AGC does not work).

Now I'd rather take a bullet than replace this thing. Seems that nearly every component in the IF deck is hung off of this thing. Has anyone ever removed just the core, leaving the frame behind, and replaced the core of Z-503? Seems like it is possible with copious amounts of epoxy. I've got a couple of spares, so I could try it once or twice before making a doorstop of this IF deck. Comments and counsel please!!!

Date: Sun, 20 Aug 2000 20:42:24 EDT
From: PABigelow@aol.com
Subject: Re: [R-390] Z-503 Woes . . Repairs In Situ?

Yes, repair of Z503 is possible. It is easy enough to remove the coil assembly with the core. Removal of the outer core is possible by using a heat gun and *carefully* sliding the outer core off the coil. The coil is would with litz wire in three equal and equally spaced sections. Unwind the wire, fix the break, rewind the coil (use a washer to keep proper spacing between the sectons).

Use the heat gun once again to aid in slipping the outer core back onto the coil form. Replace the coil assembly as before. Make sure the replaced wires do not touch the outer can.

Date: Sun, 20 Aug 2000 21:22:42 -0400 (EDT)
From: Norman Ryan <nryan@duke.edu>
Subject: [R-390] R-390A Z503 Repair (fwd)

I liked Paul Bigelow's earlier post about this problem and saved it. I may have redacted it so as to conserve disk space and hope Paul doesn't mind.

- ---------- Forwarded message ----------
From: pbigelow@us.ibm.com

The Z503 (AGC tuned circuit) was open when I acquired my R-390a. With assistance from a friend, our repair steps:

1) Remove Z503 coil assembly (just the winding assembly, not the WHOLE thing):
  a) Remove cover.
  b) Unsolder connecting wires to coil form -- make note of wires.
  c) Unsolder wire posts that hold cover that hold coil form in place.
  d) Remove coil form.

2) Using a heat gun, soften the resin that holds the outer ferrite cup:
  a) Work cup off carefully while it is hot-- the resin hardens quickly.
  b) Three wound sections are present.

3) Locate break using a very fine point and DMM.

4) Unwind offending section:
  a) Make note of direction of unwind.

  NOTE: For me it was the middle section -- unbelieveably, there appeared to be a little corrosion in the wire

5) Repair break.

6) Rewind section. To rewind middle section coil:
  a) Place circular spacers on both sides of "good" coil sections so that spacing and form of rewind become close to the original-- use a rubber washer, for example.
  b) Rewind in proper direction.
  c) Remove spacers.

  NOTE: Not having a coil winding machine we could not match the winding pattern of the the original coil. Nevertheless, it didn't look too bad.

7) Use heat gun to resoften resin in ferrite cup and slip it back over sections.

8) Glue form back into place.

9) Resolder coil wires back in place-- ref 1b.

10) Place coil form support back on top.

11) Solder wires back onto top support.

12) Replace cover. I Bigelow

Date: Sun, 20 Aug 2000 22:15:14 EDT
From: PABigelow@aol.com
Subject: Re: [R-390] R-390A Z503 Repair (fwd)

Hey Norman, Thanks for saving that old post! Fixing that Z503 was bit of work. What bothered me though was that the Litz wire had small bits of greenish areas throughout its length as if the copper was corroding in a bunch of little places. I would have thought that corrosion would be the LAST thing I would see -- with all that epoxy.

Date: Wed, 23 Aug 2000 10:40:35 -0700 (PDT)
From: Tom Marcotte <courir26@yahoo.com>
Subject: [R-390] Z-503 Swapout

I'd like to thank Chuck Rippel and all the other folks who replied to my Z-503

question. In summary, it is possible to swap out just the "guts" of Z-503 and not remove the whole assembly.To do this:

A) Remove the can
B) Remove the nuts under the can top;
C) Unsolder the long skinny stiff wires from the square top piece,
also remove the coil wires.4)remove the square top piece
D) wiggle and lift out the old assembly

When installing a new assembly, make sure to glue it in so that the possible torque of the slug whilt being adjusted is resisted by something. ThanksTom

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Date: Mon, 4 Sep 2000 16:15:50 -0500
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Several questions...

Oops. It's an R390A and those transformers should be T501, T502, and T503, not T305, etc. Working from my memory is a very dangerous thing sometimes... BTW, I looked at the schematic at lunch and that resistor replacement evidently was part of a mod. I checked the resistance from cathode to cathode of V501 and V502 and got about 660 ohms (there is a 100 ohm resistor (R513) in series with V502's cathode so this measurement will give the total of R504, R513, and L501), so I must have the mod already made in this IF deck.

Date: Sun, 10 Sep 2000 20:08:23 EDT
From: PABigelow@aol.com
Subject: [R-390] Y501 -- 455kc crystal

Not much is written about Y501 (455kc crystal) in the manual. Is its purpose to act as low cost filter in front of the 1st IF amp? If so, could R-390a performance be improved by replacing the crystal with a high quality ceramic or mechanical filter (centered on 455kc) ?

Date: Sun, 10 Sep 2000 18:33:45 -0500
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] Y501 -- 455kc crystal

Paragraph 62, page 57, TM-11-856A covers the crystal filter fairly well Its only in the circuit and provides the selectivity for the 0.1 and 1.0 kHz bandwidths. Then page 60 shows that the 2 kHz mechanical filter is used with the crystal filter on those two narrower bandwidths.

Date: Sun, 19 Nov 2000 12:24:01 -0600
From: "Bill Hawkins" <bill@iaxs.net>
Subject: RE: [R-390] C275 and more

> ... One might achieve a spot weld with a fairly simple holding jig to hold the wire against its disk and then dissipate the stored energy in some 100 mfd capacitor charged to 450 volts (+/- 300 volts depending on the required energy) through that joint.

That "+/- 300 volts" is the tricky part.

I did some spot welding of fine wires back in the early 60's (blasting cap bridge wires a few mils in diameter). When anything in the process changed, it was necessary to run a series of trials to determine pull strength versus energy. A different wire size could mean using a different capacitor to get the voltage down. Variables in the trials included electrode size and pressure as well as energy.

This is definitely not something to try on a valuable part on a one shot basis. Sure, you could start low and work up, but each time you heat the joint you change the surrounding metal structure.

Now, if there was someone out there who used to weld the wires to assemble mechanical filters, we might not have to run a thousand trials to find the right energy. Or if we had a thousand volunteers to zap their mechanical filters ...

Date: Fri, 01 Dec 2000 23:42:33 -0600
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] R725/URR audio problems

Poor AGC comes from low AGC if gain or leaky AGC bypass capacitors (including the large time constant capacitor). Have you replaced the paper capacitors? Leaky paper capacitors will lead to many problems with marginal performance.

Date: Mon, 4 Dec 2000 13:59:33 -0500
From: brumac@juno.com
Subject: [R-390] I F Cap Identification Help Needed

This may sound a little childish, but I have a cap in the IF deck that I am having trouble identifying. It is between C533 and C534, just behind the BFO bellows, and it goes to pin 3 of V505 and ground. The chassis markers on the side don't seem to be properly located and make ref to C538. The Y2K manual photo on page 6-53 calls it C551, which is located elsewhere. The value is 0.1 mfd. FYI, all the BB's were leaking and yes, ODs are going in

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Date: Mon, 4 Dec 2000 14:19:00 -0600
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] I F Cap Identification Help Needed

Not childish. Sounds like that's C538, a 0.1uF from the heater to ground. Look at the heater area of the schematic for this cap. Lots of fun replacing these three caps, especially with higher voltage ODs. I think mine are 600V. Pretty cramped, but it can be done. Take care that you place it such that the bellows still have room to move freely.

Date: Mon, 4 Dec 2000 15:19:27 -0500 (EST)
From: Norman Ryan <nryan@duke.edu>
Subject: Re: [R-390] I F Cap Identification Help Needed

On the schematic C538 (0.1 uf) is located in a small dotted line square near the power supply diagram. Pin three of V505 is one leg of its heater filament.

Date: Mon, 1 Jan 2001 10:43:16 -0800 (PST)
From: "Tom M." <courir26@yahoo.com>
Subject: [R-390] 390 IF Deck in 390A

Walter, In answer to your questions, putting a 390 IF deck in the 390A is not too tough to do. First, get a 390 IF deck. Then all you have to do is rewire the 25V filaments for 6V filaments (except for the ballast/BFO/PTO string) and then make a couple of MB->BNC adapter cables. You also need a dropping resistor on the B+. The deck will drop right in (except the screws in the 390 deck are larger than the holes in the 390A frame) I wrote up a complete procedure for Electric Radio magazine on this. Contact Barry Wiseman at er@frontier.net for the Dec 2000 issue.

Pros- excellent sound from your 390A, esp when using an outboard amp at the diode load (this is why I did it) IMHO. Listening for hours does not wear one out.

Cons- finding a 390 IF deck, inferior shape factor for serious DX (drop in your 390A IF deck for that). There are no irreversible mods to the 390A, not the case for the 390 IF deck.

Date: Tue, 2 Jan 2001 06:32:48 -0500
From: "Walter Wilson" <wewilson@knology.net>
Subject: Re: [R-390] Cap. Leakage on AGC Line?

>Still chasing my low AGC and carrier meter problem here. With a huge 10 microvolt signal I >can't get more than about minus 4-5 volts of AGC and barely 3/4 scale carrier reading.

10 uV is not huge to me. 10 uV shows only about -2 volts on the AGC on my chart. 10,000 uV or 10 mV should give you about -9 volts DC. Did you mean 10 millivolts?

> I did the resistance check outlined in the maint. manual, checking from each >module connector to ground. In the RF Module, I found an apparent >discrepancy. On pin E of J205, the manual says this should be infinity. This is >the AGC line to the RF stages. Instead, I measure a constant 1.7 megohms >(with the tubes pulled)! Could this be a leaky or shorted capacitor somewhere >in the AGC in the RF Module? But before I embark on removing the RF >module (ir looks horrendous), in case there's a typo in the book, would >someone be so kind as to measure the same pin (on the RF module) to ground >in their radio (390A) and tell me what they read? I used a high impedance >DMM. If everybody comes back saying "infinity" then here we go with front >panel and RF module -- help!

If you meant pin E of J208, the book is indeed wrong. This has been an error from earlier manuals that propagated down the line. Even the AGC schematic (which is not in the Y2K manual but exists in TM-11-856A, page 183, Figure 104) has some incorrect values. This AGC schematic should show R201 as 270K (instead of the 22K shown), and this schematic omits R234 which is 1.5 M and parallels C226 to

ground. These two will give you an impedance of 1.77 M to ground. Your readings do not indicate any AGC problems in the RF deck based on your resistance measurements. The troubleshooting tables are "usually" pretty good, but when it doubt, trace the schematic and calculate it yourself. Are there any problems with AGC voltage developed on the IF deck. Try removing the AGC jumper on the back of the radio and measure AGC voltage on terminal 3. You will have taken the RF deck out of the picture. If the AGC voltage is still low, you can isolate your troubleshooting to the IF deck.

Date: Tue, 02 Jan 2001 08:01:13 -0500
From: Jim Miller <jmille77@bellsouth.net>
Subject: Re: [R-390] Cap. Leakage on AGC Line?

In my depot maint. manual, under receiver overall gain test (section 42) it says that if the AGC is -7 volts for an input signal of between 1 and 4 microvolts, the gain is normal. I have been going by that as a reference. Is this another "typo" in this manual (I have found a few).

Date: Tue, 2 Jan 2001 08:15:51 -0500
From: "Walter Wilson" <wewilson@knology.net>
Subject: Re: [R-390] Cap. Leakage on AGC Line?

I was looking at a chart of AGC voltage versus signal input. It starts at about -2 volts for 10 uV and goes to -9 volts at 10,000 uV, drawing a straight line. On page 5-27 of the Y2K manual, step 19, it shows -4 VDC at the AGC terminal for 100 uV of signal input. Translating that to carrier level indication, this would be about 60 dB on the meter (see step 17, same page).

Date: Wed, 3 Jan 2001 21:05:20 -0500
From: "Walter Wilson" <wewilson@knology.net>
Subject: Re: [R-390] Carrier Meter Adj Pot

I bought my last carrier adjust pot from Mouser for under $10. Spectrol precision 10 turn pot with metal shaft, 100 ohms, Mouser part number 594-53411101.

Date: Mon, 08 Jan 2001 12:59:53 -0500
From: Jim Miller <jmille77@bellsouth.net>
Subject: [R-390] BFO Neutralization

When I switch the BFO on my 390A, the carrier level meter registers about one to two units. When I switch it off it goes back to zero. I can dip this residual AGC reading with the BFO Neutralization trimmer on the IF module but that's as low as I can get it. Is this a normal thing? I just installed the SSB mod involving two diodes (one across R547 and one across R546 to improve AGC attack), and a 47 pf capacitor in parallel with C535 (presumably to increase BFO injection). After this mod, the carrier meter will rest at almost 3 markings on the scale, and the neutralizing cap won't reduce it any more. Again, is this residual BFO signal affecting the no-signal AGC level a normal thing?

Date: Mon, 8 Jan 2001 12:54:25 -0700

From: "Kurt" <radiouser@uswest.net>
Subject: Re: [R-390] BFO Neutralization

When I added a 47 pf cap across C 535 I experienced the same increase in the minimum S meter reading. I have done this to two different radios and they both behaved the same way. If others have had different results please speak up.

Date: Mon, 8 Jan 2001 18:47:59 -0500
From: "Walter Wilson" <wewilson@knology.net>
Subject: Re: [R-390] BFO Neutralization

I have the Lankford SSB mod installed, which added the 47 pF capacitor. I get about 2 dB increase (2% of full scale) in carrier level with the BFO on with no incoming signal (external antenna switch in another position). I can't detect any change in the carrier meter level on strong AM signals when I turn the BFO on. I have not compared this to an unmodified IF deck, but 1 to 2 dB does not cause me any grief.

Date: Mon, 08 Jan 2001 19:24:54 -0500
From: Jim Miller <jmille77@bellsouth.net>
Subject: Re: [R-390] BFO Neutralization

I was getting quite a carrier meter deflection with the 47 pf cap installed when BFO was turned on, and it seemed to swamp weak signals, about 2-3 ticks on the meter even after nulling with the neutralization trimmer. As an experiment, I removed the 47 pf capacitor that was added with the SSB mod, and of course the stray BFO signal dropped back to normal deflection. Additionally, the SSB audio seemed just as intelligible without the cap (or the extra BFO injection), and maybe a little more so. So I will run with only the partial SSB mod, that is the diodes in the AGC to improve attack time. Must be something unique about this SW IF module..

Date: Tue, 9 Jan 2001 06:05:45 EST
From: DCrespy@aol.com
Subject: Re: [R-390] BFO Neutralization

It is not normal. You were correct to dip the BFO nuetralizing cap. With the AGC mod (I have done 3 radios with it), the S-meter zero should be the same with or without the BFO. I have tried it both with and without the 47 pf cap and find no big difference. A long shot, but maybe you should pull it and try again. The other obvious question is about the polarity of the diodes. After that, I'd say you are clearly getting some BFO leakage to the AGC amp/detector. The neutralizing cap should dip in two places during a 360 degree rotation. If not, something is wrong in that circuit. Otherwise, unfortunately, I don't know where to suggest to start. Perhaps lead dress from the mod, or a bad final IF or AGC amp tube (BFO getting through it)???

Let us know what you find.

Date: Wed, 10 Jan 2001 14:09:45 -0800 (PST)
From: Dick Davis <enigma_y_2000@yahoo.com>
Subject: [R-390] 390A IF Module Mod J. What is it?

I'm trying to find information on what the "Mod J" is for the R390A I.F. module. The mod isn't listed in my T-11-856A and if it is on the Radio Era R390A archive CD-ROM, I can't find it. Tracing the circuitry, I find some changes around the Carrier Level Meter circuitry. Does anyone have information on this, or where I can find information?

Date: Wed, 10 Jan 2001 21:11:04 EST
From: DCrespy@aol.com
Subject: Re: [R-390] BFO Neutralization

I just thought I should reepond again, as in my first note I'd said that in my three radios I had no meter movement when the BFO was turned on. I'd never noticed until the posts from some of the other guys here, but my carrier meter DOES move upward slightly when the BFO is turned on (after the mod). I still stand by my observation that 3 divisions movement on the meter scale is way too much, and is not normal. My meter just wiggles (less than a needle width upward). I would still try the items I'd suggested. You are getting a LOT MORE than normal BFO leakage to the AGC detector. I hope you have had some luck figuring this one out! Let us know what you find. 73, Harry KG5LO

Date: Wed, 10 Jan 2001 22:29:13 -0500
From: "Jim Miller" <jmille77@bellsouth.net>
Subject: Re: [R-390] BFO Neutralization

Thanks to all who responded to me "the newbie" on this. To review, my problem is that my carrier level meter jumps about one unit when I switch the BFO on, due to BFO leakage into the final stages of the IF. Neither the RF gain nor the IF gain pots have any affect on this. When I added the simple SSB mod (2 diodes and 47 pf cap), the "no signal" carrier meter reading went up to 2-3 meter units when the BFO was on. I've looked some more into this but have no real resolution yet. I received one reply that said this upward meter movement with BFO is normal...his moved upward also when he turned his BFO on. Then another who said it was not normal...and then another saying his showed maybe just a meter width movement. I've since replaced my meter pot and the meter is behaving a little better, but it still moves about one meter unit when I turn the BFO on (that's without the SSB mod). With the SSB mod (that adds a 47 pf cap in parallel with the BFO injection cap.) I get what looks like 2-3 unit jump of BFO residual carrier on the meter. I checked R522 inside T503 (as was suggested by Walter Wilson I htink, and it's still there, hasn't been clipped out. All the IF cans seem to peak up OK during alignment. The BFO neutralizing cap does appear to produce a null in this residual BFO bleed thru but not all the way to zero, and I do appear to get 2 peaks (or dips). So I am running the SSB mod with just the AGC diodes and not the 47 pf cap. Signals sound OK but maybe a little distorted due to the lower BFO injection. I am still at a loss as to the cause...maybe some manufacturing differences in the various IF modules out there. Or do you suppose I could have misaligned the IF stages causing the neutralizing cap to have reduced effect?

I'll probably just live with it for now and go back to it later. I replaced the carrier meter today and the carrier pot and now the meter seems to respond in a much more

healthy manner. This is an incredibly hot and impressive receiver, well designed with plenty of gain. And not as difficult to maintain as it first appeared to me. Front panel has been removed with no problem. I've had the crystal oscillator module out and cleaned it, done maintenance (cap replacement etc) on the AF module, ...almost completely recapped the IF module,...next comes removal and a general inspection and cleaning of the RF module, then PTO end point and linearity adjust when I get the courage up.

Date: Thu, 11 Jan 2001 09:31:58 -0600
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] BFO Neutralization

... This is an incredibly hot and impressive receiver, well designed with plenty of gain.....

THAT may be your clue. Have you done an IF gain setting procedure as described on Chuck Rippel's web page? It could be that the "gain distribution" in your radio is out of whack. Gain distribution, means the relative gain in the various stages. If the IF section has too much gain (VERY easy to have) then some stages will be operating at too low a gain. This idea may not be well founded, since the BFO is injected after the stages of the IF that have gain.. I do not have schematics and such here to reason out the situation. BUT, I suggest you do that procedure - it is quite easy - and then see what you get.

Date: Fri, 12 Jan 2001 05:05:46 -0500
From: "Jim Miller" <jmille77@bellsouth.net>
Subject: Re: [R-390] BFO Neutralization

Thats what I'm starting to think...However, I still get the meter deflection with BFO on even when the IF gain pot is all the way down. It's bleeding into the very last stages, maybe the AGC amplifier. One thing comes to mind... is everybody's carrier meter the same sensitivity? When I got my 390A the carrier meter was a dog, the calibrator registered only about 3 units. After a new meter (actually a NOS glow in the dark original), some serious recapping of the IF, bug fixes and alignment, i now get mid scale to slightly over on the 100 khz calibrator signal. So if my meter, being original now, is hotter than others who have commented on this BFO leakage, that could explain why others don't see as much deflection when the BFO is turned on. Also, I am careful to zero the meter with the BFO turned OFF and the RF gain on the front panel all the way off, and no antenna. Then if I turn the BFO on, I see the deflection about 1 meter unit, maybe slightly more. If you zero your meter with the BFO on or RF gain up, I think you may get a false zero, so turning the BFO on and off won't be as noticable on the meter.

Not gonna worry about it anymore for now...now have bigger problems..went into the RF deck and cleaned it, replaced C275 with an orange drop (it was a .033 black beauty..yes it really was .033 and not .0033!), a bad resistor, etc, cleaned it and replaced it and worked great...until I started lubing the gears and slides and then she quit...the 1st oscillator stopped. I suspect I got some oil somewhere it shouldn't be...Any ideas? Wish me luck\73 Jim N4BE

Date: Fri, 12 Jan 2001 06:36:43 -0500
From: "Barry Hauser" <barry@hausernet.com>
Subject: Re: [R-390] BFO Neutralization

Here are some thoughts, barely 2 cents worth:

1. The meters vary. The NOS one you got might not be exactly original spec. Remember, the originals have a DC resistance of only 17 ohms -- very rare. There are a lot of original looking subs that have higher resistance. Don't take an ohmmeter to it yet -- check Dr. J's post about how to check the DC resistance. If it is original/on spec, then you might want to check the resistors in the bridge circuit for the meter to see if they were either subbed out or drifted. If the meter is not a 17 ohm job, then you have to change the bridge resistors to get the right action.

2. Before you start looking for esoteric problems due to oil in the wrong place, check tubes. Also check if you didn't completely tighten a connection here or there. (or if something snapped inside a plug shell). Then you might just check the cap you just put in although that's unlikely. One of two or three variants of Murphy's Law may be operative -- (a) while you're fixin' one thing, 'nother will break, and or (b) high failure 50 year old part with 25 years to go replaced by bright shiny new part, one out of 10,000 that will fail after 2 hrs. or just after you screw everything back together. For example, you've been moving things around a bit, and sometimes a borderline tube will fail after being jounced, so it's a coincidence but not exactly -- what the medical profession calls "complications". How much oil did you pour in there? The ratio is one quart to a couple thousand radios, not the other way .. nevermind. Seriously though, you'd really have to overdo it quite a bit for that to be the cause. Of course, if you spot an oil slick under the radio that runs down the bench onto the floor, then maybe...

Could also be you're fussing about with that R-390A way too much. Some are verrrry sensitive, pick up on those cues -- nervous sweat, shaky hands, facial expressions, body language, cussing, groaning -- and get upset. Ever wonder why there's such a big divide in experience with these things? Some don't fix it til it breaks guys blissfully run with original caps, no variac or bucking transformer for 30 years with no problem and have the original ballast tube. Other guys replace every cap and questionable resistor -- confirming they're all bad -- and still have more to do. Could be attitude or maybe even mojo or something. Did ya' know if you look too hard at those BBOD's they'll split? It's a little known, but proven, self-fulfilling prophecy. Those who take a real hard close look at 'em invariably find split ones, whereas the nonchalant types don't.

Date: Fri, 12 Jan 2001 06:43:00 EST
From: DCrespy@aol.com
Subject: Re: [R-390] BFO Neutralization

One quick thought.. are you sure that you have a 6AK6 and not a 6BA6/5749 in at V504? This could account for back leakage of the BFO signal. Since the pinouts of the tubes are the same, the substitution would appear to work.. but....

Date: Fri, 12 Jan 2001 17:39:29 -0500

From: "Jim Miller" <jmille77@bellsouth.net>
Subject: Re: [R-390] BFO Neutralization

I checked...it' is a 6AK6. Thanks for the idea though. Right now the BFO thing has been hugely overshadowed by something I broke in the RF deck and can't find yet.

Date: Sat, 24 Oct 1998 11:54:18 -0500 (CDT)
From: Bill Hawkins <bill@iaxs.net>
Subject: Re: [R-390] Caps and the VTVM.

DMM's have pretty high impedance. The key would be whether or not the sound from the radio changes when the DMM lead is applied to the AGC. Since AGC voltage is within a feedback loop, you also need to know precisely how much signal you are injecting. The error at the signal generator could be much larger than the error from the DMM. But, the most common cause of low AGC voltage is leaking caps - *if* the other things that affect gain are OK, such as tubes and alignment.

Date: Sat, 24 Oct 1998 12:35:45 -0500
From: "Dr. Gerald N. Johnson, P.E." <geraldj@ames.net>
Subject: Re: [R-390] Caps and the VTVM.

DMM SHOULD be high impedance but that's not guaranteed. With contemporary solid state circuits tending to be much lower impedance than ordinary vacuum tube circuits, some makers and vendors of DMM take short cuts in input impedance because it eases their design and production tasks and doesn't mess up readings in many circuits. That being said, its important for trouble shooting to always KNOW the test meter impedance AND the meter impedance used to make the normal voltages chart in the shop manual. Otherwise you WILL be confused by some voltages showing different values (higher or lower according to the meter impedance) than the table. Some voltages will read right, some will be different.

Date: Sat, 24 Oct 1998 12:27:44 -0700
From: Philip Atchley <ko6bb@elite.net>
Subject: Re: [R-390] Caps and the VTVM.

That test point E402 is for the grid voltage on the Xtal Osc, you peak it when tuning the trimmers. I found (at least on mine) it is very sensitive to loading, either capacitive or resistive. I used a Heath VTVM which has a 1MOhm isolation resistor in the probe, still loaded it some. So I put a 1 Meg resistor (very short lead one E402 end) into the test jack then used my probe on that. Was able to tune easier with less loading effect. (true 1 meg will change meter reading but this is a "peak" adjustment anyway)

Date: Tue, 16 Jan 2001 20:12:42 EST
From: DJED1@aol.com
Subject: Re: [R-390] B+ Dropping Resistor, Paint, Etc.

It's possible that you can't cancel the BFO leakage after increasing the BFO coupling cap because the neutralizing cap is not large enough. You could probably check this theory if you can tell whether the lowest meter reading is when the neutralizing

cap is at full capacity. You could try shunting a similar cap across the neutralizing cap. Just a theory, I haven't tried the Lankford modification.

Date: Tue, 16 Jan 2001 23:00:32 -0500
From: "Jim Miller" <jmille77@bellsouth.net>
Subject: Re: [R-390] B+ Dropping Resistor, Paint, Etc.

Thanks for the idea...but when I look at the position of the rotary part of the trimmer it appears to not be at its limit and I get two dips close to each other. So it doesn't appear to be maxed out. It's not a bad thing but it just doesnt seem to be nulling as far as it could. Copying of signals is fine. I have done half of the Lankford mod, but did not add the 47 pf parallel cap yet, because of the BFO bleed thru. I will eventually find it.

Date: Wed, 17 Jan 2001 21:42:35 EST
From: DCrespy@aol.com
Subject: Re: [R-390] B+ Dropping Resistor, Paint, Etc.

> It's possible that you can't cancel the BFO leakage after increasing the
BFO coupling cap because the neutralizing cap is not large enough. .....

Interesting idea.

If you get two dips or nulls in less than 180 degrees of trimmer rotation, that is not the problem (ie. there is a SPECIFIC value, not just the extremes, that achieves minimum). Also, the trimmer balances the input and output of the 4th IF. I believe it is designed to offset the capacitive coupling in the final IF tube that could lead to leakage back to the AGC amp. It is well isolated by the final IF transformer from the BFO injection cap. In any case it should have little effect. In my radios it has not been an issue.

Date: Wed, 17 Jan 2001 23:01:02 -0500
From: "Jim Miller" <jmille77@bellsouth.net>
Subject: [R-390] Re: BFO Neut. Etc.

I haven't tried just replacing some IF tubes. They check good on the tester but as you suggest there may be too much interelectrode capacitance in one or more of the final IF tubes. Will try that. It's more of a curiosity than a real hinderance to receiving...the radio receives beautifully. Now, Stand by guys, I'm about to start adjusting end spread and linearity on this Cosmos PTO next.

Date: Fri, 19 Jan 2001 14:46:05 -0800
From: "Roger L Ruszkowski" <rlruszkowski@west.raytheon.com>
Subject: Re: [R-390] quest on modifications

- - what is the sense of stagger tuned 455kc if filters (453-455-457kc)
- - are there experiences in cutting out the 455kc filter resistors in T501toT503?

Do not cut the resistors out of the R390 IF deck. It gets down to 2KC in the 2KHZ switch setting and 100 Hertz in the .1KHZ setting. Chopping the resistors out just

screws up the impedence match between the tube stages and you get more loss from that than the change in band width that come from messing with the resistors. Been there done that as school house bugs for the new students to trouble shoot as part of their class room training in the early 60's before the R390/A went into the class rooms for training.

The stages are stagger tuned to get the right coupling between the primary and secondary stages of each IF can. You can get a hell of a lot more out of the IF deck R390 or R390/A by aligning them to the manual and then swapping tubes. The noise level and gain in the tubes is much greater than the changes in the transformers. Good mil tubes can be much better than other cheap tubes. Tubes with hours on them can be less noisy than new tubes. A zippo applied to a tube can do a lot for its noise. Heating the filaments on the tube tester do not work the same as a zippo applied to a tube. go figure. With 455KHZ at 150 UV in you better be getting 1/2 to 7/8 watts out and 30db signal plus noise to noise out of the IF deck and audio deck with -7 volts on the diode load. Roger KC6TRU

Date: Sun, 21 Jan 2001 19:13:08 -0500
From: Al Solway <beral@videotron.ca>
Subject: [R-390] IF Gain Adj. Pot R519

My recently restored R-390A has satisfactory sensitivity of less than 0.2uV on all bands except band 3 and below where it is less than 0.3uV. Band 7 is 0.35uV. My question concerns IF Gain Adj R519. After alignment and tubes changes that improved performance the final position of R519 is at about 80% of max. I used the procedure that is on Chuck Rippel's site to set R519. It is at this position that get the best sensitivity using Chuck's procedure for measuring sensitivity. Is this a normal position for R519 at 80% of max.

Date: Sun, 21 Jan 2001 19:00:19 -0700
From: "Kurt" <radiouser@uswest.net>
Subject: Re: [R-390] IF Gain Adj. Pot R519

I wouldn't worry about the position of the gain pot. The sensitivity you are measuring is pushing the limit of the receiver and Chuck's method is designed as to use the minimum amount of gain to get the best useable sensitivity.

Date: Sun, 21 Jan 2001 20:36:22 EST
From: Llgpt@aol.com
Subject: Re: [R-390] IF Gain Adj. Pot R519

Exactly Kurt, although most are set somewhere between 75 - 80 % YMMV depending on the particular receiver condition of tubes etc.

Date: Tue, 23 Jan 2001 09:03:41 -0800 (PST)
From: "Tom M." <courir26@yahoo.com>
Subject: [R-390] Zero Beat, How To

The question came up today as to how one might set the BFO for use as a zero beat. Here is what I do after a long warmup:

1) tune to a local broadcast station.

b) set selectivity to 2 (or lower, your choice).

iii) measure your diode load voltage and tune for max (this puts your IF at the center of the filter, supposed to be 455 kcs).

d) zero beat the bfo, and reset its knob to zero.

If the station is on an even hundred, then you can flip on the calibrator and calibrate it. No need to use WWV (sorry Roy Morgan) as broadcast stations are well controlled in frequency. The WWV signal is subject to fading whilst the locals are not. This procedure is close enough for BA work. No Cesium atoms required.

Date: Tue, 23 Jan 2001 17:17:32 -0500
From: "Barry L. Ornitz" <ornitz@tricon.net>
Subject: [R-390] BFO Zeroing

Rather than worry about using a counter or other test equipment to set the BFO knob at the correct point, there is a much easier and more accurate method to center the BFO within the receiver's passband.

Step 1: Pick which filter you desire the BFO to be centered in its passband. If you are a CW operator, you will probably choose the 1 Khz bandwidth position. For SSB reception, use the 2 kHz bandwidth filter.

Step 2: Tune the receiver to a point where there is no signal, just noise, with the BFO off.

Step 3: Turn on the BFO and adjust it to the point where the noise sounds the lowest pitched.

Step 4: Loosen the BFO knob, and turn it so the knob pointer is at the 12 o'clock position. Loosening the knob usually moves it so turn the shaft to check that you really have hit the lowest pitch position.

This method works because of the fact that white noise has a uniform frequency spectrum. When you turn the BFO on frequencies on both sides of the BFO are heterodyned down to audio. The highest frequency noise you hear will be limited by the filter bandwidth. If the BFO frequency is off to one side of center, you will have a wider bandwidth of noise. At the point where the noise has the lowest sounding pitch, you have exactly centered the BFO in the receiver's passband.

Date: Tue, 23 Jan 2001 20:47:21 -0500
From: "Tetrode" <tetrode@sprynet.com>
Subject: [R-390] Ultimate BFO Zero Beat

Can't resist.....here's what I do when a radio is on the bench..... First, I connect my frequency counter to the IF OUTput BNC on the back of 390x. Then, I tune in any

strong unmodulated carrier, usually it's a 100 KC calibrator signal. (If there's not enough IF level to drive the counter, then I switch the AGC mode to Manual and purposely overdrive the IF a bit for some more output.) Adjust the KC main tuning until the counter reads 455.000..... Turn on BFO, zero beat it to the test carrier, and set the adjustment. I guess I like to do it this way because I know I'm setting the BFO to a measured reference frequency instead of the center frequency of the crystal filter. Yeah I know the crystal frequency will be close but this is my particular flavor of flyspecks.

Date: Wed, 24 Jan 2001 13:52:08 -0500
From: swlchris@juno.com
Subject: Re: [R-390] Ultimate BFO Zero Beat

I forgot to give an example of what is going on here. I'm sorry , that would be causing some confusion if you all didn't know what was going on here I would think. Ok.... The R390 is on and tuned to 9870. AM mode now ,no BFO on, it is coming in about 20 or so on carrier meter on a transmission. Go to switch BFO on and in the zero postion it is coming clear no warble or anything. If I tune down 2 khz to 9868 I can't tune it in at all in SSB with the BFO. If I tune up to 9872 then if I tune the BFO to almost the -2 postion I can tune it in. So does this mean that the BFO is off by a couple of khz from the 455 khz if? If so then I need to return the BFO knob to get the 9868 to work on the - - side of BFO and 9872 to work on+ side of BFO? Or is this a nonseperable BFO as in like a Sangean 803A where the BFO is just centered on the frequency and tuning off doesn't really give USB\LSB?

Date: Sat, 27 Jan 2001 20:29:10 -0500
From: Thomas W Leiper <twleiper@juno.com>
Subject: Re: [R-390] Ultimate BFO Zero Beat

Tuning Hints 101

With it centered (theoretically) you will here both sidebands equally, such as if you zero beat on an AM signal. At that same setting you would hear only one sideband perfectly well if only one were present AND your selectivity was not too tight. If you are listening in the "8kc" position and you are tuned to the "carrier" or fundamental frequency of the upper or lower sideband signal, the four kc bandwidth above and below the center frequency is enough to receive either sideband without retuning and with sufficient fidelity.

The reason you would adjust your BFO up or down would be to offset a similar adjustment you might make on your main tuning control to maximize the LSB or USB signal by "centering" the tuned passband onto either sideband to improve reception of that sideband while simultaneously reducing interference which may be caused by signals on the opposite sideband or close to the frequency thereof.

In other words, start by cutting your passband down to two or one kc and tune (with the BFO "off") onto the sideband signal until you get the maximum carrier meter deflection regardless the intelli(garbled)ility, and then reduce the RF gain until the meter deflections are minimal but present. Then you turn on your BFO and adjust plus or minus until the signal is clarified. Finally, crank the RF gain up to the highest

level that leaves the most powerful signal undistorted.

When you are finished, you will see that you have, in fact, adjusted the BFO very close to the same amount as the "offset" you tuned in the main tuning to maximize the sideband in the first step, usually about 750hz for voice communication signals and 1 to 1.2K for higher fidelity broadcast SSB signals.

The actual amount you offset the BFO will be slightly affected by your filters and crystal mixer frequencies, but the effect is minimal, and you will find that it really has to do with the nature of the signal. In the case of your Non-A, the shape of the passband does not have the sharp "skirt" of the cheap mechanical filter jobs ("A"'s) and you will find that you can adjust for "voice" verses "music" to a finer degree without running into distortion caused by the skirt and ripples across the passband inherent in the "cheap, reduced cost mechanical filter equipped R-390A illegitimate step-children of the R-390" that infect the racks of so many unfortunate subscribers to this reflector...but I digress.

For instance, a good exercise would be to tune to the USB signal of the Armed Forces radio (around 6460 ?? I think) which has a USB voice channel and FSK or RTTY on the lower sideband, as well as several other close and interfering utility sigals. You will have to set your selectivity to 2Kc or less and offset tune to get the voice signal out clearly. Set the selectivity to 1/10 Kc and "center" tuning on the sideband before opening up to 1 or 2 kc for fidelity.

After some experience you will know where to set the BFO and bandwidth for different types of signals, and you will simply tune the main tuning for clarity. But it is important to learn how to do it the other way around so you can learn the characteristics of your radio. However with tough signals, I will always find myself adjusting tuning and bandwidth for maximum smoke before turning on the BFO.

Date: Mon, 29 Jan 2001 10:40:25 -0600
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: [R-390] Static problem

Someone's frying bacon in my radio. When I first turn it on, I get periods of static that last for several seconds each. After a good warmup (30 min. or so), this seems to subside completely. I also notice that if I flip the mode switch from Stdby to AGC or from AGC to MGC, I get a buzzy, raspy, poping noise that lasts for maybe 1/2 second. The noise is accompianed by a brief dimming of the panel lamps. The If I slowly rotate the switch between these modes, I don't get this noise.

Does it sound like the two problems I'm having are related? Is it possible dirty contacts on the mode switch are causing the bacon frying noise? Does a gassy tube sound this way? Is it indicative of another component going bad?

I've fed the IF to my TS440S tuned to 455kc and I hear the bacon-frying there. Unless the noise is coming up from the mode switch, I suppose this might indicate it's somewhere in the RF or IF modules. Does the bacon-frying noise I'm hearing indicate anything common (other than breakfast may be cooking)?

Date: Mon, 29 Jan 2001 11:56:12 -0600
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] Static problem

Failing capacitors make those sounds. Failing potentiometers sometimes make those sounds. Failing resistors can make those sounds. Unless the paper capacitors have been replaced, I bet on them as the problem. Mica capacitors can make those sounds, but its less common, ditto disk ceramics.

Date: Mon, 29 Jan 2001 12:02:32 -0600
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Static problem

All brown beauties have been replaced. It does, indeed, sound like a scratchy variable resistor, but turning all the ones on the front panel don't affect it. I'm hoping I'm not going to have to isolate a failing component in RF deck. That thing is almost impossible to operate outside the box. :(

Date: Mon, 29 Jan 2001 13:09:46 -0500
From: jmille77@bellsouth.net
Subject: Re: [R-390] Static problem

I recently had an arc-over occur in the function switch (the switch that changes from standby to agc to mgc etc., the one you note in your email I think) Several of its contacts are used to switch B+ to different stages. It turns out that one of these pins (I forget which one and don't have my manuals here) is very close in proximity to the pin that connects to the break in relay. A carbon path had formed over the years and was leaking. My receiver started popping last week also. I suspect that in spite of good intentions that my use of cleaning spray may have accelerated the breakdown. Eventually, it gave in completely (last week to be specific) and nothing worked right, although the B+ fuse didn't blow. I had to remove the switch from the panel (not necessary to unsolder the leads) and inspect it carefully with a magnifying glass. There between two pins on the rear of the switch was a nicely formed hole filled with black carbon that had formed over the ages. I cleaned the little hole out as well as I could with a dental pick, getting as much of the carbon out as possible, clean down to the virgin wafer material, and filled it with a tiny dab of epoxy cement. Works good as new now.

Date: Mon, 29 Jan 2001 19:55:38 -0500
From: "Jim Miller" <jmille77@bellsouth.net>
Subject: Re: [R-390] Static problem

The thing that gave it away was the thin trail of smoke eminating from the switch wafer!

Date: Tue, 30 Jan 2001 10:29:03 -0600
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] Caps,

<snip> A resistance check on an IF transformer would detect open coils, but not

open tuning capacitors. To detect open tuning capacitors, I'd check the distributed capacitance with a Q-meter which will allow me to compute the value of the tuning capacitor which is most often 100 pf. Open connections to mica capacitors molded in the base is a common failure mode of IF transformers. Windings can go open, most commonly from marginal stripping and soldering of the wires at terminals inside. IF transformer with wire leads tended to be color coded. Red for B+, green for grid... As I recall some Hammarlunds are prone to loose the 1500 KHz IF transformer which hasn't been made for decades.

Date: Tue, 06 Feb 2001 11:36:32 -0600
From: "Dr. Gerald N. Johnson, electrical engineer" <geraldj@ames.net>
Subject: Re: [R-390] R-725 on eBay

The 390 type IFs were to have IMPROVED linear phase response, not the other way around... It's the mechanical filters that have nonlinear phase response that causes trouble in DF applications.

Date: Tue, 6 Feb 2001 10:48:22 -0800 (PST)
From: "Tom M." <courir26@yahoo.com>
Subject: [R-390] R-725 Extra Transformer/390 IF Conversion

I may have written that the extra transformer in the 725 was for the 500 series IF filaments. In fact, the filaments in the 500 series IF are wired for 6V (except for the PTO/BFO/ballast which are 25V). I recently converted a R-390 deck for use in the 390A, and no extra transformer is required (by the way, it sounds great!). I believe the extra transformer in the 725 is set up for hum-bucking at the PTO. Wally, K5OP is the expert on this trick. Sorry for any confusion.

Date: Mon, 12 Feb 2001 07:58:45 -0800
From: "Roger L Ruszkowski" <rlruszkowski@west.raytheon.com>
Subject: Re: [R-390] Bandwidth Problem?

If it is a rock, the DC resistance should be very high.
Three ways to check a crystal.
One is to insert it into a test osc and see if it works.

Two is to feed it with a signal gen and look at it with a scope. When the gen is tuned through its resonant frequency the scope output will increase.

Three set the generator up with modulation and tune the receiver to the generator. Hang a meter on the diode load or audio out and watch it. Tune the receiver up and down around the signal. The signal should peak across a small dial range.

As you go from 16Khz, 8Khz, 4Khz, 2Khz, 1Khz, .1Khz on the band width switch then the receiver tuning range of the generator signal should get narrower.

Sort of like you are doing. You find that the 1Khz and .1Khz are just no more narrow than the 2Khz switch setting. Which is you current problem.

If things are leaking around the 1KC and 0.1KC filters you maybe should be looking

for stuff soaked into the wafer sections of the can forms or wafer switches.

Back when I use to dunk the whole deck into the degreaser machine. Little did I understand the problems this was going to cause in these receiver 25 years later. I was expecting them to all go to the scrap year and get replaced with better solid state receivers.

Would some of you other Owner Operators like to offer some specific help for Keith on this.

Date: Mon, 12 Feb 2001 16:02:45 -0500
From: "AI2Q Alex" <ai2q@adelphia.net>
Subject: [R-390] Bandwidth and "DX troubleshooting"

Let me offer a bit of "DX troubleshooting:"

The single 455 kHz quartz crystal used in the 0.1 and 1 kc. filter positions in your R-390As is used in BOTH positions of the switch---so if the filter works in the 0.1 kHz position and not in the 1 kHz position, the problem isn't the crystal.

Keep in mind that the circuit is arranged to de-Q the xtal to change BW by means of the rotary switch S501 and caps C501 and C503 in conjunction with R502 and R503. Check the schematic diagram for this very simple series-parallel switching configuration. It's shown in Fig. 3-4 on page 3-13 and is explained in paragraph 3.2.9.2 of the 21st Century docs, and is also shown and explained in the TM.

The resistors are hand-selected during manufacture, so it's most likely that the crystal and/or resistors have aged, causing the shift in circuit performance. If the filter didn't work in either position, I'd buy the argument that it could be the rock, but if it works in the 0.1 position, it's more likely the resistors or the switch contacts.

Check those components with your ohmmeter and you'll likely find the source of this seemingly elusive bandwidth selection problem.

Date: Wed, 14 Feb 2001 13:31:04 +0100
From: CLEMENS@ps.au.dk
Subject: [R-390] Filter choice affects S-meter reading

Perhaps a dumb question to the assembled wisdom of the group: Why would the carrier-level meter reading on one R-390A invariably drop about 20-25 db when I switch from the 8kc to the16kc filter? Not that I often do that, but still. And this is no matter how spot-on the frequency I am. Is there something I can adjust, or do I have to live with it? This is a Motorola from mid-1956.

Date: Wed, 14 Feb 2001 09:44:35 -0500
From: "AI2Q Alex" <ai2q@adelphia.net>
Subject: RE: [R-390] Filter choice affects S-meter reading

My guess, again using the fallible "DX troubleshooting" technique, is that

(a) you have a defective filter
(b) the contacts on BANDWIDTH selector switch S502/S503 are dirty/broken
(c) capacitor C507 or C516 are defective
(d) variable caps used in modified filter assys. C564 or C561 are defective.
(e) variable caps used in modified filter assys. C564 or C561 are mis-adjusted

Take a look at your filter assembly and try tweaking C564 and/or C561 using an insulated alignment tool to see if that makes a difference. If it does, you can realign those caps if you have a signal generator.

Date: Wed, 14 Feb 2001 14:14:24 -0600
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Filter choice affects S-meter reading

>Why would the carrier-level meter reading on one R-390A invariably drop about 20-25 db >when I switch from the 8kc to the16kc filter?

Your 16 KC filter is tired, worn out, had a failure, or is just plain busted. Get another one.

Date: Wed, 14 Feb 2001 15:57:50 -0800 (PST)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] Filter choice affects S-meter reading

Yes, there is something to adjust, the trimmer cap on the filter. Also, check the center contact underneath the trimmer, one of mine was shorting to ground and making just the problem you found.

Date: Sat, 24 Feb 2001 12:54:49 -0800
From: "khgrant@ix.netcom.com" <khgrant@ix.netcom.com>
Subject: [R-390] IF Module questions

Has anybody removed the BFO oscillator assembly? What is the procedure? It is not listed in the Y2K manual. I need to replace R530 (22k) that is buried underneath the BFO coupler. I need to get the coupler out of the way so's I can replace said resistor (it measures 30k instead of 22k). If someone could explain the procedure, I would appreciate it (and maybe add it to the Y2k manual).

I'm chasing a couple of problems:

1. The BFO seems to instantly shift in frequency a bit every once in a while. I'll tune in a signal on a sideband and after a while the beat frequency jumps a bit, requiring an adjustment to the BFO knob. Sounds like a bad cap or resistor to me; thus my search. I'm not sure if R530 could cause a shift, but it needs replacing.

2. As I've reported several times, I'm having trouble with my filters. In particular, 0.1 and 1 kHz bw positions dont seem to differ. In the 8 and particularly the 16 kHz positions, I get a high-pitched audio oscillation
that's hard to describe. Sort of a 'zing' type effect to the audio signal. I hope I don't have to replace my filters. Any ideas? It sounds to me like something is just at the

edge of oscillation, but I don't yet have a clue as to what.

3. Overall the audio in my rig is pretty crappy. Very 'muddy', indistinct. I've tried some tube swaps so far, but havn't found the problem. I'll keep plugging away at this thing. Any suggestions or words of encourgement greatly appreciated.

Date: Sat, 17 Mar 2001 16:12:00 -0800
From: "khgrant@ix.netcom.com" <khgrant@ix.netcom.com>
Subject: [R-390] Re: IF Noise Problem!

Gentlement, I need some help: My R390A has a noise problem in the first IF amp stage that I'm having trouble locating. It produces a popping, crackling noise when things warm up a bit. Sometimes it comes and goes, but it seems to be getting worse. It sometimes breaks into an almost continuous crashing noise then later might settle out to occasional pops or hisses or dissappear for a short time. I isolated the problem by pulling the input cables from the RF deck - no change. Pulled V501 and all is quiet. Back in, noise returns. I've checked resistor values and they seem within range (all high as usual).

I've recapped C504, C505, and C553. I've swapped the V501 with several other > tubes with no joy. The noise is affected by the bandwith control only in its frequency response. At narrower bandwidths, the popping still occurs, just low amplitude lower frequency components of the noise. I've tried freeze spray on the components in the area (and everywhere else) with no change in the noise.

Does anyone have a suggestion? Should I start replacing resistors? Can the mica caps cause symptoms like this? What components should I focus on first? Has anyone else experienced a problem like this? I appreciate your help in advance. Well, I've now replaced all of the resistors and all but C50 and C503 around the 1st IF stage, and the noise is still there! It comes and goes at will. I've re-soldered all of the connections in the area that I can. I'm running out of ideas. Can anyone offer a debugging suggestion? Could it be in a different stage? As noted above, the noise is present without a connection to the RF input. The noise goes away if I remove V501.

The sound of the noise gets filtered by the BW filters but does not go away. With the 'scope I can definitly see the noise bursts on the plate of V501, but can't see anything on any other pin (my scope probably doesn't have enough sensitivity). Could it somehow be Z501? If so, what should I try?

Date: Sat, 17 Mar 2001 18:49:11 -0700
From: "Kurt" <radiouser@uswest.net>
Subject: Re: [R-390] Re: IF Noise Problem!

The noise that you describe can be made by a bad mica cap. The thunder storm sound is fairly well documented in the Hollow State News Letter with it's cause traced to bad micas. Using a can of freeze spray you can isolate the bad cap or you can just replace them all around V-501.

Everyone worries about replacing all of the paper caps because they leak. I have had just as many problems with the postage stamp micas; especially the pink ones

with only the color code for the value. When testing / replacing the micas don't forget the ones that are part of the 0.1kc -1kc crystal filter. Even though they may be out of the circuit they can still make noise.

Date: Sat, 17 Mar 2001 20:29:48 -0800
From: "khgrant@ix.netcom.com" <khgrant@ix.netcom.com>
Subject: Re: [R-390] Re: IF Noise Problem!

Thanks for the tip on the caps. I have not replaced any of the micas yet. I tried the freeze spray and couldn't alter the symptoms at all. What kind of cap is inside of Z501? It is one of those short hollow tubes with the leads wrapped around on each end. Is that a mica cap? Looks like I'll need to find some replacement caps for the filter circuit. What type of caps should I use to replace them with?

Date: Sun, 18 Mar 2001 00:13:00 -0500
From: "Tetrode" <tetrode@sprynet.com>
Subject: Re: [R-390] Re: IF Noise Problem!

Keith, as another idea, don't forget the tube socket itself as a source of noise problems. I've got one in the RF deck that occasionally gets noisy despite careful cleaning and application of dexoit. The noise was independent of the tube put in, and only went away after a treatment. Next time I go through the radio I plan to get a very small wire brush and polish the socket contacts.

Date: Sun, 18 Mar 2001 18:37:56 -0800
From: "khgrant@ix.netcom.com" <khgrant@ix.netcom.com>
Subject: Re: [R-390] Re: IF Noise Problem!

Well, this is turning out to be a saga! I thought I had the noise isolated to the first IF stage, but I was wrong. I replaced almost all of the components around V501, but the noise kept comming back. Then I tried pulling V501 again just to be sure and the popping / crackling noise came back after warm-up. Thanks for all of the suggestions from the group so far. I checked the socket pins for V503 and they seem to make good contact.

Here is an interesting experiment I tried: I disconnected V502 pin 1 (the input to the 2nd IF amp coming from the BW filters) and connected it via a new 22k resistor to the AGC line, isolating the 2nd IF from the first IF. With this setup, the nose returned. However if I bypass pin 1 to ground with a 0.005 uf cap, the noise goes away! Why would this happen? I tried using the bypass cap on pins 2 and 6 with no affect.

I'm beginning to wonder if I'm getting noise coupling in from some other stage. Someone suggested that the mica caps in the mechanical filter section might be the cause, but I don't see how that could be the case when the noise is present with the 2nd IF disconnected from the filters. Has anyone seen disk ceramics produce this type of popping crackling noise? I'm still searching for the problem. Anyone have ideas I can try?

Date: Mon, 19 Mar 2001 18:13:46 -0700
From: "Kurt" <radiouser@uswest.net>

Subject: Re: Re: [R-390] Re: IF Noise Problem!

Keith: Perhaps you have a bad silver mica somewhere along the AGC line. Remove the jumper on the back of the radio between TB102 terminals 3 and 4. This will separate the AGC line in the IF deck from the AGC line in the RF deck. There are several silver micas along the agc line in both the IF and RF decks.

Date: Wed, 21 Mar 2001 18:40:07 -0800
From: "khgrant@ix.netcom.com" <khgrant@ix.netcom.com>
Subject: [R-390] Re: IF Noise Problem (continued)

[an ongoing saga continues...Well, thanks for all the help so far on the noise problem in the 2nd IF stage.

Here is where I am: the 1st IF amp has been removed (V501), and the 4th IF amp has been removed. The AGC has been disconnected at the rear. Power supply looks good. No other oscillations in other parts of the IF. I have replaced all of the components around V502 and V503 except for a couple of ceramic 0.005 caps and R514 and R550. I also replaced R511, the resistor across the input of T501. I monitor the noise on the plate of V503. With my 'scope, I
think I can see the noise on the plate of V502, but it is hard to tell. At this point, my best guess is that the noise is coming from the plate circuit of V502. Based on a process of elimination, that pretty much leaves the mica cap across the input to T501 (C557).

A puzzlement: I can kill the noise by hooking a 0.005 uf disk between the grid of V502 and ground. Why is this? My knowlege of tube operation is somewhat limited. The noise is NOT coming from the filter section (I disconnected V502 from that).

Question: I know these caps were selected at the time the IF transformer was built. How badly will I screw up the performance of the transformer if I replace it? Does anyone have a (good) replacement for T501?

Any words of wisdom (or encouragement)? Thanks for putting up with my ordeal.

Date: Wed, 21 Mar 2001 20:04:40 -0800
From: "khgrant@ix.netcom.com" <khgrant@ix.netcom.com>
Subject: [R-390] IF Transformer Question

I have a question about the T501 IF transformer in my R390A.

I suspect that the mica cap across the primary may be the source of noise in my radio (I've done a lot of work trying to isolate it). I looks like there are actually 2 caps across both the primary and secondary windings. One on each side is a mica cap near the top of the can. The others are down near the bottom next to the resistors. They have a shape somewhat like a 1/2 W resistor, but the leads are radial and the body is rounded like it was dipped in a coating. Anybody know what kind of caps these are? How about the color code they use? They seem to have colored dots (blobs?) along one side.

If you were to guess which cap (on the primary) might be going bad on me, which one would you guess? Others on the list have mentioned silver-micas going bad on them, so I am wondering about this other cap in the transformer.

I'm a little nervous about replacing compenents in the transformer. I don't want to screw up its Q. Anyone rebuilt an IF transformer before?

Date: Thu, 22 Mar 2001 09:09:13 -0800
From: "Roger L Ruszkowski" <rlruszkowski@west.raytheon.com>
Subject: [R-390] [R-390A] IF Transformer Question

I have a questions about the T501 IF transformer in my R390A. I suspect that the mica cap across the primary may be the source of noise in my radio (I've done a lot of work trying to isolate it). There are actually 2 caps in the transformer cans. One is across the primary winding and a second one across secondary windings. Some caps are near the top of the can. The others caps are down near the bottom next to the resistors. Some caps in my receiver have a shape somewhat like a 1/2 W resistor, but the leads are radial and the body is rounded like it was dipped in a coating. They seem to have colored dots (blobs?) along one side. Anybody know what kind of caps these are? [1950's style mil spec caps!! Silver on mica with a round body cover. Silver on ceramic with a hollow center.]

How about the color code they use? Compare your part to the TM and you can determine the pattern from end to end. The dot are like the color bands on the black beauties caps. The Radio Armature hand book has a page on how to read the dots and bands. Some web pages are also available if you are endowed with net access]

We know the caps in the IF transformer were selected at the time the IF transformer was built. How badly will I screw up the performance of the transformer if I replace the caps?

[No problem, The slug will let you tune the circuit back to the correct frequency. If the slug goes to center and does not peak then you need more cap. If the slug drops out the end and does not peak then you need less cap. More or less cap here being a fraction of PF.]

Others on the list have mentioned silver-micas going bad on them, so I am wondering about these caps in the transformer can. If you were to guess which cap (on the primary) might be going bad on me, which one would you guess?

[If you have more than one cap on the side of a transformer, these are just two parts to get the selected design value. Silver mica caps do go bad. But at the low failure rate, predicting if its this one or that one based on collective knowledge is still pretty vague at this time for the circuit under consideration here.]

>I'm a little nervous about replacing components in the transformer. I don't want to screw up its >Q. Any words of wisdom (or encouragement)? Anyone rebuilt an IF transformer before?

[Been there, done that. The cans have a cover, off with the cover. Inside is a top

board and a bottom board. Two studs space the boards apart, hold the cover on, mount the can to the deck and frame the stack. Ignore these. On one side of the stack will be a pair of wires from board to board (up and down in the stack). These extend through the bottom board and are the "lugs" for the "transformer". On the other side of the stack is the same setup. One side is primary. The other side is secondary. The coil, cap, (caps), resistor, (resistors) tie between a pair of these stack wires. Past experience has been cold solder joints. Some very fine skill and things in there can be fixed. In the process of working on the lugs under the can, heat moves up the wires and melts joints in the stack. If you replaced any caps under the deck to one of these can lugs, you may have a cold solder joint on the wire in the can above the lug you needed to work on. The cap or two I seen go bad, were broke and were replaced. We ordered a new can to get the cap and changed the cap in the can rather than changing the whole can from under the deck. We put the new can cover on the stack and dropped the rest in the trash. A 50 year old bad mica is likely, I myself am trying to locate the one (or more) in my IF deck Doing a cap swap in the stack is a low risk venture and you should give it a try. After you do the work in the stack, go back to the bottom and check the "lugs" for cold solder joints there. The "Cans" are robust circuits and at 455Khz you are OK. Work in the stack will not trash the Q or get you so far out of value that you can not tune the transformer to a proper peak.]

>Does anyone have a (good) replacement for T501? Maybe just the right value caps? Thanks, Keith [Good Luck with this problem Keith, Do let us know what you find.]

Date: Thu, 22 Mar 2001 21:56:20 -0800
From: "khgrant@ix.netcom.com" <khgrant@ix.netcom.com>
Subject: Re: [R-390] Re: IF Noise Problem (continued)

Thanks for the tip on re-soldering the leads. When I get back to the bench,I'm going to try resoldering all of the circuit connections. Failing that, I'll pull out the cap and replace it. Appreciate the help! Keith

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Date: Thu, 22 Mar 2001 21:57:50 -0800
From: "khgrant@ix.netcom.com" <khgrant@ix.netcom.com>
Subject: Re: [R-390] [R-390A] IF Transformer Question

Thanks Roger, I'll give it a go! Keith

Date: Fri, 23 Mar 2001 20:56:42 -0800
From: "khgrant@ix.netcom.com" <khgrant@ix.netcom.com>
Subject: [R-390] [IF noise problem] Cap color code?

Well, I've resoldered all of the connections around V502 and V503, including the internal connections of the IF transformer with no success. I replaced one of the caps across the input side of the IF transformer. It was a silver-mica. No success. What I am left with is a second cap across that input, and thus the question about the color code. I know what the colors are (bad booze rots....etc). I need to know how to interpret the meaning of the numbers.

I have a small cap from my IF transformer, about the same size and shape as a 1/2 watt resistor but with rounded ends, like it was dipped in epoxy. The leads come off radially, not axially like a resistor. The colored dots start near one end. Which way do I start reading, and what
do the digits represent?

Date: Sat, 24 Mar 2001 21:38:27 -0800
From: "khgrant@ix.netcom.com" <khgrant@ix.netcom.com>
Subject: Re: [R-390] [IF noise problem] Cap color code?

[I'm not sure I sent message properly, so I am sending it again. Sorry if it get's duplicated] Ok, I need help with the color code of this small cap I pulled out of my IF can. It is a small radial with a brown body. It has a large violet spot on one end, followed by smaller orange, white, black, and red dots. Now I don't know which dirction to read the digits so it is either:
†††††††† 7 3 9 0 2 † or † 2 0 9 3 7 I'm sure at least one of the digits is a tolerance value? I'm guessing that this should be small value cap. Maybe 39pf or 200pf?. Could someone help me out with this one?

Date: Sun, 25 Mar 2001 17:47:20 -0800
From: "khgrant@ix.netcom.com" <khgrant@ix.netcom.com>
Subject: Re: [R-390] [IF noise problem] Cap color code?

> According to the information I have I offer the following. The cap appears
> to be a Group III Temperature Compensating Style CC Capacitor.
>
> The large violet dot is the Temperature coefficent and for your application
> (violet) -750 parts per million per degree centigrade.
> Orange dot is the 1st significant figure...3
> White dot is second significant figure....9
> Black dot is the Multiplier.....1
> Red dot is the capacitance tolerance =/- 2% given you are over 10 uuf in
> value.
>
> Hope this helps. By the way is there a yellow MIL identifier dot on the
> rear of the cap?
>
> Duffy (N3JHA)

Date: Sat, 7 Apr 2001 16:20:32 EDT
From: Llgpt@aol.com
Subject: Re: [R-390] BFO

>To answer a few who saw I was not clear,- the BFO just sits there for 45 sec. >to a min.,, then it >starts doing it's thing...Tube o.k., Circuit checked o.k. when >the deck was re->capped..(Actually, I mean that long after the radio is warmed >up and recieving..)

Try this, I had this happen a few years ago to me. The BFO front panel switch was dirty. Clean with de-oxit or your choice of cleaners then try it.

Date: Sat, 7 Apr 2001 19:52:33 -0400
From: "Tetrode" <tetrode@sprynet.com>
Subject: Re: [R-390] BFO

I've got a pretty good idea what's going on with your radio, although it's not a big deal. In both the 390A and nonA the BFO and VFO tube filaments are in series and their filament current is derived from the infamous 3TF7 ballast tube.

I once had the same problem you do with one of my nonA's except that it was the VFO that took a while to start up, and sometimes it wouldn't even want to start unless the line voltage was a few volts on the high side. The problem was the ballast tube was only delivering about 10 VAC to the filament string instead of the nominal 12.6 VAC, so the VFO tube's cathode emission was reduced and the oscillator had a hard time starting. For a short term fix I put in a fresh VFO tube that had more emission and wasn't bothered by the low filament current, but later I did the usual mod to the ballast tube socket so that I could substitute a 12BH7 and things have been fine since.

Out of six 3TF7 tubes I have only two have an output current that is within 10% of their 300 mA spec, which is supposed to supply a nominal 12.6 VAC output in this particular application. The other two were well below, and two were well above. I would guess not many folks bother to check their ballast tubes and just assume that if they aren't open they are OK. However, my experience tells me they can degrade over time just like any other component, or maybe they were never quite good to start with (rejects?).

Date: Mon, 16 Apr 2001 09:57:00 -0600
From: Jordan Arndt <jordana@nucleus.com>
Subject: Re: [R-390] IF Noise Problem

I have just found a contributor to this type of noise.. it has been a problem in my SW for awhile now, and I have discovered it coming from the PTO... it occurs together with a slight shift in frequency of the PTO output, and can be heard as a slight audio shift through the passband in AM mode or a shift in Het frequency with the BFO on.... This may help in your case also... 73 de Jordan....

Date: Mon, 16 Apr 2001 13:22:08 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] IF Noise Problem

Disk ceramics, as with everything else, can fail and have done so. Use your oscilloscope to see if the one of the caps is causing the trouble. Bypass any suspected cap with a MUCH BIGGER one.. if the noise gets less, you have found the culprit.. Use of a socket extender helps a LOT here.. if none available, hook the new BIG bypass cap directly to the pins of a tube (insulate with teflon sleeving to get it into the tube shield base with out shorting) and see what happens.

SOME few socket extenders have little cotter pins on each tube pin allowing you to unhook each one. If you have such an extender, you can isloate the suspected

screen, say, with its cap and feed it externally with another dropping resistor and cap. Take heart.. if you have replaced ALMOST everything, you are almost there!

Date: Mon, 16 Apr 2001 22:04:43 -0400
From: Jim Miller <jamesmiller20@worldnet.att.net>
Subject: Re: [R-390] IF Noise Problem

I would also check resistors, especially screen, plate and cathode resistors. They can break down with age. I changed out about 100% of the 2200 ohm resistors in my IF strip because they had drifted out of tolerance. A cracked resistor could cause noise like that. And from experience I know you can have one that is bad internally and look perfect externally. Maybe some cooling spray would reveal something. N4BE

Date: Mon, 23 Apr 2001 11:03:06 -0400
From: "Chuck Rippel" <avsl@erols.com>
Subject: Re: [R-390] Harmonic Crystal Help Needed

Bad crystals are not uncommon. That problem typically mainfests itself as bands that are "out" or large frequency differences when changing from band to band.

First, make sure the rear panel "OVENS" switch is off (turned full to the left stop). That should not be on unless you happen to have the radio out in the arctic cold.

Failing that, go to International Crystal and simply replace all of the crystals. They are about $20 each. typically, the know what crystal type is needed once you tell them what radio it goes in. However, should they not, ask them for a type CR-36/U which is in an HC6/U configuration..

I would also replace the 17mhz 1st crystal oscillator and also 200khz calibrator crystal while you are at it.

They have several grades of crystal, I would ask for the mid-grade.

Their number is (800) 322-9426

- ---

Date: Mon, 23 Apr 2001 08:57:40 -0700
From: "Roger L Ruszkowski" <rlruszkowski@west.raytheon.com>
Subject: [R-390] BFO micro dial

Yes, Kevin, Micro Dials are available and you can add one to any 1/4" shaft you may have. The dials were an ASA modification for better BFO set up. These were used on receivers dedicated to RTTY copy. The dials count up or down. and will turn until they roll over. On the receiver there is no stop. You can crank your BFO or BFO coupler right into the trash with one of these dials. A count of about 11 is 1Khz. so +033 is +3Kz and 977 is - -3Khz. You can go to about + or - 4Khz if you have your coupler well adjusted so you do not over stretch or of squish it. The BFO coil unit will provide that range on both sides of 455Khz.

I use to know the numbers for setting the counter to different RTTY shifts. The micro dial numbers were easier to tune up than the original knob. For CW work its a wash.

For SSB it helps. It is a bolt on change. You change the knob and the front panel bushing. You need the very small allen wrench for the knob set screws. Once you get it assembled right, you can drop the IF deck in and out with no more effort than with the standard knob.

Any bolt on geared knob would function as well. The micro dials just looks as cool. Ay mon it's was a spook receiver in its last life.

Date: Mon, 23 Apr 2001 11:04:08 -0500
From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Harmonic Crystal Help Needed

You might want to buy an entire crystal deck from ATC (www.atc.com). While the deck itself is pretty much trashed, it comes with a full set of crystals. Bear in mind, though, that they aren't guaranteed to work either, but it might be worth it to have the spares on hand. They're only $27 now. Note this doesn't cover the 17mc or 200kc crystals.

Date: Mon, 23 Apr 2001 15:49:45 -0700
From: K7JB John <k7jb@uswest.net>
Subject: Re: [R-390] Harmonic Crystal Help Needed

I took a look at the crystal deck enlarged photos from ATC and looks like about all you get is the crystals. The ceramic adjustment caps are all missing, so those of you who think you are getting a full drop in deck, look again! Good price for crystals if they work. I have a deck I got from Fair Radio with crystals and have often wondered if the small red mica caps in parallel with the ceramic adjustment caps might suffer from silver migration. I found plenty of them in my 75A-4 that were either leaky or just plan shorted which results in all kinds of noise problems. If they were leaky in this crystal deck, makes me wonder how much the output of the oscillator would be down in signal amplitude, or just dead! If anyone has replaced any of these and noticed that the signal amplitude has come back up, it would be nice to hear from you. Anyone been there, done that?

Date: Mon, 23 Apr 2001 20:50:35 -0500
From: Tom Norris <badger@telalink.net>
Subject: [R-390] Crystal Help Needed

This is not aimed at anyone in particular, just those that fuss about ATC and mark's posts and products. This is NOT meant as a personal attack on the folks doing the fussing, just a commentary on my part so take it as you will. ATC is advertising the deck as a source of crystals only and is pretty specific in letting you know that is what you are getting. I have one. The crystals are brand new, and all are on frequency, much more than the ones in the receivers I have currently. I may try to purchase another deck if there are any left. At $10 per crystal at Fair and others, this complete set is a steal!!!

There are very few folks left that even sell surplus of any kind as it is usually cheaper to just toss it in a landfill. Mark is doing the R-390 and GRC-106 community a SERVICE by offering this stuff.

Why do folks continue to criticize him for helping us? Much more of the demonizing, and HE will start putting the few parts he has left in the dumpster along with the lions share that went in there to begin with. The stuff on the web site is just a fraction of what was there before the dumpsters were filled. ATC was a major subcontractor on the 390A and the GRC-106 and other items. (My 1967 EAC unit has all ATC coils for instance!)

He is doing up a favor for Pete's sake!

Date: Mon, 23 Apr 2001 22:09:28 EDT
From: Llgpt@aol.com
Subject: Re: [R-390] Crystal Help Needed

My.002 cents worth, Tom I agree with you 100%. There will always be the bitchers and grumblers no matter what is being sold. I can remember when Chuck sold the spare tube sets along with a bunch of "extras" and people bitched. Well folks guess what..... There will be less of it tomorrow than there is today. Get it while you can.

Date: Mon, 23 Apr 2001 21:25:22 -0500
From: "Bill Hawkins" <bill@iaxs.net>
Subject: RE: [R-390] Crystal Help Needed

This could only be said by someone who does not care about the money. And so it is with the people who complain about ATC. They do not understand what is being offered. I can only hope that Mark is encouraged by the money that rolls in, and not discouraged by words that would not be uttered where the buffalo roam. (and the skies are not cloudy all day ...)

Date: Tue, 24 Apr 2001 12:29:30 -0400
From: "Chuck Rippel" <avsl@erols.com>
Subject: Re: [R-390] Crystal Help Needed

I have met Mark personally and can tell you he is very helpful and was very reasonable to deal with. Anyone should have no problem getting something he has but, selling R390A parts to individuals is not ATC's main business thrust. Its something they are doing to make a few $$ on the inventory they still have. I explained to Mark the following the radio has and he is accommodating we R390A owners by NOT throwing the spares he has in the dumpster. Be patient with him. He's trying to help. Just because one might not get the
answer you want to hear does not mean they or their company are bad.

Date: Tue, 24 Apr 2001 23:09:47 -0400
From: Jim Miller <JamesMiller20@worldnet.att.net>
Subject: Re: [R-390] American Trans-Coil

ATC has a selection of trimmers that are in the form of multiple trimmers on a single phenolic board intended for use in various coils and IF cans. The board sizes he has aren't directly compatible with the trimmer boards in the xtal osc deck. However, I have repaired bad trimmers in the xtal deck individually by disassembling the

trimmer. You can remove the rotary part and the dielectric pad, then replace the pad and rotor with the same parts removed from a good trimmer. To disassemble a trimmer is very simple. Just use needle nose pliers to gently pull the retaining spring metal on the reverse side...slide it away from the shaft. Works like a champ. Getting to the trimmer boards in the xtal deck is a little tedious, requiring desoldering of a coupld of wires, removal of the switch shaft, etc. But it can be done. Never ever get deoxit or other chemicals on the trimmer parts, however. Jim N4BE

Date: Wed, 25 Apr 2001 10:16:52 -0400
From: "Chuck Rippel" <avsl@erols.com>
Subject: [R-390] Re: American Trans-Coil

I have literally thousands of Erie Trimmers for the R390A brand new, still sealed in the bag.

Date: Thu, 26 Apr 2001 21:10:35 -0400
From: Bob Camp <bob@cq.nu>
Subject: [R-390] Interesting Crystals

I was tearing into the crystal oscillator deck on an R-390A and came across an interesting problem. Every crystal in the deck had vented. I *assume*this happened after the radio went in service and they were not manufactured with an open hole out to atmosphere. Am I correct in guessing that the oven heaters must have run away to make this happen ? If they did they sure didn't damage much of anything else. Obviously the fix is to heat up the crystals and re-seal the vent hole when they are hot. The question being has anybody else tried this and had any luck with the process. Normally an HC-6 gets sealed right after calibration. They aren't designed to see atmosphere for long ...

Date: Thu, 26 Apr 2001 22:30:37 -0400
From: "Charles A./Leonor L. Taylor" <calltaylor@earthlink.net>
Subject: Re: [R-390] Interesting Crystals

Go ahead and solder-seal the crystals. I won't tell anyone if you won't. If they don't work, recycle them into an environmentally acceptable container such as a dead hippy. Crystals are evacuated (something your mother spanked you for doing when you were young) and repressurized with some sort of inert gas [argon, pluton, klingon, whatever] to prevent oxidation of the elements.

Date: Thu, 26 Apr 2001 22:47:34 -0400
From: Bob Camp <bob@cq.nu>
Subject: Re: [R-390] Interesting Crystals

Actually the HC-6 stuff never made it to the evacuation / back fill process. At least not in any of the crystal plants I've worked in. Back fill and all that stuff came along with resistance weld or was a coldweld / glass type process. The solder seal process just ran them down a heat track that melted the solder at the base. They slid down the track and cooled off enough to let
the seal harden. Then the girl hit the vent hole with a little solder to seal the can. They were good and hot at the time but not back filled.

The only exception to this that I am aware of was a process they used in Germany on and off over the years. They would blow a little iodine into the part just before seal. The idea being that it would act as a getter. From what I've seen it didn't work very well ....

Still seems pretty weird that the crystal oven could get hot enough to do that to the crystals ....

Date: Tue, 1 May 2001 15:44:18 -0400
From: "Chuck Rippel" <win.308@home.com>
Subject: [R-390] Significant R390A WWW Site Updater

I just added a significant section to the R390A WWW Site. New is a full overview of the various IF filters used in the R390A. I think the results will suprise you!

Go to: http://www.avslvb.com/R390A/index.html Look next to the "New" symbol and click on the "About R390A Filters" link. That will take you to a direct link to the story also acessible from the "New Additions" page.

Date: Tue, 22 May 2001 10:17:11 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Son of a Question For The Assembled Multitude

>Well I did a little more fiddling with my T-501 core problem.
>3) Find another T-501 - anybody got one ?

If you get to that point, do let me know.. I just might have something here.. hehe

>I doubt that the coil is causing that big a problem, but the IF does peak up
>better if I drop a lump of ferrite on a stick into the core.

BINGO! Find a small core that fits the thing, slice off a short section, and put it in there to improve the adjustment. WAX it and the tube before you do and you'll have no further sticking problems. (Use butchers wax or car wax.)

Date: Fri, 13 Jul 2001 13:47:36 -0700
From: "Roger L Ruszkowski" <rlruszkowski@west.raytheon.com>
Subject: Re: [R-390] R390A rebroadcaster

<snip>.....how to run an IF deck while out of the radio... <snip>

Set the R390 up on end, on the bench. The IF deck will then set on the bench and can be plugged in and operated. You can give it a quarter twist so you can peak into the under side. You can also put the If deck up on blocks so you can have a bit more cable freedom. You do have blocks for your R390 service bench don't you? Would you set be natural wood? or the custom stained ones?

P.S. Why do you think its your work that has this receiver broadcasting in the FM

Band? It could have a bug in there. I could have a mod to relay some shortwave stations to the local campus. You may own a repeater and just not understand it yet. Then again !!! Do let us know what you find.

Date: Fri, 13 Jul 2001 17:57:56 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] R390A rebroadcaster

I seem to remember one field change for the R-390 that was to cure "spurious oscillations". You should investigate all known field changes and see if there is one related to this symptom.

Date: Fri, 13 Jul 2001 15:59:50 -0700
From: Richard.McClung@dielectric.spx.com
Subject: Re: [R-390] R390A rebroadcaster

This may or may not help. Short version.....

****

URGENT
Department of the Army Modification Work Order
MWO 11-5820-294-35/2 Modification of the Radio Receivers R-390/URR and R-390A/URR to Eliminate Spurious Radiation
5 October 1959

Purpose of modification is to eliminate continious radiation at 340 mc as a result of parasitic oscillations, by connecting the suppressor grid to the cathode of the local audio output tube V603.

R-390/URR:
Unsolder and remove the jumper lead connected between pin 2 and fround of tube socket XV603. Connect and solder a suitable length of No. 22 AWG solid wire between pins 2 and 7 of tube socket XV603.

R-390A/URR:
Unsolder and remove the jumper lead connected between pins 2 and 4 of tube socket XV603. Connect and solder a suitable length of No. 22 AWG solid wire between pins 2 and 7 of tube socket XV603.

Date: Fri, 13 Jul 2001 16:12:38 -0700
From: "Roger L Ruszkowski" <rlruszkowski@west.raytheon.com>
Subject: Re: [R-390] R390A rebroadcaster

>I seem to remember one field change for the R-390 that was to cure "spurious >oscillations". You should investigate all known field changes and see if there >is one related to this symptom..... Roy

Great Thought. Let's get those details up here again folks. Wallace needs some help here. My humor on bugs is the answer he needs. One of those spurious oscillators is getting him for sure. What luck to have it hit the FM band and actually know the problem exist. How many of us have our own radiating decks and do not even suspect it? Roger.

Date: Sat, 14 Jul 2001 09:35:27 -0400
From: Bob Camp <bob@cq.nu>
Subject: Re: [R-390] R390A rebroadcaster

The first question : "is this a bug or is it a feature ? ". People go to great lengths to improve the audio chain of R-390's and running them through an FM stereo system sounds like a good idea who's time has come :) Time to box it up and sell it on eBay for *major* bucks.

First thing to try is to turn the RF gain all the way down. An easy way to do that is to pull the jumper on TB102 that's between pins one and two. That kills V501 and V502. The audio on the carrier will go away when you do this. The thing to watch is weather it kills the carrier. If it kills the carrier then I'd bet on something wrong with one of those two tubes.

Next try the good old pull the tubes trick (pull a tube put it back in, pull the next one ...). See if when it stops. If you are lucky it will only stop when you pull one of the tubes. Start with the AGC and detector tubes (V506 / V509) and work back towards the first IF amp tube. As you pull each tube out check the markings to see if some previous owner "improved" things by making a tube substitution. The 6BA6 isn't a super hot tube and people have been known to put in "better" tubes. Generally the result is a mess (like maybe VHF oscillation ...). If you come across any that are from countries that you need a visa and shots to visit you might sub them temporarily .... Next I'd check the connections on the new capacitors you put in. A lot of what you do a re-cap job is to replace screen bypass caps. If you get one wrong, or if it's defective you can get VHF oscillation. I still find it *very* hard to believe that anything the size of those clunkers does any good at all at VHF but that's what the book says.

If you have seven pin and nine pin tube socket extenders I would at least try them. With parasitic oscillations they may not help since the oscillation may go away with the culprit tube up on the extender. If not you should come across a tube with a lot of 98 MHz on it's plate or screen. Usually it's volts peak to peak, not milivolts that you are looking for.

Once you identify the tube that's doing it then flip the deck over and visually check a couple of things. There should be a short from the suppressor grid to cathode or to ground. Plate, screen, and cathode bypass caps are next. If they all look ok then start poking around on the IF deck live. Paralleling bypasses is probably the first step. Hope this helps. Some of it is fairly basic - sorry if I went back to far.

Date: Sat, 14 Jul 2001 11:26:45 -0400
From: Bob Camp <bob@cq.nu>
Subject: Re: [R-390] R390A rebroadcaster

Tubes are very high frequency devices. The lead dress in a 390 is not the sort of thing you would do at 100 or 300 MHz. Any time you significantly move parts around in one of these radios you may start things going. I have not checked my radios for this sort of thing. Probably the easiest way to check would be a sniffer loop on the end of a piece of coax. Plug the other end into a spectrum analyzer and you could spot the problem pretty quick. Fixing the problem once you spotted it would take a bit more time. I suspect that the problem is more likely to happen in radios that have major mods or weird tubes. Obviously the military ran these radios for a long time with very few problems. There's nothing in the TM's about checking for parasitic oscillation. If the 390's routinely sing at VHF I suspect that they would have found it to be a problem for them. They had enough stuff running up there that it would have messed them up big time. They certainly found the audio stage oscillation problem and sent out a mod to fix it.

Date: Mon, 16 Jul 2001 17:32:44 -0700
From: "Wallace Gibbons" <rockwall@sourceoneinternet.com>
Subject: [R-390] R-390A Rebroadcaster update

I spent a little time chasing the FM broadcast capabilities of my R-390A last night. I traced to the offending stage with a FM receiver with an S meter and a small coupling loop connected to the antenna input. I poked around the IF deck (and audio, just in case) and looked for the strongest signal on the FM receiver. It's the 6AK6 IF stage that's the culprit. I pulled the tube prior to that stage to stop the 455 khz IF signal. Then I plugged in a 7 pin tube test adapter to give me access to the 6AK6 pin signals on the top of the chassis, and with a scope I could see the oscillation on the plate, screen, cathode, of the offending stage. The measured frequency was about 102 mhz. I tried better high frequency bypass caps on the cathode and screen to ground. No help at all. The only way I could stop the oscillation was to turn the BFO neutralizing trimer cap (C525) until the oscillation quit.

Judging from the circuit used for that BFO neutralization cap, and the feedback path it takes off the plate winding of the 6AK6, well, looks like it could be positive feedback with some parasitic circuit inductance and the right trimmer setting.

I don't use the BFO on this receiver so I set the trimmer for the middle of the tuning range where the stage doesn't oscillate, and that appears to have got rid of the offending oscillation. The oscilloscope doesn't show any signal at all on the plate unless the prior stage tube is replaced back in it socket.

Just thought I'd pass this along, I'd be interested in comments about the oscillation

and the reasons for it. Maybe the IF gain is set to high?

The oscillation is gone, receiver seems to be working fine, I don't use the BFO so can't comment on my repairs effect on that. Maybe this winter I'll dig deeper, for now it's OK.

Thanks to all on the list who emailed comments and suggestions.

Date: Tue, 17 Jul 2001 00:29:51 -0400
From: Norman Ryan <nryan@intrex.net>
Subject: Re: [R-390] R-390A Rebroadcaster update

Nice work resolving the oscillation problem. It will be nice to learn more about its why and how sometime. Here is a simple procedure for setting IF gain, developed by Chuck Rippel.

Setting IF Gain on the R-390A:

1. Disconnect antenna.

2. Tune to 15.2 MHz.

3. Set FUNCTION at MGC.

4. Set BANDWIDTH at 4 KHz.

5. Set RF GAIN at maximum.

6. Peak ANT TRIM.

7. Set LINE METER at -10 DB scale.

8. Set LINE GAIN at maximum.

9. Adjust IF GAIN ADJ (R519) for LINE LEVEL meter reading between -4 and -7 DB.

10. Re-zero CARRIER METER with CARR METER ADJ (R523).

Re-zeroing Carrier Meter:

1. Set FUNCTION on AGC.

2. Set RF GAIN at minimum.

3. Adjust CARR METER ADJ (R523) for zero setting on carrier level meter.

Date: Tue, 17 Jul 2001 10:36:09 -0400
From: "AI2Q Alex" <ai2q@adelphia.net>
Subject: [R-390] Quashing VHF oscillations

Now that you've localized the 102 MHz re-radiation problem, why not try using some judiciously placed ferrite beads at the offending IF stage? Slipping a bead or two over the grid pin, or even possibly the plate and/or screen pins, won't affect normal operation one iota, but may very well add enough series inductance to quash the parasitic circuit.

In fact, being as the oscillation seems resistant to the tube adapter (did you see a change of frequency at all when you inserted the adapter?) you might be able to make a "chicken connection" of the ferrite beads on the adapter, just to see if they affect the oscillation.

If you think you're on track, you might think about winding some small parasitic suppressors as an alternative to beads. Use a few turns of wire over a 47-ohm (or so) carbon resistor (putting the coil and resistor in parallel). That forms a low-Q lossy element that may stop the oscillation.

You could try putting one in series with the control grid, and/or the plate lead. I've used these successfully in RF amplifiers to prevent (not stop) parasitic oscillation. In those circuits I can "see" the VHF resonant frequency with my grid-dip meter, and then de-Q it with the loaded
suppressor resistor-coil combinations.

Date: Mon, 23 Jul 2001 22:31:38 -0400
From: "Walter Wilson" <wewilson@knology.net>
Subject: [R-390] Popping noise with the BFO on

I've been chasing a problem for several weeks, which just about has me whipped. It's a popping noise (like popcorn in the microwave) after I turn the BFO on. Here are the symptoms: It happens with any IF deck installed in this chassis. Move the IF deck to another chassis, and it works fine. Same situation for the AF deck, Power Supply, PTO, and RF deck. The problem always stays with the chassis (I've verified this twice). So I've concluded the problem has to be somewhere in the chassis wiring or the chassis-mounted components.

The noise seems to start in the detector stage. If you pull V504, the noise is still present. If you lift the BFO injection lead (12 pF coupling capacitor), the noise of course disappears; just like turning the BFO off with the switch. I thought it might be a bad BFO switch or bad wiring to the switch, so I jumpered around the switch inside the IF deck. No change. I also jumpered the diode load inside the IF deck to be sure it was not a loose or dirty connection there, and still no change.

If you disconnect the limiter wiring at pin 9 coming from the IF deck, you pickup a slight "hum", but the popping disappears. I've checked all the wiring going to the limiter potentiometer (bypassing with jumpers straight from the IF deck to the front panel). I've also replaced the limiter potentiometer (twice). Here's where it gets interesting. I took two R-390A's side by side. I wired the diode load from the bad radio (terminal 14) to the good radio (terminal 15), and no popping noise. I then reversed the arrangement, wiring the good radio back to the bad one. Still no popping noise. So with the bad radio feeding into a good audio deck, no popping,

and with a good radio feeding into the bad radio's audio deck, no popping. Does anyone have any idea where I might look next?

Date: Tue, 24 Jul 2001 08:47:43 -0700
From: "Roger L Ruszkowski" <rlruszkowski@west.raytheon.com>
Subject: Re: [R-390] Popping noise with the BFO on try 1

I suspect a connector oxide problem. It make look good but them its over 50 years old. I or one of my friends may have dunked the chassis in the TTY degreasing machine some where back then. It solved my problem of dirt that day but now its a old age problem. Good eye ball and just good methodology.

Here are the likely areas.
AF deck connectors. IF deck connectors. The harness on the front panel.

Pull the harness connector back covers off and push the insulation on each lug up. Look for a bad solder joint. Looking at the schematic will show some pins need a closer look than other pins.

Drop the front panel and look at limiter and contacts.

Check the BFO circuit.

Most common, One of those connector pins is less than good and giving you a open between the pin and plug.

Second the stuff you can not see is breaking down and discharges. some voltage is breaking over and arcs. you hear a pop. The discharge path is come crud you can not eye ball and can not probe with a ohm meter.

Doing the chassis in the dish washer is not going to get into the connector back shells where the problem is likely located.

You find it is not in the module side.

Take the chassis modules out. Take the chassis out to the yard with the soap and water. Open up the likely connector back shells and go to work with the soap and water.

Give it all a good bath and shake dry. Let it dry in the sun for a Sat and Sunday after noon.

(Wrong !!!!! Drop it all in a engine block degreaser tank and hang it out to dry for a week, rotate it and let dry for another week.)

Date: Tue, 24 Jul 2001 15:27:29 -0400
From: Al Solway <beral@videotron.ca>
Subject: Re: [R-390] Popping noise with the BFO on try 1

About year ago now I was in the process of restoring my Bluestripper from Fair

Radio. I did not turn on power to the radio but dismantled it down to nuts and bolts except the gear train. Every thing was cleaned and inspected with a 5 power loupe including the harness. Each connector cover was removed as described by Roger above. I found 2 cracked solder joints. None were actually open but were potential failures. After cleaning, replacing all the paper caps and out of spec resistors power was turned on. The radio was alive on all bands. The radio was aligned, tubes replaced and finally finished on 9 January 2001. Sensitivity was similar, though not quite as good as what Walter reports on his site.

Every thing did not go as smooth as it seems. One major problem after replacing the RF Gain Pot (out of spec) was intermittent and erratic operation oporation of the gain. Finally found that it was a broken wire inside a wire to one of the pot lugs. The break was about 1/4 inch back from the lug and just beyond where the solder wicking ended. Repairing the wire cleared the final electrical problem.

So my point is that what Roger is referring to can cause a multitude of electrical problems. Intermittents are the worse kind to find and age can make a poor solder joint so much worse. Inspection can find some of them but not all. I feel that what Roger suggests is holds a lot of water.

Date: Tue, 24 Jul 2001 15:34:25 -0500
From: "Bill Hawkins" <bill@iaxs.net>
Subject: RE: [R-390] Popping noise with the BFO on try 1

Wonder if the "popping" is an intermittent RF oscillation that becomes audible when the BFO is on - and not otherwise related to the BFO. But then there is this neat fault isolation trick of using the diode load terminals of two receivers. What that hookup does is connect the grounds of the two sets together and add some capacitance to the diode load line. I'd try it with just the two sets grounds connected, leaving the diode load jumpered for single set operation. Then I'd try hanging a small cap from the diode load jumper to ground.

Date: Tue, 24 Jul 2001 14:21:52 -0700
From: "Roger L Ruszkowski" <rlruszkowski@west.raytheon.com>
Subject: RE: [R-390] Popping noise with the BFO on try 1

>Wonder if the "popping" is an intermittent RF oscillation that
>becomes audible when the BFO is on - and not otherwise related to the BFO.

Real good point that should not get passed over with out some thought.

Date: Thu, 26 Jul 2001 21:52:18 -0400
From: "Walter Wilson" <wewilson@knology.net>
Subject: Re: [R-390] Popping noise with the BFO on - SOLVED

Bob Camp wrote: I'd bet you that you have a piece of coax / shielded wire that is arcing.

You were right. It is one of those tiny little coaxial wires. The bad one goes from the diode load jack to one side of the Limiter potentiometer. The voltage only increases

to about 15 or so volts at the diode load point when the BFO is turned on, but it seems to be enough to cause problems. Bypass this wire with jumpers, leaving all else in play, and it's as quiet as as a mouse after the BFO is turned on.

Lots of folks from this list sent many good suggestions, and I tried many of the "quick" checks. But I had guessed it might be in the wiring. I had to unsolder both ends of the offending wire to get it out of the circuit in order to determine it was bad. This one kept me busy for a while, but at least it's been found. Now on to fixing it.

Date: Thu, 26 Jul 2001 22:29:14 -0400
From: Bob Camp <bob@cq.nu>
Subject: Re: [R-390] Popping noise with the BFO on - SOLVED

Glad you found it ! It's a pain to fix and make it look right. You can always route a replacement wire outside the harness but it will look odd. Maybe somebody out there has a wiring harness they don't need, it'd make the job a little easier.

Date: Fri, 27 Jul 2001 06:28:31 -0400
From: "Walter Wilson" <wewilson@knology.net>
Subject: Re: [R-390] Popping noise with the BFO on - SOLVED

This unit is mostly a Stewart Warner unit. The wiring harness looks very clean, and I still cannot detect any visible clues even now that I've isolated the problem. The coax does have the clear cover over the shielded cable. This was one of the harder ones to find. Until you unsoldered the wire and it's shield, it kept arcing no matter what else you jumped around. Even when you tried to jump out the diode load jumper connection right inside the IF deck, this piece of bad coax was still hanging off the wiring just waiting for enough voltage to arc. I had worked on this one several times in the past and set it aside, but I decided this time I would not stop until I found it. I probably have 20 or more hours invested in this one, simple little problem. This kind of problem is a humbling experience.

Once I get the cable out, I'll let the group know if I can detect any visible signs on the bad cable.

Date: Fri, 27 Jul 2001 09:37:38 -0400
From: "AI2Q Alex" <ai2q@adelphia.net>
Subject: RE: [R-390] Popping noise with the BFO on - SOLVED

Good work doggin' that one down Walter. It reminds me of an experience I had years ago with an open inner conductor on an ultra-fine coaxial line on a VHF transmitter board. That kind of fault is often tough to find when it only rears its head under extreme conditions. You are to be congratulated for finding it. Now, go ahead and enjoy your R-390!

Date: Mon, 6 Aug 2001 14:21:25 -0400
From: "rbethman" <rbethman@home.com>
Subject: Re: [R-390] Fw: Frequency display lamps

If you follow the 1956 Manual instructions, or Chuck Rippel's instructions, you are

tuning the the upper slugs to ONE IF, and the lower slugs to ANOTHER IF. In fact, you are taking the peak of the crystal filter response and ALSO broadening it to about 1.6 kc. What most folks miss is that the R-390A/URR and similar radios were designed to provide for RTTY, voice, CW, AND Multi-Channel use. To allow for the Multi-Channel use, the receiver was intentionally set to be a little bit broader than people have really thought. Chuck Rippel's instructions: http://www.avslvb.com/R390A/html/if_deck.html

Specifically demonstrate this by the shift in signal generator output frequency between the upper slugs and the lower slugs. If you sit down and go through the 1956 manual carefully, you will find that you are doing the same thing effectively. I am refering to Electric Radio issue #26, June 1991. The IF cans have a minor modification made. (Horrors! Blasphemy!) Not so! Easily returnable to original. The methodology in tuning the filters is different also. Throughout both alignment pieces, the IF is fed 455kc. It is not changed, and the procedure is different on the filters to tighten them up also.

The ER mods don't putz around with testing umpteen tubes. In my mind part of the falacy of some "Guru's" is to maintain these radios just as they came out from the factory. If that is what people want, fine. I have a slightly different agenda. If I can change the tube lineup with later made miniature tubes that have significant lower noise figures, tighten the IF bandpass and filter width to what it "really" can do, then I have a fine vintage quality piece of equipment with better capability.

The results of the author of the mods is that the leakage from the test equipment finally limited his ability to increase the sensitivity or decrease the noise figure by any further amount. I agree that cap replacement with orange drops will help. But that is not the level of improvement that I am after. The sensitivity that I have gotten to so far is that I CANNOT turn the IF gain down enough to meet the alignment instructions. The potentiometer doesn't have enough range.

Date: Sun, 12 Aug 2001 15:12:11 -0400
From: "Warren, W. Thomas" <wtw@rti.org>
Subject: [R-390] Sticky IF slugs

Whoopee, my '56 Motorola IF strip is coming to life. After replacing 18 capacitors and 12 out-of-spec resistors, the strip is mostly working. It's acting like both the 2kHz and 4kHz mechanical filers are dead (oh, joy!), but the 8kHz and 16kHz filters do work. The strip has plenty of gain, etc.

Now to the question at hand. Some of the slugs in T501, T4502, T503, and Z503 are mighty hard to turn and/or just plain stuck. What is the preferred way to loosen up these slugs? Someone said that he used just a little bit of WD-40. I'm a little concerned about the long term effects of WD-40 on the phenolic coil forms. How about moderate heat? Anyone tried that? With a heat gun or in a 150 degree oven to loosen up the old stickiness? Sure looking for good suggestions at this juncture. I've got about 25-30 hours so far just in this IF strip and I'm beginning to see the light at the end of the tunnel. I certainly don't want to do anything foolish at this point.

Date: Sun, 12 Aug 2001 16:55:06 -0400

From: Norman Ryan <nryan@intrex.net>
Subject: Re: [R-390] Sticky IF slugs

Hooboy, so close after all that work, I can imagine your concern. Have not yet encountered sticky slugs (knock on wood, now reaching for my head), so can only speculate.

I guess it's a question of what's down in there. If it's waxy, maybe a wee shot from a heat gun, then a milli-squirt of WD-40, if the slug begins to give. What about a 40 or 60 watt light bulb placed near the IF can for several minutes? Heat would penetrate more gently than with the heat gun.

Joe's R-390A Zippo not recommended. :-)

I don't feel that the WD-40 would be harmful if you wipe off slug and Q-tip the phenolic tube right away. YMMV, though, and I may be off base and hope others who respond will pass on their experiences to the group.

My slug tool is plastic and twists quite a bit with sluggish slugs. The tool probably would break first before breaking a slug.

Keep us apprised of your progress, OK?

Date: Mon, 10 Sep 2001 21:56:51 -0400
From: James Miller <JamesMiller20@worldnet.att.net>
Subject: Re: [R-390] on coax short

Well I have confirmed that the crackling noise (with BFO on) was indeed due to some kind of dielectric breakdown in one of the mini-coax lines running from the IF module to the diode load terminals, and to the limiter control. Not sure which of the lines is in question, but I plan to replace all of them. Now the hard part: Either threading new cables into the wire harness, or run them separately! The fun begins. Thanks to all who had suggestions!

Date: Tue, 11 Sep 2001 07:38:46 -0400
From: Bob Camp <bob@cq.nu>
Subject: [R-390] forwarded 390a message on coax short

Just for the record I have seen what appears to be military work on R-390's that did it both ways. If they put in a new wire they then laced over it and the original wire to hold it in place. In some cases the second lacing job did not stand the test of time and it came loose. Since you are going to have to re-lace either way I think I'd pull the old wire and do it right. That way the radio winds up better than when you started. While you are in there you might just replace anything that looks like trouble ...

Date: Sat, 13 Oct 2001 16:06:58 -0400
From: Mike Sullivan <michaels@kc2kj.k2nesoft.com>
Subject: [R-390] R390a AGC Help needed

I have a Motorola 390a with a nasty agc problem. Let me provide some background:

1. Bought at Shelby Hamfest.

2. Noticed AGC problem and "blindly" replaced C547, 551,548 and noticed no change.

3. While had IF module applied Lankford AGC mod by placing parallel IN4148 diodes accross R547 and R546.

4. Still no luck, got more serious and noticed positive .5 volt on agc line under no signal condition.

5. Found bad 220 pf capacitor, C 546 that was leaky. Replacing it resulted in negative agc (~-0.14 volts). Carrier meter now indicates but seems way off. AGC action still not right.

6. Prepared the following input voltage/Carrier Meter/AGC voltage table to get a handle on AGC problem:

Input v.	Carrier Meter	AGC voltage
1 uV	0	-0.14v
10 uV	0	-0.14v
100 uV	2	-0.14v
1000 uV	52	- 0.50v
10000 uV	90	- 4.18v
100000 uV	~110	- 6.68v

All measurments taken with a URM-25D, terminated through URM25 antenna simulator.

7. One aspect of the problem seems that the AGC delay action is delayed too much and cuts in too late. However, the distrotion cuts in somewhere between 100uV and 1000uV. A scope set at the grid of 3rd IF amp shows the IF signal going into positive region of the input and clipping at the stage. It seems like no AGC is being effectivly applied earlier in the signal chain. However have measured AGC at IF stages.

Help! I have measured AGC voltage at the RF and 1sr, 2nd and 3rd mixers. The 10 megohm meter loads (or detunes) the rf amp and some of the mixers they do follow AGC voltage it seems.

Date: Sat, 13 Oct 2001 17:38:24 -0700
From: "Kurt" <radiouser@uswest.net>
Subject: Re: [R-390] R390a AGC Help needed

There are several things to look at to isolate the AGC problem. There are two basic causes for your problem. 1) a short or leakage on the AGC line pulling the voltage down or 2) there is not enough AGC voltage being generated. Some things to try:

0. Remove the mod and fix the AGC problem. Then you can put it back.

1. Make sure the tubes are good.

2. Disconnect the AGC line from the AGC detector and see if the AGC voltage increases as the input signal increases. A 100 uv input should produce about -4 volts of AGC. If this stage is working ok then look for problems on the AGC line.

3. Pull out the tubes on the AGC line one at a time starting with the RF amp tube and working towards the detector. This can help isolate the problem.

4. You can separate the AGC in the RF deck from the IF deck by removing the jumper on the back of the radio. If you need more help email me.

Date: Sat, 13 Oct 2001 22:16:04 -0400
From: James Miller <JamesMiller20@worldnet.att.net>
Subject: Re: [R-390] R390a AGC Help needed

On my 390a I found a few leaky bypass caps on the AGC line at various locations (IF and RF decks). I think these are .005 or .001 (dont have the schematics here). I basically went through the entire radio and replaced them all. They go bad with age (yes even the so called unbreakable disc ceramics). And a leaky tube grid can also pull the AGC down, so check the tubes. And most tube testers reveal enough grid leak to identify a bad tube as a cause for AGC problems, so you may have to try them all by hand. 73 Jim N4BE

Date: Mon, 15 Oct 2001 11:28:48 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] R390a AGC Help needed

>I have a Motorola 390a with a nasty agc problem.....<snip>

1) Measure all resistors in the AGC circuit. Careful study of the schematic may reveal ways you can do this withOUT taking the RF section out of the radio. I suspect you will find at least one high value resistor which has drifted much higher than it should be.

2) Replace each tube controlled by the AGC one by one with KNOWN GOOD NEW tube. You may have a leaky tube. Watch the AGC buss voltage with a HIGH impedance voltmeter.

3) Make resistance readings from the tube pins (the agc controlled grids in particular) and compare with the manual values.

4) Make sure you have replaced all, repeat all paper tubular capacitors.

There are other more sneaky methods for discovering AGC problems. I include here some messages from my saved posts file:

>Here's a quick check to see if a leaky C551 is getting you down.
>The best way to test it of course is to apply B+ to the cap and measure its

>leakage current directly but here's one you can do from the comfort of your
>radio listening chair.
>*****
>With the radio cold, turn it on, let it stabilize for 10 minutes or so, and
>tune in a calibrator signal.
>Make a note of the Carrier level meter reading in the FAST mode.
>Use the reading in the FAST mode as the reference as C551 is out of the
>circuit in this position. (We will also assume the other two caps in the AGC
>circuit are good.)
>Switch to MED. C551 is now connected from the AGC line to ground. If the
>Carrier meter level drops it is due to C551 leakage.
>Switch to SLOW and note the Carrier level again. This is even a better test
>since the cold end of C551 will now have some B+ voltage on it from the
>plate of the AGC time constant tube V506A.
>Now let the radio warm up real good for a few hours.
>Repeat the three tests done previously, again using FAST as the reference.
>Comparing FAST to SLOW will show the largest difference (if there is one).
>If there is significant C551 leakage it will be much more apparent now when
>the radio is hot than before. Capacitor leakage will always increase with
>temperature.
>
>*******
>When I did this test with my 390A I could see about 2 dB difference between
>the FAST and SLOW positions when warmed up. Nothing to get upset about but
>it does indicate some leakage occurring. Ideally, the carrier level should
>read the same in all three AGC speeds.
>When I originally went through my IF deck, I checked C551 out of circuit
>with 300 VDC applied and measured 0.82 uA of leakage at room temp, which
>increased to 5.6 uA after I warmed it up good with a heat gun.
>At the time I didn't have any good substitute caps to put in and I was
>tackling much bigger problems with the radio, so I just flagged it as
>something to take care of the next time I take the radio out for a few final
>touches that are left to do.
>The toughest part of this test is looking for tiny level differences on the
>small R-390 carrier level meter. Also, sometimes the movements on these old
>meters can be a bit sticky. A VTVM with a large instrument meter or DVM
>connected to the AGC line would indicate AGC voltage differences much
>better.

>From: Nolan Lee <nlee@gs.verio.net>
>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.
>nolan

Good luck, and please report the cure when you do find it. Roy

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Date: Sat, 20 Oct 2001 16:40:07 -0700 (PDT)
From: MICHAEL OBRIEN <mikobrien@excite.com>
Subject: [R-390] Thanks for help with HQ-180 avc problem

I would like to thank everyone for their help and tips on fixing my HQ-180 AVC problems. I would also thank Les Locklear for the table of voltages to check. I t showed I also had a gain problem. The problem was traced to a bad tube socket pin for one of the 455 IF tubes. The HQ-180 has joined the rest of my SWL station (sw-8,frg-7, frg-8800,hq-145a and brand new yaesu vr-5000) where it is doing a very nice job of keeping up with the newer receivers. Now to find the time to work on my SP600 and R-390A.

Date: Tue, 6 Nov 2001 12:46:54 -0500
From: twleiper@juno.com
Subject: Re: [R-390] Frequency Stability Mystery Solved

> Further frequency monitoring reveals that with the thermostat
> set at 105F, the temperature up-down cycle is so long and
> slow (5-10 minutes) that the frequency changes by up to 50Hz.

That's becuase there is no adjustable "heat anticipator" function in the thermostat. They probably pick the best temperature that "resonates" with the thermostat and "cold" ambient temperature. But there IS a reason they only say to use the ovens in cold operating conditions, and this certainly is it. In other words, turning the ovens on does not give you better stability under normal conditions, but will improve things under cold conditions, especially during warm-up. For the most part, crystals are stable at any temperature, so it is just a matter of keeping the oven constant at "some" temperature. You could, in other words, use a refrigerator instead of an oven. To the degree that the oven temperature differs from that of the ambient temperature, regulation can be more precise because the "flow" of heat out of the oven (or into the refrigerator) is larger and easier to control.

For instance, at "normal" oven temperatures you could do away with the thermostat all together, or simply use it for over-temperature protection. I would experiment with simply inserting a series resistance or dropping the voltage to the heater to the point where it is held "on" by the thermostat at all times, and see where the temp ends up. Another clever modification would be to put an ajustable resistance ACROSS the thermostat contacts. In this case, you would adjust the "off" current up until the thermostat is just barely "off" at all times. The benefit to this configuration is that it would still allow rapid warm-up, though it might over-shoot for a little while. Either way you do it, the above type of operation will provide very stable oven temperature that is minimally effected by changes in ambient temperature... and NOT effected by

complex heater, insulation and thermostat hysteresis characteristics.

Just what we need here, a transition to an HVAC design round table...

Date: Tue, 6 Nov 2001 12:10:53 -0800
From: David Wise <David_Wise@phoenix.com>
Subject: RE: [R-390] Frequency Stability Mystery Solved

> the ovens on does not give you better stability under normal [snip]

I wouldn't be surprised if it were better with the t-stat at the stock temperature, but I don't want to give my VFO that kind of beating. There's a reason it's not recommended except extreme cold/hot. (Yes, they recommend running the ovens in desert conditions "because of the large difference between daytime and nighttime temperatures.")

> For the most part, crystals are stable at any temperature, so it is
> just a matter of keeping the oven constant at "some" temperature.
> You could, in other words, use a refrigerator instead of an oven.

They went so far as to pick crystals whose TC goes through zero at approximately the oven temperature, so the cycling would cause minimum shift. They did something similar with the VFO. The Final Engineering Report has a VFO frequency-vs-temp graph (Figure 68)
which shows that their intent was for it to be on-freq at 25C and 70C.

> To the degree that the oven temperature differs from that of.....

I believe that. When the Final Engineering Report started talking about damping in the context of temperature vs time, I knew I was in over my head :-|

> a.....put an ajustable resistance ACROSS the thermostat.....

If I hadn't buttoned up the VFO (and what a nitpicky process that turned out to be!), I'd do that. As it is, if it bugs me enough I'll put in a time-delay relay to run the ovens 15 minutes and then off. All I want is a quick warmup. Overshoot is a known issue. According to the F.E.R., the Signal Corps wanted a 15-minute warmup. Collins tried and tried but the best they could do was a 30-minute warmup, with, get this, the biggest error at exactly 15 minutes.

Date: Fri, 23 Nov 2001 16:07:07 -0500
From: Mike Sullivan <michaels@kc2kj.k2nesoft.com>
Subject: [R-390] r390a agc problem finally fixed

This is a followup on the r390a I bought at Shelby hamfest that had an AGC problem. I finally fixed the beast. After replacing every capicitor in the AGC chain including capacitors in the RF deck, fixing two burned out resistors and still not getting proper AGC action I got serious and found low resistance in the AGC line. Seperated RF deck from IF deck and traced low resistance to IF deck. Traced problem to a poor solder joint (with solder splash) shorting signal return of mechanical filter to ground.

Interestingly, the filters all appeared to work, but the short prevented AGC voltage from being applied to second IF amplifier.

I suspect that problem appeared in receiver after replacing the mechanical filter and that receiver was placed "on the shelf" for further repair later. Problem was tough to find (for me), given the poor quality of soldering, might have been beyond repair capabilities of tech, but who knows.

At least this fine old receiver is now hearing signals properly!

Date: Mon, 26 Nov 2001 14:09:52 -0800
From: "Roger L Ruszkowski" <rlruszkowski@west.raytheon.com>
Subject: [R-390] 390A AGC Circuit Problems.

I have a similar problem (maybe exact same problem) with my AGC. Expecting more caps need replacing I have been avoiding the problem. Great Ideas on where to start on this circuit. Years on the bench and I am still amazed at what I do not know about these receivers.

Date: Wed, 5 Dec 2001 09:57:23 -0800
From: David Wise <David_Wise@phoenix.com>
Subject: RE: [R-390] Nice package for sale

> The radio was restored by me and has been running fine
> for the last year, except the BFO coil recently got a little
> squirrely. I have a replacement and can fix if needed, or.....

I just fixed a BFO problem. After a couple hours of warmup, mine would suddenly jump a couple hundred hertz. Then it would stay there. Turned out to be slight oxidation on the mounting screws for the stud-mount cap and choke inside the can. This is an easy R & R, with only one caveat: DO pull the shaft out of the chassis before trying to remove the bellows coupler.

Date: Wed, 5 Dec 2001 11:32:02 -0800
From: David Wise <David_Wise@phoenix.com>
Subject: RE: [R-390] Re: Baluns

> using before. Several strong stations now pin the carrier
> meter, and the receiver is obviously overloaded. Spurious signals are now

No kidding! With a very strong signal, there's enough AGC to cut off the AGC time-constant tube V506A. At that point, there's enough current to put the meter just at full scale (or maybe a little above). The only time you'll get higher is when the 4th IF V504 is drawing grid current. (This is what makes the meter deflect in MGC mode.)

Date: Mon, 10 Dec 2001 09:16:36 +0200
From: "Bryce Ringwood" <BRingwoo@csir.co.za>
Subject: RE: Meter Cal (was RE: [R-390] Re: Baluns) - Dumb Question

Is there a relationship to 'S' units ? I have an idea in the back of my mind (what's left of it) that 100uV = S9 or something like that.

Date: Mon, 10 Dec 2001 07:48:23 -0500
From: Bob Camp <bob@cq.nu>
Subject: Re: Meter Cal (was RE: [R-390] Re: Baluns) - Dumb Question

One part of the calibration procedure on the R-390 is to set the IF gain pot. When you do this you set up a relationship between the S meter and the input to the radio on a specific band. It also sets up a relationship to the voltage on the diode load test point. Unfortunately there is no standard point for S9 in general. Some radios have 100uv as S9 others have 100uv as 20 db over S9. That makes signal reports a bit of a mess .... These days the standard way to set up the IF is for best sensitivity (noise figure). That will give you a different S meter reading than the old approach. In general we set the IF's up to be have less gain than the old way. The net result would be that if 100uv = S9 per the old way then maybe 250uv = S9 when you do it the new way.

Date: Tue, 11 Dec 2001 13:19:54 -0800
From: "Roger L Ruszkowski" <rlruszkowski@west.raytheon.com>
Subject: Re: [R-390] Ye Olde How to.

>One thing I have pondered is how to operate the IF strip outside the receiver > (where I can poke around with a 'scope while it is operational.

- ----------

You can pull the IF deck free of the chassis and get it out. Turn the receiver up on end with the IF deck End down on the bench. Lay the IF deck on its side alongside the receiver. You then plug the IF deck cables back in and operate the receiver. You can probe into the IF deck as needed. This also works for the Audio deck if you need to go into there. You can turn the receiver up on the other end and do the RF deck. However we have some aversion to pulling the RF deck.

Date: Sat, 15 Dec 2001 08:28:15 +0100
From: "Claudio Spiritelli" <oldradio@tin.it>
Subject: [R-390] ACG problem

This is my first post on this list. I just finish to rework my 390A and I was very happy with the result. Perfect reception on AM on all bands, and very good sensitivity. SSB was not perfect therefore I decided to make the Lankford modification. Results on SSB were great, but whenI went back to AM , I had a surprise. With maximum RF gain, on a strong signal, the ACG is not working properly (I am assuming) and I am having a lot of distortion that goes away as soon as I diminish the RF gain.

I could reverse the modification to see if the cause was that one or if something else did happen while I was working on the unit. I decided to ask to this audience in order to have more inputs on the possible cause and how it can be resolved without taking the modification out (it works great on SSB).

The modification is usual , with the 2 diodes and 47 pF in parallel to C535. I did not use 1N4148, but some other unknow diodes.

Date: Sat, 15 Dec 2001 07:39:51 -0500
From: "Dan Martin" <dmartin@visuallink.com>
Subject: Re: [R-390] ACG problem

Regarding a quick evaluation of the 390A AGC circuitry, you can check the resistance to ground of two pins, one on the r.f. deck and one on the i.f. deck. Male pin 6 on J512 on the i.f. deck is the AGC line throughout the i.f. deck. It should read "open", or infinite to ground. Any less than this and you may have leaky AGC bypass caps. Similarly, check pin E (J208E) on the r.f. deck. This is the AGC line running throughout the r.f deck. All of the manuals I've seen (Y2K and Dec. '61 TM) will spec this r.f. deck AGC pin at infinite, just like the i.f. pin. However, on the r.f. deck AGC line there is a high value 1.5 megohm resistor (R234) paralleled to ground with C226, one of many .005 uF bypasses, near the 6DC6 at the end of the AGC line. As a result, I think 1.7-1.8 megohms, or so, is a typical figure for J208E and the 'infinite' may be a typo. At least a couple of us on the 390 reflector have noted this. Others, make comment, please, if you have a point of view.

Finally, when making very high value resistance readings such as AGC line checks, be aware that some modern DMM's (like my Fluke) may "give up" and indicate infinite whereas a decent analog meter, such as an HP-410C, may go on to settle at a very high but still measurable value of many megohms.

Date: Sat, 15 Dec 2001 11:55:43 -0800 (PST)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] ACG problem

So far, Claudio, you're right on the money! The distortion is on the SSB as well when listening to a strong station. I sometimes have to reduce the RF gain to about 7 to tune them in. I don't know of a fix to the problem, I just live with it. Its really only a problem when listening to a weak station talking with someone on a much stronger station, then I have to "ride" the RF GAIN.

Date: Sat, 15 Dec 2001 20:43:20 -0500
From: "John KA1XC" <tetrode@worldnet.att.net>
Subject: Re: [R-390] ACG problem

If the distortion you hear is severe, I'm thinking that those unknown diodes you put in might be the source of your problem. That IF AGC amp can generate a lot of voltage swing, perhaps the diodes are breaking down under large signals. This will cause loss of AGC control which will further increase the IF AGC voltage and so on. Take a look at the AGC and diode load voltages at the rear terminal blocks when the problem occurs. If the AGC becomes less negative and/or diode load becomes more negative it means your losing AGC control, detector overload quickly follows.

Date: Sat, 15 Dec 2001 22:21:03 -0500
From: James Miller <JamesMiller20@worldnet.att.net>
Subject: Re: [R-390] ACG problem

Try removing the diodes temporarily to see if the problem goes away. There may

also be a bad capacitor somewhere on the AGC line. Additionally, if someone lubricated the gear on the antenna trim shaft, the oil could be creating a path to ground. The antenna trim shaft is actually insulated because the trimmer capacitor, inside the aluminum can, is actually tied to the AGC line at the RF amplifier. Oil contamination can cause poor AGC response.

Date: Sun, 16 Dec 2001 00:17:44 -0800
From: "Bill Smith" <billsmith@ispwest.com>
Subject: Re: [R-390] Odd AVC effect or?

> I agree it does not sound like a tube problem.(therefore all tubes are now very suspect) <snips>

Yep. That's what it seems to be, all right. I have three 6082 regulators, all of which are not very good. One tests with what seems to be extremely high GM, another has what might be good GM, but the needle on the tube tester falls off quickly, and the tube fails the life test on a Hickok 752A. The third tube is just a roasted toaster, no emission left. I had monitored the B+ through the test plug on the side of the reciever. Voltage was stable, but low, then suddenly move in a ramp up to 190 volts, then would drop to 130 volts, or so, then slowly build again to 190. Think there is a grid problem in the 6082 with high emission. I replaced the tube with the high GM and now the voltage is stable at 175 volts. It takes a while to get there, so likely both tubes now in the set should be replaced.

> Sure it quits oscillating after it heats up,
> But is the receiver operating at its best?
> I just suspect the receiver would be better off
> if you tracked the part down and replaced it.

Still working on suspect capacitors. 2 down, and counting. I was looking at E208 again, and all seems fine, except on band 3, where the bias goes quite a bit more negative than on other bands. Is this normal? I noticed that special switching occurs on that band. Haven't fully explored the circuit yet, or measured V203's (6C4) cathode voltage or current via P221.

Date: Mon, 17 Dec 2001 14:56:02 -0800
From: David Wise <David_Wise@phoenix.com>
Subject: RE: [R-390] Odd AVC effect or?

Either that 6082 has grid emission, or the tube controlling is has trouble. You're right on top of it now. Does it pass your tube tester's Gas test? Let the tube warm up for 5 minutes or so before trying it. Here's one scenario: At 130V, the 6082 has way more V across it than usual so power dissipation is up. The grid gets hot enough to emit, which drives it positive. When it's up there, V across the tube is down, it cools off, and the grid stops emitting. Now the cathode is tired and V falls back below normal. Rinse, lather, repeat. As Roger said, a [thermal] relaxation oscillator.

Date: Wed, 19 Dec 2001 09:38:29 -0500
From: "Steve Hobensack" <stevehobensack@hotmail.com>
Subject: [R-390] bfo ripple

I wonder if anyone has had this problem and know of a fix. When I first turn on my r-390a (1963 imperial) and its cold, there is a slight ripple on all cw and ssb signals. It is very weak. I have checked the decoupling cap in the bfo circuit, checked the ac filament line which includes the rectifiers, 3tf7, vfo 6ba6, bfo 6ba6, checked and replaced tubes in that line (thought it was a k to f short). After about a 3 hour warm-up, the problem goes away. Any ideas? Thanks.....Steve KJ8L

Date: Wed, 19 Dec 2001 11:28:15 -0500
From: "AI2Q Alex" <ai2q@adelphia.net>
Subject: RE: [R-390] bfo ripple

Have you checked the electrolytic filter caps? It sounds like you have excessive power supply hum. Is the ripple 60 cycles or 120 cycles? if you can discern which, that will tell you whether it's a power supply problem, or leakage, etc. The 120 Hz hum indicates a p/s problem, due to the full-wave rectification, but possible poor filtering. By the way, recently I had a bad 60-Hz hum problem on a 51J-4 that I was restoring. After 30 minutes it would start up, and get progressively worse over time. I used an old Heathkit signal tracer to locate it. When I got to the last IF stage, the tracer's probe was quiet when placed to ground, but hummed when placed on a grounded terminal strip lug nearby. Huh? Tightening the lug's mounting screw with a SpinTite wrench eliminated the hum---it was loose!

Date: Thu, 20 Dec 2001 08:43:32 +0100
From: "Claudio Spiritelli" <oldradio@tin.it>
Subject: FW: [R-390] ACG problem

Thanks for the help on the ACG problem. I did resolve completly the problem by using a good pair of new 1N4148 diodes and a 30 pf capacitor. After I adjusted the neutralitation, the receiver is doing a great job on SSB as well on AM even with big signals (ACG voltage up to -6-7 volts). I have an R-9000 Icom receiver, but beleive me, I do enjoy more to R-390A , it's a different feeling , tone, and everythink. I may have to ask some more help in the future. I had to recalibrate a couple RF transformer (Z202- Z204) twice at a distance of few days, I am
not sure yet if it is becouse I did reassemble the unit and they were out of position or if there is other reasons. I still need to investigate and also to see if it will happen again.

Date: Fri, 21 Dec 2001 08:31:06 -0500
From: "Steve Hobensack" <stevehobensack@hotmail.com>
Subject: [R-390] Z-503 can

Did you see the z-503 can that went on Epay for $44.62? Item nr 1308649212.

Date: Fri, 21 Dec 2001 08:59:14 EST
From: Llgpt@aol.com
Subject: Re: [R-390] Z-503 can

P.T. Barnum said it best..... It is a higher than normal failure item, but they can be repaired, it's almost always a broken wire caused by the plastic piece turning inside.

Date: Fri, 21 Dec 2001 09:35:29 EST
From: Llgpt@aol.com
Subject: Re: [R-390] Z-503 can

If the problem is fixed, the price is irrelevant IMHO.

Date: Fri, 21 Dec 2001 09:33:43 -0500
From: "rbethman" <rbethman@home.com>
Subject: Re: [R-390] Z-503 can

Being the one whom won the bid, I can tell you it isn't a broken wire. The slugs are cracked, and other such things in this Collins s/n 35 IF deck that I'm trying to resurrect. Sometimes the supposedly ridiculous price has good reason.

Date: Fri, 21 Dec 2001 09:48:00 -0500
From: James Miller <JamesMiller20@worldnet.att.net>
Subject: Re: [R-390] Z-503 can

As one having two 390a's on the bench, one working perfectly, one a basket case, and another on the way (with its Collins case), I enjoy being one of Barnum's subjects. Yes an average of $700 a pop. It ain't the money, it's the fun! How many of us own boats? Not me, that's like pouring money down a rat hole. How many of us blink an eye as we drive our new Lincoln's off the lot at a immediate 15% depreciation? How many of us pay income taxes? And what about those golf $1000 golf clubs? Don't forget booze and cigarettes. Yep indeed, there are a lot of us born every minute! Now I'm driving over to the Fla west coast to pick up my latest. Happy holidays everyone!

Date: Fri, 21 Dec 2001 10:02:33 -0500
From: "rbethman" <rbethman@home.com>
Subject: Re: [R-390] Z-503 can - The rest of the story

The Z503 can at the "ridiculous" price is also an NOS can. It is a spare that never got used. I managed to get a Z501 can innards for postage. I guess you could say it all evens out I've bit off a healthy hunk of restoration. I've got my hands on a Collins R-390A s/n 232. It sure has seen a lot of service, but with the exception of one 26Z5W, it is ALL there - even the ballast tube! I've never seen one before this. The only non Collins component is the PTO which got changed somewhere during maintenance with a Cosmos. I have an individual that is willing to trade across the board a Collins PTO for the Cosmos PTO.

The front panel shows the use it got. There is an arc of wear around the Kc knob that has worn through the gray, the primer, and is down to bare aluminum. The arc around the Mc knob is only into the primer. There looks to be two cans in the RF deck that have been replaced over time. It has only one fuse, and is marked with "Mod 1" on all modules except the PTO. It has sat in DRY storage for sometime, with no or VERY little corrosion.

Yep! Another E-Pay item. Paid less than a Fair Radio unchecked one. (Shipping is

another matter) The meters are the original Simpson's. I can tell you that the lower part of the bezel being bent in is NOT an operator's idle hands. The VU meter lower part of the bezel is bent in, but it is too straight and true to be anything but machine stamped.

Date: Fri, 21 Dec 2001 19:36:49 -0500
From: "John KA1XC" <tetrode@worldnet.att.net>
Subject: Re: [R-390] Z-503 can

Mike, give Fair a call/email, they can often get parts from junked modules. I bought a used Z-503 for $12 a couple years ago from them and it got the radio going again.

From: "Steve Goode" <goode@tribeam.com>
Date: Wed, 2 Jan 2002 10:42:22 -0600
Subject: [R-390] AGC operation question

This Christmas vacation was a good one for my R-390A and me. I finally got the rig back together after recapping, cleaning and fixing a PTO problem. It is working very well now. I have a question about the normal operation of the AGC switch. In this radio, if I start at the slow AGC position and switch to the medium position, the radio is muted for about two seconds and then slowly comes back to the proper level. Switching between the slow and fast positions does not exhibit this muting. Is the muting normal in switching between slow and medium?

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] AGC operation question
Date: Wed, 2 Jan 2002 10:52:30 -0600

If I'm not mistaken, this is proper operation and I think it's mentioned in the manual. Mine does the same thing.

From: "Michael P. Olbrisch" <kd9kc@elp.rr.com>
Subject: RE: [R-390] AGC operation question
Date: Wed, 2 Jan 2002 16:59:22 -0000

Mine does this too. Never gave it any thought, but since it don't arc or smoke when it does it, I guess it is OK.

From: Llgpt@aol.com
Date: Wed, 2 Jan 2002 12:25:21 EST
Subject: Re: [R-390] AGC operation question

Perfectly normal, often referred to as the moment of silence. Les

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Subject: Re: [R-390] 6080 in place of 6802 - RMS ???
From: "Roger L Ruszkowski" <rlruszkowski@west.raytheon.com>
Date: Wed, 9 Jan 2002 11:38:32 -0800

<snip>.....I am using 12BY7 myself for the 3TF7. I did have a jumper in the socket and used 2 12BA6's for the BFO and PTO. But a diode poked into that socket would

much simpler to install. I do like the 6BA6 5749 tubes better than 2 12BA6's. When I when through my last noise reduction drill over Christmas, I found I had no way to judge the noise of the 12BA6's in the PTO and BFO circuits. By using the 6BA6's, I was able to select 2 very quiet 6BA6 tubes and use one in the PTO and one in the BFO. Selecting 6BA6's in the first IF tube socket for best noise is more sensitive than using the BFO or PTO socket.

From: "Chuck Rippel" <R390A@R390A.com>
Date: Thu, 10 Jan 2002 12:26:09 -0400
Subject: Re: [R-390] SP600JX17 - drift

All very true and good points Barry. A good bit of the drift problem may be caused by the chassis expanding with heat. The SP-600 chassis is not the most robust on on the block and not near as immune to flexing as say, the R390/or the "A" variant.

The regulator I install keeps the filament voltage dead on and even compensates for resistance changes in the actual tube filaments to maintain the same current flow value. The radios still drift. I would suspect they would drift if you regulated every voltage applied as the problem does not appear to be electrical in cause.

The radio still drifts. Les Locklear pointed out in a conversation we had last night that you can pass your hand over the VFO tube on top and if the BFO is on and a station tuned it, the receiver will "pull" just a tad.

I accept the drifting as a part of the personality of the SP-600 family of receivers. BTW having the special tube shield on the VFO oscillator tube that anchors to the main chassis has little effect on drift. That the original is there or its been replaced with an IERC makes little difference.

Date: Thu, 17 Jan 2002 08:28:08 -0800 (PST)
From: <jlap1939@yahoo.com>
Subject: [R-390] SSB and the 390

Since no one has fought this it seems for some time:

At the risk of ridicule, I am going to give an effective method of BFO setting to "0" by using your ears, And also remind that the correct method always works, provided that alignment is very good on the unit in question. I do this in response to a few inquires I have had and because many still believe people like me, who listen to obscure SSB transmissions are confused at best..If you haven't gotten into it, you should try it..With this method you can find very weak /obscure stations...

May I remind you that after you (in my case), obtain a properly aligned unit, (including many others in addition to the 390 series,) or else have aligned your own unit, including neutralization..that you may want to check VERY CLOSELY for "0" on the BFO. This is to allow accurate frequency setting and readout, that can well surpass your ability to visually resolve the VR counter.

First the correct method..::(Isn't it?)

Find total quiet place, then also disc. ant.
Set bandwidth at 0.1.
Leave BFO OFF, Turn to Cal. on function.
At any 100 kc point, tune to FIND the point that produces an increase on the carrier meter. (it may be very tiny, so watch carefully. You may want to "rock" back and forth).
Now set bandwdth at 2 or 4 or even more on some.
Turn on BFO
Zero-beat the sig. (re-check)
Set knob at "0".(either internally or by the knob)

Hope I did this right...

However, a Sig Corps Sgt. named Stone, (yes he was related to Sgt. Rock), showed me this:

"Good aligned radio...take off the BFO knob..go to dead spot, disc. ant, use cans, turn on BFO..LISTEN! Turn BFO shaft..(if you can't, you're a -----,) and tune to lowest sound generated by the BFO, by "rocking". Do several times. You will be more accurate than with any other procedure. replace knob at "0"". (this is the way I wrote it down 40 yrs ago.)

I do this, and know that it is best for me. I can tune to a freq. where I know that activity will be encountered, that is exact, w/PLO unit, and then tune my 390 (of course + or - for each sideband, after CAL. at the nearest 100), and I am more accurate, based on the voice freq. produced, than with the cal. set system. It works on my SP-600 well also, but is not as accurate. In other words, I can go to a given freq., and when the traffic starts, I will be tuned "perfect". I start about + or - one and one half on the 390 non a.

To really bore you, I give the reasoning:

Visual resolution nowhere near equals audible. (See many sights on web.) If you watch the meter, you will never get optimum, as your vision is not that sharp. By using the natural sound of the BFO while not encountering a signal, you can find its LOWEST sig. point. (Many persons can detect a change of as little as 3 cents, and most at 4 or 5 cents. There are 100 cents in a semitone, (which is for example, C to C# on the music scale.) I suggest that this is a figure that will be off in freq. by a very small figure. Of course it would depend upon how accurate YOU could actually be, and a "tonally challenged" person might not do very well...so don't hold me too much at blame if it doesn't work.. It might be worth a reminder that good SSB, WITH OR WITHOUT a converter, is something you need to LISTEN for, and take the time to learn. You will have to find a result that gives the correct sound for the voice, so it is the same as if that person was standing right beside you. In addition, because you are encountering many diff. levels of strength with set internal generator, you must keep the RF gain reduced... Those who don't agree, please forgive the foregoing.

Date: Thu, 24 Jan 2002 08:49:09 -0800 (PST)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] What is the Crystal in the 51J filter ?

> I am restoring a 51J the crystal filter section is missing, so I am
>rebuilding it, I can make up a switch, and even a differential capacitor. So, what is special >(if anything) about the 500KHz crystal.

I don't know what crystal was used in the 51J xtal filter, but the usual 455 kHz xtal filter xtal was a small black plastic case with solder lug terminals coming off both sides, for lower shunt capacity across the filter than the FT-243 or other holders of that period. I would expect an HC-6 holder xtal would work well, the version with long wire leads even better. Bend the leads at right angles as soon as they leave the case for lower stray C. Wire up the xtal filter with heavy stiff wire, running straight from point A to point B, rather than looped in a circular path for stability. At the same time, the circuit should be arranged to have as little stray C as possible.

From: "Jim Temple" <jetemp01@athena.louisville.edu>
Date: Fri, 25 Jan 2002 13:35:29 -0500
Subject: [R-390] Stuck slugs

In aligning the fixed IF in my "massacre" rig, I have found that the bottom slugs in the T501 and 502 coils are stuck. Any advice as to how to unstick them without breaking them? I have considered a hex wrench that fits the slug to overcome the whimpy plastic wands I have.

Subject: Re: [R-390] Stuck slugs
From: "Roger L Ruszkowski" <rlruszkowski@west.raytheon.com>
Date: Fri, 25 Jan 2002 12:58:42 -0800

<snip> Pull the can tops off the transformers.
Dial the top slug all the way out of the transformer so you can work on the bottom one.

A hex key is an acceptable way to work a tight slug loose. Think about it and do not over force it. The transformer slug can be adjusted from the bottom through the chassis deck.

Pull your deck up and look into the bottom to see if you get any clues.

Likely the wax has gotten hot in storage and bound the slugs. A bit more force than expected will pop them loose.

Pull the covers and the deck and look first.
No reason to get surprised

The fellows will give you a list of solvents to try.
My list or solvents from the 1970's is not OSHA or group approved.
We don't do that any more.

Date: Fri, 25 Jan 2002 16:25:00 -0500
From: Jim Brannigan <jbrannig@optonline.net>
Subject: Re: [R-390] Stuck slugs

If you can get at the slugs with a hair dryer, heat them, it might help. The last time I took a hex wrench to a slug it took me two days to completely disassemble the unit.

A week to wait for the new slug to arrive mail order (I got lucky finding one) and another two days to re-solder the leads to the coil (they broke off when the form twisted from the hex wrench torque) and reassemble the unit. Then I could finish the alignment. Just a thot

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Subject: Re: [R-390] Stuck slugs
From: "Roger L Ruszkowski" <rlruszkowski@west.raytheon.com>
Date: Fri, 25 Jan 2002 16:57:05 -0800

If you can get at the slugs with a hair dryer, heat them, it might help.

From: "Claudio Spiritelli" <oldradio@tin.it>
Date: Sun, 27 Jan 2002 10:50:02 +0100
Subject: [R-390] Popping noise problem

Hello to all, I just discover a problem with my 390A. In order to ear the problem I must do the following:

RF gain ..... completely CCW
Local AF gain.....completely CW
Limiter .....OFF

In this situation there is a "creaking" and "popping" random noise in the speaker. During normal operation is very hard to ear and only in presence of weak signal. I tried to localize the source of the noise by "sectioning" the receiver. The AF section does not produce the noise, as well as the RF section. The source appears to be on IF section. I did section more deeply and I removed the "Diode Load" jumper and the noise is still there. This make me to believe that the source is between the "Diode Load jumper" and the first AF amplifier, witch leaves only the "Limiter". Analyzing the noise with a "scope", I see the noise as a very short but high spike on the "signal line" in the "limiter" section (actually when the Diode load jumper is in place, the noise propagate backward to the detector as well). On the B+ line , I see low frequency variation (with the scope at is maximum sensibility of 1mV/div) witch I think is the "filtering" trying to bypass the spikes, so I am assuming that the noise is not coming from there. When I turn the limiter on, the noise disappear on the audio as well as I do not see it with the scope and the B+ line does not have any low frequency variation. That made me to believe that the capacitor C536 was the cause. Wrong.

There are not to many other components in that section that can cause such a noise and after I replaced the tube (5814A), I did run out of options. One more piece of information, it appears that the noise goes away after the receiver is on for more the 1 hour.

Unless my analysis is wrong and the noise has different source, I need some help from the experts.

From: "AI2Q Alex" <ai2q@adelphia.net>
Subject: RE: [R-390] Popping noise problem
Date: Sun, 27 Jan 2002 09:49:36 -0500

Thanks for your posting. Recently, I had a 1958-vintage Collins KWM-1 transceiver on my bench. A block-style **mica capacitor in the set's product detector was operational, but noisy** as all get-out.

In the KWM-1 circuit, in Standby mode, audio from the set's product detector was fed into the set's AF amplifier string, along with sidetone when on CW, and I could hear that puppy crackling away like mad in the loudspeaker when I was transmitting, and of course it was "in the background" on receive, although well masked by incoming signals.

I zeroed in on it by sectionalizing, as you're doing, using a signal tracer and scope.

It was a satisfying feeling to clip it out and see all the noise go away.Finding it was relatively easy; replacing it was tricky (very tight quarters), but now all's well in KWM-1 land.

Good luck. You'll find the bad part--and then you'll be very happy!

Date: Sun, 27 Jan 2002 09:46:31 -0500
From: James Miller <JamesMiller20@worldnet.att.net>
Subject: Re: [R-390] Popping noise problem

I had the same problem with my 390a. Someone on the list suggested that the miniature coax cables were experiencing a **breakdown of the center insulation** due to aging. After some experimentation, I discovered that was indeed the problem. After replacing the coax cables from the IF module to the diode load connector, and from there to the Limiter control, my problem was fixed. Apparently the little coax cables begin to break down with age. Unfortunately this can be a tedious job! Jim

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From: "Walter Wilson" <wewilson@knology.net>
Subject: Re: [R-390] Popping noise problem
Date: Sun, 27 Jan 2002 13:43:08 -0500

That was indeed my problem on one R-390A. I replaced the coax between the Diode Load and the Limiter pot/switch, and the problem disappeared. To confirm this before you break into the wiring harness, you'll have to disconnect the existing coax at BOTH ends, and patch in a substitute piece of coax.

From: "Claudio Spiritelli" <oldradio@tin.it>
Subject: RE: [R-390] Popping noise problem
Date: Sun, 27 Jan 2002 23:52:00 +0100

Yes I did change the capacitor as well as I did change all the capacitors around the limiter (C549,C532,C536,C531) the only one I did not change yet is C537. I am convinced that the noise is generated on this section , as a matter of fact even

without C531 and C549 (section completely isolated) the noise persist since I can see it on the plate (pin1) of V507 with the scope, this test should also eliminate the suggestion from James (coax cables to the Diode Load). I am afraid that the problem is on the socket of V507. Is this possible? Or should a pay attention to the resistors as well? or am I overlooking something?

Date: Sun, 27 Jan 2002 23:29:20 -0500
From: James Miller <JamesMiller20@worldnet.att.net>
Subject: Re: [R-390] Popping noise problem

My posts don't seem to be making it through, so I will try again:

> A follow up...
> On my 390a if I recall correctly the popping would NOT occur as much
> when the RF gain was cranked down. It seemed to occur more when the RF
> gain was at maximum and there was a strong signal, which meant the diode
> load voltage was at it's highest magnitude...hence the coax insulation
> would tend to break down (causing a pop) when the RF gain was full up
> and a strong signal (AM or carrier) was present. Claudio mentioned that
> he hears it when the RF gain is turned down (full CCW)...so maybe
> (hopefully) his problem is not coax related. Just a thought.
>
> Someone emailed me asking for me to discuss the procedure I used... So
> here it is...If it has been determined to be the coax that is bad, you
> can either attempt to thread new ones through the wiring harness or
> leave the bad coax as is in the harness and route the replacements
> separately, perhaps using tie wraps to secure them to the outside of the
> harness. I chose to remove the old coax and thread replacements through
> the harness. Believe it or not, I succeeded in doing this while leaving
> the lacing reasonably intact. The replacement coax should be the very
> small stiff variety with smooth plastic cover (RG-174 I believe). The
> stiffness and smooth casing helps in threading it through the harness.
> I used the old coax as a "puller." Cut the old coax from the diode load
> terminals, and solder its braid to the braid of the replacement. Keep
> the junction as compact and smooth as possible so that it will pass
> through the harness easily. And you may need to use a lot of silicone
> spray to lubricate the harness and the replacement coax as you thread it
> through. You will need to loosen or temporarily remove any cable
> clamps, and some, but not all of the lacing and insulating sleeves may
> need to be removed to facilitate movement. Needle nose pliers, good
> eyesight and a lot of patience pushing and pulling are also needed.
> Alternatively you can remove all lacing, replace the offending coax, and
> then relace the harness with new lacing or tie wraps. After getting the
> new coaxes into the harness and the ends positioned where they need to
> be, you will need to make the connections. This is easy at the diode
> load terminal points and the limiter switch at the front panel. But
> there are connections at the IF module connector that must be done
> also. You will need to remove the cover from the IF module connector
> and replace the connections there. In my case, I chose to replace all
> coaxes related to the IF module connection to the diode load terminals

> and from there to the front panel switch. My receiver also had the
> diode load test point on the front panel so this had to be accommodated
> as well. All in all, about a 2 day job, 2 hours per day for me. Just
> be sure it's not a bad capacitor etc. first, to avoid this cable repair
> if you can.

Date: Mon, 28 Jan 2002 07:27:44 -0500
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] Popping noise problem

Well, that reminds me ... of someone on the list who's always reminding us to check the nuts 'n bolts on the chassis and modules -- particularly the ones on the tube sockets. Apparently the lightest corrosion between these screws and the modules can cause breaks, high resistance connections or intermittents in grounds. This might be related to the problem disappearing after the rig warms up fully. The fix involves going over all the tube socket mounting screws with a screwdriver -- loosening and tightening.

To that I'd add checking under the hoods of the multiconductor connectors, particularly the large rectangular ones on the audio and IF decks.. The cables stiffen up with age, the strain reliefs are not fully effective, and when you go to unplug them, leads and shield braids can snap or crack. As I've mentioned probably a half dozen times already -- I had a non-A where the main tie point ground inside the large AF deck plug cover was broken -- just a buss wire wrapped around all 12/13 braids goint to a single terminal (13, I think ;-) The cable going to that plug tends to droop down below the chassis and get jostled when you move it around.

Look for stuff like that. You might have to dumb down to find this bug.

From: "Jim Temple" <jetemp01@athena.louisville.edu>
To: <r-390@mailman.qth.net>
Subject: Re: [R-390] Popping noise problem
Date: Mon, 28 Jan 2002 09:14:27 -0500

Adding to Barry's list, be sure to carefully check the ground that is anchored by T207 under the RF deck. When I cleaned and tightned mine, the rig "sprang" to life. This is one that is not anchored by a tube socket screw and has several caps and resistors attached.

Date: Fri, 01 Mar 2002 14:46:12 -0500
From: Al Solway <beral@videotron.ca>
Subject: [R-390] IF Subchassis Resistor Value R-390

Need help with a resistor value. The installed resistor, R554, is 470 Ohm, 1 watt. It measures 800+ Ohms so it needs replacing. My problem is that the schematic indicates that R554 is 2200 Ohms. What is the correct value? This is the original resistor, no signs of desoldering in the entire IF Chassis except for the BFO module.

Radio Info.
  R-390 Collins IF Chassis. Collins

Serial No. 2113 Serial No. 2571
Contract No. 14214-PH-51-93

From: "Walter Wilson" <wewilson@knology.net>
Subject: Re: [R-390] IF Subchassis Resistor Value R-390
Date: Fri, 1 Mar 2002 20:53:14 -0500

The following was stated in Hollow State News #36, page 5 [Metz]:

"R554 coming off Z503 is schematically 2.2K. In four IF decks, the installed value was 470 ohms (and looked original). I temporarily removed this resistor and used a substitution box to experiment. It seemed that the 470 sounded much better than the 2.2K or any other value for that matter."

Date: Fri, 01 Mar 2002 21:14:06 -0500
From: Al Solway <beral@videotron.ca>
Subject: Re: [R-390] IF Subchassis Resistor Value R-390

Well the consensus is that the R554 should be 470 Ohms. The out of spec R544, 800+ Ohms has been replaced. I thank you all for the response. What a great bunch you all are. When I get the radio working I will let you know what, if any problems I have with the AGC.

From: "John KA1XC" <tetrode@worldnet.att.net>
Subject: Re: [R-390] IF Subchassis Resistor Value R-390
Date: Fri, 1 Mar 2002 21:56:13 -0500

I've only seen the 470 ohm 1 watt in the several 390 IF decks I've worked on, and other folks on the list have told me the same. Maybe this little piece of info could be developed into a secret password or something to identify the 390 owners from the 390A owners.

From: "Jack Antonio" <dia@dia.reno.nv.us>
To: <r-390@mailman.qth.net>
Date: Sat, 2 Mar 2002 22:26:12 -0800
Subject: [R-390] Mech filter question

I just woke up one of my R-390As after a long nap, and it appears the 2 kc filter is dead, nothing on the .1, 1 or 2 kc filter positions. Wiring appears OK. Filter worked OK last time I used the radio, looks like this was a shelf failure. Question number 1 is this: are ohmmeter checks on the mech filter input and output terminals dangerous to the filter? I checked my ohmmeter on the Rx1 scale, and into shorted leads, it puts out 50 mA, which seems like it might be too high for the mech filter. The higher ranges put out less current, which brings up question number 2:

What should the resistance of the input and output coils be? And yes, C-553 has been changed.

Subject: Re: [R-390] Mech filter question
To: r-390@mailman.qth.net

From: "Roger L Ruszkowski" <rlruszkowski@raytheon.com>
Date: Tue, 5 Mar 2002 17:18:49 -0800

Jack, Did you get some direct mail back to help you with the filter. I did not see any thing posted on the reflector. Use the Hi range (less current) and measure the ins and outs, Compare them to the 4 or 8. All should have about the same. Most filters do not just pop open. Look for a switch wafer that got oxidized. Look for a spider web with under the deck or under the cover.
Look for some crud shorting the trimmer cap.

Date: Sun, 21 Apr 2002 14:33:12 -0500
From: David Medley <davidmed@sbcglobal.net>
Subject: [R-390] [R390] FS R-390 assemblies

I have the following R-390 parts for sale. Condition as noted.
1. IF decks. Complete without tubes or shields. Not tested $120.00
2. Audio/VR decks. Complete with tubes, inc 6082s. Not tested 50.00
3. Power Supply units. Good transformer but need some rewiring 25.00
4. Sets of two large knobs. Recently powder coated. Clamps missing 50.00

Will ship CONUS at buyers expense. Dave

Date: Sun, 21 Apr 2002 16:10:02 -0700 (PDT)
From: "Tom M." <courir26@yahoo.com>
Subject: Re: [R-390] Make your own R-725 was: FS R-390 assemblies

Note to project types who wanted to roll their own R-725. Dave has the coveted R-390 IF decks.

Date: Sun, 5 May 2002 22:58:08 +0200
From: federico.baldi@virgilio.it
Subject: [R-390] =?iso-8859-1?Q?MICRODIALS=20FOR=20R=2D390A/URR?=

I'm searching informations and if is it possible photos about MICRODIALS, a sord of knobs with an digital mechanical counter inside, that I heard were applied instead of BFO knob on R-390A/URR employed by NSA. I found a box with five of this knobs. Any help very appreciated. Federico BALDI

From: "Greg Werstiuk" <greg_werstiuk@msn.com>
Subject: RE: [R-390] MICRODIALS FOR R-390A/URR
Date: Sun, 5 May 2002 15:37:38 -0700

I expect these were a "turns counting dial" as used with potentiometers for many, many years. Some models are still in production. These are sold(but not necessarily manufactured) by multi-turn potentiometer vendors such as Vishay/Spectorl, Bourns and B I Technologies (formerly Beckman Instruments). Bourns offers an embedded counter style such as you describe:

http://www.bourns.com/html/dials.html

An alternative (counter is above the knob) is the Model 15 from Vishay/Spectrol which can be found here: http://www.vishay.com/brands/spectrol/pots.html#multi_dial

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From: "Bob Tetrault" <r.tetrault@attbi.com>
Subject: RE: [R-390] MICRODIALS FOR R-390A/URR
Date: Sun, 5 May 2002 23:23:51 -0700

They were used, as I understand it, not necessarily by NSA, for RTTY reception and allowed precise settability. Others here on the list may know more about them. They were a generic type of multi-turn knob and the full range of their adjustment was not usable by the BFO. Have one and don't use it for my purposes.

From: "John Saeger" <john@whimsey.com>
Subject: Re: [R-390] capacitor analysis
Date: Sun, 2 Jun 2002 15:39:52 -0700

> Mine has had a pesky AGC problem which was very intermitent. On strong
> local stations all of a sudden I'd loose AGC action.... voltage would drop
> on the AGC buss from -9vdc to -4-6vdc and heavy distortion until the gain
> was backed off. Then it would stay like this for a while and suddenly
> return to normal.
>
> Finally tracked down the problem Friday to a bad 4 Kc filter that when it
> got heated up would short internally and screw-up the AGC line. When it
> cooled a bit it was ok.....

I haven't measured the voltage on the AGC bus, but this is almost exactly what mine is doing. I get a drop in carrier level with a lot of distortion, and a sudden return to normal. On strong local stations. But it doesn't seem to depend on which filter I have switched in. And thanks to everyone who has posted on the capacitor subject. Interesting food for thought.

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Carrier balance pot adjustment
Date: Mon, 3 Jun 2002 07:58:08 -0500

>There was a discussion a few months ago about making a few changes to
>the carrier pot adjustment to make it less critical and easier to set.
>One of the changes consisted of a resistor change and a wiring change.

Replace it with a ten-turn wire-wound pot. Works great.

From: David Wise <David_Wise@Phoenix.com>
Subject: RE: [R-390] capacitor analysis
Date: Mon, 3 Jun 2002 12:15:06 -0700

> suspect the problem is here. When the radio flakes out, the
> carrier level drops. But it doesn't happen very often. .....

Does it drop on all bandwidths, or only one? On my 1954 Motorola, the level was low on 8KC. I traced it to the mica cap tuning that mechanical filter. In my 30 years (on and off) of restoring vintage radios, this was maybe my third bad one. Micas are pretty good, but you should not trust them blindly. Those of you with newer decks with trimmers: what's the temperature coefficient? NPO, N750, something else, or unmarked? (How about the other trimmers? The manual doesn't say. It may not be important. I'll take a peek
tonight.) Mouser carries a bunch of trimmers, with various TCs. If I switch over sometime, I'd rather not figure it out by hand...

From: David Wise <David_Wise@Phoenix.com>
Subject: RE: [R-390] Carrier balance pot adjustment
Date: Mon, 3 Jun 2002 14:11:49 -0700

> There was a discussion a few months ago about making a few changes to
> the carrier pot adjustment to make it less critical and easier to set.
> One of the changes consisted of a resistor change and a wiring change.
> Can anyone provide me a copy of the messages?

The mod you're probably thinking of is mine. I posted instructions, but I couldn't find them in a recent search of the archives. I reconstitute it here, except I can't remember the wire colors.

Get the schematic in front of you. The original connection is, V504 cathode via R524 to meter, wiper, R537, and CW end. CCW end to ground. Other end of R537 to ground.

My connection is, V504 cathode via R524 to wiper. CCW end to ground. CW end to meter and R537. Other end of R537 to ground. Change R537 from 22 ohms to 15 ohms.

+ Smooth, almost linear adjustment range, with the operating point near midrange.
- Lower V504 gain (trivial, less than R524's 10% tolerance).
- More gain variation as you work R523 from end to end (trivial, *less* variation than before, when near the setpoint).
- Smaller reading on MGC overload. (Unimportant, overload is yes/no, not calibrated.)
~ Smaller full-scale reading.

(Intentional; mine read high before. To change it, tweak R537. Smaller value gives higher FS. 5.6 ohms is approximately original but puts the setpoint all the way CW. Still smooth though!) Everybody seems to to have an opinion as to how this should be fixed, and I'm no exception. My engineer's intuition says that this is the "sweet spot". It's how they should have done it. I don't know how well the R-390's carrier pot works. I expect it is fairly linear, but it might have a coarse granularity. If so, you could change it to 100-ohm carbon and apply my mod, and you'd get the same good result.

From: "John Saeger" <john@whimsey.com>
Subject: Re: [R-390] capacitor analysis

Date: Mon, 3 Jun 2002 22:00:29 -0700

> Does it drop on all bandwidths, or only one?.....

So far the symptoms are the same at 16kc, 8kc, and 4kc bandwidths. I haven't spent much time listening at 2kc bandwidth (yet). Michael Melland had suggested that it might be one of the filters themselves causing the dropout. That a short in a filter could cause a problem when listening at a different bandwidth. I was hoping to get some different symptom at some particular bandwidth if it was something like that. For example if it's the 4kc filter shorting out, I might expect the signal to drop out completely when listening at 4kc, but that hasn't happened. It's just a decrease, not a complete dropout. I still need to test the 2kc bandwidth more though. I have noticed that the 1kc and .1kc bandwidth positions don't seem to do much in the way of narrowing the bandwidth, the signal level just decreases when I select one of these positions. Maybe this is another reason to worry about C501. I don't know. I don't really understand how this circuit works. The book says that C501 is a coupling cap when using 2, 4, 8, or 16kc bandwidths, but it's something different when using .1 or 1kc. Maybe its part of some kind of resonant circuit. Maybe it's gone out of tune.

From: David Wise <David_Wise@Phoenix.com>
Subject: RE: [R-390] capacitor analysis
Date: Tue, 4 Jun 2002 14:45:23 -0700

> So far the symptoms are the same at 16kc, 8kc, and 4kc bandwidths. …

The problem's not the filters, then.

> ....it might be one of the filters themselves causing the dropout. .....

Unused filters are out of circuit, unless the bandwidth switch is messed up. See the Y2K manual, page 5-48. By the way, there's a typo on that page that could confuse your understanding of C501's role. There's a dot missing. The bottom end of C501 (which goes into Z501) also goes to V501 pin 1. In 2/4/8/16, C501 acts as a short around Y501, completely overshadowing Z501 and C520. At 1KC bandwidth, it is out of circuit. At 0.1KC, it effectively bridges R503 across R502, reducing the Q-spoiling resistance in series with C503. (C503 in series with R502 or R502|||R503 is in parallel with C524 and tunes L503.) This part of the IF deck is shown correctly on page 3-13.

> I have noticed that the 1kc and .1kc bandwidth positions don't seem to do much in the way of >narrowing the bandwidth, the signal level just decreases when I select one of these positions.

If you apply 1KC or 0.1KC bandwidth to an ordinary AM signal, the sidebands will be almost completely eliminated. The treble and midrange are gone, leaving only bass, which the R-390A's internal audio amps are very short on, so if you're listening through them, you won't hear much. If you put a hi-fi audio amp on the Diode Load output, you'll hear the bass part of the program at the same volume as before. For 1KC and 0.1KC, use CW or an unmodulated carrier and go by the carrier meter reading. I seem to remember someone on this list finding that his L503 was open. It

seems to me that that would degrade 1KC/0.1KC performance. I can't remember when I last saw a bad ceramic cap.

From: David Wise <David_Wise@Phoenix.com>
Subject: RE: [R-390] capacitor analysis
Date: Tue, 4 Jun 2002 16:10:48 -0700

> > Unused filters are out of circuit, unless the bandwidth switch is messed up.....
> Now I'm really confused. My radio is being repaired/refurbed.....

Well, you're not the only one. My bad. Unused filters are not in the *signal* path, but they are still on the AGC line. Your diagnosis has not been disproven. If you aren't up to paying for a replacement filter, you might be able to rewire the bad one in a shunt-fed arrangement on the secondary, where a blocking cap prevents it from grounding the AGC line, and you add a resistor for grid return. The resistor could be oh I don't know maybe 100k. You'd still get noises as the
filter went through its intermittent shorting regime, but the AGC would stay ok. To check your diagnosis, I'd disconnect the filter secondary return bus from AGC and ground it. This removes AGC from the 2nd IF, so you might want to back off the RF gain during the test. If the problem goes away, you've confirmed it's a filter. Then it's a simple process of elimination.

From: "Michael Melland" <w9wis@charter.net>
Subject: Re: [R-390] AGC problems
Date: Wed, 17 Jul 2002 15:19:33 -0400

Your problem sounds very much like the one that plagued my R-390A. The cause of my problem was eventually found to be an intermitant short in the 4 Kc filter. My 390A would start out with good audio and agc but when it warmed up the audio would distort until I turned down the rf gain... obviously no agc action was present. I also found the agc voltage to swing way low when this occurred. Sometimes after some minutes audio would improve and agc would return to normal. It was discovered that when the filter heated up as the radio was on it's internal components would expand/ contract and short to the case of the filter grounding the agc voltage. Since all the filteres are, I believe in this circuit, it could be any filter that is bad. The usual suspect seems to be the 4 Kc filter as I'm told it was generally the most fatigued due to use.

Date: Wed, 17 Jul 2002 15:20:03 -0400
Subject: Re: [R-390] AGC problems
From: Thomas W Leiper <twleiper@juno.com>

You're right. You've got a leaky cap(s) somewhere on the AGC line. If you so much as show a picture of a ten meg resistor to that line it will bury it's head in the ground. You also may be missing the jumpers on the back panel or, least likely, your AGC amp is weak. Finally, there is always the chance that the radio simply doesn't like you, and would work perfectly for somebody else, like Barry the Beggar.

Date: Fri, 09 Aug 2002 09:55:05 -0400
From: rbethman@comcast.net
Subject: [R-390] IF deck question

I have an older R-390A, a 1952 Collins contract, S/N 252. The IF deck is S/N 35. It was only brought up to "MOD 1". It has no variable capacitors to tweak the filters into line.

1) Should I leave it that way and just take my chances with the filter alignment?
2) Or should I try and scare up eight of the buggers and modify it so that I can bring them right in on the money?
3) If the latter, does anyone have a source of these critters?

I'm ready to start bringing it back to life, and want to lay out the course of events. (Now if I can only find L501 that I scrounged to replace the one with the broken slug.... Where oh where did I put that thing.....)

Subject: RE: [R-390] IF deck question
Date: Fri, 9 Aug 2002 11:05:34 -0700
From: "David Wise" <David_Wise@Phoenix.com>

If I saw reasonable gain out of the deck, I wouldn't bother. Unless you're a stickler for historical authenticity (in that case, you wouldn't put them in in the first place), you can use any trimmer that covers the range and fits in the available space. It won't be just a trimmer; the capacitance needed is too large. Instead, it will be a fixed cap paralleled by a trimmer. I don't remember the values, but they're in the manual. The manual doesn't say what the trimmer TC is; probably NPO. I would probably compare an NPO to an N750 and pick the one that stayed on the best. Mouser sells a variety of trimmers in various TCs. I used a couple to redo my PTO's compensation; one NPO, one N1500, and turn one up and the other down until the drift was minimized. By the way, changing the total capacitance modifies the gross linearity, bowing the curve up or down in the middle. Some of you might be able to avoid a linearity adjustment with that trick.

Date: Fri, 09 Aug 2002 14:15:47 -0500
To: "Dallas Lankford" <dallas@bayou.com>
From: Death to Spammers <cv591a@bellsouth.net>
Subject: [R-390] St.J radios...long long long msg

>I wouldn't buy an R-390A from Fair Radio or anybody else unless I was certain it did not come from the government auction at St. Julian's Creek Annex, VA.

I have to agree with you. Nasty nasty. Sad, too.

>A couple of years ago when the SJC R-390A's were hot items,..... Here are a few of the things I remember from his discussion. Stainless steel screws rusted (not surprising). This, of course, could make repairs more difficult. Yellow wrap capacitors coming unwrapped. Well, that's not too tough. Replace the capacitors. Coil windings in the shielded transformers of the RF deck starting to come unwound. I don't know how you would fix this. His conclusion (not mine) was that this RF subchassis was unsuitable for use in an R-390A.

I did some searching and found some of them. I seem to remember more. There were several threads on the prospects of rebuilding one without future problems.

(Begin Message 1)

Subject: Re: [R-390] New Owner
Reply-To: Nolan Lee <nlee@gs.verio.net>

>So, if someone got an R-390 A in their Christmas
>Stocking..... (I can dream, can't I?). Let's say a St.
>Julian's Creek victim. What would be the best first thing to do with/for it?

Rip it apart for parts. I've seen a couple of radios from there. Too many "little things" damaged by the elements. You'd be looking at hundreds and hundreds and hundreds of hours of work to bring them up to the level of a radio that'd only cost you a couple of hundred dollars more in the first place. I don't make a tremendous salary, but my spare time is worth a hell of a lot more than $0.51 an hour. They're good for parts. If I could find a couple of them local for ~$100.00 each, grab 'em for spares. Don't get me wrong, I don't have a problem with pumping tons of hours into a receiver. I just did one and am still working on a second one. BUT, I started with two clean receivers. I can't see doing this with something that'll always show the physical and emotional scars of sitting in the rain and snow and sun for a couple of years when you can start with a much nicer radio for a couple of hundred dollars more. Let's look at it from another perspective. It's kind of like deciding that you want to build and drive a nice looking, good running 1958 Buick Limited because you worship chrome and they were cooler than The King (Elvis). Where's the first place that you'd look for one to restore? Well, let's see, Otis, down at the local wrecking yard has one that you can have for $125.00 dollars and $50.00 dollars freight, I mean a $50.00 wrecker bill to get it home. Best of all. you've got a couple of hundred dollars in mad money that you picked up cutting pulp wood that the old lady doesn't know about. ROAD TRIP! Load up the dogs in the truck, take a bottle of Rebel Yell with you, and hit the road! HEEEHa! After 14 miles of dirt roads, you're at Otis's place. "Out back of the tire pile", slurs Otis. You wade thru saw briars and fight off swarms of mosquitoes, shoot two copper heads, and suddenly, there it is! An aura of fire dances around it as the chrome reflects the sunlight into your bloodshot lust filled eyes while the 4 foot tall briars rustle seductively in the wind and the cicadas make the sound of Summer time love. Here Otis!, take the money bubba, I gotta have it! Tow it out to my place and drop it next to Ma's old burn out trailer. No, the first one.... Well, after you and the dogs and the car are home, Otis is gone, and the Rebel Yell wears off, you eat a half a handful of BC's to kill the headache and you ease over to it to evaluate your new "project".

It sat out there at Otis's place a few years after the courts released it. They never did find the guys head or right foot, remember? Well, after setting here soaking in the old UV rays, rain, dew, and snow, for a few years, the stench of death and the blood stains are all gone. The chain saw cuts in the upholstery are still there though. Gonna have to fix that.... The chrome still shines, and now, it's all yours and you're now a full fledged member in good standing of the Cult of the '58 Buick Limited! Life is good bubba! It's had a few dozen other's like it stacked on top at different times, and the roof is mashed in about 6 inches and the doors won't open, but hey, it's tough, it's a 58 Buick and it's cooler than The King (Elvis)! Besides, look at all of that chrome.... Six months ago, Otis's brother in law was drunk and foolin' around on the

fork lift after his wife (the gal with the big hairdo) left him, and he accidently rammed a tine thru the grill, taking out the radiator, cooling fan, water pump pulley, water pump and the upper generator bracket. There's a few holes in the left fin where Otis Jr (product of Otis and
his 1st cousin Myra) sighted in his rifle one year. That boy never was what you'd call "right". Most of the glass and various lenses are either missing or broken. The numbers are peeling off of the odometer. The battery froze a few years ago and ruptured, leaking electrolyte all over the inner fender and radiator support and ate a hole big enough for a possum to climb thru. All of the tires are flat, two wheels missing, and the two that are there are wrong. Whoa! Look at all of those old snake skins on the engine. Cool! The deck lid and the intake manifold and cylinder heads are missing too. What the hell, 58 Buick Limited deck lids are common as dirt and so are the high compression heads for the 300 hp version of the 364 cubic inch Buick engine. Oh, oh, the carb is gone too. ;-(Not a problem, someone on the R_390_'58_Buicks_Cooler_Than_Elvis? reflector might have some for sale. Oh, I almost forgot. The back seat and carpet has been the home and breeding place of 17 generations of watch dogs for the wrecking yard. What the...is that?...no... why yes, yes, I think that it really is, it's dog fur carpet bubba! Damn, life sure is interesting at times! No thanks! I'd rather pay a more money initially and buy one that's been sitting in a barn for years, and has all of it's original innards after the little old lady that drove it into to town once a month, went insane from watching game shows and drinking fluoridated water, and committed suicide and was eaten by little Fluffy and the other 41 cats.

Your mileage may vary. If you're ever in this neck of the woods, I can fix you up with Otis's 1st cousin Mrya. Since she got that new glass eye, the upper plate, and the make over, she looks pretty hot...

nolan CAT, the other white meat!

(Begin Message 2)

Subject: Re: [R-390] St. Julian's Creek radios
Reply-To: Nolan Lee <nlee@gs.verio.net>

At 06:42 PM 11/2/98 -0500, you wrote:

>Nolan, you are fogetting about the character of these
>radios. These receivers have been all over the world
>and served as soldiers for the good old USA, they deserve
>some respect.

I'm immune to that aspect of it. They're machines, nothing more. In the mid 1970's I worked for a division of Southern Scrap down in New Orleans. I had a crew that averaged about 6 guys working with me. One of my jobs was to see that all of the electronic gear that was worth anything, stripped out of two USN WWII cruisers (Topeka & Boston) just ahead of the crews with the torches. BTW, my Collins R390A is off of the USS Topeka.) The big dollar items like the guided missle systems, fire control systems, etc. had priority. Most of the rest of the stuff was just considered as obstacles impeding higher profits. I've cut up, destroyed, burned, shredded, and

smashed enough history to last several lifetimes. I've taken sledge hammers and fire axes to stuff to get it out of the way so that I could get to something that needed to be removed when I didn't have a fire wrench (torch) handy and I dind't feel like using handtools. Sometimes we just beat on stuff for the hell of it. "Hey! Bet you a dollar that I can knock that audio amplifier off of the bulkhead with only two licks". On a side note though, I did haul truckloads of RTTY gear and other stuff, in the form of TTY terminals, FSK converters, etc. out of there that I gave away rather than see it run thru the shredder. It cost me about 3 cents a pound to do this. :-) I still have a few pieces of it. This was where I got the dozen or so R390A SSB converters that I once had. Three cents a pound. :-)

>I own several, and by the time you go all the way through
>them, it's not that much more work. They may not pass for
>bright shinny new ones, but these things will still blow
>the doors off of any rice-box/sand-box SWL receiver.

Sure they will. It's just I'd rather start with something that's in better condition. The two St.J R390A's that I looked at had set outside long enough for the digits to start falling off of the counter and the color traces on the chassis harness to fade away. I have to question the viability of the RF coils and forms, the IF coils and forms, the PTO, the potentiometers, the switches, the UV damage to the chassis wiring insulation, etc. before I spend hours and hours of my time restoring it. What will it be like, electrically, ten years from now? Twenty years?
I generally keep stuff a long time and look at it from long term perspective. They're well worth the ~$125.00 dollars that they sell for just as a source of parts. Hell, the mechnical filters in the IF deck alone are worth the purchase price.

>It's neat to make a silk purse out of a sow's ear now and then.

Some people would probably find the '58 Buick Limited that Otis sold, an enjoyable challange. I wouldn't. ;-)

>Sound's like Nolan may have ate a little too much
>CAT meat. Burrrp... It's gotta be well done...

With pecan sause.... <grin>

>In my opinion, the St. Julian's radios are worth more than
>"a just driven on Sundays by an old lady" R-390A.
>This is because of the history behind each one of them.
>When they are gone, there ain't gonna to be no more.
>These receivers are world class, if they could only tell
>us where they have been and what they have been through.

I was originally in awe of the R390A receivers when I saw my first one, but then something happened that really changed my outlook on them. Another thing that the division of Southern Scrap that I worked for did was dabble in the old GSA auctions. We bid on and won hundreds and hundreds and hundreds of R390A's back in the mid 1970's. Back then, all of this stuff was stored in warehouses and not exposed to the weather. They all had the meters back then too unless they'd been robbed for

parts. At the time, a good working R390A could bring close to $700 at the retail level. This is when a new fullsize GMC Cost me 3654.81. I put $700 down and financed the balance for three years at $98.50 a month. R390A's were not a cheap item back then. As a result, there was no enviromental damage and they looked pretty damn decent. The nice ones that were complete went first. We shipped most of those to Phil and George up at Fair Radio Sales. Some went to other places, but truckloads went to FRS. At any rate, as the pile of good complete ones got smaller and the pile of incomplete ones got larger, I would strip modules out of some radios to be able to have complete ones to ship. We also had a retail outlet and we'd keep it supplied with clean working R390A's. After a while, a point was reached where we had dozens and dozens of hulks that weren't worth the trouble to mess with. After I grabbed a few extra goodies for spares for the R390A's that I had, they were shredded bubba. I suppose that if I'd wanted to, I could have bought what was left for .03 a pound rather than run it thru the shredder but I already had a few good clean R390A's and enough spares to have lasted to today. :-) Picking thru surplus R390A's 25 years ago was a lot different than today. :-)

>This is my two cents, whoever don't like it, <delete> please.

Cool! I did like it!

(Begin Message 3)

Subject: [R-390] St.J. receiver re-build
Reply-To: Nolan Lee <nlee@gs.verio.net>

At 10:59 AM 12/6/98 -0000, you wrote:

>I have had quite a job with the I.F. module. All of the 455 kHz I.F.
>transformers needed work, I think the rain had effected the glue that holds
>each end-cheek onto the coil former, with the result that the former would
>rotate and break the wire off.

I just finished gutting an RF deck out of a St.J. receiver for parts. I found a lot of deteriation in the variable IF's and the RF coils in the RF deck due to exposure to the elements. In addition, a lot for the tuning slugs were loose on their wires. It ended up that about 20% of the plugin coils were out of spec and as a result, were scrapped. All of the capacitors in them checked goo though. :-) My comments on using the St.J. receivers as a restoration project have been voiced here before and I won't go into it here. But, if you're going to re-build a St.J. receiver, or any other receiver that's sat outside for a while, there are a few extra steps that would probably be in your best interest, for the long term, to do: First, I'd remove all of the variable IF and RF coils from the RF deck. Then, one at a time, remove the metal covers and do an inspection and swab any film or loose debris out of them, especially around the terminals, using a suitable solvent and without wetting the coils them- selves. Some of the films (maybe oil washed down from the rain from receivers stacked above it) can be conductive and give false values when you do the resistance checks and probably would contribute to signal loss. Measure the resistance of the coils and compare your readings to the manual. Then, using a good sensitive bridge or VTVM that'll do >500 megohm resistance or so, measure the resistance of the other pins to each

other and to the coil pins. If you get any reading here, you'll need to either track down the problem or replace the coil assembly. It doesn't take much of an oil residue on the phenolic to give a 10 meg resistance reading. You may find lower than normal readings on some of the coil windings due to failure of the insulation. ;-(I had one RF coil that had leakage that turned out to be the trimmer capacitor. I disassembled the cap and cleaned it and reinstalled it and the leakage was gone. Oh, while you're at it, I'd give each of the trimmers a couple of three spins in alternating directions to insure that the two little spring contacts are makling good contact. Also inspect the coil forms and see if they are coming apart. They're basically a flat spiral cut sheet rolled into a tube. I've seen them starting to unwind on some of the coils of St.J. receivers. Redoping the coils and the outside of the forms should prevent this and should stop any that has already started from getting worse. I'd suspect that this will help the receiver to hold alignment a lot longer. For the coils that meet resistance specs, I'd either bake them in the oven at a very low setting for a couple of hours or place them in a very dry (humidity) area for a few days or so and then redope the coils and outside of the forms. Don't forget to check T207, T208, and the antenna trimmer can on the RF deck. While you have the deck out, I replace the three paper capacitors on the underside of the module and check the little nut mount paper capacitor located near the 6DC6 tube. Another thing that's probably worth doing would be to clean the bandswitch to not only make sure that the contacts are clean but to remove any possible oil film. Any type of conductive film here can cause a flashover and a carbon track to the shaft and render that switch section unusable. The fiberglass ones seem to be more prone to flashover. These switches were more of a problem than a lot of people think, evidenced by the number of RF decks with mixed (ceramic and fiberglass) switch sections that I've seen. ;-(I'd apply the same steps to the coils/ switches/etc. on the crystal osc,
and IF modules.

nolan "Man, I'd kill for a Nobel Peace prize."

From: "Michael Young" <myoung76@bellsouth.net>
Date: Sun, 18 Aug 2002 21:41:31 -0400
Subject: [R-390] R390A IF chassis connector

Does anyone know the Amphenol number for J 512 on the IF chassis? Comparing the schematics of the R390 and the R390A, they seem to be mirror images.

From: "Bill Smith" <billsmith@ispwest.com>
Subject: Re: [R-390] R390A IF chassis connector
Date: Sun, 18 Aug 2002 19:45:20 -0700

Don't know if this is helpful, but according to manual NAVSHIPS 0967-063-2010 (which has a parts list!) J512 is CONNECTOR, RECEPTACLE, ELECTRICAL: 20 male contacts (02660) type no. 26-806. Hope that is an Amphenol number. J512 on the 390 is a BNC connector. The 20 pin connector is J517 on the 390.

From: "Michael Young" <myoung76@bellsouth.net>

Subject: Re: [R-390] R390A IF chassis connector
Date: Sun, 18 Aug 2002 23:25:33 -0400

Thanks Bill. That is the same AMP number as for the R390 IF module. Makes my day. Is that NAVSHIPS document downloadable from somewhere?

Date: Mon, 19 Aug 2002 05:10:34 -0700 (PDT)
From: "Tom M." <courir26@yahoo.com>
Subject: Re: [R-390] R390A IF chassis connector

If you're asking about the main power connector, they are the same on the 390 and the 390A. In fact most of the functions are the same (but the modules are not directly interchangeable).

Date: Wed, 28 Aug 2002 23:31:03 +0000
From: Philip B Atchley <ko6bb@juno.com>
Subject: [R-390] A tale of two IF decks.

Hello one more. Just pulled the IF deck from Dons R-390A. Even before pulling it I "suspected" it was an "older" unit. It is, it's an early Collins IF deck. So, out of curiosity, I put it next to the '67 EAC IF deck from my receiver. There are many observable differences.

They are... 1. Most noticeable is the lack of filter trimmers on the Collins unit. (2). The Collins appears to be "neater" in it's construction. I.E. The cable harness is much neater, point to point wiring is neater also. (3) The Collins has everything coated with that MFP crap which is going to make re-capping a tougher job. (4) The EAC deck had nearly all capacitors of the newer type, I.E. Yellow Aerovox and metal/ glass. Only one "Brown beauty". The Collins is full of the BBOD's

I believe this is an example where I'd take the EAC over the Collins every time as it has all the updates.

Date: Fri, 30 Aug 2002 16:57:55 -0400
From: rbethman@comcast.net
Subject: [R-390] A tale of two IF decks & READING the WHOLE passage

| > I noticed a couple of other differences between an early Collins IF - S/N 35
| > vs. a '67 EAC IF. The Collins Z503 and the like do NOT have holes in them
| > to allow adjustment. The early Collins IFs that I saw WITH holes, were
| > obviously NOT done at time of manufacture. It is easy to see that they were
| > drilled out later. They usually have "flashing" around them.
| > I am guessing, but it was probably done at a later date to align them.
| ++++ | This is covered in the manual!

I would have to disagree with that. Specifically, the manual says "remove" the covers that do not have holes - and "temporarily" replace them with the shop set that are drilled (or punched), perform the alignment and then "replace" the shop set with the original.
|

| The first step to doing an alignment is to punch holes in those cans.
|
So either it was laziness or failure to follow "written procedure" that resulted in the holes.

Date: Fri, 30 Aug 2002 17:07:53 -0700 (PDT)
From: "Tom M." <courir26@yahoo.com>
Subject: Re: [R-390] A tale of two IF decks.

You didn't comment on the sheet metal differences. EAC applied for and got approval to re-design certain decks so that they could be wired easier.

Date: Sat, 31 Aug 2002 22:19:04 +0000
From: Philip B Atchley <ko6bb@juno.com>
Subject: [R-390] Low IF gain problem

Yesterday I mentioned that I thought the R-390A I'm working on seemed to have low gain, though it was hearing weak ones ok (It "hears" my sig generator, AM modulated 50% at it's lowest setting of -127dBM just fine). However I mentioned I thought the IF gain seemed low as indicated on the S meter, so I checked it by inserting 150uV at 455kHz into J513 and tried setting the gain control for -7VDC at the diode load jack (per the manual). The highest I can set this for is 5.0VDC and with gain about halfway (where I set previous receivers) it reads 2.9VDC in ALL bandwidth settings.

Question. Does the Lankford AGC mod affect gain any in this IF strip, perhaps by loading it down (2 diodes across a couple resistors)? I've tried subbing tubes. If I can get the IF gain up this receiver will be working just fine (did a pareliminary alignment already). I may have to finish recapping don's IF so I can sub it for troubleshooting purposes.

From: DCrespy@aol.com
Date: Sun, 1 Sep 2002 10:55:19 EDT
Subject: Re: [R-390] Low IF gain problem

The Lankford mod does make the AGC more "aggressive". That is it takes less signal to get the same AGC action. Very strong signals are reduced more than they were before the mod. Dallas noted this in one of his HSN articles. It is a fairly obvious side effect. I have done three radios with the mod, and have not experienced the problem you describe, however. The S-meter readings did not change significantly, so I do not think it is the mod. Unless... My mods have always been done with 1N4148 switching diodes. I suspect that rectifier diodes and some older general purpose diodes may be a problem. I have run into this on similar AGC mods on the R-388. Something to check?

Date: Wed, 04 Sep 2002 13:32:53 -0400
From: Bob Login <jlogin@mindspring.com>
Subject: [R-390] AGC..Z503 stuck slug

Hi, Working on a 390A with low agc voltage. As 455kc signal is increased the agc voltage goes from positive 1v to negative but take plenty of signal.

Checked everything in both RF & IF decks. All components looked ok. So tried to peak Z503 and seemed to work but slug seemed stuck after a few turns. Put some WD on threads and tried again with plastic tool...it broke off...really feel bad about that! Any suggestions....or someone out there willing to part with a replacement?

From: "Bill Smith" <billsmith@ispwest.com>
Subject: Re: [R-390] AGC..Z503 stuck slug
Date: Wed, 4 Sep 2002 15:20:47 -0700

If you can get the pieces out, carefully put them back together again with super-glue. Don't use much glue, and make sure they fit together as tightly as possible. Properly repaired, the slug will be as good as new.

Date: Fri, 20 Sep 2002 03:31:22 +0000
From: Philip B Atchley <ko6bb@juno.com>
Subject: [R-390] Adjusting BFO Neutralization

When I finished the Langford AGC/BFO mods I needed a way to set the BFO neutralization. Not having a scope or other way to look at an RF signal at the IF output jack, I was having difficulty doing this. I even tried making an RF probe for my DVM, using a Ge diode, not sensitive enough. THEN, it hit me. I had that MilliVac RF MilliVoltmeter that was given to me (a real obsolete piece of gear). I had to contrive a way to connect to the screw on connector since the probe tip was missing. Once that was accomplished, Eureka! It worked and I was able to set the neutralization. Even after who knows how many years since the last alignment AND the Langford mods it only needed just a slight tweak. So, I guess that no matter how ugly (and it is an ugly greasy green rack mount unit) or obsolete a piece of gear is, it may still be of use in the home 'lab'.

From: "David Faria" <dave_faria@hotmail.com>
Date: Sat, 28 Sep 2002 14:01:53 -0700
Subject: [R-390] IF alignment Using Sweep Generator

Good afternoon list - just thinking abt the procedure that is going to be posted so, here's a topic. There appears to be an IF frequency unique to each filter and its not exactly 455khz. Do we align the IF for an average frequency that works for all the filters or just for the filter we are going to mainly use? Does it make any difference? Food for thought for those of us who are retired/bored and looking for when the mil. procedure is posted. And if it has been posted and I've missed it would someone please send me a copy.

Date: Sat, 28 Sep 2002 15:04:40 -0400
From: Jim Brannigan <jbrannig@optonline.net>
Subject: Re: [R-390] IF alignment Using Sweep Generator

Unless one of the filters is way off frequency, the IF bandwidth should be broad enough to accommodate the variances.

From: Rodney Bunt <rodney_bunt@yahoo.com>
Subject: Re: [R-390] IF alignment Using Sweep Generator

Tune the IF centre frequency for that narrowest filter you are using. The other filters will be wider and the bandpass of the Xtal/mechanical filter will fall within the IF. If the "narrowest" filter were to fall on the "skirt" of the IF bandpass, then the IF gain would be lower as it would be at the edge of the IF, you would also get considerable distortion on MCW.

Date: Fri, 04 Oct 2002 11:27:59 -0700
From: Tony Angerame <tangeram@lucent.com>
Subject: [R-390] Staggered IF Question

I have a Capehart R-390a in truly excellent condition. It was apparently stored in a closet shorthly after Vietnam. I've done a fair amount of recapping etc but the radio plays great and doesn't appear to need an alignment with one exception. I noticed that when I select the 4 kc and below filters the signal level as indicated by the carrier meter decreases by about 5-10db. This is true for .1, 1, 2 and 4kc vs. 8 and 16. I swept the input of the radio at the selected bandwidth say 16 kc from my generator and noted about 6 peaks throughout the 16 kcs I swept and noted proportionally less peaks for the lower bandwidths. So my theory and my question is am I seeing the peaks of the six tuned circuits in the IF (455)? Has this radio been stagger tuned to produce a uniform bandwidth in the wider positions? Is this why I notice a slight increase in gain when I select the wider selectivity positions? I notice that the manual calls for a peak alignment of the IF transformers.Seems to me this would cause a big "Hump" especially in the wider positions and I'm better off with what I've got.

From: "Philip Atchley" <k06bb@elite.net>
Date: Sun, 27 Oct 2002 03:20:00 -0000
Subject: [R-390] That R-390A "BFO Thingy"

Hello all. I use VERY sharp audio filters with my R-390a in the CW mode. While my receiver is easier tuning than 'most' I've had it can still be a little difficult sometimes to exactly set the tuning in the center of the Audio bandpass (my present sharpest filter is 80 Hz but I have a much sharper one coming). I sometimes like to tune my receiver where the desired signal makes it through the filter and the undesired is off the slope of the filter, sometimes hard to do with strong nearby carriers. I sometimes use the BFO to "tweek" the audio note a tad but then have to reset it back as I use the 100Hz IF filter too. Resettability is good, but could be better. Some of the 390A's I've seen have a little BFO vernier for setting the BFO. Are these good and resettable (seems like they would be). Can they be retrofitted to a receiver that doesn't have one or is it a pain? And lastly, are they available at reasonable cost? Can't get one right now but I'd be interested in hearing what the group has to say.

From: "Bob Tetrault" <r.tetrault@attbi.com>
Subject: RE: [R-390] That R-390A "BFO Thingy"
Date: Sat, 26 Oct 2002 20:51:35 -0700

They aren't verniers; they are still 1:1, and so their settability is only marginally better than the front panel. IMHO

From: "Barry Hauser" <barry@hausernet.com>
Subject: Re: [R-390] That R-390A "BFO Thingy"
Date: Sun, 27 Oct 2002 01:54:13 -0400

I bought a couple of those odometer style BFO knob things a while back. As Bob pointed out, they are not verniers -- 1:1. The idea may have been to improve reset-ability, but they introduce some slop. Some may be worn inside and the action is rough. They are not difficult to fit, but I doubt if it will help you. Best bet is to find the small "combination lock" style verniers -- the ones you see on some scopes and other test equipment, though I don't know if they use a 1/4" or 1/8" shaft size. They usually also have a locking lever. That would give you vernier reduction and an accurate scale for resetting. Not sure how they mount up. Alternatively, there are those small inline vernier couplings which I think are still available new from catalog sellers. It's possible they would just fit in without drilling, but the existing shaft might have to be shortened. The ones I'm thinking of don't have scales, though.

From: "Barry Hauser" <barry@hausernet.com>
Subject: Re: [R-390] That R-390A "BFO Thingy"
Date: Sun, 27 Oct 2002 13:16:25 -0500

Well, I think you're right on the small scope type verniers. Newark lists a bunch of them. Here's one:

http://www.newark.com/NewarkWebCommerce/newark/en_US/support/catalog/product Detail.jsp?id=12F4498

-- 15 turns, but as I recall, I've always seen those coupled to a multiturn pot as you point out. The business end turns 15 times around, or 11 for the other models.

But -- never say "ALL". ;-) There is a similar style, but larger -- 1.5 to 2 inches in diameter which are true verniers with reduction. Mouser lists 3 of them. Here's the link to the pdf page:

http://www.mouser.com//index.cfm?handler=fra_pdfset&dir=612&pdffile=665

These appear to be of the same style as the ones Radio Shack used to carry. I may have one or two lying around somewhere. They provide an 8 to 1 gear reduction. However, they mount up not by the front panel nut, but flush-mount with 3 screws. They take a 1/4" shaft, but have a coupling with (as I recall) a round head screw rather than a setscrew, so may need an oversized hole to clear. Not sure how much play is available on the depth. One possibility to avoid drilling 3 holes (arghhhh!) is to use 3M mounting tape. That's the stuff that's sticky on both sides, thick and rubbery. It will hold for sure, but when the time comes to remove it, it will probably take the paint with it. I seem to recall these having a rotation of 270 degrees, roughly matching a typical pot. However, the Mouser description says "calibrated for 180 degrees rotation" -- which should be good for the BFO anyway. The last type I mentioned in my previous post was truly a gear reduction drive, but I haven't found a listing for it. These were simply a knob shaft, a drive shaft and a disk shaped "gearbox" in the middle. (might have been a friction drive) No knob, no scale. Not sure how it mounted. Used to be in all the major catalogs in the old days. Anybody

familiar with those?

From: "Bob Tetrault" <r.tetrault@attbi.com>
Subject: RE: [R-390] That R-390A "BFO Thingy"
Date: Sun, 27 Oct 2002 09:14:47 -0800

They are ALL 1:1. They were built for multi-turn pots which were therefore built-in verniers over the single turn variety. They all mount to the front panel nut.

Date: Wed, 30 Oct 2002 20:14:29 -0600
From: Dave Metz <metzd@intelos.net>
Subject: [R-390] BFO question

I recently fired up a nice EAC A model that has been sitting on the shelf for a couple of years. When I put it away, it had just been polished, cleaned, aligned, and working great! It still seems to work fine except for the BFO. You cannot turn it far enough CCW to get a zero beat even taking off the knob and gently turning it to the left stop. (perhaps another quarter turn (if available) would zero beat it at full CCW) So far the only thing I have tried is changing the BFO tube but no change. Is there anything else except inside the BFO assembly itself that could cause this? Any points would sure be appreciated.

From: "Philip Atchley" <k06bb@elite.net>
Subject: Re: [R-390] BFO question
Date: Thu, 31 Oct 2002 01:25:31 -0000

I'd suspect one of the capacitors in the BFO circuit has gone "belly up". Possibly the mica unit that is directly connected to the BFO coil (don't have the schematic in front of me right now).

Date: Tue, 10 Dec 2002 08:23:26 -0700
From: Chip Owens <owens@atd.ucar.edu>
Subject: [R-390] Z-503 replacement & R-542 value

Some archive info on the value of R-542 suggests 470 ohms instead of the original 2.2K-ohm value.I'm curious about this. How does decreasing the value of a de-coupling resistor improve performance? The archive info is a couple years old. What is the current thinking on the value of R-542? And what performance improvement is achieved by decreasing it to 470 ohms? I'm replacing Z-503 (the hard way) and since I'm in that part of the IF chassis I thought I'd replace any out-of-spec component at the same time.

Date: Mon, 16 Dec 2002 13:44:46 -0500
From: Albert Solway <asolway@sympatico.ca>
Subject: [R-390] Soldering Fine Gauge Wire

To All, Some time ago there was a request on how to remove the the insulation on fine gauge wire as used in IF Transformers. One of the responses was to use an aspirin to remove the insulation. My question is, what is the procedure. Any other techniques would also be appreciated.

The wire from L52, part of T1 in my SP-600, was broken. The remaining useable length is about 0.5 inch to short to reach the terminal it goes to. A splice is needed. I tried solder with only a flux and the iron without success.

The insulation is a high temp type and will not melt with the soldering iron. The broken wire was most likely the original fault in the SP-600. I found it by accident while replacing the BBODs.

Date: Mon, 16 Dec 2002 02:17:24 -0500 (Eastern Standard Time)
From: Helmut Usbeck <vze2gmp4@verizon.net>
Subject: Re: [R-390] Soldering Fine Gauge Wire

I've so-so luck with the aspirin technique, best bet seems to use a cheap aspirin with no coating.

What I've been doing of late to tin small gauge wire on coils and toroids is to puddle a blob of solder on the end of an iron and then run the wire though the blob which burns off the insulation and tins it nicely after a quick wipe with a rag.

From: "Bob Tetrault" <r.tetrault@attbi.com>
Subject: RE: [R-390] Soldering Fine Gauge Wire
Date: Mon, 16 Dec 2002 11:37:02 -0800

I've been doing the solder blob as Helmut describes for years.

Date: Mon, 16 Dec 2002 14:34:14 -0800
From: Dan Merz <djmerz@3-cities.com>
Subject: Re: [R-390] Soldering Fine Gauge Wire

Al, I've done a few repairs similar to your task . I never liked the "heat it in solder until" technique - some coatings just are very resistant. I've gone down to about #44 wire size - and I scrape the wire by holding a flat piece of metal on one side and lightly scrape with a scalpel or xacto knife. You have to work different sides of the wire so it takes a little time - it helps to have a magnifier. Then when I've seen enough copper, I fashion a splice with small bare copper wire wrapped on the two ends you want to join, #38 or smaller, and solder the two joints. Fine tweezer help here. I've had very good success with this, especially on transformer windings and rf coils. Dan.

Date: Mon, 16 Dec 2002 15:10:26 -0800
From: Dan Merz <djmerz@3-cities.com>
Subject: [R-390] BNC to MB adapter?

Hi, I need an adapter to take one end of a BNC jumper cable to type MB, (the small bayonet connector in a 390a). I believe this adapter is an Amphenol 47200 connector, like the i.f. output connector on the back of a 390a. I am going from the BNC connectors on a 390 i.f. chassis (male bayonet/female pin) to the corresponding two MB (female bayonet/female pin) cables on a 390a. I need two of these adapters. Does anyone have a couple of these to spare, know where I could find

them, or know of another type of connector that will do the job without altering the connectors on the 390a? thanks, Dan.

From: Buzz <buzz@softcom.net>
Subject: Re: [R-390] Soldering Fine Gauge Wire
Date: Mon, 16 Dec 2002 20:19:46 –0800

I have a small bottle of paint remover on my workbench. I just dip the end of the wire in, wait a few seconds, then wipe the insulation off.

Date: Fri, 20 Dec 2002 12:46:21 -0800 (PST)
From: "Tom M." <courir26@yahoo.com>
Subject: [R-390] R-390, Low AGC Voltage

Group, I have a 390 with a low AGC voltage, runs about half of what my 390A deck runs. The 503 coil works, AGC amp (V509) amplifies, rectifier rectifies, I've changed numerous suspect caps, volts look OK, tubes are OK, and yet I still have low AGC voltage. When I impose a negative DC voltage on the 3-4 terminals on the back, the gain goes way down, so I know the controlled tubes are being controlled. The radio plays OK except AGC action is not as good as expected. It loses control on very loud stations such as BBC 5975. I'm thinking of running a SS full wave bridge rectifier ahead of the tube rectifier to boost the rectified voltage, i.e. send only negative volts to the 12AU7 rectifier instead of the AC from the AGC amp output. Has anyone ever tried this, or otherwise have suggestions about 390 AGC low level?

Date: Thu, 02 Jan 2003 18:30:19 -0500
From: MURPH <rickmurphy1001@earthlink.net>
Subject: [R-390] Those pesky trimmer caps

Does anyone know where I can purchase the trimmer caps that are in the second osc? I have two that are bad but am looking to replace them all. I might have to resort to soldering substitutes under the deck. Gone are the days when one could walk into the local electronics parts establishment and get this kind of stuff. No where to be found here in Chas. SC.

Date: Thu, 02 Jan 2003 18:43:29 -0500
From: "Jim M." <jamesmiller20@worldnet.att.net>
Subject: Re: [R-390] Those pesky trimmer caps

If these are the ones in the xtal oscillator, American Trans Coil sells pulls from old 390-a's. They're on the web.

From: "Steve Hobensack" <stevehobensack@hotmail.com>
Date: Thu, 02 Jan 2003 18:52:35 -0500
Subject: [R-390] bfo problems

My r-390a has a slight hum when the bfo is on. Cw and ssb signals have a slight "vibrato" sound. Cw notes are not clean and crisp with any setting of the mgc level. I suspected one of the filter caps, but they are ok. The decoupling cap on the bfo 150v b+ is ok , there is no cathode to filiment short.

I turned off the bfo switch, and injected a 455 khz carrier from my urm-26d signal generator to pin 5 (plate)of the tube socket. I still had the hum with the signal generator acting as the bfo. The radio sounds fine listening to a m broadcast. Any ideas ??? Thanks

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Date: Thu, 02 Jan 2003 19:01:40 -0500
From: Jim Brannigan <jbrannig@optonline.net>
Subject: Re: [R-390] bfo problems

I had a similar problem with a 75S-3B. It drove me crazy trying to find it.....
It turned out to be a bad tube in the PTO.....

From: Llgpt@aol.com
Date: Thu, 2 Jan 2003 19:29:32 EST
Subject: Re: [R-390] Those pesky trimmer caps

Check with Chuck Rippel, at one time, he had a large supply of the trimmers.....
http://www.r390a.com/

Date: Thu, 02 Jan 2003 19:50:02 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] bfo problems

> My r-390a has a slight hum when the bfo is on.....

My bet would be AC modulation of one of the oscillators. Most oscillators will FM before they AM so low level modulation would only be apparent with the BFO on. Going *way* out on a limb - check the PTO first.

From: "Walter Wilson" <wewilson@knology.net>
Subject: Re: [R-390] bfo problems
Date: Thu, 2 Jan 2003 20:27:47 -0500

As Jim said, check the PTO tube. But while you're in there, make sure the metal L-shaped grounding strap that contacts the PTO shaft is making good contact. This is the electrical ground for the PTO shaft, and should NOT have any lubrication applied. If any is there, remove it. If the PTO shaft is not grounded properly, the oscillator will warble.

From: "Kenneth G. Gordon" <keng@moscow.com>
To: "Steve Hobensack" <stevehobensack@hotmail.com>
Date: Thu, 2 Jan 2003 21:03:07 -0800

Substitue the HF oscillator tube and/or any heterodyne/conversion oscillator tube. I have an HQ-110-C which did the same thing. BOTH the HF (tunable) oscillator tube and the 2nd conversion (crystal) oscillator tubes had high cathode to filament leakage.

My TV-2 said they were both all right. Cured it by substituting new tubes. Afterwards, I

found a service bulletin from Hammarlund that explained the problem, which was apparently not uncommon.

From: DAVEINBHAM@aol.com
Date: Fri, 3 Jan 2003 15:59:49 EST
Subject: Re: [R-390] bfo problems

Back when I was in the Air Force 40+ years ago, they taught us that if the tube tester says it's bad, the tube is bad. But if the tube tester says it's a good tube, it ain't necessarily so. The " best" way to test a tubes is to temporarily replace it with " a known good tube."

From: Llgpt@aol.com
Date: Fri, 3 Jan 2003 16:06:26 EST
Subject: Re: [R-390] bfo problems

Well put Dave!! Tube testers are a useful tool when utilized properly. many is the tube that tested good, but didn't work in a particular circuit, but did well in another. Les

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Date: Thu, 2 Jan 2003 22:26:27 -0800
Subject: Re: [R-390] bfo problems
From: ronald j deeter <k6fsb@juno.com>

I had a very similar problem tracked it down to a filament to cathode short on the AGC rect tube V509. So look for a tube. substitution is the fastest way to track it down.

Date: Sun, 19 Jan 2003 22:42:57 -0800
From: Dan Merz <djmerz@3-cities.com>
Subject: [R-390] Tightening shaft connection?

Hi, is there a good trick to tighten the bandwidth shaft coupler if the shaft coming out of the i.f. chassis seems a bit small.

The shaft coupler worked ok on the 390a i.f. chassis but when I put the 390 i.f. chassis in the 390a radio, the shaft seems a bit small for the coupler even when tightened down pretty tight (gap closed).

More to come on the successful conversion of the 390 non-a i.f. to go in the 390a, but I'm trying to solve this problem so I can change bandwidth without taking the i.f. chassis out - it seems awkward to have to do that. I tried putting a 2 mil shim sheet on two sides of the shaft in but that still didn't give enough purchase on the shaft. Maybe there's a gritty substance that would help? thanks, Dan.

Date: Mon, 20 Jan 2003 06:59:03 -0800
From: Dan Merz <djmerz@3-cities.com>
Subject: [R-390] 390 non-a i.f. in R390a

Hi, I completed the conversion of a 390 non-a i.f. chassis to go in a R390a radio. This follows the article of Tom Marcotte in Electric Radio Dec 2000 describing the

conversion.

I found his article flawless in the detail given for point-by-point wiring changes and thank Tom for writing the article and providing me a readable schematic for the 390 non-a chassis and some other information on the R-725.

I deviated slightly in a couple of cases to utilize some of the existing wiring but this was just a preference on my part and amounted to the same connections. Most of the wiring mod's involve converting the series connections for 25 v filament supply used in the 390 non-a to the 6.3 volt connections required in the 390a, plus dropping the B+ voltage a bit. This is all explained clearly in his article, along with the background for the R-725 radio which the final set emulates. No modification of other parts of the 390a radio are required other than taking the 390a i.f. chassis out.

The conversion was done on a junker 390 non-a i.f. chassis sold on eBay and it worked immediately upon putting it into the EAC 390a set, which brought a feeling of relief since I had no idea what might be wrong with the junker chassis and I didn't have a 390 non-a radio to test it in. One of the bigger tasks was to make a cable adapter for BNC to mini-BNC, or MB, connectors for the two inputs from the 390a r.f. chassis. Tom used two of the 390a i.f. output adapters of the type on the rear panel of a 390a. I had trouble finding these, and I'd like to thank Roy Morgan for his assistance in trying to get the relevant connectors from The RF Connection - I opted not to use their MB female to BNC female adapter because the two critical parts would have cost $20 each plus shipping and I would have to make up two short BNC to BNC cables as well.

Instead I used some chassis mount MB connectors from Fair and made a small aluminum box with the MB connectors on one side with RG 58 entering on the opposite side, with a BNC connector on the outside end of the RG 58. I can't say cheaper is better but it was a bit of fun and turned out well. If there is any interest, I'll post the details of how I did that but it's not too complicated. I'd recommend buying the RF Connection adapters unless you enjoy cutting and bending metal like I do. I'm assuming the adapters from RF C look more or less like the 390a back panel i.f. adapter.

I was quite impressed with the appearance of the 390 i.f chassis, though it's much more crowded than the 390a i.f. chassis and not the easiest thing to reach into with a soldering iron, even a small one. My first reaction on looking at what had to be done was "ughh." As Tom advised, use any trick you can think of to do the soldering. So when I finished the soldering, I felt I had done something challenging and had not destroyed the beauty and function of the unit in the process. I hope the next guy looking at it will find equal enjoyment with the unit. This project took about 2 years to complete, most of that time looking for the i.f. chassis after I read Tom's article. I got this chassis Dec 27 so it took about 3 weeks to round up the connector stuff and make the conversion after that.

I'll post my impressions once I test the set a bit more; I'm going to add the two diodes ala Lankford and increase the bfo coupling cap. Thanks to all for earlier comments regarding the connectors, Dan

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Date: Mon, 20 Jan 2003 20:42:57 -0800
From: Dan Merz <djmerz@3-cities.com>
Subject: Re: [R-390] 390 non-a i.f. in R390a

Hi Scott, an R-725 is more or less what I now have, though built by contractors, and had the 390 non-a type i.f. in a 390a radio, and a couple of other mods, one to improve PTO stability and an added 25 volt filament supply to power the R-390 i.f. chassis.

The purpose was to eliminate the non-linear phase shift caused by mechanical filters, which caused errors for direction finding equipment, and I guess to have a current production radio at the time. The decision was made that was nearly the same as the 390a otherwise, in the early 50's. Approximately 300 were made according to Tom's article. I don't know more details of exactly how it was used.

Yes I did it for the fun of the project and to explore and perhaps enjoy the audio characteristics of a 390 non-a i.f. , which is reported to be more pleasant to the ear. Why not just use a 390? I don't have one and decided I would rather not obtain one for now because of space and effort to get it going and the 390a I have is a clean set - one 390 type radio seems to be enough so far. They are somewhat inconvenient to casually move around from a behind-the-scenes location and use when the fancy strikes you. Who knows what the future will bring. I've been known to change my mind about such things,

I have several other types of communication radios competing for shelf space where I can operate them so my decision was biased by that consideration. I am pleased by the consideration that the chassis can be easily swapped in about 15 minutes, and either will work interchangably in the 390a radio. I can't think of a reason to have this conversion if you already have a satisfying 390 non-a unless you want to see if it will perform a little better, or are just very curious and like the unusual.

Marcotte wrote in an earlier ER article about the R-725 he had at the time, April 1996: "How does it work? Quite well, just like an R-390, but with the smoothness of the fewer gears of the R-390a gear train. It is actually more sensitive than my all-Collins R-390 and R-390a, and has none of the ringing caused by the mechanical filters in the R-390a." So that's my story and I may not stick to it. If I missed some aspect that interests you, ask away, best regards, Dan.

Date: Mon, 20 Jan 2003 14:31:42 -0800 (PST)
From: "Tom M." <courir26@yahoo.com>
Subject: Re: [R-390] 390 non-a i.f. in R390a

The R-725/URR is a modified variant of the R-390A. It has a special IF deck (95% like the R-390 IF deck except it runs on 6V instead of 24V) called the Series 500 deck, which enables the 390A frame to be used in DF applications as with the TRD-15. The R-725 also has a PTO mod to prevent hum. Motorola, Arvin and Servo were engaged in making the new IF decks for dropping into existing R-390A's, pressing them into DF service.

The new IF decks were not entirely new; some parts were salvaged from the (now

junker) R-390A IF decks that were removed. The R-725 has the nice sound provided by the tuned circuit IF, arguably better than that of the 390A with mechanical filters. Why not use the 390? Because I don't have one. The objective of the project was to get better sound out of the R-390A, keeping the R-390A IF deck available for hard core DX. There are no permanent mods to the 390A, which was another objective.

Date: Tue, 21 Jan 2003 16:02:55 -0800 (PST)
From: "Tom M." <courir26@yahoo.com>
Subject: [R-390] R-725/URR Hum Bucking Transformer

Someone asked about this. In the original article about the R-725/URR, I wrote that the extra transformer was for IF filaments. But then I got some info from Servo which stated otherwise (mea culpa!). "A hum-bucking circuit has been added to the R-390A/URR to improve performance. This modification places a positive dc voltage on the filament of the variable frequency oscillator (vfo) (V701) in the receiver, reducing the heater-to-cathode leakage of 60 Hz into the signal." Further on the hum thing.

"The following modifications have been made to reduce hum.

(a) Open small enclosure at end of vfo unit and lift pin 3 of V701 from ground.
(b) Connect a 0.01-uF capacitor between V701-3 and ground.
(c) Connect V701-3 to J709-C. <==(this connects new transformer. Ed.)
(d) Connect P109-C to P121-E (filament return)
(e) Disconnect and dead-end wire (with tape) from P112-8."

End of Servo info.

ps The Servo info also indicated provision has been made for use of a dynamotor for DC operation (anyone seen this?).

From: Llgpt@aol.com
Date: Tue, 21 Jan 2003 19:31:01 EST
Subject: Re: [R-390] R-725/URR Hum Bucking Transformer

You forgot to add the original R-725/URR receivers had a MU-Metal shield around the PTO. No mention was ever made of this in their (Servos) blurb, but obviously was placed arounf the PTO to eliminate any spurious emissions from the PTO that would/ could have interfered with the DF'ing.

Date: Tue, 21 Jan 2003 21:43:21 -0800
From: Dan Merz <djmerz@3-cities.com>
Subject: Re: [R-390] Tightening shaft connection?

Tom, I might need that coupler. After making the Lankford diode additions and a 47 pf cap to the bfo output, I discovered the coupler was actually broken on the bandwidth shaft connection right near the nut so that is kaput - I guess I didn't see this before and/or possibly over-tightened it to cause the break. I also noticed the coupler on the bfo shaft is broken on the side opposite the tightening screw but it will still clamp down enough to work. I remember discussion of these being susceptible

to breaking. I looked at one closely and it looks like an anodized aluminum alloy - definitely non-magnetic material - so I'm assuming aluminum. Has anyone made these out of brass or a material not apt to do this. The fracture reminded me of season cracking of some brasses which is a stress corrosion problem. High strength aluminum alloys can also have this problem. I am quite curious about how these shaft couplers were fabricated - does anyone recall anything about them?..... It's tomorrow now and I decided to make my own couplers out of 6061-T651 aluminum plate that I found in my garage - hopefully these will be better than the originals - they are about half done - fortunately the hole is a standard size, 5/16 inch and aluminum is almost like wood to saw, file and shape so it's not going to take long. I expect these to be superior to the originals. Are the small size type more suscetible to breaking than the larger ones - it appears to me they would be from the shape?

Another problem as well. The bfo is not acting very nice now - if I turn it on with say a broadcast station tuned in, the gain is reduced immediately to a low level. I wanted to re zero it since I turned it some when I was working on the circuit under the bellows. I don't seem to hear the bfo like I did before when it was tuned off zero.

Do I have too much bfo getting into the agc circuit with the increased capacitor (47 pf across the original 10 pf) I put in or is this the symptom of some other problem? I explored this a bit to make sure I didn't fry the coupling caps when I soldered but I don't think that's the problem. Is the adjustment of the neutralizing cap critical enough to cause such a big effect. My first reaction was to take the added cap out and see if good behavior returned.

From: "Drew Papanek" <drewmaster813@hotmail.com>
Date: Wed, 22 Jan 2003 17:15:46 -0500
Subject: [R-390] R-725/URR Hum Bucking Transformer

.....original R-725/URR receivers had a MU-Metal shield.....

Mu metal is used for magnetic shielding and is often found encasing electrostatic deflection CRT's in oscilloscopes. There it prevents trace deflection caused by stray magnetic fields from 'scope's power transformer.

Magnetic shielding for PTO in R-725 would prevent FM-ing of PTO signal due to transformer induced 60 Hz "permeability modulation". The aluminum PTO cans would not provide magnetic shielding but would provide effective RF shielding thereby minimizing the aforementioned spurious RF emissions.

Date: Wed, 22 Jan 2003 16:39:04 -0500
From: Jim Brannigan <jbrannig@optonline.net>
Subject: Re: [R-390] Tightening shaft connection?

Actually the problem with most AM detectors is too little BFO injection in relationship to the IF signal. Of course these detectors are not build to filter the increased BFO signal and it will get into the AGC.

Date: Wed, 22 Jan 2003 14:39:28 -0800

From: Dan Merz <djmerz@3-cities.com>
Subject: Re: [R-390] Tightening shaft connection?

Hi, my interpetation of Bob's comment was that the 47 pf caused too much bfo into the detector for the agc - my goal in putting it in was to increase the level needed for ssb, as Jim noted. I have now taken the 47 pf out and the set behaves itself now as far as agc goes. Because I have to crank down the rf level a bit, I'm thinking it could use a little more bfo but it's workable with the just the 10 pf. It's much better than it was before I put the 2 diodes in, so I'm happy with that. For some reason (maybe I didn't want to take the bfo bellows out), I didn't put the 47 pf in my 390a i.f. chassis a year or so ago, and I was happy with the radio without it. I wanted to try it in the 390 non-a chassis since the bellows was already disconnected by the previous owner, or at least loosened easily. I'll probably forego experimenting with tweaking the bfo injection at this point (chassis removal fatigue !!) - it's easier to tweak the r.f. gain on real strong ssb stations.

I finished making the shaft coupler out of 6061 aluminum and it works very nicely. I made it 1/4 inch thick instead of 0.2 inch thick like the original because that was the thickness of my aluminum plate. All the bending in this gismo takes place at the thin section at the bottom of the hole opposite the screw so I just thinned that to 64 mils compared to 80 mils for the original,
so the bending force and stiffness would be about the same. It should have less stress at the outer side as a result and may last longer. I would guess that all failures of these couplers occur either at the bottom thin section or at the root of the square corner where the screw head or nut sets. If they failed somewhere else, I would be very suspicious of the type of material
used. I'm only mildly suspicious so far.

I had a failure of each kind in my two couplers. My replacement has somewhat longer ears where the screw goes to avoid the notched/thin section near the screw and the shaft hole. I'll keep my eye out for originals to put in the radio when it leaves me, not soon. Right now I'm happy to have a beefier version since I anticipate exhanging the two i.f. chassis occasionally without worrying about breaking them.
thanks for
the comments, Dan

From: "Sam Letzring" <sletz@msn.com>
Date: Fri, 31 Jan 2003 18:54:23 -0700
Subject: [R-390] AGC Problems

I have a nice Stewart Warner 390A with a Collins IF module. I can't seem to get the AGC voltage I think I should get. WIth 30- 40 uv RF in at 1.5 MHz I get plenty of IF output and > -10 volts output on the Diode load- but < -1 volt on the AGC line. What should the AGC voltage be? I have seen values quoted up to -10 volts? Any ideas on what I should check? Have checked tubes and caps in the area of the AGC amps, detectors etc. Any clues will be greatly appreciated.

Date: Fri, 31 Jan 2003 21:20:30 -0500
From: Jim Brannigan <jbrannig@optonline.net>
Subject: Re: [R-390] AGC Problems

I don't recall the correct AGC voltages, but -1VDC seems low. Did you align the IF, including the AGC amp?

From: "Jim Miller" <jamesmiller20@worldnet.att.net>
Subject: Re: [R-390] AGC Problems
Date: Fri, 31 Jan 2003 22:17:10 -0500

What kind of meter are you using to measure it? If it's a low impedance volt meter, it may be loading down the AGC line and giving an false low reading.

Date: Tue, 18 Feb 2003 12:44:57 +0100 (CET)
From: =?iso-8859-1?q?fef?= <ik0ire@yahoo.it>
Subject: [R-390] I.F. alignments & BFO

I.F. alignments I am systematizing the my R-390a, anybody could give me of the counsels in worth to: (1) I want to replace the valve V207" 6AK5," I desire know like make gives that the valve v207e mail under the group of tuning. (2) When I insert the BFO order on ON I listen to only that the modulation becomes Dark but there is not no variation of note acting on the BFO order/ Pitch You excuse The trouble, here in ITALY has not found people that could Realign l'R-390a. Surely I will ask you other counsels for realign my Receiver, you want to excuse me, Yours sincerely Frank

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Date: Tue, 18 Feb 2003 07:50:19 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] I.F. alignments & BFO

I am not totally sure what problem you are asking about. The stuff below covers more than one problem. BFO - Here's what I would check - more or less in order:

1) Swap out V506, V505 and V504.

2) There is a shaft attached from the pitch knob to the BFO coil. Sometimes this shaft comes loose. Make sure that the coil moves when the knob moves.

3) If you tune to a strong signal with the bandwidth set to .1 KC the BFO should zero beat with the pitch set to 0. If it does not then loosen the pitch knob and move the shaft until the zero beat is at 0.

First Crystal Oscillator - V207 - Here's what I would check:

1) Check the tuning on T207

2) Open up the crystal oven HR202 and unplug the crystal Y201. Clean the leads of the crystal and the oven. Clean the socket that the crystal oven plugs in to. Put the crystal back in the crystal oven. Put the oven back together. Put them back in the radio.

3) Swap out V207 and V202.

4) Check that FC no 7 has *not* been done on your radio. If it has then reverse it. In other words make sure that R210 is 56K ohms and *not* 220K ohms.

5) Check the tuning on T207.

From: "Jim Shorney" <jshorney@inebraska.com>
Date: Sat, 22 Feb 2003 13:20:28 -0600 (CST)
Subject: Re: [R-390] R-390A ....more AGC

How about this? http://www.littelfuse.com/ASP/Search/Detail.asp?ID=522 Bidirectional or unidirectional silicon avalanche surge surpressors, 1500w. 1.5KE10CA are under a buck in single quantities from Digikey. Longer life and probably faster than a MOV.

From: flood@Krohne.com
Date: Tue, 11 Mar 2003 10:23:06 -0500
Subject: [R-390] BFO Question

Wow I get to ask my first question! Please forgive my being a bit rusty on hollow state technology. I had my training during the fall of hollow state and the beginning of solid-state and as it would turn out I know enough about each to be dangerous.

My early 60's vintage Amelco R-390A has bfo trouble. It would generate a signal but the frequency sounded high (sorry did not measure it) and there was very little adjustment with the dial. A tube swap did not help and looking at the drawing and being dangerous as mentioned above, I thought that there was not much that could be wrong there other than the little, pto I think, bfo can. A new one just arrived from Fair Radio and thus generates, pun intended, my question. The shaft on the new bfo can is a bit stiff not easily turned by fingers. There seems to be a bit of oxidation on the shaft bearing. Is it OK to put a drop of oil on it without risking damage of some type and if so what is the official BFO lube approved by the list? I certainly don't want to get blacklisted for using solid-state lubricant.

Is the old bfo repairable? I can't resist opening up little things like this, especially if it has a stamp telling me not to do so!

Subject: Re: [R-390] BFO Question
From: flood@Krohne.com
Date: Wed, 12 Mar 2003 09:57:16 -0500

Sorry to you and all, I should have mentioned it but I thought of this as well and removed the knob and tried the whole range of the control. Two or three times the bfo came to life but any shaft movement would kill it again. That is why I purchased the new bfo. Thanks, John Flood KB1FQG

>Did you loosen the BFO knob on the shaft and try to bring it within range?

There is a physical stop on the front panel that keeps the knob from rotating more than half way in either direction..... but the bfo inductor is a multiturn job. I've had this happen on a recently acquired R-390A. The bfo would barely come within range but

I just loosened the knob, pulled it back from the stop, zeroed the bfo, then reset the knob. good luck, Phil

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Subject: Re: [R-390] BFO Question
From: flood@Krohne.com
Date: Wed, 12 Mar 2003 11:12:01 -0500

Oops hit send to soon, Thanks to all who have made suggestions for checking out the BFO. Perhaps I was not clear enough in my question. I am going to replace the bfo and I would like to know is it safe to add some "oil" to the shaft of my new "unused" Fair Radio bfo. I just opened it and the shaft is a bit tight. It seems to be from a small amount of oxidation from sitting in the box all these years. Sorry for the confusion here.

From: "Drew Papanek" <drewmaster813@hotmail.com>
Date: Wed, 12 Mar 2003 13:33:32 -0500
Subject: [R-390] BFO Question

John Flood wrote: <snipped> My early 60's vintage Amelco R-390A has bfo trouble.

The BFO knob has a tab providing a robust end of travel stop for BFO shaft. If knob is installed too far out on shaft, tab is non functional and it is possible to turn several revolutions. BFO can provides no real stops; forcing at end of travel will easily break BFO tuning slug partially or completely. This may be your trouble. Remove and open that can despite those warnings which simply goad you on! Make a note of wire connection points. BFO slug/shaft can be rejoined with great care and sparing use of epoxy.

>A new one just arrived from Fair Radio .....Is it OK to put a drop of oil ...

Oil won't hurt. A lubricant prized by many list members is Mobil 1 synthetic motor oil. It does not gum up as some others do. Fair Radio is very good about customer satisfaction; you might consider returning the unit for another replacement.

From: "john page" <n8blb@hotmail.com>
Date: Sun, 16 Mar 2003 16:16:15 -0500
Subject: [R-390] looking for parts (V501 fault)

Yesterday I asked if anyone had an I.F chassis as mine had a bad socket. And since it was in a really hard place to get to I thought I would try to get a new unit. Thanks to all who responded with help and offers. I thought I would have one more crack at it before shelling out lots of green. GOOD news. I did fix it. Acted like a bad socket in that you could wiggle the tube and it would work. Yes I did try several other tubes. Today I got to measuring voltages at the socket. It was V501 the first I.F. amp. No B+ on pin 5 but it did have screen voltage on pin 6.It sure doesnt have far to go from pin 5 to pin 6. Well it turned out to be in a one inch piece of wire from L505 to V501 pin 5. It was broken inside of the insulation. I was able to repair the wire and now the unit works great. Well almost great.Now it wont turn off. The filaments stay on as does the dial lights. Looks like the micro switch on the function switch is staying closed. That

sure looks like a pain to get to. Oh well I always wanted an instant on 390. Its always in standby this way. I remember someone saying that this is not good though. Learning the 390 the hard way, John

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From: flood@Krohne.com
Date: Wed, 19 Mar 2003 11:53:17 -0500
Subject: [R-390] Re: [R-390A] BFO Question

Thanks to all who replied with your bfo comments. A drop of oil on the "unused" shaft smoothed things out a bit. It still was much tighter turning than the bad one in the radio or other good units that some people had as could not be turned by my fingers on the shaft. I believe this is caused by an internal (o-ring?) seal on the shaft, similar to the one used to seal the bfo(pto) case. After many years of use this wears down allowing the shaft to turn much easier. It would seem that, this being the case, the new bfo did not have a problem after all and turns as it should. Perhaps this experience will benefit others in the future. My Bristol wrench set came in yesterday, I installed the new bfo last night and all is well. It turns out that the internal core was broken on the bad one. I am almost brave enough now to drop the front panel and repair the stuck microswitch on the function control! BTW Am I allowed to listen to anything other than AM on this fine old radio without getting flamed?

Date: Sat, 29 Mar 2003 09:29:24 -0500 (EST)
From: "David P. Goncalves" <dpg@coe.neu.edu>
Subject: [R-390] R-390(nonA) IF Cans

After a long wait, I have recieved my first (may not be the last) R-390. The modules have been handled roughly, and there are quite a few scratches, gouges and dents. Nothing too bad, just looks ugly. Now for my question: Besides the dents, I'm noticing that the tops of the IF cans are all 'pushed in', andf that the can nuts are tightened 'till the sides bulged out. Is this normal, or was it a bad day in the shop for this radio? Is there any harm in banging out the dents?

From: "John KA1XC" <tetrode@worldnet.att.net>
Subject: Re: [R-390] R-390(nonA) IF Cans
Date: Sat, 29 Mar 2003 15:30:17 -0500

Hi David, yes to both of your questions. It's fairly common to see IF transformers that have been over tightened somewhere along the line, those deep draw cans (a piece of art in themselves) cannot support a lot of force without starting to buckle along the edge. The tops of the cans in my 390 were buckled pretty good, but they straightened out easily by tapping out the dents with a wooden dowel against the workbench. The shields cans are just that, only shields; the transformer frame itself is secured from the inside of the chassis. If the mounting hole are seem out of alignment after straightening out the cans you can use a small round file to enlarge the hole a little.

Date: Mon, 31 Mar 2003 08:46:40 -0800
From: Dan Merz <djmerz@3-cities.com>
Subject: Re: [R-390] R-390A with R-390 IF deck on E-Bay

Gordon, they aren't directly interchangeable without modification. But the 390 IF

deck will physically and mechanically fit and can be electrically modified to operate. This mostly involves rewiring the filaments from series (390 non-a) to parallel (390a) and a couple of other changes at the underside of the cable connector plus making up two cable adapters for BNC to mini-BNC. The result is a nice sounding radio, Dan.

Subject: RE: [R-390] Frequency Shift With AGC Level
Date: Mon, 21 Apr 2003 10:30:01 -0700
From: "David Wise" <David_Wise@Phoenix.com>

> From: Jim Miller [mailto:jamesmiller20@worldnet.att.net]

> I've noticed that with the BFO on a strong carrier, when I lower and raise
> the RF Gain, there is a slight change in beat note pitch, maybe 100 cycles
> or so. This doesn't happen on my other 390a. Have swapped..... snip....

Since the oscillators are unbuffered and not all of the B+ is regulated, there is a certain small unavoidable shift. However, there is also possibility of avoidable shift. Make sure the 0A2 is regulating. One of their wear-out modes is a rise in breakdown voltage. Combined with high screen current and low line voltage, it may be dropping out. Note also that the BFO uses unregulatedB+ . If you can rig up a stable external BFO, it will help isolate the shift.

From: "Dave Faria" <Dave_Faria@hotmail.com>
Date: Thu, 24 Apr 2003 19:25:22 -0700
Subject: [R-390] Looking For Suggestions - Stuck Slug

GE List. I scanned the archives looking for a solution to a stuck slug on a 390A IF Deck. Only one thread in the archives is where a fellow broke a stuck slug. Of course it's the last slug to be peaked on my deck. Any suggestions? Heat it up in the oven? Or maybe try the freezer? I'm open for ideas. Lubricants??

From: "Jim Temple" <jetemp@insightbb.com>
Subject: Re: [R-390] Looking For Suggestions - Stuck Slug
Date: Thu, 24 Apr 2003 21:42:19 -0400

I had the same problem a few months ago. I tried to use a metal allen wrench and, of course, broke the slug. I ended up ordering another from Fair. I have seen suggestions to heat the coil, and other suggestions to put a couple of drops of WD-40. Next time I think I will use heat as the first resort. Hair dryer?

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Subject: RE: [R-390] Looking For Suggestions - Stuck Slug
Date: Fri, 25 Apr 2003 07:48:13 -0500

I think I would refrain from anything like WD40 as it can degrade the coil form.

Date: Fri, 25 Apr 2003 09:10:13 -0400
From: Jim Brannigan <jbrannig@optonline.net>
Subject: Re: [R-390] Looking For Suggestions - Stuck Slug

If there is wax on the slug, then a hair dryer or soldering iron, applied carefully, should loosen it. Don't use a heat gun, they get way too hot. From painful experience, do NOT force the issue. The best bet is to try and find a replacement coil. The coil form is cardboard and will not take much abuse.

From: "G4GJL" <G4GJL@btopenworld.com>
Subject: Re: [R-390] Looking For Suggestions - Stuck Slug
Date: Fri, 25 Apr 2003 17:21:38 +0100

Heated sealing wax in the end of a small blunt stick. Q-tip, 1/8 inch metal stock; long screw; & a whittled dowel Worked fine for me on a Blue streak project a while back.

Date: Fri, 25 Apr 2003 13:24:21 -0400
From: Kim Herron <kherron@voyager.net>
Subject: Re: [R-390] Looking For Suggestions - Stuck Slug

I, too, would keep the lubes out of the coil. I've had success drilling out the core with small drill bits and a pin vise. This, of course, assumes that you have another core. The actual ferrite core will break up rather easily and the pieces can be blown out of the coil and a replacement core installed.

From: "Kenneth G. Gordon" <keng@moscow.com>
Date: Fri, 25 Apr 2003 10:15:58 -0700
Subject: Re: [R-390] Looking For Suggestions - Stuck Slug

I have had excellent luck with saving the scraps of smashed slug, grinding them up with a mortar and pestle, mixing the resultant powder with epoxy glue, and putting the mix into a straw of the correct diameter.

From: "Bob Tetrault" <r.tetrault@attbi.com>
Subject: RE: [R-390] Looking For Suggestions - Stuck Slug
Date: Fri, 25 Apr 2003 10:36:46 -0700

That is a heroic story to someone who imagines that these things are as near to magic as they will ever get, but the iron powder is only that, and the straw and the epoxy is a logical step. The proof is the tune-up and I'm sure that the coil peaks as it should. The YMMV part hinges on anyone's ability to use the minimum epoxy...

From: "Kenneth G. Gordon" <keng@moscow.com>
Date: Fri, 25 Apr 2003 11:56:03 -0700
Subject: RE: [R-390] Looking For Suggestions - Stuck Slug - a possible solution...

Yes. Making slugs with threads on the outside and hex shaped holes in the center are a lot more difficult, but can be done. The first time I did this was for an R-1004 with a smashed slug. In that receiver, the IF cans were tuned by a small, slotted, piece of threaded brass rod with a flat on the slug end. I just stuck the rod down into the epoxy/iron mix and let it harden. Then peeled off the straw. Worked beautifully. And as Bob says, you must use a minimum amount of epoxy.

Date: Sat, 26 Apr 2003 22:09:02 -0700
Subject: Re: [R-390] Looking For Suggestions - Stuck Slug
From: ronald j deeter <k6fsb@juno.com>

I had good luck using super glue gel and a small stick, glue the stick to the centre of the slug, wait till hard, then slowly remove the core, I had found replacement cores in other scrap equipment-- Old tv's and junk radios, of course size and weight are of importance. if it isn't cracked just stuck- try heat the outside and cold freeze the core - sometimes it works. Re-lubricants-preferably not, be sure the core is not cracked, however I have used a real light oil (Kano), then cleaned with alchol, relube lightly with bees' wax

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Date: Fri, 02 May 2003 21:02:26 -0500
Subject: Re: [R-390] R-390 Spectrum Analizer
From: blw <ba.williams@charter.net>

> Please share the details of your Q Multiplier hook-up with us. Thanks.

I hooked it up per Hollow State Newsletter #24. I tapped pin one of V204. It says that it won't affect anything, but audio is a bit lower with the HD-11. It works well when I need it. It won't do anything to a strong station, but it works very well on weaker ones. It pulls them right out. I haven't had to null much yet, but I have tried to null and 'flop' over to peak like I do on a Datong FL-3 on the RBL-5/Quantum QX Pro loop setup for LF beacons. It doesn't seem to be as sharp that way. On the Datong, I can catch a weak beacon in a mess of other ones, put it in null mode and null out the weak one that I want to ID. Then, I just hit the peak button and that station pops out louder and much, much better. The HD-11 is no Datong FL-3, but it is simple and works using two sides of a 12AX7. One side for nulling and one side for peaking. No coupling cap is needed. I think the voltage range is up to 300 vdc. You can get these things for around $25, and it well worth the money to peak weak stations. I'm sure the nulling will be more valuable as I use it more. I have a QF-1, which is almost identical, but it needs something like 160vdc for power to the 12AX7. The HD-11 is easier to hook up.

Date: Fri, 16 May 2003 18:47:02 -0700 (PDT)
From: Rodney Bunt <rodney_bunt@yahoo.com>
Subject: Re: [R-390] Digital Radio Mondiale

I received a mixer kit from SAT-Service@t-online.de cost 25 Euros (about the same for dollars US) yesterday in the mail from Germany. It is VERY small. About 1/2" square. There are few connections, an "in" and an "out" and a volts 7

- 20 v has its own onboard regulator. The LC version specifications say it can be tuned + or - 12kHz from 455kHz have not hooked it up yet, so it may go to 500kHz. It is so small it can easily be installed inside anything, but my idea was to build it inside a small 'die cast' metal box, with IF in IF out and volts in using BNC plugs etc. In this way I could move it around and try it on a variety of rigs.

An ideal solution would be to get the Crystal controlled version and switch in crystals for the IF's

455kHz IF = 467kHz crystal (supplied)
500kHz IF = 512kHz crystal (still looking for one)
100kHz IF = 112kHz crystal (hopeing to find one....)

 50kHz IF = 62kHz probly easier to make an LC or other higher oscillator with a divider circuit, a bit on the complicated side so not considering this seriously, but would be nice to see how the Hammarlund HQ-180 performs or even the Hallicrafters SX-100. For a R-388, I would connect to the IF out J104 to the "mixer" then the 12kHz IF out to the sound card input on the PC/laptop and then use the sound/speaker output to listen to the recovered audio. This needs the 512kHz oscillator/crystal. No mods to the rig at all. What do you think ????

From: Llgpt1@aol.com
Date: Tue, 10 Jun 2003 21:46:41 EDT
Subject: Re: [R-390] R-390A Cost Reduction and Improvements (was dead horse

> >Has anyone ever tried to brew up a coil/capacitor
> >replacement for the mechanical filters?

Well, we could use the Kiwa filters which have better shape factors and the prices are not bad. They have better audio qualities and are compatible with any receiver with a 455 kc if. At present, I use a Kiwa Map Unit with 6 cascaded filters resulting in bandwidths of 2.9 and 6.8 with shape factors of 1.32 and 1.62 respectively. I realize that many of us won't want to change the filters and want to continue to use mechanical filters. Then, use the Rockwell/Collins torsional mechanical filters, beware though, they are expensive. Ya pays yer money and ya takes yer choices.....

Date: Wed, 11 Jun 2003 12:46:05 -0400
From: tbigelow@pop.state.vt.us (Todd Bigelow - PS)
Subject: Re: [R-390] R-390A Cost Reduction and Improvements

I seem to recall our pal Nolan posting something about this. Maybe it was Dr. Jerry, or a combination of both? It all came from the understanding that, eventually, all of the filters would fail and we'd need to figure out some way to repair/replace/retrofit them. Might be something in the archives?

Date: Wed, 11 Jun 2003 12:37:15 -0700 (PDT)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] R-390A Cost Reduction and Improvements

Ok, so what's the recipe, ala R-390 style, for an LC filter?
Can the R-390 filters be used in an R-390A? Or do we have to start from scratch, winding a coil shouldn't be too tough, selecting a cap to go with it should be easier. Or do we have to have a tuneable cap for adjustment? Would a slug tuned coil be better? Any ideas/possibilities for producing a short run of such a thing?

Date: Wed, 11 Jun 2003 16:05:09 -0400
From: Roy Morgan <roy.morgan@nist.gov>

Subject: Re: [R-390] R-390A Cost Reduction and Improvements

>Ok, so what's the recipe, ala R-390 style, for an LC filter?

Would be coil winders, Just look at the design and construction of the R-390 non-A IF section. Start there. Thrree or four stages of very carefully designed, built, and tuned "double tuned inductively coupled" IF amplifiers. See Radiotron Designers Handbook, 4th Edition to get a start on the theory and practice. Then see Valley and Wallman's RadLab book: Vacuum Tube Amplifiers for stagger tune methods, if you wish.

Date: Wed, 11 Jun 2003 16:09:40 -0400
From: Gord Hayward <ghayward@uoguelph.ca>
Subject: Re: [R-390] R-390A Cost Reduction and Improvements

Doing the coils shouldn't be too hard. I rebuilt the AGC coil in my R390A using a slug tuned unit that I found in my box of coils. The trick was to use a big L and small C to get the Q that I needed. It took me two tries to get it right. The first try gave a peak, but the Q was so low that it didn't give enough gain to get a high enough AGC voltage. The second try was dead on and the result meets the specifications for the performance and the carrier meter calibration is good. I think the IF strip construction will be a pain. To this end I've thought about trying (I know this is unrealistic :-) to get an R390 IF deck and adapting it to the R390A . How about an outboard R392 IF strip? Solid state tubes are another can of worms that I've thought about. Easier in an R-392!

From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] R-390A Cost Reduction and Improvements
Date: Wed, 11 Jun 2003 16:30:36 -0500

Adapting an R-390\URR IF deck to an R-390A\URR is not at all unrealistic. Seems I remember the Military had it done because of the phase shift problems the mechanical filters created in diversity operations. There is a military designation for it...I just can't remember it at the moment. Someone on this list did the conversion just in the last few months....I remember the posts.... Les Locklear...Chime in here anytime I know you have the info on it! Finding a source for R-390\URR IF decks is the biggest problem! (maybe that's what you meant by unrealistic)

Date: Wed, 11 Jun 2003 14:40:54 -0700 (PDT)
From: "Tom M." <courir26@yahoo.com>
Subject: [R-390] R-390 IF, was Dead Horse, Hi, and Other Subjects.

I've done the 390 IF conversion for the 390A, and so has Gene (I think it was Gene). Works like a champ. I run it in my regular rig.

Date: Wed, 11 Jun 2003 16:48:33 -0500
From: "Robert M. Bratcher Jr." <bratcher@pdq.net>
Subject: Re: [R-390] R-390A Cost Reduction and Improvements

>Adapting an R-390\URR IF deck to an R-390A\URR is not at all unrealistic.

It's known as the R-275. I saw one at a hamfest 4 years ago in Irving TX.
Should have bought it but I didn't think about it at the time...

Date: Wed, 11 Jun 2003 15:05:57 -0700 (PDT)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] R-390 IF, was Dead Horse, Hi, and Other Subjects.

Sure, we've covered that scenario. But that burns up already rare R-390 IF decks. I'm talking about making NEW filters for the R-390A out of discrete, generic parts, or even custom made parts.

From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] R-390 IF, was Dead Horse, Hi, and Other Subjects.
Date: Wed, 11 Jun 2003 17:16:19 -0500

I think the KIWA filter modules would be the way to go...unless you are just trying to go back to L\C filtering...

Date: Wed, 11 Jun 2003 15:26:46 -0700 (PDT)
Subject: Re: [R-390] R-390 IF, was Dead Horse, Hi, and Other Subjects.
From: <djmerz@3-cities.com>

>Tom/Cecil, I did the conversion and also use the 390 non-A IF. deck all the time in the 390a - kept the regular 390a i.f. deck in reserve but doubt it'll go back in. Yes, my biggest problem was finding the 390 i.f. deck which took about a year of looking and I finally bought one on eBay. I think I've only seen 3 on eBay since I started looking, and no luck trying to get one out of other guys. At one point Fair Radio told me they had some parts decks but the price seemed too high, about $125, if I remember right, to go that route without knowing where I'd find other parts I might need. I didn't pursue that avenue and ended up paying about a $100 for the one I have. I doubt that I hear more with the conversion but it's pleasant listening. Dan

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Date: Wed, 11 Jun 2003 18:38:36 -0400
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] R-390 IF

How about this crazy idea: Leave the original IF deck in there and tap off ahead of the MF's with a switch or RF plug 'n socket setup to feed the signal into another rx with a good L/C 455 IF? The other receiver would also need a similar gimmick. Maybe a crossover switch setup? Actually, the other receiver could be ... brace yourselves .. a NON-A. Or maybe even an SP-600.

Date: Wed, 11 Jun 2003 16:18:22 -0700 (PDT)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] R-390A Mechanical Filter replacement

Well, yeah, kind of, The KIWA is expensive, I think it would be good if it fit in the same place as the mechanical filters, too. And, of course, it HAS to sound good,..... maybe better.

From: "Scott Seickel" <polaraligned@earthlink.net>
Subject: Re: [R-390] R-390 IF, was Dead Horse, Hi, and Other Subjects.
Date: Wed, 11 Jun 2003 19:48:25 -0400

The chemo may have me a bit brain dead these days but it sounds to me like you guys need to trash the chepo 390a's and get yourselves a quality 390 that needs no mechanical filter replacements. (and is more sensitive too)

From: Llgpt1@aol.com
Date: Wed, 11 Jun 2003 19:17:03 EDT
Subject: Re: [R-390] R-390A Cost Reduction and Improvements (was dead horse

It was the R-725/URR. which used the R-390A and a modified version of the R-390/URR IF deck. The mechanical filters caused a phase shift in the DF equipment which was small at the antenna, but when extrapolating it out to the source, it could have amounted to hundreds of miles in error. Servo Corp. of America manufactured the IF decks (interesting fact that they were located in the Richmond Hill area of Long Island) this area was also the home of several other defense related industries, such as American Trans Coil. My good friend Tom Marcotte N5OFF documented this in Electric Radio several years ago. Les Locklear, Gulfport, Ms.

From: Llgpt1@aol.com
Date: Wed, 11 Jun 2003 19:19:14 EDT
Subject: Re: [R-390] R-390 IF, was Dead Horse, Hi, and Other Subjects.

You weren't listening were you, too busy kicking over beehives. Kiwa Industries has 455 kc filters that have wonderful audio and work great. Better shape factors than mechanical filters too. Remember this: Mechanical filters will only resonate so many times and then they die.....end of story.

From: Llgpt1@aol.com
Date: Wed, 11 Jun 2003 19:20:08 EDT
Subject: Re: [R-390] R-390A Cost Reduction and Improvements (

Close, but dyslexic.....R-725/URR

From: Llgpt1@aol.com
Date: Wed, 11 Jun 2003 19:24:14 EDT
Subject: Re: [R-390] R-390 IF, was Dead Horse, Hi, and Other Subjects.

> Leave the original IF deck in there and tap off ahead of the MF's .....

Kinda like a Hammarlund HC-10 or SPC-10.....or, Taaaa Daaaaa a Kiwa Map Unit. It connects to the 455 if output.Makes it into a whole new receiver.

Date: Wed, 11 Jun 2003 17:40:09 -0700 (PDT)
From: John Kolb <jlkolb@cts.com>
Subject: Re: [R-390] R-390A Cost Reduction and Improvements

The mechanical filter could be replaced with a single IF transformer or one or two tuned LC circuits, but the overall bandwidth of that filter position will no longer be 2, 4, 8 or 16 kHz with steep skirts.

Instead, it will be the overall selectivity of the replacement LC tuned circuits plus the added rejection of the remaining IF transformers in the set. It would take a number of hi-Q tuned circuits to match the response of a 2 kHz mechanical filter. There may be a shortage of R-390A mechanical filters in the Collins "N" case, but there's not a shortage of 455 kHz mechanical filters - many flow past on that auction place.

Many could be adapted for use in the R-390A if one doesn't need the replacement to fit within an "N" filter case. Alternatively, a good ceramic filter and matching circuitry would fit inside a replacement filter case, and would give a rounded top response rather than the rectangular top of a mechanical filter, but could give a good shape factor. (Wouldn't have the MF ringing either)

You can find a couple of R-390A filter plots as well as some ceramic filter plots on my website, <http://members.cts.com/king/j/jlkolb>

Date: Wed, 11 Jun 2003 22:54:08 -0700
From: "W. Li" <wli@u.washington.edu>
Subject: [R-390] Re: R-390 IF

I like the idea of leaving the original IF deck in, tapping off before the mechanical filters. How about running the R-390A's 455kc IF signal thru an outboard BC-453 (remember those ARC-5's that we all cut our teeth on?) that has its own 85kc IF and passable audio. I did this as an experiment and it sounds fine. BC-453's can be had for $25 or less at hamfests.

From: "Merle" <lal@cyberwc.net>
Date: Thu, 12 Jun 2003 08:47:20 -0400
Subject: [R-390] Meter needed !

Hello to the list.. Just finished rebuilding my first R-392 receiver, works like a champ ! The meter that came with the radio has a white background with several vertical green stripes. I have seen pictures of this meter someplace but can't remember what it was used on. The meter operates but looks strange. I would like to replace it with the correct meter for the radio. If anyone has one they might sell or can direct me to a place that sells them I sure would appreciate it..

Date: Thu, 12 Jun 2003 11:29:36 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: RE: [R-390] R-390A Mechanical Filter replacement

>The early mech filters were much more peaky in the passband than what was
>later considered good in the late 75A's and 75S's. As much as 6dB!

Bob, Do you mean either or both of the following..???

1) Pass band ripple in the R-390A filters can be as much as 6 db.

2) Pass band ripple in the filters used in the 75A and 75S receivers is much less than 6db.

Date: Thu, 12 Jun 2003 19:15:29 -0700 (PDT)
From: <jlap1939@yahoo.com>
Subject: [R-390] LC sections for the 390a

Joe is legit. I have heard of such a thing, and was told it could be done by an eng, but I never saw a 390A w/LC filters. Please, if anyone has tried it or knows of it, reply to us...!

From: "Forrest Myers" <femyers@attglobal.net>
Date: Thu, 26 Jun 2003 20:02:28 -0400
Subject: [R-390] Shaft Clamps

While putting the IF deck back into my R-390A, I noticed that the bandwidth switch shaft could not be tightened enough to not slip. Found that the little shaft clamp was broken. Switched to broken clamp to the BFO shaft and put the BFO clamp on the bandwidth shaft. They both work now. The BFO shaft is much easier to turn so the broken clamp is working on it. However, I'd like to get a replacement clamp to replace the broken one. Does anyone have an idea where one could be found? Replaced the two blocking capacitors in the IF deck, re-assembled the rig and fired it up. It still works so it survived the road trip from Little Rock, AR to Jackson, TN OK. I'm going to have to beef up my work area before getting serious about finishing up work on the rig. My solid state workbench is still shaky and too small.

From: "Mark Richards" <mark.richards@massmicro.com>
Subject: RE: [R-390] Shaft Clamps
Date: Thu, 26 Jun 2003 20:49:08 -0400

Forrest, A very fine fellow, Dave Medley, sold a few of these to me a while ago. He can be reached through: http://www.davemed.com/

From: ToddRoberts2001@aol.com
Date: Thu, 26 Jun 2003 21:45:01 EDT
Subject: Re: [R-390] Shaft Clamps

One source for gear clamps that I have not heard mentioned recently is STOCK DRIVE PRODUCTS/STERLING INSTRUMENT. They have a catalog that has to be seen to be believed. You can look through their parts listings online but I would really recommend you request one of their catalogs.

The one you want is called INCH DRIVE COMPONENTS. They have dozens of gear clamps in different styles, some identical to the ones used in the R-390A and they will accept small orders. Also they will manufacture parts to your specifications. I had often thought about having them make up a number of the Oldham Coupler assemblies. They can make up an exact copy of the part you want but not sure how costly it would be. To see them online go to this address : <A HREF="www.sdp-si.com">www.sdp-si.com</A>. 73 Yours Truly,

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Date: Sat, 05 Jul 2003 10:57:37 -0400
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] New 390A owner & fan

<snip> Haven't had the chance yet to look deep inside to see what's been >replaced but it was demonstrated working before I bought it so functionally I >know that it's basically OK. Functionally, everything seems to work.

Even so, pull the IF deck and look "under the bonnet". Hopefully you have a spline wrench to unfasten the two clamps on the controls. You should check C553 (I think) -- that's the mechanical filter killer, should it short out. We routinely replace those with a new orange drop or other new manufacture cap as a preventative.

There are clear photos on Chuck Ripple's web site http://www.r390a.com/ProbCaps.html Also be sure to visit Al Tirevold's web site http://www.r-390a.net/faq-refs.htm

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From: "James Bischof" <jbischof@nycap.rr.com>
Date: Sat, 12 Jul 2003 00:48:55 -0400
Subject: [R-390] agc problem +

AGC problem fixed. It was **R546 in the IF deck**. Now I have to figure out why I loose all audio when I turn on the limiter. I am feeling good this morning. I want to thank every one who responded.

From: ToddRoberts2001@aol.com
Date: Wed, 23 Jul 2003 03:37:59 EDT
Subject: [R-390] Synchronous AM Detector Kit

In case anyone is interested, Steve Johnston WD8DAS is again offering his AM Sync Detector kit for $159 or assembled for $229. His prices include shipping. His sync detector uses the famous Sony AM Stereo IC - the same one used in the Sherwood unit I believe.

The IF center freq is 455 KHz but is adjustable for IF's of 400-500 KHz so it could be used with other receivers like the R-388/51J-4 with 500 KHz IF. Should work great with the R-390A. The audio output is around 100mv suitable for connecting to an external audio amp. I am ordering one and will be glad to report to the list how it works. You can read more about it at this address : http://www.qsl.net/wd8das/syncinfo.txt

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From: "John KA1XC" <tetrode@comcast.net>
Subject: Re: [R-390] Synchronous AM Detector Kit
Date: Wed, 23 Jul 2003 11:42:02 -0400

fixed mangled link..... www.qsl.net/wd8das/syncinfo.txt

Subject: RE: [R-390] Synchronous AM Detector Kit
Date: Wed, 23 Jul 2003 11:08:47 -0700
From: "David Wise" <David_Wise@Phoenix.com>

Nope - the Sherwood SE-3 uses an NE602, an NE604, and a discrete VCO.

Date: Wed, 23 Jul 2003 12:37:55 -0700 (PDT)
From: "Tom M." <courir26@yahoo.com>
Subject: Re: [R-390] Synchronous AM Detector Kit

You can also use a Sony 7600G instead of buying the assembled box.
Take the IF from the 390A, tune 455 on the Sony. Voila.
Or take the IF from your 51J, tune 500 and likewise.
Works like a champ.

Subject: RE: [R-390] Synchronous AM Detector Kit
Date: Wed, 23 Jul 2003 12:56:22 -0700
From: "David Wise" <David_Wise@Phoenix.com>

Or an ICF 2010. Sometimes you can get one with a blown front-end for cheap. It may be deaf for normal use, but it can still hear the IF output.

From: "Scott, Barry (Clyde B)" <cbscott@ingr.com>
Date: Tue, 29 Jul 2003 12:16:01 -0500
Subject: [R-390] S-Meter?

Phil's SINPO ratings prompted me to look up the definition of this code. I guessed some of it but was unsure of the rest. I found the following link useful.

http://www.rnw.nl/realradio/practical/html/reportingcode.html

Curious, though. I paid less than US $600 for each of my R390As. If I had paid more, would the meters in them be true S-Meters and not just "tuning indicators"??

Date: Wed, 30 Jul 2003 09:27:55 -0400
From: Gord Hayward <ghayward@uoguelph.ca>
Subject: [R-390] Re: R390A S-meters

I ran a calibration of mine in the middle of the frequency range I use and the meter was pretty well bang on. Each division was close to the specified 10 dB and the line was straight. From this I'll claim its a real S-meter. Further, I took the AGC from the back and scaled it for another Collins S meter (I got it at a fleamarket so the donor was not killed by my hand!) so it gives real S-units with S9 beng 50uV at the ant terminal. The delayed AGC means that it won't read below S6. I use both the meter reading and SINPO in my log and on my QSL card, just to keep other hams confused!

Date: Tue, 02 Sep 2003 12:52:24 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] R-390A Audio hiss

Adjust the IF gain setting..It is very common for folks who don't understand to set the IF GAIN adjustment too high. They think it "makes the receiver hotter." It is a mistake.

(It is also a mistake to put higher gain tubes in place of the normal ones..Check that you have the correct tubes installed, especially the 6DC6 in the first RF amplifier.) Here is the IF Gain set procedure:

IF GAIN SETTING

Here is Chuck's procedure:
From: http://www.R390A.com/html/gain.html>
Text in brackets [...] is mine (Roy, K1LKY)
****
Procedure to set R390A IF Gain:

Once the receiver has been fully mechanically and electrically aligned, the final procedure to perform before "buttoning it up" is to set the IF gain control. [This means that you should have done the mechanical alignment - set the cams properly and so on.] Many otherwise very sensitive R390A's are thought not to be due to weak signals being covered by noise generated by excess IF deck gain.

Allow the receiver to warm up for at least 1 hour then:

1- Terminate the antenna input
[This means unhook any antenna and put a 50 ohm resistor,or a 125 ohm resistor, on the balanced antenna input, no signals from any antenna or signal generator.]
2- Set receiver for 15.2 mHz
3- Set the "FUNCTION" control to MGC
4- Select the 4kc filter with the "BANDWIDTH"
5- Set "RF GAIN" control to 10 or maximum [If your receiver goes whacko at this point, reduce the IF gain setting as in step 9 till it behaves right.]
6- Peak the "ANTENNA TRIM" for maximum noise as indicated on the "LINE LEVEL" meter [If you do not get a noticeable peak, your receivers front end and rf amplifier stages are not working right.]
7- Set "Line Meter" switch to -10db scale [minus 10 db]
8- Set "Line Gain" control to full CW or "10."
[Local Audio gain 0 or low if you are listening to it.]
9- Adjust IF gain control, R-519 to cause "Line Level" meter to indicate between -4 to -7 VU.
10- Re-zero the carrier meter control, R-523
[This can be a touchy adjustment.]
11- Set controls above for normal operation and reconnect antenna.

From: "James A. (Andy) Moorer" <jamminpower@earthlink.net>
Subject: Re: [R-390] INFO Cristal Y201 and Y203
Date: Tue, 2 Sep 2003 14:13:18 -0700

(1) Y201, 17 MHz - this will be a SERIES mode crystal

(2) Y203, 200 kHz - this should be a PARALLEL mode crystal with parallel capacitance of about 30 pF. That will put the proper frequency right in the middle of the tuning range of the adjustment capacitor. I think the package should be the HC-6/

U package, but I haven't actually looked to make sure. Anybody else know for sure?

The resistance at resonance will not be critical. Just ask for "as low as is reasonable". For the 17 mHz, it will be around 400 ohms. For the 200 kHz, it will be much higher. These can be ordered from JAN crystals. Their inside sales person is Sue Brick sueb@jancrystals.com I like them because they will make crystals one at a time. You can order them from the web site at www.jancrystals.com. Any questions you don't understand on their form, just don't bother to fill them in. They will contact you if there is a problem.

From: "Dave and Sharon Maples" <dsmaples@comcast.net>
Subject: RE: [R-390] R-390A Audio hiss
Date: Tue, 2 Sep 2003 21:13:42 -0400

All: For those who are also LMR types, I wonder if using a SINAD meter and a signal generator that does AM would allow us to do this just as well? Seems to me (but I could be wrong) that checking SINAD at reference sensitivity would allow the IF gain to be set quite accurately. What does anyone else think?

From: "Richard " <theprof@texoma.net>
Subject: [R-390] INFO Crystal Y201 and Y203
Date: Wed, 3 Sep 2003 20:35:29 -0500

I purchased the crystal oven with both crystals from American Trans-Coil http://www.atc-us.com/ for US$13.00. This may be a cost effective source even if you do not need the oven.

Date: Sat, 27 Sep 2003 20:51:17 -0700
From: Chuck <ka6uup@pacbell.net>
Subject: [R-390] R390A Popping

My R390A has recently developed a problem. During ordinary listening conditions in either AM or SSB, it pops at regular intervals. The signal strength meter jumps when this occurs. But, the pops are not always the same amplitude on the meter. The popping seems to respond to a change in agc settings. At first I thought it was external interference as it quits when the antenna was disconnected. However, after comparing other receivers in the shack and hearing nothing, I came to the conclusion it is internal. Before tearing into the radio I thought I would ask the group for ideas and suggestions

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From: "Russell Barber" <rfidman@pacbell.net>
Subject: Re: [R-390] R390A Popping
Date: Sat, 27 Sep 2003 21:28:44 -0700

I also have a R-390A and am hearing a popping sound. In my case however I am hearing it on my R8500 as well. I had to use the wide Am bandwidth setting and turn the noise blanker off. I never heard this popping until I moved out to California. I have heard this popping at a different QTH in town so I know it is not local to my house. The limiter on the R-390A does eliminate the popping but at the expence of some fidelity.

Date: Sat, 27 Sep 2003 21:22:38 -0700 (PDT)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] R390A Popping

That sounds like an electric cattle/horse fence in the area.

From: "Dave Faria" <Dave_Faria@hotmail.com>
Subject: [R-390] R390A Popping
Date: Sun, 28 Sep 2003 08:04:56 -0700

GM Chuck. I have had a similar problem but, its been a few years and I don't remember if the "pop" occurred at regular intervals. If u have use of an o-scope and tube extenders look at the trace around the tubes and see if that gives u any clues. What I have had on two 390 non "a" radios is a failure of the coil just after the final mixer. I think its t-207 on the 390 non "a" and it might be t-208 on the 390a. One of my coils was in the process of failing open and was causing the same popping sound. The 390 manuals give a dc resistance for the winding of each coil so pop the coil cover and check. Incidentally for those who are interested I sub'ed a 390a mixer coil into the 390 non"a" and it works fine to this day.

From: jamesmiller20@att.net
Subject: Re: [R-390] R390A Popping
Date: Sun, 28 Sep 2003 05:04:37 +0000

I had the same problem. Unfortunately it turned out to be a break down in the center insulation of the mini-coax cables carrying the diode load signal from the IF module, to the rear terminal strips, up to the front panel, etc. After tediously replacing these coaxes the problem went away. I was put onto this by another on the list several years ago who had experienced the same thing. I forget who. Popping will tend to be more noticable when the diode load voltages go higher due to the breakdown in the coaxes. Strange but true. Of course it could be otherthings too, like bad caps, a bad tube, etc. Good luck.

Date: 5 Oct 2003 14:21:31 -0000
From: "Walter Wilson" <wewilson@knology.net>
Subject: Re: [R-390] R390A Popping

I may have been the "other" person on the list, as I had this same problem and have shared it with some. The problem was in the small coax cable that goes connects the limiter to the diode load. It was very tough to troubleshoot, and finding it was mostly a process of elimination. I was able to unsolder the coax at both ends, and test with a piece of coax jumper prior to removing the old coax and relacing it back into the wiring harness.

From: "JamesMiller" <jmiller1706@cfl.rr.com>
Subject: Re: [R-390] Capacitor Heresy
Date: Sat, 1 Nov 2003 13:48:09 -0500

<snip> Another thing I discovered in this radio... on one band (the upper AM

broadcast band) the carrier meter would change about 10-20 dB for no apparent reason, usually a function of how long the radio had been on. It would play solid 60 dB on the local station for 30-45 minutes, then suddenly drop 10-20 dB. It was a local station and this was not due to propagation changes. After much head scratching and deduction, this was finally traced to an intermittent failure in a capacitor in one of the band coils. It was in coil Z202-1, a 2400 pf cap (C-235-1) inside the coil can ... one end of this cap "touches" the B+ line feeding the V201 RF Amp via the coil in Z202. The other end of this cap. is in series with a 180 pf cap, both across the coil. My suspicion is that the radio was used a lot by the previous owner on the broadcast band, hence this cap. was subjected to B+ longer than any others, and developed a failure. Alternately, the higher value combined with aging resulted in a voltage breakdown of some kind. The failure didn't change the resonance of the coil greatly, but enough to reduce the signal coupled to the next stage. I bought a new can and it works well now. I suspect that any questionable performance on other specific bands could be traced to similarly failed capacitors in the coil cans for those bands (C232-1, C234-1, C238-1, etc). The moral is don't forget internal failures in these cans when diagnosing problems. (PS I got the replacement can from Fair Radio)... <snip>

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

I've been working on a R390A that I got through a trade and have several questions. It is basically a Stewart Warner receiver (RF deck and chassis), but the IF module is an EAC, the audio and power modules are Collins and the PTO is Cosmos. So far I've recapped it and checked the values of most of the resistors. I've replaced the power cord with a 3-wire cord and cleaned and the gears, bearings and slides. As soon as the Deoxit arrives and I can clean switch contacts and assorted sockets, I'll put it together and see if it works, then align it. Now to the questions.

I decided to measure the resistance from the AGC lines to ground. The IF module showed infinity, as it should. I then measured the AGC line on the RF deck and found approximately 80 K ohms (way too low). I don't know why I did this, but while troubleshooting I removed V203 and V204 and found that the resistance went up to 3-4 megs (better). Well that suggested some pretty bad tubes if they could show low resistance from grid to ground without the filaments on. After checking them and finding them to be ok (no shorts and not gassy) and subbing them with known good tubes and finding the same decrease in resistance, I started looking at how they were wired. The first thing I noticed is that the 27 ohm resistors that go to the grids were connected to pin 1 on each tube. A quick check of the base drawing shows that pins 1 and 5 are internally connected, so that explained why with the tubes inserted I got the low resistance. I was measuring the resistance of the B+ line to ground! Well, with further checking, I found that the cathode resistor/capacitor was connected to pin 2 of V203 and to pin 7 of V204 and there was a jumper to pin 2 on V204. So, it appears that the jumper was left off of V203. Now the real strange observation, pin 6 (grid) of V203 and V204 were both connected to ground!!! I've never heard of a grounded grid convertor. So, the first question is does this mod look at all familiar to anyone? Was there a mod that just didn't get completed correctly or was there a tube change?

Now the second question. The AGC line to V201 goes through R201, which is listed as a 270k resistor. My deck has a 3.3 meg in parallel with a diode for R201 with the cathode toward the transformers. It also has R233 replaced with a 3.3 meg resistor and another 3.3 meg resistor from E208 to ground. I seem to remember a change in the AGC for the RF amp, but can't remember it. And the third question is what is the purpose (if there is one) of an added diode between terminals 3 and 5 on TB102? This is the AGC DIV/NOR connection on the back. I forget the number, but it is a 3-digit number and looks like it might be a germanium diode.

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

From: "JamesMiller" <jmiller1706@cfl.rr.com>
Date: Wed, 19 Nov 2003 22:14:06 -0500
Subject: [R-390] Clavier IF Module - Ugh !

Wow! Working on a EAC 390a that has a Clavier IF module, ... unbelievable. Couldn't get the IF module to behave, occasionally it would slowly loose gain then it would come back again. Plus some strange intermittants. I discovered that one of the IF amplifier tubes would loose filament (making the gain go away slowly) then it would come back. **Found that the ground lead to the filament pin had not even been soldered at the factory!** Wire was looped through the socket pin, but not soldered! That explained the intermittent filament. Soldered it and that particular problem went away, but now another intermittent around another tube. Again, another pin not soldered, and three loose screws holding ground lugs. While I was in it, I did a complete check of all joints, and found 3 more suspect/cold solder joints as well. Well finally, the IF module works fine now, but Clavier must have had miserable quality control! Didn't they also make electric organs?

Date: Thu, 20 Nov 2003 05:04:32 -0800 (PST)
From: "Tom M." <courir26@yahoo.com>
Subject: Re: [R-390] Clavier IF Module - Ugh !

All modules were supposed to be inspected by a govt inspector so sounds like the system broke down. I suspect your module was an over run and never made it to service. What is the contract/s.n.???

From: "JamesMiller" <jmiller1706@cfl.rr.com>
Subject: Re: [R-390] Clavier IF Module - Ugh !
Date: Thu, 20 Nov 2003 17:40:39 -0500

The order # on the Clavier IF is DAAB05-70-C-1194; SMC 343621; SN 15

Wow! Could this be a collectible? I bought this radio a couple years ago from a guy

who said it was EAC, just now getting around to rejuvinating it. Everything else appears to be EAC except for the IF and the Cosmos. IF works fine now so I guess it doesn't matter except to the purists. I'm refurbishing the radio to the point where I want to sell it back into the "pool". Replacing the "problem" caps, linearizing the PTO, etc. I have two others (a Collins and a Stewart-Warner), which is already one too many. If anyone is interested in this EAC with a Clavier IF, fixed and working when I finish going thru it, let me know. This is not a mechanical rebuild as Mish or other experts would do, but it will be working well electrically when I finish, a good starting point to continue from. The front panel probably needs a repaint - it's the etched variety. Knobs and dial cover probably could use a repainting too. I'll probably take a loss selling it, but I need bench space in the garage.

From: "Joel Richey" <richey2@mindspring.com>
Date: Sat, 22 Nov 2003 10:44:33 -0500
Subject: [R-390] Bracket for cxr adj pot./

Tnx to all who offered one of these, I wasn't able to respond to everybody who offered, now Iam looking for the 8KC filter for the R390A if anyone has one they would like to sell I would be interested as long as I don't have to get a 2nd mortgage on the homestead. Got a question, the cxr meter pegs on strong sigs and funny thing is it does it with different IF modules, behaves the same with either of 3 IF modules I have, anybody seen this before.. Tnx

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Date: Sat, 22 Nov 2003 09:19:58 -0800 (PST)
From: John Kolb <jlkolb@cts.com>
Subject: Mechanical Filter --Was [R-390] Bracket for cxr adj pot./

See <http://members.cts.com/king/j/jlkolb> and follow the links
to the For Sale - Mechanical Filters and Crystals page. I've also got plots of the R-390A filter responses for anyone that might find them of interest.

From: "mparkinson1" <mparkinson1@socal.rr.com>
Date: Sun, 23 Nov 2003 22:06:33 -0800
Subject: [R-390] OSC Deck

Does anyone know it the R-1247 Osc deck is the same on the R-390a deck and if so are the all the cables the same to do a direct hook up. Someone asked me this and I have never seen a R-1247 so I could not give them an answer. Surely someone other might know this question.

Date: Tue, 25 Nov 2003 09:11:31 -0500
From: MURPH <rickmurphy1001@earthlink.net>
Subject: [R-390] R390 IF strip conversion

Does anyone know where I can get information for converting a R390 IF strip for use in a R390A ? Thanks in advance

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From: R390rcvr@aol.com
Date: Tue, 25 Nov 2003 09:27:29 EST
Subject: [R-390] R-390 IF Strip into R-390A

Tom Marcotte did an article in ER , Dec,2000 on the process. Someone probably has that article, or perhaps you could contact Tom directly. courir26@yahoo.com

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Date: Tue, 25 Nov 2003 08:10:48 -0800 (PST)
From: "Tom M." <courir26@yahoo.com>
Subject: [R-390] URL for R-390 IF conversion

I've posted the requested text to this URL: http://www.geocities.com/courir26/r725conv.htm
Hope this helps. I've been running this 390 IF deck in a 390A for a couple of years with no problems.

Date: Tue, 25 Nov 2003 08:14:37 -0800
From: Dan Merz <djmerz@3-cities.com>
Subject: Re: [R-390] R390 IF strip conversion

Hi, I strongly recommend the ER article by Tom. I successfully did this conversion and was very pleased with the result. It's stayed installed since I made the conversion. The toughest part for me, besides finding the 390 IF. chassis in the first place and soldering in cramped quarters, was finding the adapters for BNC to mini MB connectors for the two cables. Since then they are showing up on eBay all the time, under $20 each - I made mine up using a small junction box with 2 chassis mount mini connectors from Fair Radio connected directly to the bnc cable coming thru small holes in the box going to bnc connectors on the other ends of the cables. The adapter you need is the type that is chassis mounted on the 390a for the i.f. output at the rear if you don't want to fuss with building a box like I did. Hope this helps, Dan.

From: "Dallas Lankford" <dallas@bayou.com>
Date: Wed, 24 Dec 2003 15:32:46 -0600
Subject: [R-390] USB & LSB Filters and BFO Fine Tuning

For several years I have had some high impedance USB and LSB filters which require 130 pF resonating capacitance. These seemed like ideal USB and LSB filters for the R-390A, except for the work involved in removing the original filters and installing these, and these did not have flanges. Flanges are essential, otherwise RF will leak around the filters. Making and fitting the flanges to the filters turned out to be easier than I thought. Details of this mod can be found in the FILES section of the YAHOO R390 group. The obvious advantage of this mod is that you can set the BFO PITCH and forget it.

There are several reasons why an unmodified R-390A is not a great SSB receiver. Fortunately, most of these have been addressed in the past. The KCS tuning rate has not, mainly because there seems to be no way to add fine tuning to the KCS tuning. The BFO tuning rate has also not been addressed generally, though there were a few R-390A's with BFO reduction tuning gizmos with a counter dial. I never used one, so I can't say whether it solved the SSB tuning problem or not. My BFO tuning mod uses voltage variable diodes, and works very well. The tuning range is 200 Hz (for 1 turn), which is equivalent to a 30:1 reduction in the BFO PITCH. You tune in a

SSB signal as well as you can with the KCS knob, and then clarify the signal with the BFO fine tuning knob. The knob is attacked to a pot which is installed in the DIAL LOCK hole. This mod can also be found in the FILES section of the YAHOO R390 group.

From: "Dallas Lankford" <dallas@bayou.com>
Date: Wed, 24 Dec 2003 21:01:16 -0600
Subject: [R-390] More USB & LSB Filters

I forgot to mention that I don't know where I got the 526 9365 000 and ...65 000 filters. I also have a pair of 526 9364 061 and ...65 061. They seem to be the same filter, except perhaps for a bit wider bandwidth. That doesn't matter if you use a 6 kHz roofing filter like I do. I believe I got the ...061's from Surplus Sales Of Nebraska several years ago for $100 each.

From: "Drew Papanek" <drewmaster813@hotmail.com>
Date: Tue, 27 Jan 2004 18:13:39 -0500
Subject: [R-390] RE: HSR-2 vs 390a

On an Electric Radio article comparing the simple HSR-2 vs the R-390a, Dan Merz wrote:

What caught my attention was the statement –

>"Comparison to my very well working 390a was dramatic, I could CLEARLY
>hear signals that were well under the hash level of the 390a, but very
>comfortable copy on the homebrew receiver." (snipped) But what I'm wondering about, are there other factors that would make the 390a inferior in
>certain cases to a simple receiver as expounded in this article?

The aforementioned statement regarding HASH level of the R-390A could have some basis even for a well-functioning R-390A. The R-390A's mechanical filter response has extremely sharp skirts; wonderful in crowded ham band conditions but not so good in impulse noise situations. Hash as we sometimes define it is a form of impulse noise. Those filters will ping and ring, "smearing" out the pulses and making interference worse. One listening to a high quality AM signal with the R-390A can hear a slight raspiness to the audio; the filters ring on transient modulation peaks. The R-390 non-A has LC filtering (the IF cans) which has a more gradual skirt characteristic largely devoid of ringing and hence does far better in the presence of impulse noise. That also accounts for the superior audio quality of the non-A. I have an el cheapo Hallicrafters S-120 which is a low entry level general coverage receiver. Tube lineup is the All-American Five minus the 35W4 (selenium instead). Normally in side by side comparisons a signal that is not even detectable on the Halli will be armchair copy on my R-390A. But enter strong 60 Hz power line hash and on moderate strength signals the great '390A is humbled by the lowly Halli.

Rolling your own R-725 by stuffing the non-A IF module into an R-390A has its merits. However, that module can be hard to come by.

Here are some ideas (possibly without merit) I've been pondering for R-390A IF

module modification. (Forum Tranquility Preservation Statement: Performing the following modifications would constitute heresy! Shame upon he who would attempt them!)

1.Replace one or more of the "mechanism a philharmonic" (mechanical filters) with a filter comprising cascaded LC sections. These could be modern miniature IF cans with added impedance matching in and out. Modern ceramic filters plus impedance matching schemes could also be used.

2.Bypass 16 KHz filter entirely, add attenuation to match losses in the remaining filters. Change values of or remove the Q spoiler resistors in the R-390A's IF cans. Realign with less (or even no) frequency staggering. Fiddle with cathode resistors to reduce the gain which was raised by can mods. The IF cans so adjusted would then define bandwidth in the switch position labeled "16 Kc". That would be the high fidelity, impulse noise resistant mode. Using the narrower bandwidth positions would then provide mechanical filtration at the original bandwidths (provided the filter in use had a narrower bandwidth than newly defined by IF cans). Original function (and susceptibility to impulse noise) in the narrower positions would be preserved. These modifications might be attractive to one whose IF module has a defunct 16 KHz filter, if not for the fact that the 4Khz filter fails most frequently.

3. Keep the Philharmonic Quartet (16, 8, 4 ,2 Khz) intact but add relay switching to put the Quartet on hold and swap in LC or ceramic filtration as desired.

4. Add that panadaptor output jack you've been thinking about and use it to feed an external IF/detector/audio unit.

A better "modification" might be to acquire the R-390 non-A.

From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] RE: HSR-2 vs 390a
Date: Tue, 27 Jan 2004 17:40:15 -0600

Those sound like some good ideas to check out...I had thought about the IF deck mod to replace the Mechanicals with some LC filtering or ceramics. I know many new radio's now days can be ordered with the Collins mechanicals or ceramic filters so there must be some level of interchangeability.

From: "K1KQ" <k1kq@motorhomesusa.com>
Date: Wed, 28 Jan 2004 09:09:10 -0600
Subject: [R-390] OOPS! C-553 not C533

My post should have read C-553 not C-533... Damn that spellpecker.

>> "I have decided to take the conservative approach with respect to C533 and replace it" <<

Date: Wed, 11 Feb 2004 17:18:16 -0500
From: Jim Brannigan <jbrannig@optonline.net>
Subject: [R-390] Hum

I have a '67 EAC R-390A with a low level hum that is making me crazy. The hum is controlled by the AF gain control and therefore before it. It is influenced by the 800cps bandpass filter and disappears when V601 (1st AF amp) is removed. The plug in Capacitors have been replaced with new electrolytics. C609 in the cathode circuit has been replaced and the Rippel audio mod installed. The tube has been swapped for another and the hum still persists. Short of replacing every component in the 1st AF amp, I'm stumped!! Any suggestions?

From: "John KA1XC" <tetrode@comcast.net>
Subject: Re: [R-390] Hum
Date: Wed, 11 Feb 2004 21:53:44 -0500

Hi Jim, the hum might not be in the audio deck. Here's some tips..... Does it go away when you click ON the noise limiter? If so bypass cap C536 in the IF deck could be open. You could also have filament to cathode leakage in one of the detector or noise limiter tubes. To further isolate the trouble, disconnect the Diode Load jumper (TB103 terminals 14&15) which will break the connection from the detector and see what happens.

Date: Thu, 12 Feb 2004 08:10:52 -0500
From: Gord Hayward <ghayward@uoguelph.ca>
Subject: [R-390] Hum

I had a similar problem and as John mentioned, it was a filament to cathode leak in the noise limiter. The impedances in that stage are high so the leak was small enough not to show up on my tube tester, but big enough to give lots of hum. Replacing the tube fixed the problem, but I only found it by substitution.

From: "AI2Q" <ai2q@adelphia.net>
Subject: RE: [R-390] Hum
Date: Thu, 12 Feb 2004 15:43:22 -0500

Jim: Tighten down all under-chassis hardware, such as terminal strip grounding points. That cured a nasty 60-cycle audio hum problem here in a recent 51J-4 overhaul on my bench.

From: "Bernie Nicholson" <vk2abn@batemansbay.com>
Date: Fri, 13 Feb 2004 12:24:02 +1100
Subject: [R-390] 390a hum

I had hum in my 390a and after some searching I found that it was caused by heater cathode leakage in the 6BA6 in the VFO replacing the tube fixed the problem But I initially looked in the audio and IF module

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From: "Steve Hobensack" <stevehobensack@hotmail.com>
Subject: RE: [R-390] agc repair
Date: Mon, 12 Apr 2004 20:03:23 -0400

Gene, AGC voltage is very feeble. Any gassy/leaky tube, usually a 6BA6, or a leaky

cap in the AGC circuit will suck down the voltage. There is no easy way to find the leaky cap. It usually involves cutting one end free, and using a megger or the old fashined magic eye cap checker. Good luck.

Date: Tue, 13 Apr 2004 08:35:03 -0400
From: Gord Hayward <ghayward@uoguelph.ca>
Subject: [R-390] Re: AGC repair

Another thing to check is the antenna trimer. Its shaft is live to AGC. That is why the isulated bushings are important. Spraying with even a slightly conductive lubricant is bad news.

Date: Sun, 11 Apr 2004 16:12:06 -0400
From: Bob Camp <pb@cq.nu>
Subject: Re: [R-390] agc repair
To: Gene Dathe <dathegene@hotmail.com>

With "no agc voltage at all" (I assume that means zero volts) I sure would check the resistance of the AGC line to ground. It sounds like a short in one of the bypass cap's or cables. Assuming you find a short at the back panel TB102 then unplug the modules one by one. Either the short will go away when one of the modules is unplugged or the short is in the main wiring harness. If it's in the harness check the normal pinch points. Hope that helps. Bob Camp

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Date: Fri, 16 Apr 2004 19:47:00 -0700 (PDT)
From: "Tom M." <courir26@yahoo.com>
Subject: [R-390] Build Your Own R-725 Link

I was asked to furnish the link to this article, so I thought I'd also post the link as well:
http://www.geocities.com/courir26/r725conv.htm

Spend your summer lining up parts for fall completion. Since I did this project a few years back, I hope I can still find my R-390A IF deck.

From: "John KA1XC" <tetrode@comcast.net>
Subject: Re: [R-390] agc repair
Date: Sat, 17 Apr 2004 00:54:17 -0400

I've fixed three "no AGC" problems and none involved leaky caps or tubes, although the former can certainly degrade AGC action. The one that was toughest to find but easiest to fix was a 390A that acted like the AGC line was shorted to ground but the resistance measurements looked OK. The problem was that one side of the diversity OR-ing diode on the rear terminal had been bent over and was touching the chassis, so it was clamping the AGC line to within a few tenths of volts to ground! The other two problems each occurred in a 390 and 390A IF module. The Zxxx coil that is the resonant plate load for the AGC amplifier tube opened up and thus the poor tube wasn't getting its B+. Had to replace that coil in each IF. :^(73, John

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From: "D. ball" <ke1mb@hotmail.com>
Date: Thu, 22 Apr 2004 14:14:17 -0400

Subject: [R-390] To un-mod or not

I have just recently bought a 59' Steward-Warner. It is in really good condition but with some mods. My first question is, a co-worker who worked on the 390's in the service believes that if a mod was done by military personal under factory approved updates then that mod should be considered "stock", and under a collectors point of view it be valid. I would like to know if the 85' vintage radios had tubes instead of diodes. Secondly is someone made some IF mods in my radio. V506 seems to be a diferential product detector now. And there are various diodes in the AGC section which I have not mapped out. It all works very nice. But I don't use the radio that way. I use the IF out. That way I can play and not cut up the radio :) I notice that when I use my Kenwood 930s as the demodulator (with 60db of pad) I get very good results with the 390 on MGC. I am wondering if the stock ACG would work better using the 390 as a down converter only. I don't plan on selling this radio, the best city radio ever!! With the kenwood 930 dialed up on 455kc +/- some, and the 390 as the front end, I hear things neither radio can hear by itself. It is a scary combination.

Date: Thu, 22 Apr 2004 14:06:27 -0400 (EDT)
From: <ah7i@atl.org>
Subject: Re: [R-390] To un-mod or not

> I don't plan on selling this radio, the best city radio ever!! With the
> kenwood 930 dialed up on 455kc +/- some, and the 390 as the front end, I
> hear things neither radio can hear by itself. It is a scary combination.

You answered your own question...

Date: Thu, 22 Apr 2004 21:57:35 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] To un-mod or not

Odd but true - most receivers do not present a 50 ohm load to the antenna. When you pop a radio on to the 455 KHz output of the R-390 you put a "strange" load on the 455 KHz output of the radio. Like everything else on the 390 it will do better if you align it with that load in place *if* that's the way you are going to run the radio. A second thing to play with is the good old IF gain adjustment. You may find that a lower gain setting will still drive the outboard radio and give you better overload performance. Since both of these adjustments are reversible there's not much risk in trying them to see if they help or not.

From: "D. ball" <ke1mb@hotmail.com>
Subject: [R-390] To un-mod or not
Date: Thu, 22 Apr 2004 23:42:41 -0400

The buffer amp in the 390a does a good job, but regardless i have to use 60db of attenuation between the IF out and the kenwood 930. The signal is too hot otherwise, here you get a perfect 50 ohm load for the 390's IF out. The 60db is a must, you will overdrive your HF rig without it.

Date: Fri, 23 Apr 2004 10:13:31 -0400

From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] To un-mod or not

> The buffer amp in the 390a does a good job, but regardless i have to
> use 60db of attenuation between the IF out and the kenwood 930. The
> signal is too hot otherwise, here you get a perfect 50 ohm load for
> the 390's IF out. The 60db is a must, you will overdrive your HF rig
> without it. D. ball

One option might be to move the IF pick off point closer to the start of the IF chain. Obviously this involves modification to the radio ... One good option might be to use a scrap IF strip that's missing a couple of the filters. That would leave your "real" IF strip intact.

Date: Fri, 23 Apr 2004 13:28:47 -0400
From: wwarren1@nc.rr.com
Subject: Re: [R-390] To un-mod or not

It's even easier than that, simply disconnect the plug bringing the 455 kHz IF signal from the RF deck to the IF deck and use that signal to go the auxilliary receiver. Yes, one misses the mechanical filters of the 390A, but one also misses the intermod of the first IF stage, which according to some of the documentation, is one of the main sources of troubles. However, with that setup, you'd be getting the image rejection and selectivity of the 390A front end.
Remember that the IF deck is set up for 150 microvolts input at 455kHz for -7 volts on the diode test point. Thus, the RF deck as the front end to the aux receiver may still be too hot. That is, approximately a 2-4 microvolt input to the 390A antenna will deliver 150 microvolts to the RF deck, and that's about a -83dBmw signal. -83dBmw shouldn't overdrive the aux receiver, but with presumably no AGC on the 390A RF deck, the signal will go up very considerably (should be linearly) with increased antenna signal strength. Hope this all makes sense.

Date: Thu, 03 Jun 2004 10:55:13 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Solid State Ballast 'quirks'?

> ... If I was going to bet on the cause it would be a loose connection.....

Troubleshooters:

Bob's comment is right on, but reveals a possible other mis-adjustment. If the IF strip is contributing much at all to the set's noise (with the RF section not working), its gain is probably set too high.

See the procedure to set the IF gain on Chuck's website at http://www.r390a.com/ and specifically at: Under "Technical": "Setting the IF Gain for Maximum Performance"
http://www.r390a.com/html/gain.html

Note: "Terminate the antenna input" means put a resistor across the two balanced

input pins of about 100 to 200 ohms. The basic concept of this adjustment is that the radio's internal noise should come almost entirely from the first RF stage for best performance.

It's common for folks to crank the IF gain adjust pot up so they get louder signals. This upsets the carefully designed balance of gain in the various stages of the radio and leads to reduced performance - particularly in small signal detection capability and in overload and cross modulation characteristics. Those who used to service these sets in military situations where small signal performance was very important report that new RF front end tubes are noisier than those with some hours on them. So if you are tweaking for best noise, use a broken-in 6DC6.

> .. It's good to have a VTVM to do the measuring with. ... .

See this link for a Heath V-7A priced at $15. (I still have the one I built in about 1959, and it runs just fine!): http://www.af4k.com/miscpart.html
If you want a genuine TS-505 as specified in the R-390 manuals, here is one:

>TS-505 VTVM ("http://www.w2ec.com/ts505.jpg"), includes cover and probe.
>$25 plus shipping from NY 13732 Ray W2EC "w2ec@bmjsports.com"

These VTVM's have a meter face that is a bit harder to read than the Heath, but they are quite indestructible. By rights, no R-390 repair person should be without one for authenticity. It has been rumored that very difficult to find faults in R-390 receivers have cured themselves permanently when the TS-505 was turned on and brought to bear.Note that this meter also has an AC/RF probe that is useful from 30 cps to 10 mc and below 40 volts RMS. The diode used is a 1N70 germanium diode, not the hard to find and expensive vacuum tube ones found in the HP 410 meter probes. If you blow it out, a modern PIN diode will likely work just fine. By the way, the same fellow has a URM-25D that has been overhauled:

>URM-25D Signal Generator "http://www.w2ec.com/urm25d.jpg"), perfect
>operational condition, with manual copy and HSN reprint of Dallas
>Langford notes. All caps have been replaced per the HSN notes.
>Also includes accessories as shown: ("http://www.w2ec.com/urm25dacc.jpg").
>$125 plus shipping from NY 13732

Date: Sat, 12 Jun 2004 17:47:34 -0400
From: "Dee C. Almquist" <w4pnt@velocitus.net>
Subject: [R-390] SPECIAL R390A PANEL (6kc & 8kc)

Have you ever considered a narrower filter like 6kc & move the 8kc filter to the 16kc slot, eliminating 16kc? This means re-silk screening refinished panel that puts 6kc where 8kc position was & changed 16kc to read 8kc with same fonts as original. I have some pics of one done this way. Its pretty neet & I think I will modify my 390A this way when I restore it. That 16kc filter is much too broad & I seldom use it. But I use the 8kc a lot. And 6kc is just right for AM operation with reasonable band conditions.

Because of a request for 2 special R390A panels, I have the screen in stock to do

many more this way. Cost Will be $135. for this "special", front side.

Date: Sat, 12 Jun 2004 21:38:53 -0500
From: Tom Norris <r390a@bellsouth.net>
Subject: Re: [R-390] SPECIAL R390A PANEL (6kc & 8kc)

What about also doing a small panel with the markings screened onto it? Panel you say? What is Tom talking about? Well, something similar to the blank panel the R-725 has on the selectivity position, but with a hole for the filter switch. Circular or rounded edge square, take the nut off the switch shaft and put the plate on, covering the original markings for those of us with either engraved or silkscreened panels You know how cheap some of us out here are! hehe

Probably mean making another screen though. :-(Of course the $135 for an entire isn't bad.

Date: Sun, 13 Jun 2004 09:01:12 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] SPECIAL R390A PANEL (6kc & 8kc)

With the stock audio chassis the 16 KHz filter isn't as useful as it might be. On a radio running an improved audio chain the 16 KHz filter can be nice under the right conditions. I wouldn't use it on a crowded band though ... The filter that really does the major work around here is the 4 KHz on AM. It's about as narrow as you can get and still get a usable signal. The real limit on what you can do is finding the old filters in the right bandpass and impedance combinations.

Date: Sun, 13 Jun 2004 10:05:18 -0400
From: "John KA1XC" <tetrode@comcast.net>
Subject: Re: [R-390] SPECIAL R390A PANEL (6kc & 8kc)

> With the stock audio chassis the 16 KHz filter isn't as useful .....

Or when tapping of the Diode Load output to a hi-fi amp and speaker.

>I wouldn't use it on a crowded band though ...

I like to use the 16 kc BW when monitoring 29.0 MC or so for activity, it increases the chances of hearing something if the band opens.

Date: Sun, 13 Jun 2004 10:33:23 -0400
From: "Forrest Myers" <femyers@attglobal.net>
Subject: [R-390] r-390a chirping CW

I have a Capehart R-390 sn# 557 that is working quite well except for a couple of problems. All bands and all filters work. There are a couple of problems though and I'm asking the learned group on this list for any quick information or ideas.

Problem #1: Good clean CW signals chirp when heard on the 390a. It sounds like the BFO changes frequency with AGC levels. Checking the voltage at the audio

module and it's a steady 150.1 volts. Haven't checked farther into it.

Problem #2: Audio level is low but sounds good. I have to run the Local Gain control wide open to get a comfortable listening level. This problem has crept in over the past year. All tubes have been replaced. the radio has been re-capped, including the filter capacitors in the audio module. It has been aligned and the PTO is very linear after setting the end points. The rig works very well except for the above mentioned problems. I've been away for about 9 months and haven't used the rig. Am planning on getting into it again after building a set of test wire extender so I can check into voltages and signals. Just thought I'd put out the symptoms to see what advice I could gather.

Date: Sun, 13 Jun 2004 18:15:20 -0400
From: "James Miller" <JMILLER1706@cfl.rr.com>
Subject: Re: [R-390] r-390a chirping CW

I have found that replacing the first and/or second mixer tube may help the chirp. Changing AGC on the mixer seems to cause it to load down the oscillators as the AGC increases, pulling them off frequency slightly. Also could be another suspect tube, maybe an osc. tube.

Date: Sun, 13 Jun 2004 23:36:20 -0400
From: "James Miller" <JMILLER1706@cfl.rr.com>
Subject: Re: [R-390] r-390a chirping CW

Another thought: Check to be sure the 150V regulator tube is firing (it's mounted on the audio module). If the VR tube is bad, the 150V line may not be held constant, and changing AGC could cause it to change as the tubes pull more/less current. I think the BFO (and maybe the PTO) is run off the 150 vold line, so if it's changing a lot the BFO would tend to "chirp". Put a VTVM on the 159 line and watch it.....

Date: Mon, 14 Jun 2004 15:39:27 -0400
From: JMILLER1706@cfl.rr.com
Subject: Fwd: Re: [R-390] r-390a chirping CW

This has taken on an interest to me because I have two 390a's here, one is a Stewart-Warner, the other a Collins (almost). I notice a very slight "chirp" barely noticable in the SW as AGC changes. However, it was much more noticable in the Collins until I changed a mixer tube, ...it is lessened, but still noticeable, maybe a tad more than the SW now (judging by ear). My theory was that the AGC was pulling on a mixer tube, which then pulled more on one of the oscillators causing it to "chirp". Changing the tube reduced it. I also observed the +250 volt line which drives the xtal oscillators and other stages, and noted a moderate change in its level as AGC changed (a change in AGC would cause all controlled tubes to pull a varying plate load from that line). The 250V line in both radios seemed to pull the same amount, but the Collins still show a little more "chirp" as AGC changed. I would guess by ear to be 20-40 Hz. Is this normal? Would be interesting to hear from others... turn your BFO onto a strong, stable signal and run RF Gain up and down. ... you may notice a slight pulling in beat note. Do others note this also?

Date: Mon, 14 Jun 2004 19:34:38 -0400
From: Jim Brannigan <jbrannig@optonline.net>
Subject: Re: [R-390] r-390a chirping CW

I had a problem with a 75S-3B that drove me crazy. On CW and SSB there was distortion on the signals, AM was OK. It almost sounded like VHF aurora distortion. I checked everything.... . a scope on all the oscillators..the whole works....I tore apart the product detector circuits and no luck.....I put a CV-591 in the IF chain and it was still there!!!! Finally I changed all the tubes, AGAIN.....and it was gone.... Backtracking through the tube substitutions I discovered that the PTO was FM'ing. This did not show up on the scope because I was using a signal generator, and not an SSB or CW signal. In the end, I replaced all the components in the PTO, except the coil. So far so good....

Date: Mon, 14 Jun 2004 20:30:34 -0400
From: "Steve Hobensack" <stevehobensack@hotmail.com>
Subject: [R-390] r-390a chirping CW

I think the recomended way to copy cw is in MGC. Does the radio chirp in MGC? (local gain high, rf gain adjusted for volume). If the set has an added product detector or audio derived agc, it shouldn't chirp. (rf gain at max, local gain adjusted for volume). You might monitor the pto canister output signal and the crystal osc output signal and see if it chirps there.

Date: Mon, 14 Jun 2004 21:10:25 -0400
From: "Michael Murphy" <mjmurphy45@comcast.net>
Subject: Re: Re: [R-390] r-390a chirping CW

I wonder if the chirping R390A fixes bona fide chirp by undoing it? De-Chirping in effect. Of course the chirp would have to be going in the right direction - like upper side chirp and lower side chirp.

Date: Tue, 15 Jun 2004 10:24:20 -0400
From: "John KA1XC" <tetrode@comcast.net>
Subject: Re: [R-390] r-390a chirping CW

Not too unusual for radio's of this era when their RF gain is run wide open for CW copy. My GPR-90 has the same chirpy phenomena which is minimized by using SLOW AGC or eliminated by backing down the RF gain. Got to remember these old radio's have free-running oscillators with no buffering between them and their loads, and mostly unregulated supply voltages. Today's synthesized radios will spoil you in this respect. John

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Date: Mon, 05 Jul 2004 09:45:25 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] filters needed

Assuming their web site is correct American Trans-Coil still has partial IF decks for sale. They are at http://www.atc-us.com/ATCSHOP/ . Their web site is a bit tough to navigate but the R-390 parts are hidden in there somewhere. The decks they have

are missing all the tubes, transformers and some of the under deck stuff like the BFO coil. They do have all four filters on them and at the price they have listed are probably your best bet if you need more than one filter. I have dealt with them in the past and their stuff has always been as advertised. Occasionally they have been a bit slow to take stuff down off the web site when they run out of it.

Date: Sat, 17 Jul 2004 13:04:14 -0400
From: "Vic/Johanna Culver" <vculver@verizon.net>
Subject: [R-390] Hang AGC Circuit

Sorry -- this originally sent to wrong address. I hope it doesn't duplicate. Hello, Group. A really good friend gifted me this morning with something he said I really needed for my R-390 -- a very competently built "HANG AGC" unit. Two tubes, even!.

The information indicated that it was from a design published in 'the handbook.' I assume this handbook is an older version of the ARRL Radio Amateurs Handbook. Would anyone care to comment on the pro's and/or con's of adding a hang AGC unit to a radio -- beyond the fact that some of us don't want ANYthing that 'ain't stock.' Thanks, Vic

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Date: Sat, 17 Jul 2004 16:49:10 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Hang AGC Circuit

The AGC in the R390 has a slower attack speed than more modern AGC circuits. A number of people have done a number of things to change this. Probably the most common way to go these days is to put a couple of solid state diodes and a couple resistors in the AGC. The idea usually is to speed up the attack time and leave the decay time where it is. The net result is an AGC that cuts in fast and then drops out slowly. One term for his is "hang".

The solid state diode mods are no cut, no chop mods. They are easily reversed if in the future you decide to go 100% stock. For that reason alone I would recommend them over some of the earlier tube based designs that involved more surgery to the radio. I do not know if the tube versions worked as well as the solid state versions, but it is safe to say they did not work any better.

Date: Fri, 30 Jul 2004 14:02:05 -0600
From: "Mike Wells" <mwells@gcea.coop>
Subject: [R-390] Hello

I am new to the list. I just picked up a couple R-390A's last week and thought I would see what sort of helpful pointers I could get. The receivers I picked up are nice units. One is a Collins built unit and the other is a Capehart unit. I'm sure that there has been lots of chatter about the 26Z5 rectifier tubes. I am in need of one and started looking around and it appears they may be hard to find and expensive. Is there a good source for them? I am also curious about the calibration of the carrier level meter. I have adjusted the zero set point, however with the two 390's setting side by side one registers a much higher reading on the same signal, yet they both hear very well. Guess that only listening by ear isn't a good sample so would you think its just

an alignment problem?

Date: Sun, 29 Aug 2004 09:07:47 +0100
From: Charles B <ka4prf@us-it.net>
Subject: [R-390] Notch filter

Is there any one add on that I can get to produce a notch filter function for my R-390A. I don't want to modify the receiver. I have the QF-1A unit, but it's kinda of old and I don't trust it.

Date: Sun, 29 Aug 2004 09:20:05 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Notch filter

As far as I know there is no way to do an internal notch filter on the IF of the 390 without significant modifications to the radio. The IF output is probably your best bet combined with an external IF. In order to really do a good job with a notch filter it's better if the filter is at the IF. Of course this is just the start of the process. Since you now have the entire tail end of the IF outside the radio some things have changed. The AGC now really should come from the external unit and feed back into the radio. The 390 is at least set up for this part of the
process. I don't know of many boxes that are set up that way though....

The next thing is that the demodulator is now in the external box as well. That makes the mode select switch on the radio nonfunctional. Finally feeding the audio back into the radio is a little problematic. It can be done but it is not as easy as it should be. A lot of the boxes just went ahead and did their audio. That takes out the volume control knobs and audio filtering as well.

That's a lot of stuff just for an IF notch filter. But if you are still game, keep on reading .....

Most of the good old IF notch filter designs worked with IF's around 50 KC or so. They would mix down from 455 to a final low IF, filter, and then demodulate. I do not remember any good notch designs that worked directly at 455. They may be out there, but not on any radios I ever owned. If you go that way it's not just a notch, it's an entire extra IF strip.

One thing that has come along since the R-390 was born is digital signal processing. Most people look at this as a neat way to do filtering, but it's more than that. The one thing that most DSP units do very well is adaptive notch filtering. Properly done they also made good demodulators. You can do the process at either audio or at the IF. The IF processing is better, processing at audio is cheaper.

Of course if you are going to do it all at audio then there is another solution. A lot of people use outboard audio filter boxes. The AGC does not work the way it should and you still need some strange stuff with speakers. The one I happen to like is the JPS NIR-10. They show up on various sites fairly cheap.

If you want to go the IF route about the only source I know of for outboard boxes is

Sherwood Engineering. Their box works well with the R-390 and they have good support for their products. It's a small market and I'm a bit surprised anybody can afford to make new gear like this.

Now if you still are not satisfied there is the roll your own approach .... 24 bit A/D's and 32 bit floating point DSP on an R-390. A little work with the good old C compiler and you'd be in business. Think of the possibilities ..... we could name it the R-390B

Date: Sun, 29 Aug 2004 11:12:33 -0500
From: Jerry K <w5kp@direcway.com>
Subject: RE: [R-390] Notch filter

Or, you could run your 390A audio into a Timewave DSP-599ZX like I do, have it all in one neat little box, and still have a spare channel left over for an additional receiver.

Date: Sun, 29 Aug 2004 19:42:09 -0500
From: bw <ba.williams@charter.net>
Subject: Re: [R-390] Notch filter

The Heath HD-11 works very well as either a notch or a Q multiplier. Best of all, it is tube gear using the 12AX7. I've had mine hooked up for a year now. They are fairly cheap.

Date: Mon, 04 Oct 2004 18:00:22 +1000
From: Damien Vale <lcval1@netcon.net.au>
Subject: [R-390] IF module disassembly

I want to change C533 in the IF module but can't get at the base connection without removing H243 which is part of the BFO pitch assembly. Are there any problems associated with this? Although the set is working fine (a Collins 1955 series), C533 is covered with a white powdery material so I would like to change it, and while I'm there the ones adjacent to it C534 & C538.

Date: Thu, 7 Oct 2004 14:05:13 EDT
From: K2CBY@aol.com
Subject: [R-390] IF module disassembly

None, so long as you keep track of which lead goes to which pin of the BFO assembly.

Date: Thu, 07 Oct 2004 14:21:55 -0400
From: N4BUQ@aol.com
Subject: Re: [R-390] IF module disassembly

It's been a while, but as I recall, I removed the BFO when recapping my first R390A for just the reasons you describe. Just solder the wires back to it as they were and you'll be fine.

Date: Thu, 14 Oct 2004 12:51:51 +0800

From: face@netunltd.com.au
Subject: [R-390] r-390 Army manual mods

R-390A MANUAL:

A QUERY: My manual is the Army version TM 11-856A (stamped ME 147+ O2a inked in) Jan 1956. (odd that it came with a supposedly NAVY R-390A !) It has been much annotated and seems to have been used for shop maintenance work. There are inked in additions to the diagrams and some typed inserts replacing 'x' d out pictiures.

QUERY: I have a page (original page from a different manual) inserted between pages 108 and 109 (covers Fig 64 .. IF sub chassis, top view and Fig 65, bottom view.) The inserted page (is) pages 3 , obverse 4 , showing the same sub chassis, but with obvious photo differences. The inserted page has the reference 'TAGO 6903A ' on the bottom. The photo references are TM856A-34 and TM856-35 (original manual) and on insert TM856A-C4-1 and TM856A-C4 ??? (final bit obliterated by cigarette burn... so used as maintenance manual for sure!)
The insert shows some major differences to the original layout..Example: It shows a bunch of 4 trimmers on FL502 marked C513,C358, C571, C512. When I can get another more abled body body to help me take my R-390A out of its rack,(got no slides) I will then see if mine looks the same. Until then, can anyone tell me the relevance of this , please ?.

i.e. Are the added trimmers a later and necessary mod ?
Are there differing versions of the mech filters / and or tuning methods in these things? (I have an IF alignment sweeper somewhere that doesnt load things much when hooked up.. looks like I may have to use it .....is sweeping the IF the best way to align ? .. usually is)

ADDENDUM: Seems its likely all this has been reviewed by you guru's before ... To save everyones time re cycling the wheel, if there's previous links to any of this, how do I get on to them? (I'me an internet novice).

Date: Sat, 30 Oct 2004 14:07:55 -0400
From: "David C. Hallam" <dhallam@rapidsys.com>
Subject: [R-390] R-390 Problems

I have a problem with my R-390 nonA and don't know exactly where to start. The radio went dead. I suspected a B+ problem and found that one of the 26Z5W rectifiers had gone bad. I replace both and now can measure 180 VDC at the test point for regulated B+. The radio still is dead. Symptoms; (a) no movement in either the line audio or carrier level meters on any band with either manual or automatic gain and ....(b) no noise on the local audio output at any setting of the audio gain control

455 kHz signal from my URM-25D applied to test point E210 (grid of the 3rd mixer) produces the expected output measured with the 410B at the diode load terminal until the pass band is increased to 8 kHz or 16kHz. Then it's like something breaks into oscillation as the diode load voltage increases to something like 100 or more

volts.

I guess the next step is to start checking the voltages at each tube, but I wondered if someone might have an idea as to a specific location to concentrate on.

Date: Sat, 30 Oct 2004 14:50:16 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] R-390 Problems

Well the first thing to *always* be sure of any time you see IF filters involved is to be sure that the "magic" B+ blocking capacitor is in series with the filters. I see no reason why that would be your problem but it never hurts to be sure. The 26ZW5 can get pretty dead and the radio will still work. I suspect yours has been dead for a while and you just found the problem when the second issue started up. As you may have guessed the problem is likely to be an IF stage going into oscillation. Since it changes with the filters it probably is one of the stages ahead of the mechanical filters. I would also do a resistance check on the filters just to be sure the two wide band filters are still ok.

Date: Sun, 31 Oct 2004 08:02:32 -0500
From: "David C. Hallam" <dhallam@rapidsys.com>
Subject: [R-390] R-390 Problems Update

Thanks to all who replied to my request for help. The problem turned out to be a failed ballast tube. I changed the VFO and BFO tubes to 12BA6's and stuck the paper clip jumper in the ballast tube socket. All is working well again. I don't know if the failure of one of the 26Z5W rectifier tubes precipitated the failure of the ballast tube or if they were two unrelated malfunctions. The rectifiers were replaced with a pair of Ted Weber's copper top silicon plug in's.

Date: Sun, 31 Oct 2004 09:40:10 -0500
From: "David C. Hallam" <dhallam@rapidsys.com>
Subject: RE: [R-390] R-390 Problems Update

I replaced the 6BA6's in the VFO and BFO with 12BA6's, which eliminates the need for the resistor to replace the ballast tube.

There has been a recent discussion on this list about the ballast tube and ways to replace it. I think the general consensus is that the ballast tube really is not needed to stabilize the VFO unless you looking for the last little bit of stability. If so, you need to replace the ballast tube with something more sophisticated as given the relative "stability" of the AC line, the ballast tube doesn't do much in that regard.

Replacing the VFO and BFO with 12 V filament tubes is one of the suggested mods.

Date: Tue, 23 Nov 2004 10:45:36 +0000
From: Charles B <ka4prf@us-it.net>
Subject: [R-390] BFO Pitch

I had the IF subchassis out of my R390A last week to check underneath to see if

there were any problems i.e. burnt resistors etc. There weren't. Anyway, I had inadventently turned the BFO Pitch shaft when it wasn't hooked up and consequently I think my pitch maybe off. Anyone know the proper procedure for adjusting the Pitch WITHOUT instruments before connecting it back onto the knob?

Date: Tue, 23 Nov 2004 03:41:50 -0800 (PST)
From: "KC8OPP Roger S." <kc8opp@yahoo.com>
Subject: Re: [R-390] BFO Pitch

Tune in a known freq station, WWV works good. If your dial is set right it should read XX.000 depending on the freq. Tune for max carrier level at the lowest bandpass possible to make sure your centered on the freq. Turn on the BFO and zero beat. Should be 0 on the BFO dial.

Date: Tue, 23 Nov 2004 09:27:57 -0800
From: "Kenneth G. Gordon" <kgordon@moscow.com>
Subject: Re: [R-390] BFO Pitch

What has always worked pretty well for me is to set the selectivity at one of the narrower positions, but usually not the narrowest, tune in a place with NO SIGNALS, turn the BFO on, turn up the RF and AF gain so I can hear a lot of band hiss, and adjust for lowest pitch.

Date: Fri, 10 Dec 2004 00:31:17 -0500
From: Bill Abate <wabate@dandy.net>
Subject: [R-390] AGC problem

My 390A is almost finished its restoration. Looks pretty good and works well. Well, except for SSB reception. If I try to tune in a ssb signal I get a lot of distortion in the audio and the signal can't be tuned in properly. If I try the old method of max audio gain and reduced RF gain, all is well. Of course this is not the way other R-390A's work. BTW, AM reception is pretty good but has some distortion in the audio.

I figured that the AGC was not working properly so I ran the AGC test in the manual. I adjusted the ,local audio for 1.7V of audio with 5 microvolts of RF. I then increased the RF sig gen to 1000 microvolts and the audio output went to 20 volts. It's supposed to increase to 3 volts, so I found the problem. The problem is I can't seem to find the cause. I have AGC voltage on pin 2 of v506 (AGC line). I got these AGC voltages with my sig gen:

5 mv -> .04VDC
50mv -> -.2 VDC
500mv -> -3.8 VDC
5000mv -> -7.1 VDC
50000mv -> -9.6 VDC

I also found the AGC voltage on all the tube grids it was supposed to control. The only thing I can conclude is that the AGC voltage is insufficient but the manual does not say what the voltage should be with varying inputs. At least I could not find it. I also tried slow, med and fast AGC and the results were the same. Anybody have

data on the AGC line? Any ideas as to the cause??

Date: Fri, 10 Dec 2004 02:42:30 -0600
From: "Bill Hawkins" <bill@iaxs.net>
Subject: RE: [R-390] AGC problem

Don't have voltages for you, but here are a few ideas: Do you have the right tubes? No sharp cutoff where they should be remote cutoff.

Does the S meter read correctly?

Do the resistors in the AGC circuit have the correct measured values? How about the cathode resistors of the controlled tubes? They should be within 20% of the schematic value.

Is the resistance to ground of the AGC line greater than 100 meg if you isolate the line? Can you measure the resistance with something that applies 20-30 volts to the line? Or just apply voltage to the line with three 9 volt batteries and see if it propagates down the line correctly.

Date: Fri, 10 Dec 2004 09:34:26 -0500
From: "JamesMiller" <jmiller1706@cfl.rr.com>
Subject: Re: [R-390] AGC problem

AGC voltage for the front end RF Amp tube exists on the tuning shaft for the antenna trimmer ... if there is oil or grease on the fiber coupler and washers associated with the antenna trimmer, the oil could show as a path to ground for the AGC voltage at this stage. This can reduce AGC effectiveness for the front end. Spray with a non-oil based degreaser cleaner such as Big Bath. I have also found that sometimes the . 005 bypass capacitors at the AGC points throughout the radio can go bad and pull down the line. I have had to literally replace all of them in one radio. Finally, AGC is developed in the IF Module ... there is a tuning coil there that looks like an IF can Z-something, I forget the number) that you have to tweak to get the right AGC action.

Date: Fri, 10 Dec 2004 11:49:41 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] AGC problem

Have you set the IF Gain setting?
See: http://www.r390a.com/; and in particular: http://www.r390a.com/html/gain.html

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Date: Fri, 10 Dec 2004 12:42:13 -0500
From: "James Miller" <JMILLER1706@cfl.rr.com>
Subject: Re: [R-390] AGC problem

I read your original post again, where you said "this is not the way others work... " I have one 390a (a SW mfgr) that handles SSB pretty well at high gain. I have a Collins 390a that doesn't do well at high gain, on SSB, but works well otherwise. But I think the 390a that handles SSB without distortion is not the norm. Your receiver may be just fine and working normally, since you say it is OK when the RF gain is

reduced. There are some AGC mods on the web that can help, one simple one uses a couple of diodes in the IF deck. But in general I think that a 390a that distorts on SSB at high gain is normal. Just my opinion..

Date: Fri, 10 Dec 2004 12:33:42 -0600
From: Jerry K <w5kp@direcway.com>
Subject: RE: [R-390] AGC problem

I second that. I'd guess your 390A is probably working just fine. Both of my 390A's ('63 Teledyne/Imperial, '67 EAC) copy SSB wonderfully well with the BFO set correctly and the RF gain at about 7 or so. Crank the gain all the way up and it's distort city. So what? If I wanted a hands-off SSB receiver I would look to Japan or Tennessee for it. It also wouldn't weigh 85 pounds, wouldn't have anywhere near the mechanical/electrical "cool factor", and if it broke I'd have to pay a small fortune to mail it to the manufacturer to get it fixed. Where's the fun in that? :-)

Date: Fri, 10 Dec 2004 14:11:29 EST
From: DJED1@aol.com
Subject: Re: [R-390] AGC problem

My TM 11-856A has a graph of AVC voltage versus signal level which you can compare with measured results.

It shows about -2V at 10 microvolts in, -3.5V at 100, -6.5 at 1000, and -9V at 10,000. This depends on having set the receiver IF gain per the manual. I haven't seen any data on how flat the AVC response is, but I know my receiver audio output increases several dB as I increase the RF input by 40 or 60 dB. Let us know what you find. I'm going to make some measurements and see how well my AVC works.

Date: Fri, 10 Dec 2004 13:34:30 -0600
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] AGC problem

Well I figured it would come up so I'll go ahead and bring it up...is that 10uv at 50 ohms input or 120 ohms. I'm guessing 120 but our generators are nearer 50. Where's Bob Camp...

Date: Fri, 10 Dec 2004 15:55:11 -0800 (PST)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] AGC problem

Don't look at me I was reading this new website: http://webpages.atlanticbb.net/~w3np/

Date: Sat, 11 Dec 2004 00:55:56 -0500
From: Bill Abate <wabate@dandy.net>
Subject: Re: [R-390] AGC problem

OK guys, thanks for the info. First off I have the gain pot a little on the low side for a better s/n ratio. If anything that should help. My sensitivity is between 0.6 and 1.1

microvolts for 10 db s+n/N. All the tubes are correct and have been tested in a Hickok before aligning the rig. It really is perking quite well. I have that darn linearity adjustment to do for the Cosmos PTO, but I got sidetracked on this SSB thing.

I pulled the IF deck and played around with it for most of the day. I replaced a few resistors and caps but not because they were that bad. Same results.

I got one more piece of data that makes no sense. The suppressor grid of V504 and V508 (pin 2) has +6 V on it instead of the -2.5 that should be there according to my manual. The voltage does not change with AGC or MGC selected with the function switch so I conclude that it is coming from V509 and not the AGC bus itself. Now the no signal voltage on pin 1 or 2 of V509 is -.5 V and should be -1.9 V. Maybe that is why I am not getting the AGC voltages that Ed, WB2LHI, said his manual indicates.

One thing that I think has helped is to lower the B+. The military put diodes in the place of the 26Z5's and the voltage was 255 which is a little high. I inserted a 10W 40 V zener and got the voltage down to 215. The distortion is not that bad now. I can copy some stations with full RF gain but it still does not have good fidelity. Maybe I moved the overall gain of the rig to where the AGE has more of an effect? I am still blaming the AGC voltage. Z503 has been peaked but maybe there is something wrong with it? Not ready to give up yet.

Date: Sat, 11 Dec 2004 03:05:27 -0500
From: "James Miller" <JMILLER1706@cfl.rr.com>
Subject: Re: [R-390] AGC problem

Get the ohmmeter and check the values of all resistors, replace any out of spec. ones. Start with the IF module. The old carbon resistors tend to drift higher as they age. Especially check cathode, plate and screen resistors (they tend to change from being in the line of power flow). The resistor aging problem is more common than you would think. They can "look" good cosmetically and still be very bad.
JM

Date: Sat, 11 Dec 2004 03:09:15 -0500
From: "James Miller" <JMILLER1706@cfl.rr.com>
Subject: Re: [R-390] AGC problem

One more suggestion: Tighten all the hardware, screws, nuts, etc.especially those that hold the tube sockets and ground lugs down. Again, they loosen with age due to heating/cooling cycles. And don't discount a few cold solder joints or even joints where the mfgr forgot to solder and QC. I had an IF deck by Clavier once where at least 5 pins had absolutely no solder on them at all. Anything can happen.

Date: Sat, 11 Dec 2004 09:36:44 -0600
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] AGC problem

Bill you are trying to make a SSB radio out of one that was never designed to be one. I have never seen an unmodified R-390A that would copy SSB with the RF gain full up...it wasn't designed to do so. Most require that the RF gain be reduced several

notches to get any kind of decent demodulation of a SSB signal. That's why all the modification information over the years such as the "Langford AGC" mod etc..... It's an age old problem. It sounds like your radio is working properly....with some voltage readings that are out a bit. What are you using to measure them? Needs to be an old not so high tech analog style meter. One that loads the circuit a bit. That is what was used when the readings were documented. Something like an old Simpson 260 would be in order I would think. Other can comment on that as well...

Date: Sat, 11 Dec 2004 21:01:13 EST
From: DJED1@aol.com
Subject: [R-390] AGC problem

I made a few measurements on my receiver to see what the AVC characteristic was. I got the following curve, which shows pretty good AVC action:

microvolts in	AVC volts	audio level
5	-1.0	-5 dB
50	-4.0	-3 dB
500	-7.0	-2 dB
5,000	-9.4	-2 dB
50,000	-12.3	-3 dB

I was also curious about the input impedance match to the generator, so I put my MFJ antenna analyzer on the receiver input. Interestingly, all readings at center frequency were in the range of 25 to 50 ohms, with the reactance being tuned out by the antenna trimmer. I suspect I may have a bad measurement because the signal level is so high. Has anyone done a similar measurement? Is the receiver input really 100 ohms or so, or have we been worrying about
generator mismatch for nought?

Date: Sun, 12 Dec 2004 16:56:49 -0500
From: Bill Abate <wabate@dandy.net>
Subject: Re: [R-390] AGC problem

My AVC voltage at 5 and 10 mv does not agree with yours. It is less. 10mv shows -0.25. Can't figure anything to increase it. The high end is OK. Resistors and caps have been replaced. SSB reception is still distorted but not as bad as when I was running 255 VDC B+. My friends 390A receives SSB at full RF gain and sounds good. Maybe I can swap radios when he isn't looking! :)

I won't bother you guys further with this as I think this is as good as I'm going to get it. At least I was able to get the radio to meet the AVC spec in the manual so something was accomplished. I may experiment with the gain adjustment pot to see if that helps. I believe it is IF gain causing the problem and not RF gain. Next year's problem. On to the Cosmos PTO!

Date: Tue, 14 Dec 2004 19:17:09 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] AGC problem

Sorry to be late on this one.... I think the AGC side of this has been pretty well worked over. There is another side to this though. The distortion on SSB detection is related to the way the BFO works as a detector. It distorts when the RF signal gets to high for the way it's set up. One of the things that directly affects this is the level of the BFO voltage injected into the detector. Since the AM detector diode gets used as a mixer when the BFO is running it's characteristics also get into the act. Some 390's have been modified to increase the BFO injection and some have some detector tubes in them that have gotten a bit soft. In this case a soft tube *might* work better than one that's up to spec. I would also agree that most R-390's do not work very well on SSB with the RF gain turned all the way up. If I was going to look for something odd I would take a look at the radio that picks up SSB fine rather than the one that has problems.

Date: Wed, 15 Dec 2004 15:42:22 -0500
From: "Drew Papanek" <drewmaster813@hotmail.com>
Subject: [R-390] ACG problem

>SSB reception is still distorted but not as bad as when I was running
>255 VDC B+. My friends 390A receives SSB at full RF gain and sounds
>good. Maybe I can swap radios when he isn't looking! :)

Perhaps you and your friend could swap IF (or other) modules for test purposes- that would certainly help pinpoint the location of any circuit fault. You could take voltage measurements at various points on the substitute module and compare with those taken from your module. Maybe your IF module would provide the desired SSB reception in his radio, telling you that the problem lies elsewhere in your radio.

On the same topic Bob Camp wrote:

(excerpted) >Some 390's have been modified to increase the BFO injection and some have
>some detector tubes in them that have gotten a bit soft. In this case a
>soft tube *might* work better than one that's up to spec.
>I would also agree that most R-390's do not work very well on SSB with the
>RF gain turned all the way up. If I was going to look for something odd I
>would take a look at the radio that picks up SSB fine rather than the one
>that has problems.

Bob brings up some very good points. Again, module swapping or even tube swapping (from the other radio) could provide clues. About B+ voltage: Bill's 255v seems a bit high even for a radio with 120VAC power and no B+ reducing devices. Where was the B+ measured? At the rectifier cathodes is not a good place because the large ripple voltage there would confuse many DC meters, giving inconsistent/ inaccurate readings. A better place would be at the filter caps (remember, the filter is choke input). The screen of the audio output stage (either Line or Local) is convenient-yank the 6AK6, wrap a wire around the appropriate pin and plug back in. The wire can be left in place to provide a convenient B+ shock hazard :)

I measure 180 volts B+ at the 6AK6 screen with 120VAC power supply input and 200

ohms in series with the rectifier common cathode lead (solid state diodes).

Date: Thu, 16 Dec 2004 22:24:07 -0800 (GMT-08:00)
From: Tony Angerame <tangerame@earthlink.net>
Subject: [R-390] Re: R-390 Digest, Vol 8, Issue 11

Let's not forget about the "Dallas lankford" ssb agc mod. It consists of adding a voltage doubler (Two Diodes) to the agc line. The faster action (attack) of the solid state devices and the increased agc voltage allow one to operate with the rf gain all the way up. I use it with an outboard selective rf voltmeter which has a product detector for excellent ssb. He also had a way to increase bfo injection to make the diode detector more acceptable. I think the old timers must be tired of responding with this answer so offically being old myself I took up the yoke.

Date: Fri, 07 Jan 2005 08:49:03 -0500
From: Gord Hayward <ghayward@uoguelph.ca>
Subject: Re: [R-390] AGC Cap

I wouldn't use an electrolytic. At the best the ones I've seen have a tolerance of +80/-20% and they leak. It would be like putting a resistor across the AGC! I did find a suitable substitute - I think its either 1 or 2 polycarbonate caps which give a replacement smaller than the metal box in there now. I put them in a box of stuff waiting to be installed when I pull the set out of the rack. I have a few things to do but currently, if it ain't broke, I ain't fixing it.

Date: Fri, 7 Jan 2005 09:50:12 -0800
From: "David Wise" <David_Wise@Phoenix.com>
Subject: RE: [R-390] AGC Cap

What Gord said. Even a new electrolytic will leak about as much as your bad old oil/paper cap. The new cap *must* be "no"-leakage, for example any of the plastic film varieties. I suppose ceramic would be up to the job, but I've never seen one at 2uF/400V. It would be quite a lump! I replaced mine with a small AC motor cap, again with a plastic dielectric. It fitted easily in the original can after gutting. That's not a pleasant job, but since it wouldn't fit under the chassis it was my only choice. When cruising, the cap won't see more than about 200V,
but if you have a SS power supply there will be more during warmup but not more than about 350 for sure. Since cap life depends more on cruising voltage than transients, even a 400V cap will last for generations.

On a related note, I breadboarded my anti-moment-of-silence mod, and it looks good. As expected, 0.15uF is the optimum value if you like the old time constant. 0.1 and 0.22 are perceptibly off. Next week I'll do quantitative measurements. I'll modulate the signal generator with a slow square wave, and watch the AGC line on a scope.

Date: Sat, 8 Jan 2005 15:10:29 -0800
From: "ELDIM" <eldim@att.net>
Subject: Re: [R-390] AGC Cap

Is that AGC Cap an metal encased OIL BATHTUB with mflange mtg holes on each side? Or, is it a plain axial lead type? I know I have many here in the inventory. What was the Part Number? I concur, that using an electrolytic is not a good solution.

Date: Sat, 08 Jan 2005 18:41:29 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] AGC Cap

The AGC cap is an oil in metal type. I don't think it's a standard one though. Given the state of most of the oil and paper caps it's probably best to replace this one with a plastic insulation part. Popcorn noise on the AGC line is the last thing you want to have.

Date: Thu, 20 Jan 2005 16:19:45 -0800
From: "David Wise" <David_Wise@Phoenix.com>
Subject: [R-390] Ending The Moment Of Silence

I did it! I have perfected a mod that eliminates the carrier level disturbance when switching the R-390/391/390A AGC rate. Only the front panel wiring changes. It is 100% compatible with standard IF decks and those with the Lankford AGC mod. This is how Collins should have done it, it would have cost them next to nothing. Like the carrier level pot, the engineer just didn't think it through. The mod I posted earlier had side effects that ultimately caused me to reject it, although it was very compact and easy to do. This mod borrows an idea, but otherwise it's totally new. I have tested it extensively, and the ergonomic improvement is just fantastic. You'll never realize how obnoxious and fatiguing the stock AGC switch is until you try this.

Pros:

No more "Moment Of Silence" (SLOW to MED)
No more blasting (MED to SLOW)
Same time constants as before, or season to taste
Compatible with existing modules
Reversible (no holes)
No "box on the side", it's all internal
Works with decks that have a bad C551

Cons:

Needs a new AGC switch (2-pole vs 1-pole)
Needs a piece of sheet metal (if you want it to be neat)

Performance:

OLD
FAST-MED: Dip, Nothing, or Surge, depending on signal levels
MED-SLOW: Severe Overload for 1-2 seconds
SLOW-MED: No Signal for 1-2 seconds
MED-FAST: Nothing

NEW
FAST-MED: Nothing!

MED-SLOW: Nothing!
SLOW-MED: Nothing!
MED-FAST: Nothing

(Lest someone accuse me of advertising hype, I will qualify the above claims to the extent that at very high signal levels (over 80dB), you may detect a slight surge on MED-SLOW and SLOW-MED, but it's barely perceptible except under artificial laboratory conditions, where it becomes merely "perceptible".)

Cost: About $15 and a couple of hours. Well? Dave Wise

Date: Thu, 20 Jan 2005 20:13:00 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Ending The Moment Of Silence

Only the obvious question - Is it easily reversible ?

Date: Thu, 20 Jan 2005 21:21:00 -0600
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] Ending The Moment Of Silence

You have found a way to eliminate the only internal self test besides the Xtal Calibrator the R-390A possesses? I'll have to think about that one....

Date: Fri, 21 Jan 2005 09:17:46 -0800
From: "David Wise" <David_Wise@Phoenix.com>
Subject: RE: [R-390] Ending The Moment Of Silence

Sorry all, I have an emergency at work today and won't have time to write much. I did think of a couple of "Pro"s I forgot yesterday:

No semiconductors
No active components
No hard-to-find or exotic components

> Is it easily reversible ?

Depends on what you mean by "easily". It's not a plug-in like my 3DW7. You'd have to drop the front panel, unsolder three wires, remove an assembly and the new S107, remount the old S107, and solder three wires.

Date: Fri, 21 Jan 2005 15:50:09 -0800
From: "David Wise" <David_Wise@Phoenix.com>
Subject: RE: [R-390] Ending The Moment Of Silence

It's nothing scary, just a flat bracket to base a terminal strip on, to avoid gluing or drilling a hole on the front panel.

I didn't see any real mount points where there was also enough room for the strip + components. I'm going to try to put it all into an HSN article.

Date: Sat, 22 Jan 2005 09:14:35 EST
From: DCrespy@aol.com
Subject: Re: [R-390] Ending The Moment Of Silence

Dave, and all. I should still be a subscriber and have not seen a copy of HSN in at least 2 years. I think it has died a quiet death?

Please consider some other way to make the info available?

Date: Sat, 22 Jan 2005 08:00:56 -0800
From: "David Wise" <David_Wise@Phoenix.com>
Subject: RE: [R-390] Ending The Moment Of Silence

I've talked to Barry Hauser. It's been in suspended animation, but this is a good candidate to jump-start it. If that doesn't happen, be assured that the details will surface here. My announcement was to gauge your interest, as previous offerings didn't generate much enthusiasm. Controversy, yes :) In the mean time, if there's an R-390/391 nearby, or someone has some high-resolution or close-in photos that show the top rear area of the front panel and its relation to the rest of the set, I could predict whether there's room to fit the mod there. It can go anywhere, but front panel top-center is the "sweet spot". I hate trailing wires.

Date: Sat, 22 Jan 2005 08:03:31 -0800
From: "Kenneth G. Gordon" <kgordon@moscow.com>
Subject: Re: [R-390] Ending The Moment Of Silence

Try Electric Radio. They are really good people and gladly would take such an article. Go to http://www.ermag.com/ and get hold of the editor.

Date: Sun, 13 Mar 2005 11:24:24 EST
From: Flowertime01@wmconnect.com
Subject: [R-390] Bad AGC

I do thank you for the article. Would you know it. My R390 started behaving just as you describe. It works good in the Manual AGC mode and looses all gain in the AGC mode. I had been looking at the AGC sections looking for a cap that would short after it warmed up and not finding any thing. Now I have some place to go looking for the cause, and a real solution (new filter) when I find my exact problem.

I was still employed a while back and went on the road doing first article testing for a new Navy Ship. I watched engineers at several independent laboratories abuse some serious computer network equipment to qualify it for use aboard Navy ships. I had to give up the R390 net here as I was over extending my computer usage. But now I retired, moved from San Diego California to Westminster South Carolina. Maybe now I can talk to Hams In San Diego. I used to live in Spring Valley a bed room community about 10 mile from down town San Diego. I have radio contacts from Japan, Texas, Maine, Washington State and British Columbia, from Spring Valley. I knew every one in the El Cajon Radio Club, and never worked any one in San Diego. I love the aspects of antenna propagation. As soon a we finish moving in

and I get the toys unpacked, I'll get back on the Air. Most likely I should ask the FCC for a new call and give up my old California KC6TRU call. The R390A is still packed. I had a good scope get crushed in the move, but every thing else survived. A here I am, the first day back on line and Al has nailed a problem that I have been pondering for some time.

Date: Fri, 01 Apr 2005 18:32:33 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Help getting unstuck!

Well a large pipe wrench attached to the appropriate allen wrench, maybe combined with a five pound sledge probably would get it moving. The obvious problem is that almost anything past normal pressure with a standard tuning tool is likely to shred the coil rather than moving the core. There is almost no reason to believe that moving the core is worth damaging the coil. Even if things are a bit out of alignment the radio probably will work perfectly well as it's set.

Often the problem is that the coil form has shrunk over the years and now it's simply to small for the core to move in. In that case it may need *more* not less humidity to be fixed. I have never had any success at "steam treating" in this situation but it's been recommended in the past.

Another idea is that you have crud in the threads. In order to get things moving you need lubrication. The punch line here is to use a light weight oil to free up the core. To me that sounds like an excellent way to destroy the core and or the coil. I would not try it on one of my radios. Another recommendation is to use spray on contact cleaner. I have tried that one and it didn't work on my coils.

I realize none of that is much help at all. The main point is that this may be one where simply leaving it as is makes the most sense.

Date: Fri, 1 Apr 2005 17:11:16 -0800 (PST)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] Help getting unstuck!

Try some freeze spray on it, but take the cover off first to you can watch to see that you don't turn the coil instead, that may pull the wires off. Try just blowing some air from the compressor in it first, maybe it will dislodge some of the crud.

Date: Thu, 31 Mar 2005 22:44:11 -0500
From: "Michael Murphy" <mjmurphy45@comcast.net>
Subject: Re: [R-390] Help getting unstuck!

You need a can of slugout. You said that just the top core is stuck in T-501. Could have been worse - it could have been the bottom coil.

First adjust T-502 and the bottom coil per the instructions http://www.r390a.com/html/if_deck.html

I liked all of Bob's ideas that did not work of course. What about using his light oil

idea and then heating an allen wrench red hot and sticking it in just to see what would happen. Then follow up with the cold spray (or a fire extinguisher).

Next take your not so favorite hex tuning stick and coat the end with Zap a Gap Cyanoacrylate. After you stick that in and let it set up, something should move. When you are happy, saw off the end of the stick and glue on a small knob. Now you can tune the coil casually. Like he said, this is a broad tuned coil. Probably good enough to just leave it.

Date: Fri, 1 Apr 2005 23:37:52 EST
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Help getting unstuck!

>Can't seem to get the top slug in T501 to move. Craig,

Sounds like a chance to stop and test. Run the 455 into the IF deck and do a signal to noise test. If you can get a 28 to 1 signal to noise the coil is close enough and effort to adjust the stuck slug will exceed return on investment. If its close just leave it alone. If its not close then maybe you will be loosing some fidelity in the 16K band width.

Use the Adjustment of Gain Adj Potentiometer. Paragraph 73 in TM 11-5820-358-35. you want to run 150 uv of 455 into the IF deck. set the gain adjust for -7 volts on the diode load. With 30 percent modulation you should get about 0.5 watt of audio across the 600 ohm output. We metered the headphone output with a test lead that ended in a phone plug. You can meter dB with most analog AC volt meters and the instruction book (page of paper) for the meter.

Turn the signal generator modulation off. Now you have just a 455 carrier signal. The audio output should have dropped 30 dB and there should still be -7 volts on the diode load.

If you cannot get 30 dB signal to noise here, start swapping tubes around and trying to do some alignment. Trouble is there is no easy way to determine if your IF deck was stager tuned or aligned at 455.

So try to perform the stager alignment procedure as detailed in the TM first.
If you are loosing gain, go for the straight alignment.

Just leave the stuck slug for the very end. Get all the other bugs out of the way first.

Get good tubes in and do the best alignment you can get other wise.

If you get up to about 28 to 1 just leave that stuck slug alone.Only after you get everything else as best you can and you know by measurement that the IF deck is not up to minimum then get worried about that slug.

Get the cover off the can so you can see what's moving. The hot air hair dryer is the least offensive way in. Most of the time it will melt down some of the wax. Heat and soften the gunk.

You can get an IF deck from Fair Radio less crystal filters and tubes, and BFO and ballast tube. It will have a T501. The IF cans (T501, T502, T503) are all the same.

Push comes to shove and you conduct a destructive test, ask here on the reflector, someone likely has the part stuck on some of there collected spare parts and would make you an offer your not likely to refuse.

Good luck and be gentle. Roger KC6TRU

Date: Sat, 2 Apr 2005 13:50:31 -0800
From: "Craig C. Heaton" <wd8kdg@worldnet.att.net>
Subject: RE: [R-390] Help getting unstuck!

Taking a real close look at the top slug, cleaning the top, it does have a crack. So its not going to move as one piece. Cecil's idea of a root canal might be the best option if the receiver will not come up to specs. I'll use this as an excuse to put out a general call for parts n' pieces! If someone has a spare slug, T501, or a IF sub-chassis please drop me a line.

The Motorola will never be a museum piece, but it would be nice if everything would work as designed. In the coming days, I plan to go through the entire receiver and at some point will be able to try the signal to noise test.

Took the IF sub-chassis out last night and looked at what it would take to replace T501, lots of work. Root canal would save time vs the soldering iron to replace the entire transformer.

Date: Sun, 03 Apr 2005 07:55:17 -0400
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] Help getting unstuck! - Call for Mr. ATC

Unfortunately -- no IF coils/transformers. Those were harvested and sold off a long time ago, well, before I got involved. The IF decks have all four filters, but no IF cans. Most of what's there is still on the ATC site (http://www.atc-us.com). Click on the cascading drop-down menus to look around.

I'd suggest contacting Phil at Fair Radio. They often sell individual parts which they pull off parts modules as needed and which are not necessarily listed in the catalog or website. Further suggest waiting until you have a replacement in hand before getting any more aggressive with that stuck core. As someone pointed out (maybe Bob), it's broad-tuned and may well be fine set the way it's stuck.

Date: Sun, 03 Apr 2005 12:14:26 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Help getting unstuck! - Call for Mr. ATC

The 17 MHz crystal is still available from the normal crystal supply guys. You probably can get them at a better price from Fair though.

Date: Sun, 10 Apr 2005 14:00:48 -0500
From: "Barry" <N4BUQ@aol.com>
Subject: [R-390] 1.0 and 0.1 filter settings

Can someone give me the "Reader's Digest" version of how these two settings work in an R390A? I'm working on restoring the modules for my newest project. After replacing C553 (just to be safe), I plugged it in place of the IF deck in my working R390A. It seems all four filters are working; however, when I switch to 1.0 or 0.1, the signal disappears almost completely, no matter how closely I tune to the frequency. I can see that the crystal and its parallel adjustable capacitor are always in the circuit, but going to 1.0 switches out the extra cap and switching to the 0.1 position adds some extra circuitry into the mix. I don't quite understand how these other two settings do their job. If someone could elaborate, I'd appreciate it.

Date: Sun, 10 Apr 2005 12:57:08 -0700
From: "Dan Merz" <djmerz@3-cities.com>
Subject: RE: [R-390] 1.0 and 0.1 filter settings

Barry, the crystal may appear to always be in the circuit but it is bypassed by C501 when the switch is in the 2,4,8,16 positions. The crystal filter is effective only in the 1 and .1 positions. Apparently something is not adjusted correctly in the crystal filter or the crystal is defective, which is causing the filter to reduce the gain considerably. I don't recall messing with the crystal filter neutralizing in my 390a which is covered in the Y2K manual; others may have words of wisdom about problems that arise in the crystal filter circuit, Dan.

Date: Mon, 11 Apr 2005 09:23:22 -0500
From: "Barry" <n4buq@aol.com>
Subject: Re: [R-390] 1.0 and 0.1 filter settings

Thanks for the reply. I see what you're talking about now. I didn't realize the cap's job is to "bypass" the crystal, but okay on that. The problem seems to have fixed itself somewhat. I'm in the process of recapping the IF deck. I'm replacing a few caps at a time and testing between each "session" to make sure I haven't toasted anything. If it stops working, I'll be able to narrow down where I may have botched something. I replaced the two cathode bypass caps last night and DeOxited the bandwidth switch contacts.

The last test seemed to be a lot better than the first one. The signal doesn't drop nearly as much as before. I washed the deck thoroughly Saturday afternoon and thought I had it dried out pretty good, but perhaps there was still a bit of moisture hiding in critical places and that may have dried out better overnight. Perhaps the cathode bypass caps in the first IF amp were leaky. Not sure what improved it, but it appears to be working now. Six paper caps down in the IF deck and nine more to go. I'm sure glad this is my hobby! Some of these are a real pain to replace!

Date: Mon, 11 Apr 2005 11:33:14 -0400
From: "John KA1XC" <tetrode@comcast.net>
Subject: Re: [R-390] 1.0 and 0.1 filter settings

I'd recommend removing the cover from the L503 coil, and pull the 455 KC crystal out of its socket and give the pins a cleaning and De-oxit treatment.

Date: Mon, 11 Apr 2005 21:13:35 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] 1.0 and 0.1 filter settings

OOPS, Have you pulled the cover off Z501 and observed that there is a crystal in the location? Just one step in the trouble shooting process. The crystal is 455Khz and they get garbed for other projects.

Date: Tue, 12 Apr 2005 10:17:33 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] What is the difference between 390 and 390A

I can't remember the low IF frequency in the 180 - is it 60 kc?. I have an HQ-170A on the bench right now. I'm reminded of the filters used in telephone/teletype mulitplex systems since the 1930's. I have a couple of the filters used, one is at 80 kc I think (the ARC-5 low band receiver uses 80 kc IF, I think.) In any case, finding such a band filter for the right frequency might well get you a voice band width filter of superb performance. At the NRC publications-reprints page, http://www.nrcdxas.org/ I find the following:

"R2 SINGLE SIDEBAND RECEPTION ON THE BCB WITH MECHANICAL FILTERS. G. P. Nelson. Few commercial receivers covering the MW band have adequate selectivity to cope with MW interference--particularly in the presence of powerful local stations. Explains how to add mechanical filters to an existing receiver for the ultimate in adjacent channel rejection. (21) "

"R31 THE SUPER HQ-180. Dallas Lankford. Add a Collins mechanical filter to your "180". While not a "how-to" article, problems and results are discussed. (4)

"R43 CERAMIC FILTERS. Marc Bergman. A listing and description of the most commonly available ceramic filters, with data from tests. (9) "

"R46 SURPLUS MECHANICAL FILTERS. Marc Bergman. Test results of several reasonably-priced and available mechanical filters. (3) "

"R67 R390A KHZ FILTERS FOR THE HQ-180. Dallas Lankford. How to use Collins DB filters in your HQ-180 receiver. (2) "

Date: Thu, 21 Apr 2005 19:32:55 -0400
From: Bob Camp <ham@cq.nu>
Subject: [R-390] DSP IF

The idea of putting a DSP IF processor on the IF output of an R390 sounds like an interesting project. The nice thing about the 390 is that you can get at both the IF output *and* the AGC chain without modifying the radio at all.

Given the high performance RF section and the mechanical filters the result should

be very competitive. Of course this gets into the general direction of witchcraft and the like ....

Date: Thu, 21 Apr 2005 20:01:46 -0400
From: "Dave Maples" <dsmaples@comcast.net>
Subject: [R-390] RE: DSP IF

All: It's not R-390, but is anyone aware of relative INEXPENSIVE DSP eval boards still to be had? Everything I see now is $350-$400.

Trying to build an eval board is not on the possible list. I don't have (a) good circuit layout software, (b) board-processing facilities, etc., etc., The idea of doing I & Q demodulation for SSB really intrigues me.....

Date: Thu, 21 Apr 2005 19:15:39 -0500
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] DSP IF

The thoughts of an 455 Khz IF based DSP filter system has been rolling around in the back of my head for quite some time. An outboard accy. of that type would be very popular considering the number of radios that use the 455 Khz IF.

I might try sending the IF output from my R-390A to the antenna port on my Icom 756 Pro II and use the Pro as an IF/Processor/Demod and see how things stack up... My understanding is that DSP processors that go up to 455 Khz are quite expensive and mostly smoke and mirrors at this point. You'd have to down convert to something lower....

Date: Thu, 21 Apr 2005 20:17:17 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] DSP IF

Can we do DSP in hollow state, Rack and room size are no problem but I do so hate that sand state stuff even if I did slip a pair in for the 26Z5s?

Date: Thu, 21 Apr 2005 20:19:06 -0400
From: "John KA1XC" <tetrode@comcast.net>
Subject: Re: [R-390] RE: DSP IF

Dave, this isn't a board but it'll fit your budget. IK2CZL is a fellow R-390 enthusiast and has free PC DSP detector software. All you have to do is mix down the 455 KC IF output down to anywhere between 13 and 18 KC and the PC sound card takes care of the rest. I haven't tried it (yet) but it looks very cool and would like to hear of anybody that has used it.

http://www.detomasi.it/en/project.html

Date: Thu, 21 Apr 2005 19:44:35 -0500
From: mikea <mikea@mikea.ath.cx>
Subject: Re: [R-390] DSP IF

Well, doing real DSP in hollow state will involve some hundreds or thousands of tubes, with attendant heat, power, and reliability probs. It could be done, I suppose, but you're talking about implementing a real computer in hollow state, and that was found to be clunky and expensive. To do it _all_ in hollow state, you'd end up using WIlliams-tube memory, instead of ferrite cores. Fun to watch, but prone to screen burn-in, hard to keep aligned, and slow. Rack and room size probably _would_ turn out to be a problem. So would air conditioning. In dead of winter.

Date: Thu, 21 Apr 2005 21:50:56 -0400
From: "wjneill@lcc.net" <wjneill@lcc.net>
Subject: Re: [R-390] DSP IF

The original Army EINIAC artillery firing table computer was driven by a couple thousand vacuum tubes and the TM for the sucker describes power requirements, cooling requirements, and heat dissapation requirements that were resolved only through industrial-strength solutions. And, the output of the beast was directed to a Model 15 page printer in five-level 75wpm text.

Date: Thu, 21 Apr 2005 21:54:22 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] DSP IF

The trade off is basically that with tubes you are better off doing the analog processing. The digital stuff is just to hard to do. If you count up the transistors the same thing is true with sand, but of course these days nobody counts transistors. If you go with a 50 or 60 KC IF to feed the DSP stuff you could do the conversion part with tubes ...

Date: Thu, 21 Apr 2005 22:26:56 -0400
From: "Michael Murphy" <mjmurphy45@comcast.net>
Subject: Re: [R-390] DSP IF

We built something like this at work (at a higher IF frequency 45 MHz!!). I'm no expert but.. I think you have to sample the IF with an outboard A/D converter first before sending it into the DSP to keep the costs down. If you want to talk about a digital IF processor in an outboard box, the intermediate frequency spectrum (of the R390A) is first digitized by an analog-to-digital converter (ADC) into a slower digital data stream; this contains all of the signals present in the IF. Nyquist says we need to sample at twice the frequency of our 455 kHz IF and most converters can easily do this. Even low cost Sigma Delta converters (like the one in your sound card) get close to being able to do this. There may be some Sigma Deltas around which can do 1 MSPS or better.

The digitized IF signals are then translated to baseband by something called a Digital Drop Receiver or Digital Drop Converter (DDC). This could be a chip or it more likely is code running in an FPGA or DSP core. Downconversion is accomplished by digitally mixing the intermediate spectrum of frequencies with a sinusoidal waveform generated by a synthesizer. The baseband output can be thought of as the R390A receiver's 4th IF, which is selected from the DDC's other output frequencies by a very efficient brick-wall digital filter. It is at this stage that the

outboard circuit can crank in some serious selectivity. Remember, we are talking about programmable gate arrays or pure software in a DSP for all of these stages and functions. The DDC's baseband output is fed to a DSP (or into another section of the DSP or FPGA which is actually acting as a DSP), which performs signal demodulation. The DSP's output is then converted from the digital domain back into the analog domain by a digital-to-analog converter, amplified, and is made available to Cecil via a bigass tube amplifier and a speaker.

Date: Thu, 21 Apr 2005 23:18:36 -0400
From: "Bill Levy" <levyfiles@att.net>
Subject: Re: [R-390] DSP IF

What a can of worms you have opened up. Why not just buy a DSP radio and tune it to 455 and plug that into the 390A. Wouldn't that accomplish the same darn thing. Now no one say why go to the expense of another radio.....thats what we do fellows. Any excuse to try something requires a new radio!

Date: Fri, 22 Apr 2005 09:29:02 +0200
From: "Bryce Ringwood" <BRingwoo@csir.co.za>
Subject: Re: [R-390] DSP IF

There's quite a few DSP sofware packages out there - one has already been mentioned. Another on my computer is "Spectrum Lab". You'll need to convert the IF down to 25kc/s with an MC 1496 chip (or similar, or better). - or a 7360 ;-) I've got an old Analog Devices ADSP 2100 evaluation kit which I keep meaning to play with, but never get around to it. How about simply putting a hollow-state notch filter on the R390-A ? - that seems more "in-keeping with the propriety of the radio".

From: "Tom Norris" <r390a@bellsouth.net>
To: "Bob Camp" <ham@cq.nu>
Cc: <R-390@mailman.qth.net>
Sent: Friday, April 22, 2005 10:44 AM

I have tried the IF out to my Pro II. Works well. Just put the 390/390A in 16KHz, erm, I mean 16 KC bandwidth and connect the IF out to the Pro/ProII/ProIII *receive input* (so you won't transmit into your 390!!) Works great! I have considered taking the output directly from the final mixer before it goes to the IF deck, but have been too lazy to try since it involves taking the top cover off, which I can't do since the radio is in a rack (an open air rack, in case someone fusses) and I am especially too lazy to pull the radio, and my back, just to get a few more KC of bandwidth.

Date: Fri, 22 Apr 2005 13:02:04 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] DSP IF

I would like to try something that retains the mechanical filters. One thing you could try is to do equalization in the DSP. That way you could take out the delay and amplitude ripple of the filters in *your* radio. You could also turn the 16 KC filter into something like an 18 KHz filter (a modern upgrade).

As long as you are matching things up you can also calibrate the AGC voltage. More or less you build up a table of AGC versus db of attenuation. The R390 is amazingly linear in this respect so it should work pretty well. The net result is a "sort of" addition of more bits to your A/D converter. One of the reasons you need as much of this kind of thing as you can get is that A/D converters are relatively noisy gizmos. A 3 db noise figure converter is a tough part to find.

All of this would specifically match the DSP to the radio, but to me at least that's an advantage rather than a disadvantage. If you had some memory on the DSP you could store multiple radio profiles to match the various radios you used it with. The calibration and equalization stuff is pretty much transparent in normal use so you don't have a lot of added buttons or menus to cope with in normal operation. The gizmo needs to be pretty user friendly if it's going to be of any real use.

Date: Fri, 22 Apr 2005 13:14:59 -0400
From: Bob Camp <ham@cq.nu>
Subject: [R-390] DSP IF

Try 4. Keeps tripping the spam filter. If you go out and buy one of the black box radios you still have the problem of what to do about the AGC feed back into the R390. If you are after good AM you want to be able to cut back the gain on the front end and IF's to keep everything linear. You can get 16 and 18 bit A/D converters these days that will run up to the one or two mega sample range. To do things right at 455KC it would be nice to be above a 2 MHz clock rate. In order to get up to around 24 bits on the converter you are going to have to get down to a 200 KHz clock. That would put your final IF at maybe 40 or 50 KHz.

Date: Fri, 22 Apr 2005 13:54:53 -0400
From: "Veenstra, Lester" <Lester.Veenstra@intelsatgeneral.com>
Subject: RE: [R-390] DSP IF

Suggest one of the usual DBF mixers and an LO of 465 will give the "audio baseband" for the soundcard demod while the image will not be a concern

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Date: Fri, 22 Apr 2005 13:36:05 -0700 (MST)
From: Richard Loken <richardlo@admin.athabascau.ca>
Subject: Re: [R-390] DSP IF

My tastes are much more pedestrian, I want a synchronous detector so I can get away from my daily doses of audio distortion brought about by fading issues with the carrier and the sidebands. Always a way to consume time and money.

Date: Fri, 22 Apr 2005 13:42:45 -0700 (MST)
From: Richard Loken <richardlo@admin.athabascau.ca>
Subject: Re: [R-390] DSP IF

7 seconds with a 266 hmm? Now what would the delay be with the proposed tube type DSP? Suppose we could build it out of TWT's to get the speed up. How fast a digital processor can you build with a bunch of 12AX7's like IBM used to implement the 701?

Date: Fri, 22 Apr 2005 23:25:04 +0100 (BST)
From: "Gary Bourgois" <flash@skybird.biz>
Subject: [R-390] IF out

A few years ago I took the IF out from my 390A and hooked it to the antenna input of my SONY-2010, and tuned to a station with slop from an ajacent freq, Turned up the Sony volume and flipped on the Synch detector, and low and behold the interference was gone. The Sony audio does not match the great low frequencies you can get from the detector output on the 390, and I have the one with the probe jack on the front panel. Since my 390 quit a couple years ago the bands have died. I have a lot of receivers, including a zenith console, and everything is gone. Interesting that project HAARP made their own aroura borealis a few months back. I live in the aroural zone, and radio has always been weird. Now I can't get anything on the ham bands. Late nite talk show host Art Bell (also a ham) has mentioned that there is something wrong with the ionosphere, his band conditions are like mine. The only thing on shortwave is EWTN, they cut through everything. Always have. WWCR is spotty.

Date: Fri, 22 Apr 2005 17:36:19 -0500
From: "Paul Staupe" <pstaupe@qwest.net>
Subject: Re: [R-390] IF out

Good discussion of the Sony 2010.... that used to be my quick way to get synch detection out of the R-390. I'm lucky enough to have a Sherwood SE-3 that I use, and now a nice MSR-9, (but it overloads.... any AGC experts out there?) Finally, WEWN is my favorite.... I have been amazed in the past month though, they have moved their former set in stone schedule to 5850 kc for most of the night and well into the morning due to interference or propagation, I don't know which.... I should call Glenn Tapley their SW director to find out....

From: "Dave Maples" <dsmaples@comcast.net>
Subject: RE: [R-390] DSP IF

All: Absolutely good thoughts here. I'd be willing to fiddle with the DSP code if I had an eval board for it, but it would have to compete with other projects. I've had a DSP course in the past, and made As in it. It was really fun to get around a new concept and wring it out..

Date: Fri, 22 Apr 2005 20:07:49 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] DSP IF

What I'm after is AM that is easy to listen to. I'm not after Hi Fi, or AM stereo. All I want to do it tune a station and listen to it with the least strain possible. The SE-3 is a synchronous detector and it works very well with the R390. It certainly works better than the other analog synchronous detectors I have used. That said it isn't perfect. I think that with modern DSP and a bit of listening time (and tweaking and listening) you can do better. Certainly with DSP you can "vote" the sidebands by octaves. You can also do some stuff to null out heterodynes and other junk. You are not going to

get Hi FI audio (20 KHz 1 db point) out of an R390 with a 16 KC filter in it. I also don't think that many of us have stations that are clear channel enough to make something that wide practical.

Date: Thu, 26 May 2005 16:01:08 EDT
From: DJED1@aol.com
Subject: [R-390] Dayton experience

<snip> I got a tour from Gary, who does all the restorations of "checked" radios. He showed me the stash, which consists of about 5 pallets of blue stripers, and a small number of parts chassis of the non-A.

Gary said he was having trouble finding good modules now, and will probably run out of checked units in a year or so. LOTS of parts around, but definitely needing repair. I think Fair does a lot of work (including painting the front panel) on the checked radio for the extra couple of hundred they get.

The most interesting comment was that Gary has had some success with rebuilding the mechanical filters. He finds that most have a broken wire in one of the transducers, and he can repair or rewind the transducer and then replace the filter in the housing using new foam. This may be necessary in the future as the filters start to fail more frequently. <snip>

Date: Fri, 27 May 2005 09:52:53 -0700
From: "Dan Merz" <djmerz@3-cities.com>
Subject: RE: [R-390] Dayton experience

<snip> I picked up a BFO coil that I want to use in my external SSB adapter. While Fair gave me the schematic for the current oscillator, I don't have any information on which of the three terminals is which. Can anyone identify which of the terminals is the tap, which is the grid, and which is ground.<snip>

Ed, ok, I took a look at the BFO coil in the extra 390A IF chassis I have. If you point the shaft end toward your eyes with the middle pin at 12 o'clock, the terminals are numbered 1, 3, 2 in clockwise order with pin 1 at 11 o'clock, pin 3 at 12 o'clock and pin 2 at 1 o'clock. On my Artisan Electronics unit, the pins are identified by a stamped number on the unit and these numbers correspond to the schematic

Pin 1 goes to grid thru a capacitor
Pin 3 goes to ground
Pin 2 goes to cathode (center tap of bfo coil)

I checked the actual wiring on my unit in the chassis and the numbers stamped on my unit indeed correspond as described. Hope this helps, best regards, Dan.

Date: Tue, 28 Jun 2005 12:43:59 -0500
From: "Dennis L. Wade" <DWADE@pacbell.net>
Subject: RE: [R-390] C-551 Replacement/AGC trouble?

The hot glue concept or similar is actually what I'm considering doing with the new

AGC capacitor. Lead length doesn't seem to be an issue since the two tubes involved aren't even next to each other. I think just lifting the connections from the old cap and attaching the new one to one wall will work out ok. From looking at the AGC line, I think there may be some leakage somewhere as there doesn't seem to be enough there. Any quick troubleshooting hints?

Date: Tue, 28 Jun 2005 14:16:53 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: RE: [R-390] C-551 Replacement/AGC trouble?

Put an ohmmeter capable of reading high resistances on the AGC line to ground (notice if it reads the same with the nagative polarity on the line as with the positive polarity on the line)..then unplug each module (RF, and IF) in turn to see where you might be getting leakage. Knowing how the AGC wires run from the source in the IF module to the rear panel terminal and the AGC switch and to the RF module will help figure out where any excess leakage is. (One way to measure low levels of leakage is to hook up a 9 volt battery to simulate AGC voltage with a DMM on low voltage (or current) range in series plus side to ground, negative to the AGC line.. You'll be able to detect microamperes of leakage and normal AGC line currents. If the tubes are all cold, you may not detect a leaky tube, but you will find any leaky caps or cable leakages. A warmed up tube may leak more than if it's filament is cold.) THEN, with the offending module connected, remove each of the tubes involved to see if you have a leaky tube. If you find one, you are lucky. If you don't, remove the module and find the (likely) leaky cap in there. Cable wires can be leaky, too, so don't discount that possibility. Teflon wire in the AGC line would be a good idea.

Date: Wed, 29 Jun 2005 11:00:59 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: [R-390] R-390(A) gain distribution

I grew up on 70's era QST's and ARRL handbooks with W7ZOI receivers. These are extremely simplistic and generally don't have any more gain than needed. What gain there is almost always comes after the mixer. (Except for maybe the high bands where there'll be a RF amp on the front of the receiver). Obviously the R-390/390A had a different set of critera and were working with differently-capable components.

One criteria that I understand immediately is that you don't want any of the local oscillators leaking back out to the antenna in a military setting. So the RF stage before the first mixer is a necessity. It just so happens that there is plenty of selectivity around it too. I'm just a few blocks from a powerhouse MW broadcaster and I never have intermod problems in my R-390A! So even though there is an active stage before the first mixer I've never had problem with IMD there. This is one point where the W7ZOI designs have to deviate: the transistors just never have nearly the dynamic range of a tube.

But 4 stages of 455kHz IF... why so much gain there? Most receivers of the era had 2 (cheapie) or 3 stages and do just fine. How much gain is typically the 3-mixer chain capable of? Each mixer gets fed from the AGC control line, right?

It's been a while since I looked at the Collins cost reduction report... is there any

thought given in there as to eliminating an IF stage?

Date: Wed, 29 Jun 2005 12:05:32 -0400
From: "James A. (Andy) Moorer" <jamminpower@earthlink.net>
Subject: Re: [R-390] R-390(A) gain distribution

You misunderstand what the IF stages in the R-390 series do. Don't forget that the original
R-390 had 6 (!) stages of IF. Several of the IF stages have very low gain - no more than 1 or 2. These stages provide additional selectivity - not additional gain.

In the R-390 and the R-392, there is even a stage with 3 (!) tank circuits, coupled by 1 pf capacitors. You lose a lot of gain with low coupling like that, but you gain in selectivity. The overall IF section needs to provide a gain of 1000 or so, but the IF selection is almost entirely responsible for rejection of adjacent signals.

The Collins engineers needed to isolate the tank circuits from each other so they would resonate independently and each contribute another 6 dB/octave of rejection. If they are coupled too well, they stop acting as separate circuits and behave as a single tank circuit.

Date: Wed, 29 Jun 2005 14:51:02 -0600
From: "Kenneth" <crips01@msn.com>
Subject: [R-390] BFO question

I am going to get the BFO working on My R390A, once and for all. I have the Y2K manual, of course, but I need a little advice. Here is what I have; the BFO does not work, there is no calibration tone in the R390's audio but I can hear it from the SBA-1 side band adapter, I can see a calibration carrier in the signal strength meter on the R390. The tubes on the IF/RF module test good, if I can trust my tube tester that is.

Where do I start on this to figure out what is going on. I have replaced the two questionable caps in this module. The radio works fine otherwise. I have not been too motivated to repair the BFO because of the side band adapter.

Date: Wed, 29 Jun 2005 19:22:37 -0400
From: "Jim Miller" <jmiller1706@cfl.rr.com>
Subject: Re: [R-390] BFO question

It is possible that the BFO knob could have been turned multiple times either way putting the BFO frequency way off. It could be oscillating OK but be way off frequency.
---Date:
Wed, 29 Jun 2005 23:22:42 -0400
From: "Jim Miller" <jmiller1706@cfl.rr.com>
Subject: Re: [R-390] BFO question

Mine doesn't have a center detent, but if I turn it on and turn the knob several turns clockwise the beat tone will get higher and higher and then go away (it is too farr off frequency), but I turn it back the other way several turns and I hear it again. Just don't

force it if it reaches the "stops" at either end. This may or may not be your problem, just a thought I had. Could also be a bad contact on the BFO switch.

Date: Wed, 29 Jun 2005 20:28:58 -0700
From: "Craig C. Heaton" <wd8kdg@worldnet.att.net>
Subject: RE: [R-390] BFO question

Chuck Ripple has a great description on IF Deck Alignment. The last thing to do is the BFO, here is the link. http://www.r390a.com/html/if_deck.html

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Date: Thu, 30 Jun 2005 14:52:55 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] BFO question

Two of you were working on your BFO problems. It was suggested that you loosen the shaft coupler between the deck and the front panel to back the knob off the stop washer so the BFO could be adjusted from full end to end. The Idea being your BFO was running fine and just way off 455.

One of you ask if the BFO had some kind of mechanical center. Sorry not so. The coil will run from end to end and there is no "center" you just cranked the shaft to move the coil from end to end. Once you found the 455 point, you set the front panel knob and extension shaft up on zero. You adjust the knob, shaft, and clamp to not cause undue friction and stop against the stop washer. The bushing in the front panel has some play and can be adjusted to give a better center. Loosening the green screws on the IF deck and moving the deck a bit may improve the mechanical alignment of the BFO and band switch shafts.

If these simple checks did not get you in line, there are more things to do. Pull the tube and run around the socket for voltage checks. Check that the BFO on/off switch is turning the B+ on and off at the tube socket. Check your screen and grid voltages. The filaments are good as they are in series with the PTO and the receiver does play. Before you go for a coil can replacement, heat all the solder joints. Cold solder joints are known to happen. The likely one are on the pins of the coil can.

If this has not got you going the BFO coil can is known to fail. Back when you just replaced them. Nothing actually went bad in the coil can that could not be fixed.You can get the cans open and do an inspection and repair. Most problems were in the form of cold solder joints or little broken wires. The coils have a good range so fixes will not push them beyond the range where they will not tune 455 plus and minus 3 as expected. The coil can is work to get it out and back in. It can be done. I have done it a few times.

Let us know what you found your problems to be. Or if you got this far and still need some more help. Roger KC6TRU

Date: Thu, 30 Jun 2005 18:41:00 -0700 (PDT)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] BFO question

<snip>...doesn't have a center detent... <snip>

If everything is assembled correctly this knob DOES have a center detent! But it is inside the knob itself. If the knob is too far off the front panel the small protrusion inside the skirt of the knob won't contact the stop. Pull the knob off the shaft, you'll see what I mean.

Date: Thu, 30 Jun 2005 23:28:42 -0600
From: "Kenneth Arthur Crips" <CRIPS01@MSN.COM>
Subject: Re: [R-390] BFO question

Thank for all of the advice. I would not have thought of the BFO shaft being way out of position. What is interesting to me about this is this is the problem I had with the BFO on the SP 600. It's stop pin was bent and let the shaft turn freely. I am going to use my TS-510/U (HP-608C) RF signal generator to the tweaking the IF module. Using to boatanchor piece of test equipment seems to be the right thing to do. I need a manual for this beast does any one know
where I might download a copy.

Date: Fri, 1 Jul 2005 12:39:01 -0400 (EDT)
From: "William A Kulze" <wak9@cornell.edu>
Subject: Re: [R-390] BFO question

> BFO does not work, <snip>

Ken, the BFO on my unit didn't work when I got it. I could hear a very high freq tone, but it didn't change when the knob was turned. The can had the label that said don't open the can, but I figured hey, it doesn't work now, what the heck. Turns out the slug had come loose from the shaft and was just sitting in the tube. I glued it back in place and it was just fine after calibration. The chassis was bent on one back corner, so I figured it was probably dropped. If this isn't the case with yours, maybe it might help somebody else someday.

Date: Fri, 1 Jul 2005 16:37:20 -0700
From: "Dan Merz" <djmerz@3-cities.com>
Subject: [R-390] Hartley BFO FET Prod.Det.

Hi, I'm mostly thru the mechanical building part of the product detector for 390A similar to the one shown by AI2Q on this list, which has an AGC circuit in addition to the detector/BFO, and just connects to the IF out, diode load, and AGC connections on the back of the 390A. But instead of using the crystal-controlled BFO oscillator I opted to use a tapped coil BFO unit in a can salvaged from a National NC 100. In tapping the MPF102 FET BFO signal into the base of the 2N2222 buffer stage, I wonder if it's best to take the signal from the drain, much like an electron-coupled tube oscillator or from the source connection. Most circuits I find for FET oscillators take the signal from the source, analogous to cathode tap for a tube, and presumably a lower impedance coupling. Are there any opinions on why most handbook circuits show the source connection? I suppose either would work by fiddling with the various coupling impedances. I've got a week of thinking about it before I'll be able to get back to the project.

Any thoughts? Best regards, Dan.

Date: Fri, 1 Jul 2005 21:19:32 EDT
From: DJED1@aol.com
Subject: Re: [R-390] Hartley bfo FET Prod.Det.

Can't help you on the rational for where to tap off the RF, but the original oscillator circuit I used had the oscillator output from the source, and the drain was bypassed to ground at RF. So there was no choice as to where to tap off for the RF.I'd be interested to know how you make out with your project- I provided Alex with the original circuit which he published with some modifications. I started with a variable BFO, and then last winter added the crystal oscillator per Alex's circuit. I still think there has been nothing better for SSB on the R-390A than this little SSB adapter, partly because it includes an effective AVC, and partly because it requires no mods to the radio. Of course, you have to be tolerant of mixing solid-state with our beloved tube radio. Otherwise, a CV-157 is the right choice. I've taken some measurements of input and output voltages which may be helpful if you have any problems. I've also started working on adding a phase locked loop BFO so that the detector can be used for synchronous AM. Not done yet though, waiting for winter.

Date: Fri, 1 Jul 2005 23:52:20 -0600
From: "Kenneth Arthur Crips" <CRIPS01@MSN.COM>
Subject: Re: [R-390] BFO question

I found a place that has originals for a very reasonable price. The problem is this place uses Paypal for payment. I do not trust Paypal they have been hacked a number of times. Fair Radio Sales has reproductions for 15 dollars I'll just get one there. I am not really sure which 608 this one is, it's top voltage is 350 mill's I understand this is how one tells these TS-520/U's apart.

Date: Sat, 2 Jul 2005 14:30:57 -0400
From: "Michael Murphy" <mjmurphy45@comcast.net>
Subject: Re: [R-390] Hartley bfo FET Prod.Det.

This is fun stuff. I have built them both ways as well. If you want the least coupling and stability, (important if you are building a transmitter VFO and want to key something upstream without chirping) I think the source connection is the way to go.

For power, or if you want to multiply to a higher frequency, the drain is the way to go. For raw p-p voltage, use this connection into your buffer. If you want purity, the gate is the way to go. Actually, not the gate but the tuned circuit in the gate. The tuned circuit itself can be coupled to, just like in the pre-ECO Hartley days, with a good old link on the cold side of the coil. This gives you some impedance flexibility too. It's a BFO; to hell with the buffer.

Date: Sat, 09 Jul 2005 16:09:29 -0700
From: "Dennis L. Wade" <dwade@pacbell.net>
Subject: [R-390] AGC Troubleshooting

Got some time to look into the AGC trouble in my Motorola R-390A. First thing I

wanted to do is satisfy myself that there was indeed a problem. I looked at the AGC line with a strong signal and the Calibrate sig. The most I could get was about -4.9 volts at the AGC jumper. Under no signal conditions the AGC line is about +0.15v. I then took the HP-410C and looked at resistance.

From the jumper to ground, I see about 350K to 400K with a strong capacitor charging characteristic (i.e. much lower resistance rising as something charges). Unplugging the RF deck doesn't change that, unplugging he IF deck I get a steady 1.8 meg to ground from the jumper. I took out the IF deck and measured resistance from pin 6 to ground, and I see about 7 meg with no charging behavior. Looking at the Pearls of Wisdom, it says I should see infinite resistance. Looking at the schematic I see the three capacitors AGC line to ground in the 1st, 2nd and 3rd if amps (C502, C512 and C519). These seem prime suspects to me. Do you all agree, and any other components I should look at? I didn't take any voltage measurements since the 7 pin extender socket I thought I had is actually a 9 pin. :/.

Date: Sun, 10 Jul 2005 00:04:34 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] AGC Troubleshooting

I took out the IF deck and measured resistance from pin 6 to ground, and I see about 7 meg with no charging behavior. it says I should see infinite resistance. If you were doing this in 1970 with a TS 505 or a TS 352 on the K ohm range, 7 meg would be infinite resistance. You are likely OK on this test. TM 11-5820-358-35 8 Dec 1961 Para 72 b. Alignment of Z503 Page 113. says AGC should be in the range of -1 to -2 volts My mail only goes back 5 days, so I do not have your original problem with your AGC. Watch the other responses and keep asking questions until you feel you and your receiver are happy.

Date: Sat, 09 Jul 2005 21:48:45 -0700
From: "Dennis L. Wade" <dwade@pacbell.net>
Subject: Re: [R-390] AGC Troubleshooting

Thanks for the reply Roger. Good point. 7 meg may not indeed be a problem. But why don't I see the 350K I saw from the AGC jumper? So let me review why think there is a problem:

1. With all modules connected, from the AGC jumper to ground is about 350K. When the RF deck is disconnected, it remains the same. When the IF module is disconnected, it goes to about 1.8M to ground. Does this isolate it to the IF deck?

2. I don't see more than about -4.9 vdc at the AGC jumper on very strong, or the cal, signals. No signal is +0.15

3. There is distortion on strong signals.

Note that I have not re aligned the receiver yet, I still have some caps to replace in the AF deck. I'd like work on the IF deck if I need to while I have it out.

Two basic questions: Do I have an AGC problem given the measurements above?

And, is it isolated to the IF deck?

Date: Wed, 13 Jul 2005 17:24:46 -0500
From: "Dennis L. Wade" <DWADE@pacbell.net>
Subject: [R-390] More AGC Questions

In attempting to keep my sanity, I've been looking further at the IF deck I have on the bench to figure out why I might have low AC. I discovered that my A-OK filter is dead. Could this drag the AC line down? If it did, wouldn't I see that on an ohmmeter test? The AC line in the deck doesn't show excessive leakage to ground however. This deck is frustrating me because its not behaving like it has a problem in terms of the resistance checks I've done.

Date: Thu, 14 Jul 2005 00:52:53 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] AGC Problems

If switching over to AGC is not just plain killing the signals or you cannot tell the difference between AGC and MGC modes, you are likely OK. You only have one receiver (yours) to listen to. If you were an O5H, 33B, 31E, or any other MOS that used the receivers and had a chance to listen to several hundred receivers, you would know when you were listening to a bad one. So your AGC questions are a wise pondering. A full review of the subject starting from some recent post follows. Remember first that in the MGC position, the AGC line is simply shorted to ground in the function switch. The line at ground in MGC pulls the grids of the AGC controlled tubes toward zero volts. Cathode resistors in the tube stages provide some positive cathode voltage relative to the grid voltages. AGC voltage is negative. When the AGC voltage is applied to the grids of the tubes, it drives the tube stages toward cutoff. A couple volts on the grid of a tube that is working on micro volt signals go a long way in signal reduction.

If you have no signals in either the AGC or MGC mode, you expect you have a tube stage problem and have no reason to expect it to be related to the AGC line. You trouble shoot to find the stage that is not making the grade. The found problem may be in the AGC line, but it will not be the symptom that leads to a logical troubleshooting progression.

If you have an AGC voltage in the MGC mode, you should check the wire harness and function switch. In MGC mode the AGC line is not being held to ground by the function switch.If you have strong signals in the MGC mode you may have just one more bad item pulling the AGC line to ground. No Problem.

When you switch on the AGC you expect the negative AGC voltage to reduce the receiver gain a little bit. If you get no AGC gain reduction then you have to wonder if the AGC line is shorted somewhere and the receiver acts as if it is still in the MGC mode.

The carrier level adjust has been a sorry circuit since the day it was implemented. Unless you have changed some of the parts, to improve the performance, what ever your carrier meter shows you when switching the AGC is not a real inspirational

troubleshooting step.

You likely expect you have an AGC problem when you switch to AGC and you loose all your signals. Or a lot of the signals. How does opening a line from ground, and placing almost no negative voltage on it cause a loss of so much receiver gain?

You likely expect you have an AGC problem when the receiver starts acting intermittent with gain coming and going. The receiver appears OK in the MGC mode but looses signals in the AGC mode.

Now you are not looking for a shorted item. A shorted item in the AGC line looks like MGC.

You are not looking for an open resistor. The resistors work fine in the MGC mode.

>Barry - N4BUQ wrote, "When listening to a moderately strong station in the >15mc band, if I switch to AGC, the signal drops significantly from the MGC >position, regardless of the AGC speed."

This may not be bad. If the signal in the MGC position is strong, the receiver is being over driven and when the AGC is switched on, the strong signal produces an AGC voltage and a resulting signal level that is smaller than the MGC level but not over driven or distorted. However, if the receiver seems to loose lots of signals in the AGC mode, there is a problem. If the IF gain is not set to high (-7 volts) and the receiver loses it in AGC expect a problem.

A most common AGC problem is with the mechanical filters. The AGC line crosses R507 (22K) and is filtered by C512 (5,000pf). From there the AGC voltage is applied through all four filters, all the time. If one filter is pulling the AGC voltage to ground this is a problem. The filters may appear to have good band pass and performance so a simple check of bandwidth and sensitive with a signal generator and meter on the diode load may not find the filter problem. However this is a good first test if you have a signal generator. 200- 250 UV at 455Khz into the IF deck and rock the generator both sides of center to find the bandwidth of each filter. Note the diode load voltage for each filter and see if one of them has more loss than the others or has a very wide response.

The next step is too place a tube extender under V502. You want to look at the control grid voltage. The AGC is applied to the control grid through the selected filter. As the AGC is applied to all filters, and if a filter is sucking AGC, the "bad" filter will pull the AGC all the time. If you have a bad filter, you would expect zero volts on the grid, as opposed to several volts negative. The TM shows the grid to only be 0.4 volts negative. So this test is not a real sure bet either.

Ohmmeter checks may not get you anywhere either. On one side all four filters are tied to the AGC line. If the short were near that end of a filter coil winding in one filter, all four filters would read the same meter value. Thus you have no clue which filter is bad.

Good trouble shooting practice never supported unsoldering wires just to see what

will happen. Heating mechanical filter terminals is not a high item on things I would do this week.

But, if we open R507 and remove all AGC from the stage. Pull the AGC wire from the resistor and let that wire hang open. Short the end of R507 to ground, so the stage thinks it has zero volts AGC. Now review your AGC and MGC operation and retest the filter band pass with the signal generator and see how the receiver behaves. Missing AGC on one stage should give about normal performance. If all of this work has not isolated one of the filters as a candidate
for concern, I would give them a passing grade and go on to the next likely items.

Second most likely AGC problem after the filters is the bypass caps on the AGC line. Locate the green screw extractor, Bristol wrench, schematic and meter.
Go down the AGC line and just meter every cap and resistor.

>Barry N4BUQ wrote, "With a signal generator as input and the RF gain all the >way CW, I can adjust the signal generator to get -10V on the Diode Load in >MGC. Switching to AGC, the Diode Load drops to about 3.4V to 4V (depending >on the AGC speed position)."

This is not a problem, -10 volts on the diode load is over driven by 3 volts. This should produce lots of AGC. The balance point is where going from AGC to MGC to AGC produces no change on the diode load. This may not be -7 volts. This may also not be the optimum operating point for the IF gain adjustment setting. So we never consider what this balance voltage point may be.

>Roy Morgan offered the following to help deal with leaking caps on the AGC >line: Put an ohmmeter capable of reading high resistance on the AGC line to >ground (notice if it reads the same with the negative polarity on the line as with >the positive polarity on the line). Then unplug each module (RF, and IF) in turn >to see where you might be getting leakage. Knowing how the AGC wires run >from the source in the IF module to the rear panel terminal and the AGC switch >and to the RF module will help figure out where any excess leakage is.

Pull the AGC jumper off the back panel and hang an amp meter across the terminals. Observe the correct negative voltage polarity. You'll be able to detect microamperes of leakage and normal AGC line currents. Most DMM and analog meters have low amperage ranges that will handle the AGC current range. We do not know the current of a good AGC line so until someone makes some test and offers some values the number your meter produces is not going to help.
Will someone please make a test of AGC current and offer up the values they get? Inquiring minds want to know.

>Roy Morgan offered (One way to measure low levels of leakage is to hook up a >9 volt battery to simulate AGC voltage with a DMM on low voltage (or current) >range in series plus side to ground, negative to the AGC line. You'll be able to >detect microamperes of leakage and normal AGC line currents. Start with a >cold receiver. If the tubes are all cold, you may not detect a leaky tube, but you >will find any leaky caps or cable leakage. Cable wires can be leaky, too, so don't >discount that possibility. Teflon wire in the AGC line would be a good idea. Roy >Roy Morgan,

K1LKY since 1959 - Keep 'em Glowing!

Then turn the receiver on. A warmed up tube may leak more than if it's filament is cold.) If the problem is in the RF deck and you use a battery, unplugging a RF deck that is good should produce little change in current. The AGC stages are all in the IF deck. Unplugging that deck opens so many AGC lines coming and going you have no idea which end of the circuit is being offensive. This is the real problem of trouble shooting the AGC line in the receiver. Remove each of the tubes involved to see if you have a leaky tube. If you find one, you are lucky. If you don't, remove the module and find the (likely) leaky cap in there.

>Dennis wrote, "Good afternoon, got some time to look into the AGC trouble in >my Motorola R-390A. First thing I wanted to do is satisfy myself that there was >indeed a problem. I looked at the AGC line with a strong signal and the >Calibrate sig. The most I could get was about -4.9 volts at the AGC jumper. >Under no signal conditions the AGC line is about +0.15 "

OK, these are not bad numbers. Once the -4.9 volts get back to several tube grids it is on the order of less than -1 volt. At no signal we expect no AGC and a value of .15 plus is typical.

Dennis, I took out the IF deck and measured resistance from pin 6 to ground, and I see about 7 meg with no charging behavior. It says I should see infinite resistance.

If you were doing this in 1970 with a TS 505 or a TS 352 on the K ohm range, 7 meg would be infinite resistance. You are likely OK on this test. TM 11-5820-358-35 8 Dec 1961 Para 72 b. Alignment of Z503 Page 113. says AGC should be in the range of -1 to -2 volts
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Thanks for the reply Roger. Good point. 7 meg may not indeed be a problem. But why don't I see the 350K I saw from the AGC jumper? So let me review why think there is a problem: 1. With all modules connected, from the AGC jumper to ground is about 350K. When the RF deck is disconnected, it remains the same. When the IF module is disconnected, it goes to about 1.8M to ground. Does this isolate it to the IF deck?

No not really. When you unplug the IF deck you open so many wires in the AGC line coming and going from the rear panel, front panel function switch, from the AGC diode, to AGC controlled stage, you just never know what you are checking. If you do not have a good schematic in front of you and consider what you have disconnected at any give instance of measurement, you can run your self ragged.

I don't see more than about -4.9 vdc at the AGC jumper on very strong, or the cal, signals.

OK.

No signal is +0.15

OK

There is distortion on strong signals.

OK. R390/A are known for this aspect.

Two basic questions:
Do I have an AGC problem given the measurements above?
And, is it isolated to the IF deck? Dennis

So we come full circle to your original question. The part not really dealt with here is, If the AGC is killing lots of signals and is related to one of the mechanical filters, how do we determine good and bad filters.

First I will go read the archives and see what I find. I'll kick out a new post when I get there. Give me a few days to read up.

Dennis, I would say you are likely OK with your receiver. Go on with your other roubleshooting and cleaning. If you do have an AGC problem, operating the receiver will not cause more damage. You can always operate in MGC if you think you may have troubles with the AGC. You can always come back to the problem if it is still nagging at you. Having one receiver in isolation to care for by your self is a daunting task. The military trained us guys in groups to take care of bunches of receivers together with support, and this scared the hell out of most of us. Most of the tecks never got confortable about being repairmen. They did one four year enlistment and got out of the trade altogether. It was just not the military they did not like. They gave up electronics in general. Being a fellow willing to work on a glowing receiver puts you in a special class. Just being willing to give it a go earns you respect. Do not worry that you are working from a disadvantage. You have to start somewhere and you are down the road of glowing tubes. Just because some of us ran ahead and come back with tales does not make us any better. Do not let our tales worry you.

Roy Morgan added his best thoughts. Barry put in with his findings. No one has taken us to task for being way off base on this, so we are likely in the park.

Date: Wed, 13 Jul 2005 21:58:41 -0700
From: "Dennis L. Wade" <dwade@pacbell.net>
Subject: [R-390] Re: More AGC Questions

Thanks for the responses. Some have asked what the problem was, so I'll recap my previous post. By the way, it's the 16 Kc filter that's dead, not the A-OK :(AGC voltage on most over the air signals is around -4-5 vdc No signal voltage is about +0.15 Very strong/close BCB station generates about -10, pins the needle, and distorts.

Question 1. I do have a problem, right? Resistance from AGC jumper to ground 350K with a capacitor charge behavior. Unplugging the RF deck does not change it. Unplugging the IF deck puts the jumper at 1.8 meg to ground.

Question 2. Does this isolate the problem to the IF deck? Thinking that it does, I figured I'd see the same 350K or less to ground from pin 6 (AGC line) of the IF deck connector to ground. But no, its about 7 meg. This is what's confusing me. I just

received my 7 pin test sockets, so if this heat ever lets up, I can take more voltage/ resistance readings from V501 502 and 503. Note that I have not realigned the radio yet, I've recapped the RF deck and am working on the IF deck. I was hoping to solve this ACG problem before going in for a full alignment. Please excuse the repletion for those who saw the previous posts. Thanks for the help. Sign me Frustrated in Carmichael, Dennis

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Date: Thu, 14 Jul 2005 08:09:06 -0400
From: JMILLER1706@cfl.rr.com
Subject: Re: [R-390] AGC Problems

There is supposed to be a jumper on the rear panel termial strip for a remote AGC line? What would happen if it was missing?

Date: Thu, 14 Jul 2005 19:05:45 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] AGC Questions

If you have a 16K filter bad, the side effect could be a bad AGC. The output of all the filters is tied together on one side to the AGC line. The other side of the filter outputs are switched through the band switch. The unused filters are shorted when not in use. A known side problem with bad filters is the AGC acts funny. This depends on exactly what goes wrong in a given filter. You can have a bad filter without having an AGC problem. Ignore the bad filter and AGC problems for a while and work on the other items you have on the list of thing you want to do. You could open the lines to the bad filter and just let it hang. See if this changes the AGC behavior. Then every thing but the that IF band width would work for you. And you can get to the filter replacement whenever you feel the need.

Date: Thu, 14 Jul 2005 19:22:56 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] AGC Problems

>..supposed to be a jumper on the rear panel termial strip for a remote AGC ....

In the R390/A, V201 the RF amp has a R234 a 1.5 meg resistor on the AGC line to ground. So with no jumper this resistor completes the circuit path for the AGC line on the tubes that have AGC on the control grid. In MGC where the AGC line is shorted, there are other resistors in the AGC line between the grids and the short point on the function switch. There will be a small loss of receiver gain in MGC with the jumper missing. You likely may not even be able to hear the difference between jumper and no jumper with the function switch set to MGC. In AGC, no AGC voltage is fed back to anything, The AGC and MGC positions on the function switch will act exactly alike to you. The carrier meter will peg over when switching AGC time constants because all that circuit is before the back panel jumper. The audio will not be lost like normal however when changing the AGC time constant, because the AGC charging time, when
switched, is not being carried over the jumper and applied to the tubes. If you did not know, you could run the receiver for years with the AGC jumper missing and never miss a thing. As much as the receivers AGC performance has been cried about, you

may think your receiver is just normal.

Date: Fri, 15 Jul 2005 23:51:23 EDT
From: RIKKA3TXR@aol.com
Subject: [R-390] Re: C553

My '56 r-380a had a brownie in the C553 position..I still have all the pulls in a bag..But never checked them for leakage...It's not a question, I just replaced it..Not worth the money for new filters..... <snip>

Date: Sat, 16 Jul 2005 13:24:00 -0700
From: "Dennis L. Wade" <dwade@pacbell.net>
Subject: [R-390] AGC Problem Fixed :))

The nagging not-quite-right AGC line in my Motorola '390A has been fixed. The culprit: V509. Got out to the garage early enough to avoid the heat and took some voltage readings on the signal grids of V501, 502 and 503. All were slightly *positive* under no signal conditions. Pin 2 of V509 was also slightly positive. In my research through the Pearls (many, many thanks Wei Li), I kept seeing posts from Dr. Jerry that said in essence...positive grids are either from leaky caps or gassy tubes. I wasn't finding any strong evidence of leaky caps. So, almost on a lark, I swapped V506 and V509. Voila!! Negative grids return. Hooked up an antenna...noticeable improvement in audio quality. The offending tube does not test gassy on my emission type tester however, although that doesn't surprise me. So, Roger, your advice was sound..that is...go on with it and finish the radio. And I was...but after just oneeeeeee more thing to try. Thank you all for your help. I'm sure you'll hear from me again shortly as I continue on. :)

Date: Sun, 17 Jul 2005 15:08:42 -0400
From: shoppa_r390a@trailing-edge.com (Tim Shoppa)
Subject: [R-390] Excessive backlash in BFO pitch control

One of my IF decks has excessive backlash in the BFO pitch control. e.g. if I'm turning to the right, it zero beats at "0", but if I'm turning to the left, the zero beat is closer to "+1". Mechanically, I see an accordion-type coupling between the shaft and the reactor. Is this where I should be concentrating my effort, or should I be looking inside the variable inductor itself? Alignment between all the shafts is less than peachy, too. But I cannot see how this would give more than a tiny bit of backlash.

Date: Mon, 18 Jul 2005 12:37:53 -0500
From: Tom Norris <r390a@bellsouth.net>
Subject: Re: [R-390] Excessive backlash in BFO pitch control

Try loosening the bushings both at the IF deck and the front panel to make sure there isn't any binding, then take a good look at that coupling and make sure the setscrews are tightened and there are no cracks in the body of the coupling. A crack or break can cause the shaft to turn fine one way, but not so fine the other.

Date: Sun, 24 Jul 2005 07:37:05 -0400
From: "Bill Coleman N2BC" <n2bc@stny.rr.com>

Subject: [R-390] R390A AGC

My R390A has an AGC problem. With no signal the AGC voltage is -0.5V (measured with an HP410C VTVM). The AGC responds properly to signals (goes more negative to a max of appx. -15V). Resistance measurements on the AGC line look OK:

IF strip @ J512-6 = Infinity
AGC line @ J512-4 = 482K
RF deck @ J108 = 1.82M

With P512 and P108 in place, the AGC jumper on the rear = 378K

The only other voltage that is wrong is the IF strip suppressor grid bus, measures +3.4V should be -2.5V I suspected Z503, I couldn't get it to peak - Output increased as I cranked out on the slug but it ran out of adjustment range before peaking. Just replaced Z503 (nasty) and have the same result. I've gone thru 3 wholesale changes of tubes in the IF deck. I've replaced C545, C546, C548. (I keep coming back to the AGC IF Amp area) Ideas?

Date: Sun, 24 Jul 2005 08:43:10 -0400
From: "Bill Coleman N2BC" <n2bc@stny.rr.com>
Subject: Fw: [R-390] R390A AGC

Thanks Don, I should have put more info in my original post.... I have 'lifted' the AGC line at each stage of the IF one at a time (disconnecting the appropriate isolation R), the AGC voltage and the suppressor grid bus does not change. Also, measurements in the IF with the RF deck disconnected are unchanged. I did the 9V battery trick too. Readings at each of the stages are appropriate. That's why I keep coming back to the AGC IF AMP, Rectifier and Time Constant
stages. Z503 will not peak, all other stages peak nicely. It seems that the gain of the AGC IF amp is low because Z503 will not peak. I suspect the reduced output is not enough to overcome the positive bias coming from the R544/R546/R545 divider string (roughly +17V if I did my Ohms law correctly).

Date: Tue, 26 Jul 2005 15:46:06 -0400
From: "Bill Coleman N2BC" <n2bc@stny.rr.com>
Subject: [R-390] R390A AGC troubles

Maybe my earlier posts were lost in the fan / audiophile / Depot Dawg discussions. Observations:

1) Low AGC voltage (zero signal = -0.5V)
2) Suppressor grid bus (V504 & V508) is +3.4V, should be -2.5V)
3) Z503 will not peak before it's slug "tops out" in the core

I have isolated the decks, measured everything that is measurable, replaced caps. I have isolated individual IF stages and swapped tubes. All without making progress. The more I poke, measure and isolate, the more I am convinced that the problem is in the AGC Amp stage(s) rather than out on the AGC bus. All resistance

measurements along the AGC bus are OK, voltage measurements when fed with a separate source (9V battery) are OK. Along the way I managed to destroy Z503 so I pulled one out of a 'cadaver' IF strip. I noted that it's slug is fairly well centered in the core. Upon replacing Z503, the 'new' one behaved the same way.... increasing stage output as the slug was cranked toward the top but it runs out of adjustment before peaking. I fed the AGC Amp stage directly with my siggen at 450kc and Z503 will peak with the slug slightly further down in the core. I have snugged all the ground points in the entire IF chassis & replaced everything in the V508 stage except the tube socket. I think I'll disassemble the gear train, polish the parts and reassemble blindfolded, that will be less frustrating! Ideas greatly appreciated 73, Bill N2BC
PS: I have no fan installed, use a plain highly oxygenated line cord, and the receiver's mixed Stewart Warner / Collins / EAC heritage is usually just a lovable as my Lab/?/Shepard best friend.

Date: Tue, 26 Jul 2005 15:53:40 -0400
From: "Jim Miller" <jmiller1706@cfl.rr.com>
Subject: Re: [R-390] R390A AGC troubles

My old S&W had AGC problems which seemed to be centered around Z503. I remember having to work with it to eliminate a short to ground between one of its pins and the chassis. Seemed the chassis cut out for the transformer needed enlarging a bit. Another oddity that happened in the same radio was a breakdown in the center insulation of the small shielded cable carrying the diode load signal...would cause popping and loss of AGC..this doesn't seem to be your case however.

Date: Tue, 26 Jul 2005 15:54:58 EDT
From: Llgpt@aol.com
Subject: Re: [R-390] R390A AGC troubles

It is quite possible the "cadaver" Z-503 is a bad one too. They are a known troublesome part. If possible try a known good IF deck. Maybe you have a friend close by.

Date: Wed, 27 Jul 2005 10:05:33 -0400
From: Gord Hayward <ghayward@uoguelph.ca>
Subject: [R-390] Re: Z503

Mine had a similar problem and unfortunately I killed the coil when I tried to fix it. The winding is potted in goo (not ukumpucky) and the ferrite is on the outside of the coil too. When I tried to get the coil apart with heat I really did it in. So, I took a honking big coil from my junk box and a small cap and rebuilt it. It peaks and the set performs at spec now. The trick was to use a big coil to get a high enough Q which determines the impedance of the parallel resonator and hence the stage gain at resonance. (big L, small C = big Q)

Date: Wed, 27 Jul 2005 14:30:34 -0400
From: Gord Hayward <ghayward@uoguelph.ca>
Subject: [R-390] Re: Z503

It should resonate at 455 kHz. The coil I used looked like one of the old loopstick variable coils for crystal radios. I think the capacitor was somewhere near 30 pF. I stuck it together and peaked it with a scope and signal generator to be sure it would work before I started the surgery on the 390A. I removed the can top, pulled out the old coil and cap, put in the new coil and cap and replaced the can top. The result looks like it was meant to be there. Then I repeaked it in the radio as in the standard alignment instructions. Remember, the Q is quite important. I did try a smaller coil that also peaked, but the Q was too low so I didn't get enough AGC action.

Date: Wed, 27 Jul 2005 15:11:42 -0700
From: Dennis Wade <sacramento.cyclist@gmail.com>
Subject: Re: [R-390] R390A AGC troubles

I'm at work, but I don't recall that -0.5V zero signal on the AGC bus was a problem. When I finally got mine fixed (different problem though, see previous posts) the small + zero signal voltage I had been seeing became -0.4V. What are the grids of V%01, 502 and 503 doing? What do you "hear" in terms of symtoms..how does the radio sound under various signal conditions?

Date: Wed, 27 Jul 2005 18:31:33 -0400
From: "Bill Coleman N2BC" <n2bc@stny.rr.com>
Subject: Re: [R-390] R390A AGC troubles

Hi Dennis, it was my understanding that zero input signal state is around -7V. The other measurement that is 'wrong' is the suppressor grid voltage on V504 & V508), it is +3.4V, should be -2.5V. The voltage on the grids of the IF strip is consistent with the -0.5V. Externally, it sounds like minor overloading on strong signals.

Date: Wed, 27 Jul 2005 21:13:55 -0400
From: "Jim Miller" <jmiller1706@cfl.rr.com>
Subject: Re: [R-390] R390A AGC troubles

Another thought: The antenna trimmer control shaft and gears are at AGC potential in the RF stage. The phenolic gears and washers insulate the shaft from ground. If someone over-lubricated the antenna trim gears, the lubrication oil could be forming a path to ground and shunting the AGC in the RF stage, which could create overload or poor AGC action. The shaft and gears need to be purged with a chemical cleaner like Big Bath to rid them of any oil.

Date: Sun, 14 Aug 2005 19:16:47 -0500
From: Tom Norris <r390a@bellsouth.net>
Subject: [R-390] Differences in 390A IF decks

The tech manuals mention differences between older and newer 390A IF decks, and folks here have, in the past, brought up that older Collins decks were different. Indeed they are. If anyone wants to add an additional photo to their 390A photo collections, below is a link to assorted detail photos just shot of an unmodded early Collins IF deck. No dates could be found anywhere. http://www.fernblatt.net/forradio/R390A/; Just click on the files that start with collins_r390a_IF..... etc There are a few shots of a fairly late Collins 390A in there as well. I've only come across a couple of

Real Live Collins 390A's, plenty of the radios made by other contractors. Feel free to use any photo you wish, and anything else in you find stored on my server. If you click on "parent directory" then go down a bit, there are loads of other images including a directory full of photos of Fair Radio's old place. The Collins 390A shown in the pics? It's been gone for a year, sorry guys.

Date: Mon, 15 Aug 2005 05:43:52 -0400
From: shoppa_r390a@trailing-edge.com (Tim Shoppa)
Subject: Re: [R-390] Differences in 390A IF decks

I assume you're talking about the fixed rather than variable caps around the filters? I have an IF deck that is Motorola and has the fixed caps too. Not sure if it was originally that way from the factory or was a result of parts-swapping at the depot, but I was always under the impression that many Motorola IF decks lacked the variable caps and the chassis holes. What exactly is that doo-dad in the ballast tube socket?

Date: Mon, 15 Aug 2005 08:43:27 -0500
From: Tom Norris <r390a@bellsouth.net>
Subject: Re: [R-390] Differences in 390A IF decks

Tim, you know that, and I know that. I had posted the links for the benefit of those that didn't or for those that collect photos for no good reason. Or for good reason, either one. I think there is at least one, who I forget, that likes new and different pix taken.

>...about the fixed rather than variable caps.....

yup, and the fact it's a Collins [Blessed be Art, etc] AFAIR all the Motorola and Collins decks pre 1954 had fixed caps. I suppose most Mot/Col decks out there will be capless, since they weren't made past '56. An odd thing about the deck in the photo - there is no contract number marked anywhere on the thing. Just a Collins p/n and a serial. The other Collins 390A's I've had had the contract numbers, at least I think so. I may have been hallucinating at the time, though.
heehee Tom M reminded me of the different sheet metal design and other things that were used in later contracts by EAC. I may also do comparison pix showing those as well, I probably have an extra EAC module around here somewhere. (rummage rummage)

>.....doo-dad in the ballast tube socket?.....

The doo-dad? It's a "Modified Horizontal Low Resistance Current Pass Device" Which means I have a 9-pin shorting plug underneath instead of a b*11*st. The tube shield and label are there for effect, since the radio is going out the door to someone with an odd sense of humor. I used 12BA6's for PTO and BFO. The radio is an Amelco, but it's a mutt. While it has an Amelco RF deck and P/S, the IF is Collins and the audio is Stewart-Warner. Now if the p/s were Helena-Rubenstein, we'd be all set.... hehe

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Date: Mon, 15 Aug 2005 05:38:23 -0700 (PDT)
From: "Tom M." <courir26@yahoo.com>
Subject: [R-390] EAC and Differences in 390A IF decks

EAC pioneered a new assembly procedure to assemble IF decks and others (RF I think) "in the open" and then fold up the sheet metal. They got permission from Ft. Mom to do this. Notice how late EAC decks have different sheet metal folds than others. EAC also got special permission to make wire splices to enable this. I got this info from Robert Edwards of EAC. Interestingly enough, the Fowler IF decks were made the original "Collins" way. The EAC mods did not stick to the drawings issued to Fowler. Everyone confused yet?

Date: Mon, 15 Aug 2005 15:09:58 -0400
From: "John Bunting" <john@gumlog.net>
Subject: Re: [R-390] Differences in 390A IF decks

Motorola's Order No. 14-PH-56 was the first order that required the order number and the serial number to appear on all modules. Partway through that order the three fuse modification was made too.

Date: Mon, 15 Aug 2005 14:25:28 -0500
From: Tom Norris <r390a@bellsouth.net>
Subject: Re: [R-390] Differences in 390A IF decks

Thanks John. I was aware of the fuse mod, but not the order number and S/N information. Must have just overlooked it.

Date: Sun, 21 Aug 2005 17:07:40 -0400
From: Mark Huss <mhuss1@bellatlantic.net>
Subject: Re: [R-390] R-725

Basically an R-725 is an R-390A modified for HF DF using an array of vertical antennas and measuring the phase delay of the wavefront. Because of the phase shift in the mechanical filter across its response curve, they substituted an R-390 IF deck for the R-390A IF deck, then added a whole s***pot full of ferrite beads to suppress leakage normally present in the R-390A. the result is the quietest and most sensitive R-390A made. In the shop I worked in, they always had at least 6dBm better signal to noise ratio.

Date: Sun, 21 Aug 2005 16:14:25 -0700 (PDT)
From: "Tom M." <courir26@yahoo.com>
Subject: Re: [R-390] R-725, How To Make Your Own

Ferrite beads, where? I have the R-725 drawings and there are no ferrite beads to be found. Also the tuned circuit IF decks were specially made for the R-725. They did not use decks from the R-390 (although I have done that myself and it works great). Here are the simple steps necessary to roll your own R-725 style IF deck form a junker R-390. Winter is coming. Everyone needs a good project.

Date: Sun, 21 Aug 2005 16:14:25 -0700 (PDT)
From: "Tom M." <courir26@yahoo.com>
Subject: Re: [R-390] R-725, How To Make Your Own

>Ferrite beads, where? .....

The main difference between a R-725 and the R-390A is that the R-725 utilizes a custom built IF deck that is very similar in construction to the R-390 IF deck. It has tuned circuit selectivity instead of mechanical filters. The mechanical filters of the R-390A created distortion when that radio was employed for radio direction finding use.

Motorola was awarded a contract in 1956 (476-PH-56-91) to prototype the R-725. I know of a couple of these Motorola sets exisiting today. Packaging of modified sets for quantity DF use were handled by Arvin Industries and Servo Corporation of America. Approximately three hundred R-390A's were modified to the R-725 configuration. New IF decks were manufactured by the modification companies (actually salvaging some of the components from the now junker R-390A IF decks) and installed in existing R-390A's. The new IF decks were named "SERIES 500 IF STRIP ASSY." They looked almost just like R-390 IF decks except that the IF connectors were relocated to match the cables and connectors in the R-390A chassis. The circuits were designed to plug and play in the R-390A instead of the R-390. The R-390 IF decks are not interchangeable in the R-390A (until now that is, after perfoming the modification described herein). Notwithstanding DF capabilities, a side benefit of the SERIES 500 deck is that it provides a smoother sound than does the stock R-390A IF deck. Mechanical filters are said to "ring" and after a while can be fatiguing to the listener. The purpose of this procedure is to describe how one may "roll his own" SERIES 500 IF deck from a surplus R-390 IF deck. Please note that I don't advocate trashing of a good R-390 to do this mod. The IF deck I started with came from a Motorola junker. I would urge you to likewise find a junker R-390 as a source of an IF deck for this project. Make sure that the deck is in working condition prior to beginning the modification.

The R-390 IF deck was designed to operate with one 25V filament supply (unfortunately the 25V supply available in the R-390A is insufficient to power all of the filaments in the R-390 IF deck). The R-390A deck was designed to operate with a combination of 6.3V and 25V filament supplies. The task involved in this conversion is to rewire the R-390 filaments to comply with the voltages available in the R-390A and provided at the main IF deck connector, plug and play, without the addition of any new power transformers. Each of the twelve tubes in the R-390 IF deck must be addressed for full compliance with the voltages available from the R-390A. We will also drop the B+ a bit.

Plug P112 of the R-390A shall be plugged-in to the R-390 IF deck at jack J517. There is much commonality here, except for the connections mentioned herein. In general, you will be converting 25V series connections into 6.3V (herein referred to as 6V) parallel connections for most tubes, and moving the connections of the BFO/ PTO/ballast tube series to a different connection point in jack J517. The 6V filament supply shall be provided to the R-390 deck by
pin 20 of P112 from the R-390A.

General instructions: Refer to the schematic for the original R-390 as the "before" schematic. Use the best soldering technique you can in this limited access space. Don't insulate or bind any wires until instructed to do so. You will be utilizing some of

the new 6V supply connections more than once. Make sure you can recognize your new wires. I used black wire for the 25V supply, red wire for the 6V supplies, and green wire for new grounds. The first task is to install a B+ dropping resistor to better match the 180V B+ that the R-390 IF deck is expecting. To do this, locate inductor L503 under the IF deck. This will be found snapped into a holder right above pin 2 of J517. Disconnect one end of the coil, and install in series with it (the equivalent of) a 470 ohm 2 watt resistor. This will tame the B+. The first tube circuit we'll work on is the ballast tube circuit.

V508 (5749) and RT512 (3TF7) These must be supplied by the R-390A 25V filament supply. To do this, sever the connecting wire at pin 8 of jack J517 (underneath the deck) to free this slot up (hint: save access to the connector end of the wire as you will use it to wire supply to V509). Then, sever the connection at pin 2 of RT512 and wire this pin to pin 8 of J517 of the R-390
deck with a long piece of new wire. The filament return connection remains unmodified. This modification will make the BFO/PTO/ballast tube series connections identical to the R-390A 25V filament supply connections. As mentioned above, this 25V supply is insufficient to supply the remainder of the tube filaments, thus the need to employ the 6V supply for this task.

The following 6V tubes shall have filaments wired from the 6V R-390A supply. The filament pins of these tubes are pins 3 and 4. Don't sever any connections unless instructed to do so. The modification will use as much existing R-390 IF deck wiring as possible (and thus may seem a bit screwy to you untilfinished). V504 (6BJ6) 6V will come from its existing connection at pin 4.

Ground will come in the next step.

V503 (6BJ6) Wire pin 3 of V503 to pin 4 of V504 for 6V supply.
Ground V503, pin 4.

V502 (6BJ6) 6V supply will come from an existing connection at V503, pin 3.
Ground V502, pin 3.

V501 (6BJ6) Sever ground connection at V501, pin 3 and
wire pin 3 to V502, pin 4.

V505 (6AK6) 6V supply will come from existing connection at pin 4.
Ground will come in the next step.

V506 (6AK6) Ground pin 4 of V506. Wire pin 3 of V506 to pin 4 of V505
for 6V supply.

V509 (6BJ6) Locate the free wire which was cut from underneath J517,
pin 8, and connect it to the 6V filament supply at J517, pin 20.

The following tubes are 12AU7's wired in various series schemes in the R-390. They must be rewired according to their 6V option for use in the R-390A. Note two of the connections require dropping resistors on the 6V source of V507 and V510 to obtain the desired 5.3V filament voltage.

V511 Sever ground connection at pin 5.
Connect pins 4 and 5 together for 6V supply, ground pin 9.

V507 Sever connections at pins 4, 5 and 9, including the two resistors (one 120 ohm and one 22 ohm). Wire 6V supply from your previous work at V505, through the deck opening for variable capacitor C525, to pins 4 and 5 through a 3.9 ohm, 1 watt resistor. Ground pin 9.

V 510 Sever connections at pins 5 and 9.
Ground will come from existing pin 4 connection.
Remove 120 ohm resistor between pins 4 and 9.
Wire pin 5 to pin 4.
Wire 6V supply from J517, pin 20 to V510 pin 9 through a 3.9 ohm, 1 watt resistor.

There are no changes to any of the other connections in the R-390 deck. Prior to installing the modified R-390 deck in your R-390A, you must check your work.

Perform continuity checks from J517, pin 8, with RT512, pin 2.

Perform filament supply and ground continuity checks as follows. Note: There will be more than one ground connection at various tube sockets, but the filaments should have continuity exactly as shown.

Filament supply is checked from J517, pin 20.

V501, filament, pin 3; ground, pin 4.
V502, filament, pin 4; ground, pin 3.
V503, filament, pin 3; ground, pin 4.
V504, filament, pin 4; ground, pin 3.
V505, filament, pin 4; ground, pin 3.
V506, filament, pin 3; ground, pin 4.
V507, filament, pins 4 and 5; ground, pin 9.
V509, filament, pin 4; ground, pin 3.
V510, filament, pin 9; ground, pins 4 and 5.
V511, filament, pins 4 and 5; ground, pin 9.

Now insulate any bare connections, and use mini-tie wraps to secure the new wires to sturdy nearby points. To enable final installation of the deck in your R-390A, you'll need to make two adapter cables. These cables shall consist of jumpers (RG-59 is OK, approximately eight inches in length) with BNC's on each end. You'll also need two adapters of the type found on the back of the frame of the R-390A at the IF OUT jack (AMPHENOL 47200). This will provide crossover from MB connection (R-390A standard)to BNC (R-390 standard). Connect P-218 of the R-390A to J-526 of the R-390 IF deck with one of the cables. Connect P-213 of the R-390A to J-525 of the R-390 IF deck with the other cable. It is a good idea to label these cables.

Install the deck in your R-390A. You will notice that the screw holes are the same as for the R-390A IF deck, however the screws of the R-390 deck are of larger diameter.

I did not change these screw as they are captive into the deck. The BFO, BANDWIDTH, and power connector of the deck will hold it in place, however I would not install it in a Jeep this way. Changing these screws is optional.

When you turn on the power, make sure your dial lamps light up normally. If they don't, you have a filament supply problem so turn off the set immediately and troubleshoot. For great sound, instead of using the built in audio deck, I prefer to tap the audio from the diode load jumper at the back of the set. Through a 0.1 uF or larger capacitor, feed this signal into your line audio amp of choice, and enjoy the tuned circuit audio of the new R-725, errrr, R-390A with
tuned circuit IF. You'll get the smooth sound of the R-390 and R-725, but have the parts availability and support common to the R-390A for the balance of the set. I've used my modified IF deck in two different R-390A frames, and it worked equally well in both. In my opinion, it makes the long term listening experience much more enjoyable. If you have any questions about the mod, please feel free to write.

Date: Sun, 21 Aug 2005 20:21:13 EDT
From: ToddRoberts2001@aol.com
Subject: Re: [R-390] R-725, How To Make Your Own

Thanks for the great step-by-step directions to convert an existing R-390A into an R-725 "clone" using an R-390 IF deck. I have a spare R-390 IF deck I have been saving for just such a project so it will be a breeze using your instructions for the conversion. This will make a good late-summer project also.

Date: Sun, 21 Aug 2005 20:34:33 EDT
From: Llgpt@aol.com
Subject: Re: [R-390] R-725, How To Make Your Own

I never had any ferrite beads on the R-725/URR I had, it did have the mu metal shields around the PTO though. Mine was an Arvin Industries version, s/n 95 Les Locklear

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Date: Mon, 22 Aug 2005 08:41:01 -0400
From: SRosenberg@nyiso.com
Subject: [R-390] IF module C553

I have a two R390a's. One is a EAC 67 vintage. I was checking the IF module for "Black Beauties". The C553 is a silver hermetically sealed cap made by West. Are these risky to be left in place?? The other R390a is an original Collins single fuse model. I'm going to install the separate B+ fuses but the question is does this effect the value of the radio? I was thinking of putting the fuses on a bracket inside the radio as opposed to drilling holes in the rear panel.

Date: Mon, 22 Aug 2005 10:48:31 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] IF module C553

I don't think any manufacturer ever put a black beauty in for C553.

Your Westcap is spec-wise just the same as the Sprague hermetic cans that I've seen in other IF strips, and should be replaced with a new high-quality conservatively-rated cap. I like the orange drops but physically much smaller polyester caps ought to be fine too.

> The other R390a is an original Collins single fuse model. ....<snip>

Usability and safety-wise, the fuses are a way good idea. Without it a tube arc/short can take out some chokes and, worst case, start a fire. But they'll reduce the rarity of a completely-non-modded radio. It'd be interesting to know this history of this radio. Most of the ones in military use got modded to three fuses when they went through the depot many decades ago. But maybe this was a MARS or non-military (embassy, contractor equipment, ?) unit from the get-go?

Date: Mon, 22 Aug 2005 14:31:40 -0700
From: "David Wise" <David_Wise@Phoenix.com>
Subject: RE: [R-390] R-725, How To Make Your Own

I want to apologize in advance if I am bringing up something that was resolved in the past. If it was, just say so and summarize the result. Tom mentions below that most of the mod consists of rewiring the '390 deck for 6.3V heaters because "the '390A can't handle the 25.2V load". Might that not be an issue if you didn't run the ovens? As we all have sworn :) never to do? I haven't done the math. If you think this is viable, how about an abridged procedure that leaves the deck series-wired? It would be a LOT less work.

Date: Fri, 2 Sep 2005 10:16:08 -0700
From: Dennis Wade <sacramento.cyclist@gmail.com>
Subject: [R-390] AGC Problem Returns

After finding (I thought) the problem with my AGC in the 390A, it seems now to have returned. To recap the original problem briefly: Observed low no signal voltage on the line (just about 0, maybe slightly negative) instead of the spec'ed -0.4. Replaces V509 and no signal condition became as spec'ed. Noticeable improvement in audio quality. Then I proceed to do a full alignment with very good results. Radio burns in on the bench. Problem develops.

Now: No-signal AGC is back near 0, at about -0.08 to -0.10. Noticeable distortion, especially on very strong signals. AGC only develops about -7 volts on the strongest BCB signal (>80 on the carrier meter). Sounds like something is loading it again. My question is more how to isolate it to a particular stage. If I look at the signal grids of all the controlled tubes (IF and RF decks), will the offending stage be obvious, or will all the grids look the same since they are all on the controlled line. And, is it correct that if I'm looking at a low resistance on the AGC line, that I can isolate it to the RF or IF deck by pulling the IF connector and observing what if any change. Would the components around V509 be likely suspects? And probably the most elementary of all: I've been assuming that the resistances given in the voltage/resistance diagrams are with the module in question fully connected to the rest of the radio...right? Just looking for some hope..I'm hoping I don't end up digging for capacitors in the IF deck. :(

Date: Sun, 4 Sep 2005 20:43:33 -0700
From: Dennis Wade <sacramento.cyclist@gmail.com>
Subject: [R-390] AGC problems - need help interpreting IF resistance eadings

Spent some time today checking resistance values on the AGC line in the IF deck. Definite problem on the AGC bus. Where the AGC bus comes into each of the controlled stages in the IF deck:

V501 grid Pin 1 110K, should be 500 K
V502 grid pin 1 70K should be 500K
V503 grid pin 1 110K should be 500K

Obviously something is leaking badly...I checked C512 (bypassing the AGC line in the grid circuit of V502) thinking since that's the stage with the lowest resistance, that would be the problem. But, you guessed it..C512 is fine. I lifted the ground end and the AGC line resistance to ground didn't change. Just for kicks, I put the ohmeter across C502 and C519 (AGC line bypasses in V501 and V503 stages), and didn't see anything but the 110K to ground. Was that a useful test, or do I need to actually lift one end of those guys and check for sure. What else should I be looking at in the IF deck that could be loading down the AGC line?? I running out of ideas..what am I overlooking?

Date: Sun, 4 Sep 2005 22:35:42 -0700
From: Dennis Wade <sacramento.cyclist@gmail.com>
Subject: Re: [R-390] AGC problems - need help interpreting IF

> Also remember that the mechanical filters are on that line <snip>

I have the IF deck out of the chassis, so I'm pretty confident the leakage is in the deck. Would a leaky filter otherwise perform normally? In order to isolate a filter, do I need to disconnect one or both ends? Is it possible to disconnect all of them at once by lifting the common ground? (if I can find it).

Date: Mon, 5 Sep 2005 14:48:49 -0700
From: Dennis Wade <sacramento.cyclist@gmail.com>
Subject: Re: AGC problems - need help interpreting IF resistance readings

Well, I think I've isolated the problem to the output side of the mechanical filter group, so its either a filter, a mica cap (unlikely, since the filter would have to be leaking to ground too), or the switch itself. I want to go over my reasoning before I start lifting wires off the filters.

I'm still a novice at troubleshooting (won't be able to use that one for much longer). I lifted the filter end of the 22K, R507 from the rotor of the switch. This isolates the grid circuit from the AGC line. I still see about 120K from the rotor, and pin 1 of V502 to ground.

The pin 1's of V501 and V503 now show infinite resistance to ground. There is no DC path from input to output of a mechanical filter, correct? Does what I see and conclude pas the laugh test so far?

Date: Mon, 05 Sep 2005 18:03:46 -0700
From: John Kolb <jlkolb@jlkolb.cts.com>
Subject: Re: [R-390] AGC problems - need help interpreting IF

>There is no DC path from input to output of a mechanical filter, correct?.....

Correct, the input coil will measure somewhere around 50-60 ohms, as will the output coil, but infinite between the pair. Also, should be infinite between either coil and filter case (out of circuit)

Date: Mon, 5 Sep 2005 20:21:36 -0700
From: Dennis Wade <sacramento.cyclist@gmail.com>
Subject: Re: AGC problems - need help interpreting IF resistance readings

Thank you everyone for your responses.

The 8 Kc filter had a high resistance (~120K) short to ground.

When I opened up the filter box, I discovered why the 16 kc filter was out of the circuit..it has about 5K from ground to either terminal. And, one side was still wired into the common side of the filters! That helped me discover the hard way that I needed to isolate BOTHterminals (duh) since one side is all wired in common in order to find the second suspect filter. I also discovered that the tabs on the trimmers will only flex so many times before breaking. One got flexed one too many times...luckily it was the one for the 8kc filter. So, I put shrink tubing on the exposed wires and hooked up the remaining working ones and fired her up. Sure enough, no more distortion on strong signals, and overall an improvement in audio quality. Well, if I had to lose 2 filters, I guess those would be the two to lose (for my listening anyway.) I don't feel a need to replace those filters right away. I happen to have an 8 and 16 kc Clevite ceramic filters, and a 4 kc as well. I'm also wondering as I type this if there may be other filter options which would give me more flexibility. (note that this particular '390A has the "factory" SSB mods done on it). Comments are welcome. Thank you all again for your help.

Date: Tue, 06 Sep 2005 00:08:08 -0700
From: John Kolb <jlkolb@jlkolb.cts.com>
Subject: Re: AGC problems - need help interpreting IF resistance readings

Well, of course, more flexible filter options would depend on your interests. A good match for the factory SSB opbion would be to install USB and LSB filters. For more general SWL listening, a 3 and 6 kHz filters would be nice. For TTY or CW??? The trick is to either find filters with a 100 kohms in and outZ or match to the newer filters which are typically 2 kohms.

It appears that all the F455Y-xx filters Y-31, Y-60, Y-120, etc are 100 kohms centered on 455 kHz. Since the "Y" size case filters are round, but smaller than the "N" case filters, an adapter can be made to hold them and provide good shielding. Mounting the rectangular style filters would be more of a problem. "Y" series filters show up on ebay from time to time. The rectangular style filters would be harder to mount. The "V"

case filters, metal, would provide better shielding than plastic filters such as the "FA" series, and most of the "V" filters have extremely good shape factors. One could, of course, buy new filters in an "N" sized case from Dave Curry, but a couple of those would set me back more than I paid for my 390 :) There are Motorola mechanical filters for sale on my site if you decide on something a little closer to original than the Clevite ceramic filters.

Date: Thu, 29 Sep 2005 10:18:31 -0400
From: Joe Fallon <joe.fallon@philips.com>
Subject: [R-390] Whitewater mechanical filter

Came across a Whitewater electronics 8KHz filter P/N F455 X8 in the same form factor as the Collins filters in the R390A. Anyone familiar with this part and how it stacks up against the Collins brand?

Date: Thu, 29 Sep 2005 23:08:26 -0700
From: John Kolb <jlkolb@jlkolb.cts.com>
Subject: Re: [R-390] Whitewater mechanical filter

Don't have any in stock at the moment, but the Whitewaters I've seen look identical to the Collins. I believe they put their labels on filters manufactured by Collins. Motorola filters, on the other hand have a different style terminal, clearly not an exact copy.

Date: Sat, 08 Oct 2005 21:54:05 -0700
From: James Cottle <jim_cott@earthlink.net>
Subject: [R-390] How to free stuck IF slugs?

OK, so I finally got around to doing an IF alignment on my R-390A. On the first fixed IF transformer, the primary slug (bottom) moves so that I can peak the diode load at 455Khz. The top slug, however, is stuck to where an unsafe amount of torque will still not allow me to turn it in the coil form. What does one do to free these ferrite slugs in the coil form? I know that turning it with force is definitely NOT the answer, for that has been known to crack the coil form. I am left with the question: Does anyone have a tip in how to free these slugs? I know they are normally tight, but should not be immovable. I had the same problem with the single slug form T208. All I want to do is peak T203 and T208 I think these are the numbers...not messing with the staggered IF transformers) Any help would be appreciated.

Date: Sun, 9 Oct 2005 08:27:43 -0700
From: "Craig C. Heaton" <wd8kdg@worldnet.att.net>
Subject: RE: [R-390] How to free stuck IF slugs?

Sounds as if the slug is already cracked. Try using a small pick, etc. and clean the top of the slug. You might now be able to see or feel crack/cracks in the slug. If this is the case; time to shop for a new/used IF transformer. Others have been lucky and used a alignment tool with a dab of super glue and the slug has moved/peaked after the glue dried and pulled the slug away from the ID of the coil. I had this same issue on T101, don't have the manual in front of me, could be another transformer. Anyway, someone on the forum listed a transformer and some RF slugs for sale a couple months after finding the cracked slug. Just what dad needed! Another option if a

spare transformer is available/found; a root canal. Use progressively larger drill bits drilling out the stuck slug and replacing it with a slug from the other transformer. Good luck, it can be fixed.

Date: Sun, 9 Oct 2005 10:10:52 -0700
From: Dennis Wade <sacramento.cyclist@gmail.com>
Subject: Re: [R-390] How to free stuck IF slugs?

If your slug is actually cracked and not just a binding problem...stop here. This probably won't help you. I had a similar problem with the AGC transformer that binded before I could complete the adjustment. I found a tip in the Pearls that worked quite well. Put a VERY small shot of WD-40 into the top of the transformer and let sit overnight. Problem solved (for me)

Date: Sun, 9 Oct 2005 13:24:15 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] How to free stuck IF slugs?

Before you put to much effort into tweaking a core, make sure it needs to be tweaked. If it ain't broke don't try en fix it. There is a good chance the core is peaked from a previous alignment.

Put 150 uv at 455 into the IF deck and determine if you can get - 7 volts on the diode load. With 30% modulation, you should get 1/2 watt out of the local audio across a 1 watt 600 (580) ohm resistor. Between turning the modulation on and off you should get 30 DB difference in the signal plus noise to noise. This procedure is in the TM and the Y2K manual for setting up the IF deck. Changing tubes will get you more than adjusting the transformers. Back in 68 - 75 doing two a day we almost never tried to adjust the transformers. I have done the transformer adjustments and yes it will get you a little or lot more output.

If you do need a transformer or slug, list the one you need here. Fellows have spare parts decks and may be able to help you. Have no fear. If you break it, it can be replaced. You can do it your self. Or you can ask here if someone local to you can do it. Pull the cover off the transformer and do the inspections as Craig detailed above. If the problem is in a bottom slug, you can run the top slug out of the coil form and look at the bottom slug. Some times the bottom slug can be run out of the bottom of the coil form through the chassis to allow you to look at the bottom end of a top slug.

You can get the hair dryer and warm the coil core up to melt some of the wax. While it is warm you can run the slug up and down to "recut" the threads through the wax. As it cools keep the slug moving. If it gets tight again stop. Try to warm the core up and set the slug while the wax is hot.

Some have tried a small diameter long tip on a low wattage solder iron to warm a slug.

Some have tried to warm the whole deck in the oven at 200 degrees. This leaves the whole deck looking real shiney. Some like to put the deck in the dish washer before it goes in the oven. You see folks paying big bucks on E-pay for these cosmetic

operations. Along the way, the heat will let some stuck parts come free. The process is mostly non invasive, below the melting point of solder. Considering what the Julian Creek Receivers were exposed to, a trip in the
dish washer and oven is gentle cleaning.

Thinking of the number of decks I dunked into the teletype and typewriter (mill) cleaning tank, running a deck in the dish washer is fairly benign.

Do not try a bunch of solvents. The boat anchor folks have threads about all kinds of things and ways to dissolve coil forms.

If you have to drill your slug out and the replacement slug does not hang in for adjustment you have two options. One is some bees wax melted into the coil form. Second is a small chunk of rubber band. The band from an old golf ball works. A rubber band can be sliced down for a small square strand that will also work.

Someone talked about having a nice white power used by magicians to dust card decks and make them very slippery. Motorola used to provide the stuff to their technicians for use on slugs and in coil forms. The stuff is finer than talc and stays slippery when moist. The stuff a magicians power was cited as you are likely to find it in a magic shop. Magic shops being more prevalent than electronic parts shops these days. Roger KC6TRU

Date: Mon, 10 Oct 2005 12:20:56 EDT
From: N4TUA@aol.com
Subject: [R-390] More stuck slugs

I finally have reached the point of doing the fixed IF alignment and guess what. You got it. Stuck IF transformer slugs. I have inspected them closely and do not look to be cracked or broken. Are there any ideas from the group on how to get the slugs turning again? How about the WD-40 idea? I have two that will not turn T501 and T502. Any and all help would be greatly appreciated.

Date: Mon, 10 Oct 2005 11:29:54 -0500
From: "Barry" <n4buq@aol.com>
Subject: Re: [R-390] More stuck slugs

I haven't tried it, but I have heard that *gentle* heating of the slug by heating the tool used to adjust it and inserting that into the slug sometimes works. I would think you could also *gently* heat the entire xfmr with a hair dryer and that might help too. Good luck with it.

Date: Mon, 10 Oct 2005 10:02:27 -0700
From: Dennis Wade <sacramento.cyclist@gmail.com>
Subject: Re: [R-390] More stuck slugs

Although I had good results with the *very* small shot of WD-40, I would exhaust other mechanical/thermal means before I tried that.

Date: Mon, 10 Oct 2005 13:22:27 -0400

From: "Patrick" <brookbank@triad.rr.com>
Subject: Re: [R-390] More stuck slugs

If the slug is stuck, it must not have been moved for a long long time, that means to me that it is in alignment, leave it alone.

Date: Mon, 10 Oct 2005 13:29:51 -0400 (EDT)
From: John Lawson <jpl15@panix.com>
Subject: [R-390] Re: More stuck slugs

Am I mistaken in my dim remembrance that some ferrite slugs were impregnated with a paraffin compound to aleviate just this problem? And, if I am correct, is it possible that high-end radios of this era used them? Just something I recall from over 4 decades of Junque Collecting...

Date: Mon, 10 Oct 2005 13:31:22 -0400 (EDT)
From: John Lawson <jpl15@panix.com>
Subject: Re: [R-390] More stuck slugs

>.....it is in alignement, leave it alone.<snip>

Unless (as is the case here) you've changed tubes, or otherwise disturbed the circuit...

Date: Mon, 10 Oct 2005 13:39:49 -0400
From: "Patrick" <brookbank@triad.rr.com>
Subject: Re: [R-390] More stuck slugs

Then check the tubes and/or return the disturbed circuits back to what they were, the problem, if any, should be there and not with the slug..

Date: Mon, 10 Oct 2005 13:51:09 EDT
From: N4TUA@aol.com
Subject: [R-390] IF slugs

I am getting some good input on the stuck slugs and I am tending to just leave them alone. I would wonder though if one was going to do the fixed IF alignment. How do you get to those bottom slugs? What type of tool do they take? I would think the tool would be smaller than the hole in the top slug and would go down through to adjust the bottom slug. What type of tool does it take? None like I have that is for sure. Thanks for the help, Collin

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Date: Mon, 10 Oct 2005 13:25:40 -0500
From: "Barry" <n4buq@aol.com>
Subject: Re: [R-390] IF slugs

The typical adjustment tool has a short tip that has the hex shaped business end. Further down the shaft, the tool relieved to a sufficiently small enough diameter to clear the hex shape from the "upper" slug. I hope that makes sense...

Date: Mon, 10 Oct 2005 15:01:09 -0400
From: "Patrick" <brookbank@triad.rr.com>
Subject: Re: [R-390] IF slugs

The IF transformers normally require no adjustements, however, if you are set in adjusting them, follow the procedures outlined in "The 21st Century R-390A/URR technical reference" a collection of wisdom for enthusiasts, paragraph 6.2.7.1 As far as an adjustement tool, with a little patience, you can fashion a good one out of a bamboo skewer. If you narrow the shaft so that it can go thru the first slug, then the second slug can also be adjusted. Be aware that the instructions for this adjustement requires that resistor R504 should be 560 ohms.Again I stress that unless one of the transformers have been replaced, I would not adjust any of them, contrary, if any transformer has been replaced I would adjust all 3 of them. Back to the old proverb "if it is not broken, do not mess with it"

Date: Mon, 10 Oct 2005 17:37:18 -0400
From: "Drew Papanek" <drewmaster813@hotmail.com>
Subject: [R-390] Re: More Stuck Slugs

It may or may not be in alignment depending on motion, drifting capacitors, and aging characteristics of the core material. Core permeability tends to decrease with aging and hence inductance drops. But this is an R-390A we are talking about. The bandwidth is determined by the mechanical filters and the IF is otherwise broadly tuned; exact adjustment is not critical. Yes, if maladjustment were to cause the IF to become broader then the IF's noise contribution would increase, but by how much. The R-390A 's IF has far more gain than necessary and so we reduce it by use of the IF gain control. There is sufficient reserve gain to compensate for a little IF misalignment.

Date: Mon, 10 Oct 2005 19:44:54 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Re: More stuck slugs

As a radio repairman from 68-75 I did some things to R390/URRs R390A/URRs that I will not even repeat. From these "experiments" I can assure you there is no paraffin compound that will soften or dissolve in a petroleum base solvent, in the R390 slugs. I cannot say about other items as I was not subjecting them to "experiments" in removing living growths from the interior.

Date: Mon, 10 Oct 2005 20:27:07 -0400 (EDT)
From: John Lawson <jpl15@panix.com>
Subject: Re: [R-390] Re: More stuck slugs

I have miscommunicated. What I was referring to is that, over the years, I have encountered IF slugs that appeared to be imbued with some form of waxy lubricant - and since these were generally very old devices, I assumed (and y'all *know* what you get when you assume) that the substance exuding from the ferrite core was wax, paraffin, whatever. Haven't seen that many - I do have a few hundred IF and other 'cans' around here - I'll paw thru some and see if I'm remembering correctly, or if it's just another one of them damn Hippy-Era Flashbacks... ;}

Date: Mon, 10 Oct 2005 21:41:32 -0400
From: "Dave Maples" <dsmaples@comcast.net>
Subject: RE: [R-390] Re: More stuck slugs

All: If the R-390A hits the target for sensitivity, I'd leave it alone. The urge to tweak is strong, but if it's hitting the spec target, and there's a chance to tear the thing up by tweaking, the logical (but not emotionally satisfying!) thing to do is leave it alone... Just my own opinion, of course.

Date: Tue, 11 Oct 2005 21:22:24 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Re: More stuck slugs

Not all slugs are R390 slugs. I'll bet you have encountered some that were wax impregnated or not exactly as robust as R390 slugs. Other slug from other radios are likely to be compsed of almost anything. I just wanted to point out that I had never encountered a R390 or R390A slug that would dissolve.

Date: Mon, 17 Oct 2005 02:54:08 -0400
From: n4tua@aol.com
Subject: [R-390] Fixed IF stuck slugs

I have received many helpful ideas on this subject and would like to thank everyone who added to my question. I have decided to leave the stuck slugs alone for now anyway. I will continue to look elsewhere for the cause of the low sensitivity. Any ideas on this? I do receive signals that are low in volume with the rf gain turned to 100%. Also seems to be a loud noise floor. Almost like the noise is as loud or louder than the signal. Any help would be appreciated. Sure don't want to have to change those fixed IF cans.... :'- (

Date: Sun, 27 Nov 2005 13:22:02 -0500
From: Glenn Little WB4UIV <glennmaillist@bellsouth.net>
Subject: [R-390] Incomplete IF module

Some years ago I bought an incomplete IF module from a surplus house. In cleaning this weekend, I uncovered it.

The module is marked: SM-C-343621
I.F. FINAL ASS'Y FR-11-C22-C-4-26418(E) SER. NO. 0294

The module has the tube sockets, RF connectors, T5-1-T503, Z501, C506, TB501 and some small parts mounted. Very little has solder on it. Is this a rare find? Why would it have the serial number assigned before completion?

Date: Sun, 27 Nov 2005 13:55:53 -0500
From: shoppa_r390a@trailing-edge.com (Tim Shoppa)
Subject: Re: [R-390] Incomplete IF module

Is it possible this was not a "half-built" module but a "built, torn down for spare parts,

and the begun to be rebuilt" module? For reasons that I do not fully comprehend I've seen lots of stripped-down IF modules over the years, almost always missing the BFO and often missing some other parts.

Date: Sun, 27 Nov 2005 16:26:34 -0500
From: Glenn Little WB4UIV <glennmaillist@bellsouth.net>
Subject: Re: [R-390] Incomplete IF module

From what I can see, this is a module that was never completed. The filters appear to have been installed and removed. T503 was never installed (I mentioned T503 as installed earlier, this is Z503). J512, R519 and R523 were never installed. The standoff insulators are installed, but have never had components soldered to them. There are no marks on the chassis to indicate that the missing parts were ever installed.

Date: Sun, 27 Nov 2005 15:47:28 -0700
From: Les Locklear <leslocklear@cableone.net>
Subject: Re: [R-390] Incomplete IF module

Lots of those surfaced in the late 80's. In fact, many were marked with an EAC spare parts contract number. Clavier (who was originally Capehart then finally Fowler) made some of them also. Tom Marcotte has the list. I'm at work and don't have that list available.

Date: Sun, 27 Nov 2005 15:45:55 -0800 (PST)
From: "Tom M." <courir26@yahoo.com>
Subject: [R-390] Comm Systems Corp, was Incomplete IF module

Your incomplete IF module is from Comm Systems Corp of Morton Grove, IL, run by a fellow name HM Harper. They "attempted" to make R-390A's from tooling bought from Stewart Warner, but the tools were in poor condition and the company never was able to produce full sets that met satisfaction of the inspectors. The company eventually argued that R-390A's could not be made to specification (huh?) and that the contract be terminated. The govt took all the
stuff and Comm Systems quit the R-390A business.

Date: Mon, 28 Nov 2005 19:01:17 EST
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Incomplete IF module

The question was why do we find serial numbers affixed to modules before the guts get soldered into the subassembly?

We need to go back to the manufacturing process. As one is building items during the day, something must be done to track productivity to keep modules from getting shuffled and counted as production. The sheet metal was often stenciled and varnished before assembly stated. That way new people had some clues by looking at the chassis silk screen where they were supposed to install their quota of parts. As long as you have the critter getting silk screened and drying, adding a serial number was just part of the same process. This also let management track production. In the

days before copy machines and office printers, paper work was much different. You got a sheet of paper numbered from 000 to 999. You put your name and date on the paper. You put a job code number on the paper. As you built items you filled in the digits for the serial number in front of the 000 to 999 that went with the item you completed. You were expected to complete so many assemblies per day for the job code. At the end of the day you counted how many serial numbers you completed on the page. Management had a page with numbers and job codes. They placed a date after the serial number to track production. If a serial number come up on the same job code from two different days, Management would first track back through the paper and then through the employees and find out who was padding their production count. Amazing what one learns in college classes.
Roger KC6TRU

Date: Thu, 29 Dec 2005 14:22:48 -0700
From: DW Holtman <future212@comcast.net>
Subject: [R-390] Chassis finish

<snip> Another question. Was the modification that installed variable caps (C-569 through C-571) in the input and output of the mechanical filters in the IF module applied at Depot during rebuilds, or just put on newly manufactured modules? The reason I'm asking, there is an IF amp for sale on Ebay without the variable caps on the IF Module. It went through depot 1982, and does not have the variable caps. This particular module looks like it has yellow plastic caps? Ebay item number is 5847326968. I'm just courious about this mod, because I have two IF modules, one with and one without the mods. Thank you in advance for any help.

Date: Tue, 10 Jan 2006 08:38:47 -0500
From: Gord Hayward <ghayward@uoguelph.ca>
Subject: Re: [R-390] Open Z-503 AGC IF Transformer

When I got mine, Z503 was open too. I tried to steam (hot air really) the ferrite off but the whole thing came undone. Not finding a replacement, I took a big coil out of my junque box, cut the form to fit, added a resonating cap at 455 kHz and rebuilt the guts of the can. Now it's dead on spec. The trick is to use a small cap, 20 to 40 pf or so to get the Q as high as possible. That circuit needs the high Q to get the AGC voltage high enough. Do the resonance check before the cutting and installation steps.

Date: Tue, 10 Jan 2006 08:52:26 -0500
From: JMILLER1706@cfl.rr.com
Subject: Re: [R-390] Open Z-503 AGC IF Transformer

Believe it or not I have rewound RF/IF transformers like this that have been fried. If you can unravel the turns, just measure the total length after getting the wire off, go buy some small diameter magnet wire of the same gauge and length, or close, and wind it back on. It won't look pretty but it will probably work. Glue or wax to hold it in place. I did that with an RF coil in a 51S1 once. Worked great. Alternately, it is possible that a coil from generic 455 khz IF can would work. JM

Date: Tue, 10 Jan 2006 22:09:41 EST
From: ToddRoberts2001@aol.com

Subject: Re: [R-390] Open Z-503 AGC IF Transformer

An open winding in coil L514 in the Tuned Circuit can Z503 seems to be a common failure mode in the R-390A IF deck. I have run across several open-circuited ones over the years. It may be corrosion eventually breaks the tiny wire leads from the coil or it may be something to do with the insulation breaking down as this coil has about 180VDC running through it and some current. If anyone is interested I measured the inductance of L514 in Z503 as 1.385 mH. This would require a capacitance of 88pF to resonate at 455KHz. I see that Mouser has some Hi-Q miniature radial inductors with a Q of 100 in a 1.2mH and 1.5mH size. These would easily fit inside the Z503 can. The 1.2mH inductor would require 102pF to resonate at 455KHz and the 1.5mH inductor would require 82pF. The peak may be broad enough that you could get by with a fixed cap across the coil but one could also mount a miniature trimmer cap and a slightly smaller fixed cap inside the can to get the best peaking on the coil. I haven't measured the Q of the original coil yet but I do have a Heathkit Q-meter and I will check it out. I would think a coil with a Q of 100 would be suitable here. In the future the Z-503's are going to be hard to find. It would be nice if an 80 cent inductor from Mouser and a small mica cap would get it working again.

Date: Fri, 13 Jan 2006 14:43:01 EST
From: ToddRoberts2001@aol.com
Subject: Re: [R-390] Open Z-503 AGC IF Transformer

If anyone is interested here is a recap of the measurements I took of the tuned circuit Z-503 inductor coil L514. I measured the inductance of the coil as 1.385mH. I also had a chance to measure the Q of the Z-503 coil L514 and I was surprised to find it measured a very low Q of only about 30-40 Q at 455KHz on the Heathkit Q-meter. I have a bag of small 1.2mH molded inductors I picked up a while ago from Hosfelt Electronics and measured one and its Q was about 60 at 455KHz so it looks like just about any small commercial inductor would work fine to get Z-503 working again. I think those inductors only cost me about 20 cents each. I found it took about 85pF to resonate the 1.2mH inductor at 455KHz, so a typical small Mica cap would work well across the inductor to get Z-503 working again. Best to use something like a Heathkit Q-meter to determine how much capacity is needed to resonate the new coil at 455KHz due to the unknown distributed capacity of different inductors. If someone ever needed help with a burned out Z-503 I can mix and match small inductors with a small cap to resonate at 455KHz.

Date: Sun, 15 Jan 2006 10:27:41 -0500
From: shoppa_r390a@trailing-edge.com (Tim Shoppa)
Subject: [R-390] Strange BFO backlash explained!

You guys may remember me asking about a strange BFO backlash that I had with my yellow striper's IF deck last summer. It manifested itself sometimes, and not others, and while I had dinked around with it I never thoroughly understood the cause. Now that I'm putting that deck back together (I had to pull the BFO reactor to get at and replace the V505 socket, which had crumbled into dust over the years) I can understand the cause: the shaft of the BFO reactor shifts in and out a little bit. I don't know if this is "typical" or not, but seeing as how the internals work it makes perfect sense that this causes backlash. The springy-thing shaft coupler can be adjusted to

provide enough tension over the working range that this problem is at least minimized. Is the BFO reactor shaft really supposed to have this much (I'd guess 1/32") wiggle in and out? I'd be very surprised if so...

Date: Sun, 15 Jan 2006 15:54:54 EST
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Strange BFO backlash explained!

We do expect the BFO shaft screw in and out as you tune it. We do not expect the shaft to have any slop moving in and out so there should be no backlash as you adjust the BFO. I can believe the BFO bushing is worn to the point where you have the 1/32 free play in your BFO reactor shaft. Like you said the bellows coupler can be adjusted to place minimum force on the reactor shaft and the IF deck BFO shaft bushing. I believe you BFO suffered from years of mis-adjusted bellows coupler and that has caused a lot of wear on the reactor can bushing and thus giving you a lot of slop. If you can live with it OK. If not, it is not real hard to do a reactor can replacement. The reactor cans did die and were replaced.

Date: Tue, 31 Jan 2006 17:45:44 -0600
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: [R-390] IF Trimmer notes

Discovered something in the last few days that might be of interest. I've not seen it talked about here in the past. While doing the alignment on my R-390A project (mostly done R-390's) I have gone through the adjustment of the trimmers across the mechanical filters. The gain seemed a bit low on the 4 kc position so I figured it was the dreaded worn out filter scenario. While adjusting the trimmers for max gain I noticed a couple only had one peak. I would expect on the trimmers that will rotate 360 degrees to have two peaks. Some had two peaks and that was on the more sensitive positions.

The ones with only one peak would lead one to believe he had found the correct position for the trimmer which isn't so. What is in fact the case...the fixed cap is not the correct value to properly resonate that end of the filter. I substituted various values in place of the factory cap and found one that would allow adjustment through two peaks and the gain came way up. After getting all the top end tuned I pulled the deck loose and stood it up in the radio to adjust the lower trimmers as my side panel does not have the holes to allow adjustment while the IF deck is in place. I found three of the four bottom trimmers to have only one peak. I will have to pick up some more caps to continue the tuning of the lower end of the mechanical filters but I expect the final outcome to be a much better performing radio. It should allow me to reduce the overall IF gain and improve overall sensitivity beyond what I already had achieved by improving the efficiency of the coupling of the signal through the mechanical filters.

Bottom line is if you only get one peak on the trimmers, improvements in performance can be achieved by getting the correct value cap in the circuit to allow proper resonance setting. Can't go by the values in the book as each filter will probably be different. Two of mine had been changed from the Collins to the later Whitewater filters....that probably accounts for two positions being out of resonance.

The caps I pulled were 82 pf and tested OK. I also had an intermittent gain problem in the 4 Kc position which turned out to be the lead on the original fixed cap had rotated in the body of the cap causing a change in capacitance anytime the cap was pushed on....or when the temp. in the radio changed.

This radio is getting close to .1uv a little at a time with most bands running .13 to .15 @ 8Kc. Not bad for one that came out of the SJC pile!

Date: Tue, 31 Jan 2006 20:10:58 -0600
From: "Barry" <N4BUQ@aol.com>
Subject: Re: [R-390] IF Trimmer notes

Good analysis. I'd assume that with any of the ceramic trimmer types, if you don't get two peaks (or nulls as the case may be), the cap isn't of sufficient value due to whatever due to the mechanical nature of their construction.

Date: Wed, 1 Feb 2006 09:25:20 -0600
From: "Barry" <n4buq@aol.com>
Subject: Re: [R-390] IF Trimmer notes

Well, with *some* air variables. The type that have a mechanical stop at maximum capacitance will only have one "true" peak or null (depending on the circuit).

Date: Sat, 11 Feb 2006 19:05:13 -0600
From: "Chuck Curran" <ccurran@wi.rr.com>
Subject: [R-390] BFO Problem/Question for a newly restored R-390A

In April of 2005 I received a R-390A from an Uncle who had decided to hang up his radio activities at the age of 85. I had given him a 75A-3 about 18 years ago, which he traded for this particular R-390A. Upon deciding to clean out his basement, I became first on the list to get the Capehart 1961 vintage R-390A. My lucky day! This particular radio came complete , all covers present and in very, very good physical condition. I started by gathering all information, printing out full sized schematics and then diving in. It had never been touched since it's departure from the military, as near as I could tell. Seven tubes were so bad, my Hickok almost threw them back at me. I re-capped the unit, carefully cleaned all gears with a 100% disassembly. Yea, I messed up, even pulled out the Geneva, and that took a bit to get re-synced. After picking up a HP606A signal generator, I was able to properly re-align the electrical end of the radio, and all seemed pretty good, except that darn BFO! That Heath IG-102 just couldn't handle the task.

The main problem now is that the BFO would kick in, and then weaken and drop out within 10-20 seconds. Sometimes it did not work at all, and I had to flip the switch repeatedly to get it to kick in. O.K., today I decided to determine what had happened with the BFO circuit. I first checked the resistances on V505 comparing all to the manual values, most were "close" to nominal values, but off enough to cause a strong interest, especially on pin 5. I then removed the IF deck and started to dig in a bit deeper. Upon checking individual resistances I quickly found that R530, the 22K plate resistor for this Hartley oscillator, had changed from a correct value of 22K to 33K. That did not seem to be good, so I installed a new 22K resistor. OK, many of

you know how crowded things are in that part of the 390A. I needed to remove the flexible shaft coupling to access this area around the V505 tube socket. I successfully replaced this resistor, using many chunks of solder wick, and then re-installed the IF deck for a test.

I fired up the receiver, and then tried to zero out the calibration signal at 3.000 MHz- no audio tone at all was heard, but a strong Calibration signal was still present, at least displayed on the meter. I putzed around, a bit puzzled, since I had not even heard the normal 10 second long "weak" BFO signal. Where was it? I spun the dial with the BFO still on and got hammered at 2.987 MHz with a very strong signal. I turned off the BFO and it disappeared. Tried the Off/On routine and was able to convince myself I was actually controlling an off frequency BFO signal. Prior to removing the flexible coupling, I had marked the BFO sealed unit shaft with a black magic marker dot. I "assumed" I could run that puppy back to the same spot and all would be well. Wrong, I believe now that I failed.. During the flexible coupler removal, I realized there were actually four Bristol set screws, two on either end spaced about 110 degrees apart - gee, why not 90, was this a manufacturing error for this coupling? Ah, minor detail. I ended up twisting and cussing, and removed the coupler, without being sure how much the shaft had rotated. I cleverly told myself that it was surely like a variable cap, with a 360 degree rotation pattern that would just repeat itself. Maybe not?

Here is my question, sorry for the long diatribe. Should I start turning the BFO shaft until I achieve a tone at the expected points? Is this shaft on a threaded adjustment, with 3, 4, or 5 turns possible so I can achieve this? As an alternative, I thought I could try to sample this BFO oscillator output with my frequency counter, and see where it is. I think I can do this using a tube test socket and just sample the signal off the available exposed V505 plate contact point. If I am actually off by 13 KHz, I would want to "try" to turn the shaft to come back to the correct 455 KHz frequency for the center point of the BFO oscillator. If this shaft just has a 360 degree adjustment, then I guess I might have a problem, possibly with the inductor and three caps controlling the oscillator base frequency. Not likely, since it was on frequency prior to my messing with it. Being totally and 100% ignorant of the internals of that sealed BFO can, I
hope someone may have learned the construction features and can offer some advice. Is it a multi-turn adjustment, or just a 360 degree affair?

In advance, thanks for any comments on this situation, Chuck WA9POU

Date: Sat, 11 Feb 2006 20:12:03 -0600
From: "Barry" <n4buq@knology.net>
Subject: Re: [R-390] BFO Problem/Question for a newly restored R-390A

I think there are ways to do this without a counter, but I've used a counter for mine. You can pick up a signal with a loop around the oscillator tube or tie to the plate circuit through a cap. If you think you might be off by as much as 13kc, this would get you a *lot* nearer to where you should be with it. I think Roger has a "radio-only" procedure to set this, but I don't know it offhand.

Date: Sat, 11 Feb 2006 20:46:54 -0800

From: "Craig C. Heaton" <wd8kdg@worldnet.att.net>
Subject: RE: [R-390] BFO Problem/Question for a newly restored R-390A

I think the BFO is a multi-turn device. Hope you have a sig-gen or access to one, it will be needed, check out Chuck Rippel's web site, link is provided to his IF Deck Alignment page. At the bottom of the page is the correct way to set the BFO. His method works, I've used it.

http://www.r390a.com/html/if_deck.html

Date: Sun, 12 Feb 2006 01:46:59 EST
From: ToddRoberts2001@aol.com
Subject: Re: [R-390] BFO Problem/Question for a newly restored R-390A

The BFO is a multiturn device good for about 2 1/2 - 3 full turns from end-to-end of its tuning range, but do not try to force it past its stops, be very gentle with it as soon as you meet any resistance trying to turn the shaft. I get plenty of signal pickup for a frequency counter by wrapping 5-10 turns of wire around V504 and connecting one end of the pickup coil to the freq counter probe tip. Be sure to turn down the RF gain if using this method or else other IF signals across V504 can give false readings instead of the BFO frequency. Some freq counters may not have enough sensitivity when using the pickup coil method around V504 so try whatever works best for you.

Date: Sun, 12 Feb 2006 12:42:43 -0500
From: shoppa_r390a@trailing-edge.com (Tim Shoppa)
Subject: Re: [R-390] BFO Problem/Question for a newly restored R-390A

>... Sometimes it did not work at all, and I had to flip the switch repeatedly....

My guess would be a leaky capacitor that gets worse when voltage is applied (of course you wouldn't notice it until you turned on the BFO!). IIRC there are at least a couple of black beauties in that area. One is "just" some sort of bypass on the current-regulated filament string through the BFO and PTO and is hardly critical.

> that R530, the 22K plate resistor for this Hartley oscillator, had changed
> from a correct value of 22K to 33K.

Pretty common occurence! Almost all 2.2K plate resistors in my 390A's were up by several hundred percent. Well, in my yellow striper the BFO oscillator tube socket was crumbling into tiny pieces of dust. I managed to replace that, although it was an extended project.

>.....with a 360 degree rotation pattern.....

Not. In fact you will notice that the shaft is left-hand threaded, such that when you turn it clockwise it backs out of the BFO. This moves a slug in and out of an inductor core. It's also the reason that the flexible coupling is also compressible.

>....Should I start turning the BFO shaft until I achieve a tone .....

Yes. Just don't turn it past its limits, if you're doing all this with a counter then you will know when you're turning in the wrong direction and not go very far that way. When you're done, you might want to check the flexible/compressible coupling to make sure that it's not stretched to its limit either.

>.....I thought I could try to sample this BFO oscillator output with my frequency counter,

I do fine with just sticking a scope probe near the tube (may want to remove the tube shield first). That's enough of a signal to register on my frequency counter or my scope. Also works great for the crystal oscillators (the bandswitched one, the 200kHz one, and the 17MHz one.) You can also see the spiky divided-down 100kHz calibrator at the next dual triode in the calibrator too. I know the "classic" R-390A tuneup procedure only needs signal generators and voltmeters, but if you've got a scope or a counter then a lot of this stuff becomes trivially simple.

Date: Sun, 12 Feb 2006 19:11:40 -0600
From: "Chuck Curran" <ccurran@wi.rr.com>
Subject: RE: [R-390] BFO Problem/Question for a newly restored R-390A

I just wanted to let you know that the BFO is now running at 100%. Thanks to all who provided suggestions and comments. I received quite a number of direct e-mails. Lots of good discussion and some interesting stories about similar problems too. The first item I had was about the number of available turns, I did find out that the BFO shaft does have about 3 turns. I needed about 1 1⁄2 to bring it right back on the money. I used the second method of BFO calibration to get it right on the money, as shown on page 159 of the TM-11-856A manual. I am not knowledgeable enough to appreciate why the plate resistor R530 going from 22K to 33K also changed the resonant frequency, causing the last 45 years worth of service people to keep twisting it further and further to get a zero beat. The inductance and 3 mica caps in the can really establish the point for resonance, I would have expected that a lowering of the plate voltage would have decreased the output signal amplitude, but left the ,frequency alone. What am I missing in this Hartley oscillator operational theory?

It’s nice to now have the calibrator functional for more than 8-10 seconds and a decent BFO for the rest of the time. I am running out of problems – time to get a different radio?

Date: Fri, 3 Mar 2006 22:51:29 -0800 (PST)
From: Perry Sandeen <sandeenpa@yahoo.com>
Subject: [R-390] Precision AM Detector Circuit

I buy an English magazine called Electronics World. It always has a feature of reader circuits, which usually aren’t applicable to anything I need. However, in the Jan ’03 issue they had a circuit called "Precision full wave rectifier". This didn’t peak my interest until I read the last part the said it "will rectify up to about 2Mhz,with input signals as low as 10 micro-volts. I originally used it for full envelope detection in a 455Khz IF chain."

It uses 7 GASP, WAIL, KNASHING OF TEETH, very cheap transistors, and can be built on Rat Shack perf board with no sweat. In the same magazine in May ’04 an revamped circuit was done with spice simulation. While it may be tough to put into a R390, There is plenty of space in a SP600. The first article is a one page file that is 2.4 Mbyte TIFF image or a 4.8Mbyte RTF doc. The second article is 6 pages long. Each file is about 3.5 Mbytes as a TIFF file. I will be glad to email one or both to any (PMS Martyrn excepted) who reply off list.

Date: Mon, 6 Mar 2006 22:43:40 -0600
From: "Barry" <n4buq@knology.net>
Subject: [R-390] A bit more on my IF deck

I got the resistors replaced and all seems fine. I need to do a full IF alignment, but it seems to be behaving just a slight bit better. I'm not sure, but I think it doesn't take quite as long for the system to dump the charge from SLOW AGC as it did. Is that perhaps a function of that 2.7M resistor?

I wanted to check the resistances and voltages around where I had worked. Everything looks pretty good except for pin 2 of V506. According to the manual, I should have about -0.4V, but I'm getting nothing (HP410B used here). Checking the resistance, the manual states I should be seeing 500K in AGC mode and I'm only seeing 400K here. There are three resistors to GND from V506, pin 2 and they add up to 500K. Apparently I have something else parallel to this that's pulling the resistance down a bit. It's always something.

Any guesses why I don't see -0.4V here?

Date: 7 Mar 2006 14:12:22 -0000
From: "n4buq@knology.net" <n4buq@knology.net>
Subject: Re: [R-390] A bit more on my IF deck

Okay, I think I'm carrying on a conversation with myself here, but I'll continue... When I pull the main connector from the IF deck, the resistance at Pin 6 of V506 goes very close to 500K (what the book says it should be). If I reconnect the IF connector and unplug the RF deck connector, the same thing: 500K.

So, I checked the resistance at pin "E" of the RF deck (the point where Pin 6 of V506 connects to the RF deck). I get about 1.8M here. Those two resistances in parallel yeild what I'm seeing at Pin 6 of V506 when everything is connected. I haven't traced it out, but I assume if I'm supposed to be seeing 500K at Pin 6 of V506, then the resistance at Pin "E" on the RF deck should be nearly infinite. Any comments on this?

From: "n4buq@knology.net" <n4buq@knology.net>
Subject: Re: [R-390] A bit more on my IF deck

Okay, more ramblings. Tracing Pin "E" on the RF deck, I see a path through L208, R232 (22K), R231 (1M), through S207 and then through the selected L22*-2 winding to GND. Therefore, this places a theoretical 1.022M (not includine the negligible coil DC resistances) across the 500K in the IF deck at Pin 2 of V506. If this is true, then

doing the math, the reading at Pin 2 of V506 should be approximately 335K. Am I missing something here??

Date: Tue, 07 Mar 2006 11:10:52 -0500
From: JMILLER1706@cfl.rr.com
Subject: Re: [R-390] A bit more on my IF deck

Isn't V-506B the AM detector? If I am reading the schematic right, V-506B doesn't connect to the RF deck,... I htink it connects to the AF deck (it provides audio to the AF deck).

Date: 7 Mar 2006 16:44:22 -0000
From: "n4buq@knology.net" <n4buq@knology.net>
Subject: Re: [R-390] A bit more on my IF deck

Oops!!! In my post below, I wrote Pin 6 of V506. I meant Pin 2 of V506A (the grid of the AGC Time Constant Tube). Sorry.

Date: Tue, 07 Mar 2006 12:43:42 -0500
From: JMILLER1706@cfl.rr.com
Subject: Re: [R-390] A bit more on my IF deck

Let's see.... from pin 2 of V-506 it looks like paths to ground are: R547 (220K) + R544 (2.7M) to ground thru whatever resistance to ground is in the B+ line in the power supply. In parallel with: R234 1.5M which is on the AGC line in the RF chassis. What's the math for those parallel resistors? I get about 1M, which doesn't agree with the 500K you're reading...is there another resistance to ground I am missing? Look all along the AGC line to see if there are others in the RF deck...I can't find any others. Or am I reading this all wrong ?

Date: 7 Mar 2006 17:59:50 -0000
From: "n4buq@knology.net" <n4buq@knology.net>
Subject: Re: [R-390] A bit more on my IF deck

Pin 2 has a path to ground through R545, R546, and R547 which add up to 500K. The path through R544 meanders through the system and there are a few paths to ground I see; however at 2.7M, it is a bit negligible on the overall resistance. I'm thinking the 500K listed in the manual is theoretically incorrect, but I'm wondering how close that needs to be. Since I'm not getting the -0.4V on that pin, I'm trying to figure out why. It may just be a weak tube. I need to try some subs and also check that pin on my other R390A just to see if I see any differences.

Date: Tue, 07 Mar 2006 13:40:22 -0500
From: JMILLER1706@cfl.rr.com
Subject: Re: [R-390] A bit more on my IF deck

It could be a difference in tube performance, but also keep in mind that there is AGC on some grids and you could be seeing some residual AGC bias voltage. Also, with the higher line voltages today (120+ VAC), the B+ lines will run somewhat higher than spec. which could change the operating points of the tubes.

To compare against the voltages in the maintenance manual, I think you should also be using the spec-ed AC line voltage input. A variac cranked down to 115 probably. Finally, these are very high impedance circuits. If you measure grid voltage with a standard VOM, you could be dragging the voltage down through the meter. Need to use a very high impedance VTVM like they had in the old days for working with tube circuits.

Date: Tue, 07 Mar 2006 13:50:14 -0500
From: JMILLER1706@cfl.rr.com
Subject: Re: [R-390] A bit more on my IF deck

I just noted you are using a 410B VTVM which should be fine. So forget that part of my comment. I can suggest no other reasons you are not getting -0.4... but just be sure you are reproducing the exact test configuration the manual calls for. Oh, another thing that can affect B+ voltage (and operating points) is a conversion to solid state rectifiers, unless you have used a 220 ohm dropping resistor.

Date: Tue, 7 Mar 2006 14:37:57 -0800
From: "Dennis Wade" <sacramento.cyclist@gmail.com>
Subject: Re: [R-390] A bit more on my IF deck

I am at somewhat of a disadvantage being at work with none of my diagrams, but your problem sounds very much like the one I was having with my Moto IF deck when I was trying to track down my AGC problems. Where I got to was a leaky mechanical filter. I got there by lifting the ground side of the filter and watching the resistance to ground go right back to where it needed to be. I know its kind of vague at the moment..but when I get home I hope I can give you more detail. But in the meantime, don't over look the possiblility of a leaky filter(s). I ended up with two.

Date: 7 Mar 2006 23:15:42 -0000
From: "n4buq@knology.net" <n4buq@knology.net>
Subject: Re: [R-390] A bit more on my IF deck

><snip>...Where I got to was a leaky mechanical filter. .....

If you selected the "good" filter positions, did the resistance return to its correct value? I see where the AGC line ties to the filters, so that is a good possibility.

Date: Wed, 8 Mar 2006 10:55:34 +1100
From: "bernie nicholson" <vk2abn@bigpond.net.au>
Subject: [R-390] leaky filters

I also have seen quiet a few leaky filters, its caused by the foam packing inside the filter becoming crumbly and sticky and mildly conductive, I have looked inside a few filters and this seems to be something that will eventually happen to all of them in time, The same problem is also happening in Kokasai filters, I have removed the 2&4 KHZ filters in a couple of receivers and replaced them with dedicated USB&LSB filters and crystal locked the bfo on 455KHZ with a built in product detector {double triode in the ballast tube socket} it is a different receiver altogether from the original ,

but when you switch off the BFO it reverts to the original circuit for AM .

Date: Tue, 7 Mar 2006 22:22:12 -0600
From: "Barry" <n4buq@knology.net>
Subject: Re: [R-390] A bit more on my IF deck

Paydirt. I think I have some weak/gassy/whatever, tubes. I swapped V506 with another 5814 in the RF deck and I got about -0.1V at pin 2. I then swapped it with one of the other 5814's in the IF deck. This tube yields about -0.5V on pin 2. I seem to recall that gassy tubes can cause low grid voltages, but not sure about that. Also, it seems that the radio is a bit "hotter" with this tube arrangement.

I know Roger created a writeup on swapping tubes for maximum performance. Maybe I'll give that a look-see. I didn't put these tubes on the tester before firing this thing up. Maybe that will reveal something about them too (yes, I know the *best* tube tester is the circuit itself, but I want to see if the Hickock will tell me anything obvious). Oh well, this has been a fun exercise.

Date: Tue, 7 Mar 2006 21:24:52 -0800
From: "Dennis Wade" <sacramento.cyclist@gmail.com>
Subject: Re: [R-390] A bit more on my IF deck

Good news Barry. To answer your question, no..I had to actually lift the side of the filter that was common, and not the switched side. Have a careful look at the switching arrangement of the filters (if you care to now that your problem isn't the filters apparently..good thing!). If you'd like the gory details let me know and I'll have a look at the schematic and work it out again.

Date: Wed, 08 Mar 2006 08:46:36 -0500
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] A bit more on my IF deck

Sorry .. I was going to post a reply on the missing -0.4 volt thing sooner, but assumed you had already checked for grid emissions. Also, my knowledge is a bit spotty in this area - I'm going mostly from what I've learned on this reflector and I usually wait for someone more experienced to post a reply. So, someone please correct/amplify on this in case I got it wrong: A tube may be good in terms of no shorts and good quality, yet have a case of "grid emissions" - usually synonomous with "gassy". In some sockets/functions, it may have little adverse effect, however it was cited as one of the possible causes of fouled up AGC. As far as I understand, tubes are not supposed to have anything emitting from the grids at all -- they're inputs for control voltages. So, most likely, the gassy tube was putting out an errant positive voltage, cancelling out the small negative voltage you were supposed to be getting there. I magine, grid emissions could be caused by internal defects in the mechanics of the tube, but (I think) are mostly the result of the gas conducting some current out through the grid (s). Practically all tube testers have a test mode for this. Some have dedicated setups for testing grid emissions, others have a gas test. Some have a "gas" button and you're supposed to press it during the quality test to see if there is any movement of the meter. Others may have some kind of indicator bulb. There was a thread way back where someone was having problems with AGC not working and after a lot of

checking of nearly everything else, found that it was due to grid emissions from one of the tubes in the IF deck. Barry

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Date: Thu, 30 Mar 2006 13:33:41 -0800 (PST)
From: "Tom M." <courir26@yahoo.com>
Subject: [R-390] R-725 Schematic, TRD-15 notes, etc Here

I recently scanned some R-725 notes for an enterprising chap who wanted to make his own. Like Archie Bunker would say, "I'd like to give this, what do ya call, your wide insemination."The original schematic and notes from the TRD-15 manual are zipped up in parts here:

http://www.geocities.com/courir26/R725doc.zip

The notes on how to make your own R-725 IF deck are here:

http://www.geocities.com/courir26/r725conv.htm

Date: Thu, 6 Apr 2006 06:11:38 -0700 (PDT)
From: "Tom M." <courir26@yahoo.com>
Subject: [R-390] R-390 AGC Question, SLOW MED FAST

My 390 IF deck seems to have an AGC problem in that it has low AGC action on FAST (when no timing capacitors are engaged) but good AGC on MED and SLOW (when the timing caps are engaged). Anyone know what could cause this? Seems counter intuitive. The old caps are good, the no-cap is bad?

Date: Thu, 6 Apr 2006 16:04:20 -0700
From: "David Wise" <David_Wise@Phoenix.com>
Subject: RE: [R-390] R-390 AGC Question, SLOW MED FAST

It's counterintuitive, as you said. The only thing that comes to mind is unlikely. If C547 and C548 were both open, the AGC line would have next to no filtering, and would vary with the envelope, reducing it to a small value. If you have a scope, put it on the line. If nothing else, put on a high-impedance DC voltmeter and tabulate voltage vs signal input.

Date: Thu, 06 Apr 2006 22:09:47 -0700
From: "Dan Merz" <mdmerz@verizon.net>
Subject: RE: [R-390] R-390 AGC Question, SLOW MED FAST

Tom, I assume you're dealing with 390 not 390a. There's C545 (0.1µfd) still going from AGC line to ground when fast is switched in, shown in diagram I'm looking at. If this is bad (open) then on the fast position there would be no smoothing of AGC because I think this is the only smoothing capacitor to ground in that position. When switching to med or slow the C546 and C547 caps, each 0.1 µfd, would be to ground or to the B+ and AGC would be operative if they are good. My 390 has about the same level of AGC response on fast and med on a strong AM signal but different response times, as expected if it's working ok. The "no-cap" is actually one cap,

C545, I think. I didn't track the circuit all the way to the controlled tubes on the AGC line. I see the 390A has two of these 0.1µfd caps to ground on the AGC line. Dan.

Date: 27 Apr 2006 19:58:19 -0000
From: "n4buq@knology.net" <n4buq@knology.net>
Subject: [R-390] IF Transformer Covers

The IF deck alignment procedures call for transformer covers with holes in the top to expose the slug drives. I really don't want to put holes in my permanent covers. Anyone have a suggestion where I might find some spare covers I can use for this? I figure the sizes used to be fairly common and available (old TV radios and TVs, etc.), but not sure where I could find those now.

Date: Fri, 28 Apr 2006 09:17:10 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] IF Transformer Covers

390 or 390A? At least in my 390A either my covers already have the holes or I can swap around with other cans which have the holes. A non-historically accurate but easy "modern" way to make very good shields is to use modern thin unetched PCB. Cut it with scissors, join it with a soldering gun, round it with a file. I'm sure the purists who will never use a frequency counter or a scope to align their 390 because they aren't mentioned in the Navy books will object, but in terms of do-ability this has been the preferred method for decades.

Date: 28 Apr 2006 16:01:39 -0000
From: "n4buq@knology.net" <n4buq@knology.net>
Subject: Re: [R-390] IF Transformer Covers

It's an R390A. I don't have the measurements here, but perhaps I could get some square aluminum tubing. It's available from McMaster but I don't know if I can get an appropriate size. The PCB approach sounds good too. Thanks,

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Date: Tue, 16 May 2006 11:37:13 EDT
From: DJED1@aol.com
Subject: [R-390] AVC voltages?

I've had a slight problem with my R-390A for awhile - the carrier meter reads about 20 dB too high. I finally pulled the radio out of the cabinet last night and did some diagnostics, but i need some sage advice from the group. First, I set the IF gain according to the Rippel method (measure AF noise level), which also gave me -7V at the diode load with 3 microvolts in. So that seems about right, but still the problem existed. I measured the AVC at the back terminal strip: -12 V versus a nominal 9 V for 10,000 microvolts. This implies the AVC on the controlled stages is not high enough. Measured with a 10 Meg voltmeter and a URM-25. Then I measured the AVC voltage at all controlled tubes- With -12 V at the AVC terminals on the back, the IF stages had -12 to -10.5 V on their grids, but the mixers had -10.8 to -8.1 V , and the RF stage had -7.8V. I tried substituting NOS tubes in the RF and worst mixer to see if the tubes were gassy, but no change. I then measured the resistance to ground of the AVC bus, and it was about 500K as expected. Sooo- does anyone have data on AVC

voltages at the grids on a known good radio? If I had leaky caps pulling the AVC line down, I would expect a much lower resistance reading. Any other suggestions? The radio has not been recapped, but I'm reluctant to pull the RF module unless I have some clear indication that that is the problem. Ed WB2LHI

Date: Tue, 16 May 2006 11:49:31 -0500
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] AVC voltages?

It could easily be a cap problem. Many don't show leakage at the voltages placed on them by ohm meters but will affect the operation of the circuitry at their normal operating voltages. That's just a general statement about the caps in most old tube radio's. With the antenna disconnected your carrier meter is setting 20db above the zero or is it only 20db high with signal input? Does the AGC switch still do it's normal thing when switching around between the settings.....like the moment of silence etc.... Has the radio appeared to have lost sensitivity or has it maybe only developed a problem with the metering circuit? I would still expect the culprit to be a leaky paper cap or a resistor going way out of spec. Both of which we know happens...

Date: Tue, 16 May 2006 16:16:23 EDT
From: DJED1@aol.com
Subject: Re: [R-390] AVC voltages?

Just to clarify- the radio works fine, and doesn't overload on strong signals. The AVC seems to switch normally, and the meter zeros OK. However, the meter pins with a signal input that should only read 80 dB. I haven't checked the linearity, but I think it reads high for most of the range. Ed

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Date: Tue, 16 May 2006 16:53:29 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] AVC voltages?

You could just have a problem with the meter set resistor R523. This is a 100 ohm resistor across a 22 ohm resistor. This item has been a problem for setting the carrier level meter since day one. Time has not improved the performance of the circuit. The resistor gets dirty and hard to adjust. At low level low current the meter lays at zero or near zero OK. But on a strong signal the circuit current changes and in the dirty pot the conduction changes a whole bunch and the meter reads high. Several fixes have been tried and are in use. A ten turn pot is one fix. Just clean up the one you have is another fix. Add a few ohms in series with the pot to move the adjustment spot off the worn spot is another fix. Then you can replace the current pot.

As the meter circuit is not calibrated to any known standard, you can just live with it. One way to set the pot is to set it to mid scale with a good signal coming in. This is easier than trying to get the needle to lay at zero with no signal. Watch for some more post from others. Their are semantics on the WWW. One of the fellows did a wonderful job of reading almost any point we could think of and annotating the schematic with the voltages. That info is out there. I do not have the address at hand or I would post it for you. If the receiver is working OK I would think a problem in the

meter circuit. Roger AI4NI

Date: Wed, 17 May 2006 08:50:50 -0400
From: Miles Anderson <k2cby@optonline.net>
Subject: [R-390] AVC Voltages

I think we have two separate questions here.

(1) The actual voltage on the AVC line and
(2) the behavior of the carrier meter.

With respect to the AVC line, the most common problem (other than failing tostrap the AGC-NOR terminals on the back panel) is a leaky bypass capacitor. The AVC line is isolated at each controlled stage by a series 22k resistor and a .005 bypass capacitor. It comes from a very high impedance source. Leakage in any one of the bypass capacitors will drag down (closer to zero) the negative bias on the whole line. This also means that you can accurately measure the AVC voltage with a VTVM or other high impedance (1 meg or preferably 10 meg) voltmeter. In checking for leakage, don't forget that the AVC bus also drives the RF amplifier and is coupled through the bandswitch and the bandwidth control that switches the IF filters. <snip>

Date: Wed, 17 May 2006 09:39:59 EDT
From: DJED1@aol.com
Subject: Re: [R-390] AVC Voltages

Thanks to all for the comments on my AVC problem. I disconnected the RF chassis from the radio and found that the AVC line has a resistance to ground of 1.75 M, so something is leaky. The IF chassis shows more than 40 M, so it's OK. Got some other strange results though. I put a DC voltage on the AVC line and measured voltages at the test points in the RF chassis. Voltages were all in the range of 10.5 V, versus 7 to 9 V with the same voltage on the AVC terminals. I don't understand why the AVC voltage shoud behave any different than a DC supply voltage, and the 5 V drop in AVC voltage can't be accounted for by a 1.75 M leakage current through a cap. Then I remembered the problem of the antenna trimmer- it's hot with AVC voltage, and leaks when it gets dirty. I dug up some alcohol and cleaned all around the gears, and watched the resistance plummet to about 0.5 M. Must have been some water in the alcohol. I finally got it all dried out and got the resistance back to where it started, but no better. The strangest thing I found was that if I shunted the antenna trimmer to ground by putting my fingers on it, the resistance at the RF amp test point increased, rather than decreased?? Maybe I need an exorcism. Given that any further investigation requires pulling the RF chassis, I've decided to defer that to next winter when I think I'll recap the whole radio. For now, I'll have to live with some minor errors in the meter readings. Ed

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Date: Thu, 18 May 2006 20:01:42 EDT
From: DJED1@aol.com
Subject: [R-390] AVC voltages revisited

Just a tidbit for anyone else who is investigating the AVC line: As I mentioned before, I disconnected the cable to the RF module and made some resistance

measurements, which I thought indicated a leaky cap. As I was listening to the radio last night, I was browsing through the Y2K manual (a great job). I was surprised to see that the RF amp schematic was different than in my old TM, and the differences accounted for the irregularities in resistance measurements. Specifically, the newer manual shows a 1.5M resistor from the AVC line to ground in the RF module, while the old TM shows no path to ground. Since the new schematic agrees exactly with my resistance measurements, I assume I'm all OK with the capacitors, and don't need to pull the RF deck.

Date: Thu, 18 May 2006 22:22:16 -0400
From: "Jim M." <jmiller1706@cfl.rr.com>
Subject: Re: [R-390] AVC voltages revisited

I have noted that if there is oil or conductive film residue on some tube sockets, on some RF switch wafers (that carry AGC), or especially the insulated antenna trimmer shaft, then the AGC control may tend to be degraded in the RF deck. Over spraying RF deck switches or luibricating the antenna trimmer shaft can cause this. The residue can be removed by "Big Bath" or equivalent moisture displacement spray. Leaky AGC line bypass caps can also be suspect. It's a high impedance circuit so it doesnt take much.

Date: Mon, 17 Jul 2006 17:31:40 -0400
From: shoppa_r390a@trailing-edge.com (Tim Shoppa)
Subject: Re: [R-390] R390 whistle filter data

>In Chuck Felton's r390 article in Electric Radio he showed the addition of a 5Kc
>whistle filter using a 1 Henry choke and IIRC 690 µF cap in series.

My calculations do NOT put this filter at 5kc, but at 6.061kc. Of course winding or stray capacitance might bring the resonant frequency down to 5kc.

>Three questions. Was that a mis-print for the inductor value? If not does
>anyone know what he used for the inductor? Has anyone tried the mod?

Audio filters using L's and C's tend to use inductors in the 100mH to 1H range. The "classic" surplus example is the 88mH telco line-loading toroid popular in every single RTTY decoder for many decades. I think there were Brit and Euro equivalents at slightly different values. Some very small filament transformers might exhibit a winding inductance in the 1H range if you want to play around (although most will be larger). Hammond sells iron-core chokes in this range (well, generally larger, but I think they go down to 1H) new today. For AM reception on crowded SW bands I find the 8kc filter width does a pretty good (but not perfect) job of getting rid of a carrier 5kc away. Tune a little away from the QRM and it does even better (even if introducing some distortion, it still is slightly better than switching to the 4kc IF bandwidth.) I can see how 6kc filters became a "standard" on crowded bands!

Date: Mon, 17 Jul 2006 21:25:48 -0700
From: John Kolb <jlkolb@jlkolb.cts.com>
Subject: Re: [R-390] R390 whistle filter data

I once made a very effective one from a 88 mH toroid (telco loading coil) and the appropriate sized capacitor. 88 mH coils aren't as common as they once were but still many floating around.

Date: Fri, 21 Jul 2006 08:45:19 -0700
From: "James A. (Andy) Moorer" <jamminpower@earthlink.net>
Subject: Re: [R-390] Wanted: non-A IF decks

I have a bunch of them, and other R-390 (and R-390A) parts. Being 50+ years old, they are in various states of aging. Most of them look like they can be restored. $75 each for restorable ones (plus shipping).

They come without tubes or tube shields but with the BFO coil. Also have power supplies ($45 ea - but HEAVY), audio modules ($45 ea - also heavy), PTO ($75), some restorable front panels ($75 ea) and various RF deck parts.

Date: Fri, 21 Jul 2006 14:49:41 -0400
From: "Drew Papanek" <drewmaster813@hotmail.com>
Subject: [R-390] R-390 IF Module (was: Wanted)

Some years ago I worked on a 75A-3 for a friend and I noted that it had only the SSB filter and that the other filter switch position had no filter plugged into its corresponding socket. On a whim, I inserted a cap (for coupling) and a couple of resistors (one for plate load, the other for grid bias) into the unused filter socket. I then noted that reception in the now-enabled second filter switch position had quite good audio, if a bit broad.

I've pondered a modification for the R-390A along somewhat similar lines. The 16 KC filter would be bypassed and the q-spoiler resistors in the IF cans would be increased in value or perhaps eliminated entirely so that the IF cans alone would determine the radio's bandwidth in the 16KC position.

The IF would be realigned to provide a bandwidth for good audio quality and would not affect operation with the other filters since its bandwidth would be wider than those of the other filters.

The IF module so modified would have higher gain than original, particularly in the 16 KC position (no filter insertion loss) and that would need to be compensated for. Perhaps the modification could incorporate a switching arrangement to alter the cathode bias resistor on just the first stage or maybe also on subsequent stages.

Another although somewhat inferior gain compensation arrangement would just replace the 16KC filter with an attenuator to compensate for the now-missing insertion loss, and the IF gain pot would be reset. (The Q-spoiler mod/realignment would also be done.)

Just my thoughts on conserving the diwndling supplies of non-A IF modules while helping to insure that the comparatively plentiful -A IF modules get irreparably hacked.

Date: Thu, 3 Aug 2006 21:55:35 EDT
From: ToddRoberts2001@aol.com
Subject: Re: [R-390] flying R390A

Ken, I found the 500KHz filters from the 51J-4 work nicely in the R-648/ARR-41. The stock filters of 1.4KHz and 6.0KHz are not the best choices. The 6.0KHz is fine for AM but the 1.4KHz seems too wide for CW and really too narrow for SSB or AM. The F500J31 is a good substitute for the 1.4 - just about right for SSB and narrow AM. I removed the 2 original filters and installed HC6-U size crystal sockets in the I.F. module chassis where the original filter pins would go. The ends of the solder-type filter terminals on the original hard-wired F500F14 and F500F60 can be snipped off and the filters will then plug into the crystal sockets just like the filters do in the 51J-4. I subbed a F500J31 for the 1.4 and plugged in the F500F60 for wider BW and the radio really works well with those 2 selectivity choices. And it is easy to just plug in the slightly-modified F500F14 back into the radio if that filter is wanted again instead of the 3.1. 73 Todd WD4NGG

From: On Behalf Of William G Feldmann
Sent: Wednesday, August 16, 2006 01:20 PM
Subject: Re: [R-390] R-390 (Non A) Problems

I would also check on some other bands using different front end coils like below 8mc and above 16mc just to eliminate any possible problem in the front end coils or transformers. If a front end transformer is bad it's most likely a bad SM cap but I've only worked on the A model's transformers that are a snap to remove and fix. Hopefully the non-A ones can be removed by just pulling the slug racks and removing a small screw in the center of the coil like on the A. But don't know, never had any problems with them in my non-A.

Also check the AGC is working by looking at the AGC line voltage and being sure the receiver seems to not be overloading on strong signals. If the AGC is working OK and the RF stages are OK, then you most likely have a problem in the carrier meter circuit.

Try and see if there is a difference between meter reading on the same signal when switching between MED and SLOW AGC. If there is a meter level difference the 2uf oil filled cap on the plate of the meter amp in SLOW is most likely leaking. It's C551 in a A model but will be a different reference number on the non-A model.

If the AGC is working it's most likely a cap or resistor that's failed in that meter amp circuit.

Also be sure the carrier meter just isn't pinned below zero. That meter zeroing pot trouble some and is very hard to adjust. I usually replace it with a ten turn one. I'll mention that in my part 2 article in the Sep. issue of ER. Hopefully nothing has damaged the meter because stock ones are very hard to fine thanks to the demil process most have gone through.

Anyway the problem is most likely in the IF module that's easy to pull and run out of the radio. On my A model I could lay it on its side on a piece of wood on top of the

radio and still connect the cables for testing as I mentioned in my article in the Aug issue of ER. I think you should be able to do that on a non-A. I have a Collins non-A R-390 that hasn't had any problems besides a few weak tubes. But I sure went through hell with bad SM caps in the front end of my Stewart Warner R-390A that I talked about in my part 1 ER article. I'm at my second house in Mammoth Lakes but when I get back to Palmdale I'll look some more at the manual for my non-A for some ideas if your still having trouble. Let us know how you are doing.

Date: Mon, 28 Aug 2006 22:32:54 -0500
From: "Patrick J. Jankowiak" <recycler@swbell.net>
Subject: Re: [R-390] Repairing broken trimmer capacitors, search

how to repair small air-viarable capacitors:
http://www.bunkerofdoom.com/cap/fix1/index.html

Date: Fri, 8 Sep 2006 16:31:42 -0500
From: Tom Norris <r390a@bellsouth.net>
Subject: Re: [R-390] Krohn Hite 3200

> G'day group. I just purchased a Krohn Hite 3200 dual
> filter which I intend to use as a bandpass filter or
> as a notch filter with my R-390A. Originally I was
> going to use it on the audio output to speaker but
> when I got it, I discovered it has a 100K input/output

I suppose you could drive it from the diode load with its output feeding the audio deck. You may end up trying several different ways to see which works best. It shouldn't have any problem with the signal level coming from the diode load, since the input limit is 4.5 volts for both the 3200 and 3202. I've not used the filter with any equipment, but I've calibrated a few dozen of them at work, they can be fairly forgiving impedancewise, give it a try between diode load and the audio deck first off.

But... if you have a dual 3200, then you have a 3202, there are several ways to use it for a notch/bandpass filter and the thing should work fine at IF frequencies as well as audio. I think it's good to 2Mhz in high/low pass. In fact it might even be easier to use at IF freqs. If you were to use it on the 455 Khz IF freq, you'd just leave it on the x10k scale and tune around for the notches. To use it for audio you'd end up having to switch between the x10 and x100 positions, bands 2 and 3 IIRC and unless you were just going to set it up for a single notch freq and leave it, it would drive you batty running back and forth setting it up each time. You might want to refresh my memory, or hopefully someone else is more familiar with this than I am.

Date: Sun, 10 Sep 2006 11:35:04 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] oscillation in my R-390 IF

Have you had a chance to get out the nut drive, small wrench and Philips screw drive to massage all the hardware in the IF deck? A lot of problems arise from loose and corroded hardware points. These are old receivers and your R390 is older than the R390/A. Not a sure fire cure but a place to start. Also get the bolts that mount the tube

sockets. My R390 TM is still packed in moving cartons from July 2004 so I do not have it for reference. As the R390 filaments are in series you just cannot unplug a tube and divide the deck into neat sections to divide the problem down. The IF cans have a bunch of solder joins in them. You can get the covers off and do an eye ball and remelt of the solder points. You are just going to find a sorry solder joint some place that is a high impedance point. You likely cannot find it with an ohm meter as the point will measure under an ohm with a meter and be open at 455Khz. Some point should be filtered by a cap. The point is not getting the filtering it needs because of a solder joint. That point radiates some signal around under the deck and it feeds back to oscillate.

Does changing the band width switch give you any clues?
Not an easy problem to resolve.

Date: 11 Sep 2006 13:29:54 -0000
From: "n4buq@knology.net" <n4buq@knology.net>
Subject: [R-390] IF Gain Problem

I'm having some "strange?" problems with the IF gain in my R390A. If I crank it too far CCW (towards max gain) the radio will suddenly go silent and the diode load reading will spike. In order to get the radio to play again, I have to turn the control to about 1/2 position and then increase it back to a more normal setting.

Any ideas what's causing this? It occurrs whether in MGC or AGC mode and can be triggered by a strong signal on the antenna input or switching the bandwith position. Switching the BFO on and off will also sometimes bring the radio back but sometimes it won't and I have to resort to backing down on the IF gain to get it working again.

I know the IF gain doesn't need to be too "hot" and I can actually run the radio with the IF gain at about 50% and it works fine, but I'm wondering if this "swamping" effect is seen in other radios? I need to align the IF deck properly and set the IF gain control properly, but am thinking I might have issues with this deck.

I've recapped it and replaced an resistor or two that were high but haven't found anything else that seemed off with it. Thanks, Barry - N4BUQ

Date: 12 Sep 2006 14:32:09 -0000
From: "n4buq@knology.net" <n4buq@knology.net>
Subject: [R-390] IF Deck Problems Revisited

As reported earlier, when I increase the IF gain past a certain point, the diode load voltage spikes to about 90 volts and the radio goes silent. As Roy suggested, I checked the IF output and, sure enough, the thing was going into self oscillation. The frequency counter indicated it was about 410kc.

I pulled the IF deck and checked for loose grounds and bad solder joints and didn't find anything that I would suspect as a problem. I put the deck back in place and the problem persisted. I began pulling tubes trying to isolate the problem. With only three tubes left in the deck and still seeing the problem, I figured I had it pretty much narrowed down and would pull the deck again and look closer in those areas.

All this time, I was running without the IF can covers in place. I don't have holes in the tops of the cans and had been tinkering with the adjustments with them off. I put the can covers back on and it appears that the problem has mostly disappeared.

I suppose a combination of the IF cans being pretty far out of adjustment and the can covers removed was allowing the signals in the coils to interact with other components and provide a feedback route. Not sure about all that but it does seem to have cured the problem. I think once I get the holes in the cans, get them properly secured, and do the complete IF alignment, this "problem" will no longer exist.

Thanks for all the input. While my "problem" was probably more just stupidity than anything else, it did help me figure out what was going on.

Date: Tue, 12 Sep 2006 16:17:40 -0400
From: "David C. Hallam" <dhallam@rapidsys.com>
Subject: RE: [R-390] IF Deck Problems Revisited

I, too, just solved my R-390 IF deck oscillation problem of a different sort. I followed the procedure outlined yesterday by Roger, AI4NI, to set the crystal filter, Z501. I had been using the procedure given in the manual to set the crystal filter trimmer null, then could not peak the 1KC coil, and the deck would go into oscillation. I must have been doing something wrong.

Following Roger's suggestion of setting the signal generator to 455.00KC with the frequency counter and to set the trimmer for null there, I found the null of the 0.1 pass band came at a significantly different point in the trimmer's rotation than I had set before, about 60° and now I could peak the 1KC pass band coil. The oscillation was gone. Now maybe I can get on with solving the AGC problem.

Date: Tue, 12 Sep 2006 19:00:32 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] IF Deck Problems Revisited

So I am like reading in my 1977 ARRL handbook in the VHF section. And I come across this subject of lead length and caps forming resonant circuits. The book subject was how much cap and how much lead makes a resonant circuit at like 144 MHZ. The point that comes to mine is that an inch of wire and a by pass cap gets resonant at 455 (OK so 410 in your deck). Where do we get a wire and cap to resonate in an R390 or its new replacement? One each bad solder joint or 50 year old poor mechanical connection on a ground point.

So a poor connection on a ground point leaves a cap and its wire hanging like an antenna to some point. Then to really mess with us it behaves like a resonant circuit and injects the most unwanted signal back into the deck some where.

I think you are on it with getting the IF can covers back on. If you do not have holes in the can tops, drill only one can and move it around as needed. Keep the other ones covered. The nuts do not need to be installed but drop the covers on. When you are done leave the can with hole on the AGC transformer.

Running with the covers off may be a self inflicted curse.

Date: 14 Sep 2006 14:03:48 -0000
From: "n4buq@knology.net" <n4buq@knology.net>
Subject: [R-390] Staggertuned IF Question

Are all IF modules capable of stagger-tuning? I started trying this with my current project with no results. The IF won't even think about hearing a 467kc signal. I was able to do this on my Motorola, but not this one. I seem to recall reading where not all IF modules were designed to accomodate stagger-tuning. Is this true? If not, then I suppose I have more work to do. If so, then do I assume I peak all the slugs for 455kc?

Date: Thu, 14 Sep 2006 11:19:52 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Staggertuned IF Question

Certainly, it just depends on how staggered you try to make it. With the development of 30 mc IF amplifiers for radar systems in WW-II, there came a lot of study of the stagger tuning of rf/if amplifiers. Text books of the era contain the theory and practical methods for arriving at flat passband response. This depends on setting the Q of the tuned circuits, the mutual coupling values, and separation of tuning points, as I remember.

Imagine a strip tuned to one frequency. It will have the well understood bell curve pass band shape. It the Q of the coils and their coupling coefficients will determine the shape of the transfer characteristic. If you now tune some of the circuits slightly above and below the center, the top of the curve will broaden. If you tune them farther and farther away from center, you can imagine a double or triple hump characteristic. Getting the whole mess to be very flat depends on the Q of each circuit, the coupling amounts, and the degree of departure in tuning frequency from the center.

>... The IF won't even think about hearing a 467kc signal.....

We can assume this is an R-390/URR (the "Non-A"). Notice that T-501 and T-506 have resistances across the primary and secondary of the transformer, respectively. All the IF transformers also use multiple windings in a "feedback" arrangement to arrive at various selectivities. The IF transformers are pretty complicated, and were made with carefully engineered coupling coefficients to make this all work out right.

>I.....where not all IF modules were designed to accomodate stagger-tuning.

It well may be, but this is the first I've heard of it.

> If not, ...I peak all the slugs for 455kc?.....

If you can arrange a sweep generator/detector system to do your tuning, you will be able to see the effect of your tuning experiments. An Army publication ST

32-152.pdf, entitled "Visual Alignment of Radio Receivers R-390/URR and R-390A/URR" is a good place to start. Go to: http://www.r-390a.net/ and look under References, in the Army section. (It describes sweepers that do not have retrace blanking, so adaptation of the methods is needed for more modern equipment.) There have been articles published on how to build sweep generators. I don't know if FAR Circuits has such a board/article available, but someone should check their web site and report. But plenty good enough sweep generators are available on the surplus market. These topics of stagger tuned IF strips and sweep alignment methods are both very interesting to me, though I have not yet done very much experimenting. When my Radio Emporium is set up at my new QTH, I certainly will.

Date: Thu, 14 Sep 2006 10:46:45 -0500
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] Staggertuned IF Question

I'm working from memory here so YMMV....(your memory may vary) My thoughts are NO. As I remember there is a capacitor involved on each can that sets the Q for the coil...I can't remember if the cap needs to be there when you are to stagger tune or vice versa.... Seems the cap reduces the Q allowing a smooth bandpass when stagger tuned where without the cap it's too peaky.... Roger you will have to fill in the blanks on my memory cell issue on this one...
I know the R-390/URR is straight tuned but I've heard the "A's" are split...some setup for stagger tuning, some not. I've heard also of folks cutting out the caps and straight tuning but I'm not sure there are not stage gain problems with doing that... Good subject though...

Date: Thu, 14 Sep 2006 13:05:08 -0400
From: <kirklandb@sympatico.ca>
Subject: Re: Re: [R-390] Staggertuned IF Question

CAPs generally change the resonant point not the Q of the circuit. Q is a measure of the energy loss in the tuned circuit. As you load a parallel (or series) tuned circuit down, you lower the Q. For parallel tuned circuits, decreasing the parallel resistance lowers the Q. The Q of a parallel tuned circuit is affected by both the Q of the inductor and the capacitor. Generally the Q of the inductor dominates - inpart due to the resistance of the wires.

Date: 14 Sep 2006 18:09:07 -0000
From: "n4buq@knology.net" <n4buq@knology.net>
Subject: [R-390] Re: Staggertuned IF Question

I notice the values for the caps and resistors in the cans aren't specified except to say they are part of the transformer. I wonder if these components could be the culprits here? They sure look like a pain to replace, but could do that if necessary. I peeked at them during my lunch break and if I could see them well enough, I noticed that some of the caps are the rectangular molded variety while the others appear to be dipped silver micas. I wonder if the differences
were due to their capacitance values or if SMs were better on the input or output and the others were better in their respective posions. If I did replace these, I assume I'd use SMs in both positions but was curious.

Date: Thu, 14 Sep 2006 11:16:24 -0700
From: "David Wise" <David_Wise@Phoenix.com>
Subject: RE: [R-390] Re: Staggertuned IF Question

Silver mica's were a later development which superseded the molded ones. Production overlapped for quite a while, moreso for some values than others, with a lot of variation between manufacturers. Cost was undoubtedly a factor too. I wouldn't be surprised to see a mix. For our purposes today, SM's are superior in all respects.

Date: Thu, 14 Sep 2006 14:30:22 -0400
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] Staggertuned IF Question

I seem to remember that the R-390A has resistors in each can that are the "Q spoilers". A capacitor is normally of such low loss that it will not affect the Q by much. One (BAD) modification was to cut out the resistors in the -A IF cans to get extra gain.. your receiver got real "HOT". Trouble is, the IF bandpass went to hell, and there was too much gain. NOT a good modification.

Date: Thu, 14 Sep 2006 15:05:46 -0400
From: Mark Huss <mhuss1@bellatlantic.net>
Subject: [R-390] Staggertuned IF Question

I seem to remember that the first run of R-390A (the ones WITHOUT the trimmers on the top of the mechanical IF Filters. The mechanical filter cover does not have a dimple at the mounting screw) was straght tuned. When Collins did the mod to add the trimmers, they also changed the circuits on the IF transformers to stagger-tune them. At least that is what I remember from the R-390A classes.

Date: 14 Sep 2006 19:22:08 -0000
From: "n4buq@knology.net" <n4buq@knology.net>
Subject: Re: [R-390] Staggertuned IF Question

This one has trimmers on both ends of the filters and it has RC across the L in the transformers so I assume this one is broadband. I think I have other issues with it, though. I tried Roger's method of removing the 3rd mixer and injecting 455kc at the plate pin. It took a LOT of signal to be able to hear it through the IF deck. The crystal's trimmer and xfmr don't seem to peak like they should and it reqires me to crank the slugs in T501 and T502 to the near limits to get them to peak. Switching to AGC automatically gets me 20dB on the carrier level meter as opposed to zero in MGC. I'm pretty sure I have work to do...

Date: Thu, 14 Sep 2006 15:23:41 -0500
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] Staggertuned IF Question

Well I said I couldn't depend on my memory of this.....My technical side said resistors but my memory for some reason had caps stuck in it. Roy's comments about removing the resistors rings the bell for me...that was what I had heard... don't

remove whatever component it was because it screws up the stage gain balance making the IF deck too hot by increasing the Q of each stage.... Memory is a great thing...just not always accurate as I have proven.... That still doesn't speak to the fact that some "A" radio's were stagger tuned and others were not.....at least that is what I have been told.

Date: Thu, 14 Sep 2006 16:48:03 -0400
From: Bill Cotter <n4alg@qx.net>
Subject: [R-390] Staggertuned IF Question: Visual Alignment Doc

Does anyone have this Army document available in pfd format to share? It might be a good document to place in the common access web pages.

Date: Thu, 14 Sep 2006 16:56:30 -0400
From: Mark Huss <mhuss1@bellatlantic.net>
Subject: Re: [R-390] Staggertuned IF Question: Visual Alignment Doc

See http://www.r-390a.net/ and search for ST 32-152

Date: Thu, 14 Sep 2006 14:11:25 -0700
From: "Kenneth G. Gordon" <kgordon2006@verizon.net>
Subject: [R-390] Re: Visual Alignment Doc - ST 32-152.pdf

I have that. I'll post it to a web site tonight and let the list know. However, it is not the most up-to-date way of doing visual alignment.

Date: 15 Sep 2006 18:32:53 -0000
From: "n4buq@knology.net" <n4buq@knology.net>
Subject: [R-390] IF Deck Revisited (Revisited)

Since I'm having several issues with the IF deck, I made a geniune effort to check resistances and voltages on all tube pins in the IF deck. This time, I recorded all the findings along with their spec'd values so I can refer to that list for places to check. Most things were fine, but there are some grids with positive values where they should be negative, etc., so I'll begin there. The first thing will most likely be to try new/different tubes in some of those positions as I assume grid emmissions could be a problem for symptoms like that. One problem I'm having is when I switch from MGC to AGC, the carrier-level meter jumps up 20dB and stays there. I found the cathode resistor on V506A (R548) to be about 41-ohms instead of 27. I don't have a replacement, but I put a 100-ohm resistor in parallel which should bring it down to about 28 ohms. The carrier-level meter jumped up somewhat in MGC, but I can re-zero it and when I switch to AGC, it still jumps up 20dB so all I did was change the reference point. Not the main problem... What I'm wondering is a good way to debug this thing. Is it possible to start at the input and work my way forward (or vice-versa) and try to get it working properly stage-by-stage?

Date: Fri, 15 Sep 2006 15:20:25 -0400
From: Barry Hauser <barry@hausernet.com>
Subject: Re: [R-390] IF Deck Revisited (Revisited)

I don't know if this could be it, but you should check the tubes for grid emissions on a tube tester, as well as transconductance. Some testers have a grid emissions check setting, but on others it's (I believe) synonomous with the gas test. You can try swapping in new tubes, but if your spares came from the same batch, they may be similarly afflicted.

Date: Fri, 15 Sep 2006 15:42:19 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: [R-390] AGC action on oscillator frequencies, cures?

I usually use my 390A to listen to (surprise!) AM SW and BCB broadcasts. And when I do use it for CW, I usually turn off AGC (unless I am in fear of my eardrums being broken!). But sometimes I turn on the BFO and use it with AGC, and it's obvious that oscillator frequencies are shifting about (hundreds of Hz) under strong AGC action. The 17MHz oscillator (below 8Mc bands) seems to do the most shifting. This has been discussed here before, and the concensus seems to have been that AGC action on the mixer tubes causes varying loading on the oscillator, but have any cures/mods ever been propsed/discussed/shot down?

Date: Fri, 15 Sep 2006 15:48:52 -0400
From: "David C. Hallam" <dhallam@rapidsys.com>
Subject: RE: [R-390] AGC action on oscillator frequencies, cures?

Get a copy of Electric Radio for October 2005 and look at the article by Ron Deeter. See if that does anything for you.

Date: Fri, 15 Sep 2006 20:00:43 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Staggertuned IF Question

>... seem to remember that the first run of R-390A (the ones WITHOUT the trimmers on the top of the mechanical IF Filters. The Mechanical filter cover does not have a dimple at the mounting screw) was straght tuned. When Collins did the mod to add the trimmers, they also changed the circuits on the IF Transformers to stagger-tune them. At least that is what I remember from the R-390A classes.

I think you are right on the Collins Radios. Then later non Collins manufactures went back to the straight 455 tuned IF strips. The transformer and cap values in the cans were changed to get enough bandwidth and can so that a straight tune was wider than the mechanical filters. As most of the receivers were not Collins receivers most of the R390/A are straight tuned. We tuned every thing straight. Remember I was tuning for a bunch of CW operators and they could have cared less about any thing more than 2K wide. If you are trying to tune the IF for some good Short Wave AM reception, then getting the sweep generator out and doing the adjustment with a visual pattern on the scope is the way to go.

Try stagger tuning your IF deck and it will not take you long to determine if it is a stagger tuned deck or not. More bandwidth is more fidelity. It is also more noise in the band pass. If you are doing DX SW a narrow bandpass may still be a better

option. You can get a lot more fidelity by recapping the AF deck up to a good 16KHz audio than you realize by opening up the IF bandpass. Until you get the Audio deck to respond to 16KHz there is little point in trying to tune an IF deck out to that response width.

Date: Fri, 15 Sep 2006 20:10:39 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Staggertuned IF Question

>..... I tried Roger's method of removing the 3rd mixer and injecting 455kc at the plate pin. It took a LOT of signal to be able to hear it through the IF deck. The crystal's trimmer and xfmr don't seem to peak like they should and it reqires me to crank the slugs in T501 and T502 to the near limits to get them to peak. Switching to AGC automatically gets me 20dB on the carrier level meter as opposed to zero in MGC. I'm pretty sure I have work to do...

Barry, this does not sound good (Pun Intended). Time to look at the crystal and the signal generator and freq counter. You may check the coupling cap you use for injection. It reads as if your frequency is off some where. T501 and T502 should not change peak when you move back up the circuit chain and still inject 455. Why AGC gives you more than MGC I have no idea. That sounds like a problem of its own. We always expect that AGC has the gain off ground and thus less than MGC.

Date: Fri, 15 Sep 2006 20:40:18 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] IF Deck Revisited (Revisited)

You wrote that the problem persisted in the IF deck as you injected 455 into the plate of the third mixer. You can leave the RF deck aside for a bit.

Next do a wire harness check on the RF gain and from the rear panel to the IF deck. Lay the receiver on end and swing the IF deck out. Do the harness measurements from somewhere out side into some where inside the IF deck to ensure you are not going through a bad pin in the IF deck connector.

Check the receiver in all the KC bandwidths on the IF deck. A likely problem is in a mechanical filter circuit and AGC circuit at the mechanical filters. A couple of the bandwidth switches get the filters and AGC circuit combined.

An open in the AGC line will get you. In MGC there is a big resistor to ground in the IF deck. It is good enough to give you MGC operation even with the jumper on the back terminal board open. Check that jumper for a loose screw. When you go over to AGC you expect a negative voltage on the AGC line instead of ground. IF the AGC is open then you get a more positive grid voltage instead of a negative grid voltage. So you get more gain in AGC than in MGC while we
expect less gain.

Date: Fri, 15 Sep 2006 21:01:15 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] AGC action on oscillator frequencies, cures?

I have on sure cures. One problem is current limiting through the deck connectors. But once you deox them and check the back side for good solder to ensure good cross section for current conduction there is little you can do to enhance the current path in these elements. But if you have real bad pull, it could be worth your time to do an inspection and repair if necessary.
These receivers did shift. But most operators though of them as very stable. Like they never had an opportunity to work with a better receiver as one had not been built back then. But if yours shifts enough to be noticeable you likely have a problem worth investigating. It sure would be nice if you have two receivers to set up side by side to determine if one shifted more than the other. Many trouble calls went down as no trouble found when we did side by side test of two receiver and found the difference to be antenna choice or just a bad ear night. Fifty plus years of age makes a difference. A guy in San Francisco area makes solid state replacements for tubes. He could make you up some solid state tubes. You use the screen voltage pin into a zener diode regulated voltage. The cathode becomes the FET base. You decouple the cathode resistor back to ground by selecting the correct filament pin. You add to the cathode resistor to get the grid bias to fit the base bias voltage you need. A resistor into the screen zener regulated voltage becomes the cathode or drain load. A cap couples the signal back to the plate and the plate voltage is ignored. He puts the stuff in a nice sleeve with a 7 pin socket. Noise is lower. You can reengineer the guts for more or less gain. The filament voltage heat goes away. You never have to check the tube again. I have a nice 6DC6 in one of my R390/A. The noise of the RF tube is not the limiting factor in getting a better signal to noise ratio out of my receiver. So until I get to the source of my noise problem, more solid state tubes are not of value to me. I like my one solid state replacement. It is canned. I know not what is inside. It performs a little better than any 6DC6 I own. I do not think it performs better any 6DC6 that I could own. I have not measured it to be sure. So there are things that can be done.

Date: Sat, 16 Sep 2006 09:22:49 -0400
From: Mark Huss <mhuss1@bellatlantic.net>
Subject: Re: [R-390] Staggertuned IF Question

As I was taught (1975) at Devens (ASA), you tune using the Visual Alignment and stagger tune flat on 16 kHz bandwidth. As an aside, it was mentioned that if you ran across an IF deck with a filter cover with no dimple, tune that one straght. No mention of replacing the IF Deck with the newer ones. Making it meet spec was a big deal, since you did not know where it might be four years down the road. For 'Hogs' and 'RATT's' (Morse Code Intercept and Radio Teletype) you could get a better noise floor by straght tuning them, and we did that on special order, and made a notation with grease pencil on the IF Deck's filter cover.R-390's and R-725's required sweep alignment for best operation. Never bothered to do the three-point alignment on them (mostly R-725s). Besides, the point on them was to get flat phase shift through the IF deck, with bandwidth being secondary. They were used for doppler DF, and phase shift could throw them off a few degrees, as well as widen the propeller, making direction more ambigous.

Date: Sat, 16 Sep 2006 09:52:29 -0500
From: "Cecil Acuff" <chacuff@cableone.net>

Subject: Re: [R-390] Staggertuned IF Question

Good stuff....that's what I was looking for. Some way to know when to do what. Sounds like one can stagger tune or straight tune the dimpled cover decks...your choice depending on how you will use the radio but always straight tune the decks without the dimple. This probably needs to go into the Y2K book somewhere....and Pearls.

Date: Sat, 16 Sep 2006 10:22:17 -0500
From: "Barry" <n4buq@knology.net>
Subject: Re: [R-390] Staggertuned IF Question

Is it possible to switch filter covers between a straight-tuned deck and a stagger-tuned deck?

Date: Sat, 16 Sep 2006 13:07:55 -0500
From: "Barry" <n4buq@knology.net>
Subject: [R-390] IF Resistance/Voltage Chart

I mentioned I had documented the resistance and voltage readings for the IF deck I'm working on. I created a WordPad document and placed it here:

http://www.knology.net/~thelanding/V&R.doc

Some of the values jump out at me as potential problems (e.g. grid voltages positive when they should be negative, etc.), but some of them are more subtle. If you do open the document and see anything that you care to comment on, by all means let me know. I'm trying to get this thing working right.

Date: Sat, 16 Sep 2006 18:26:34 EDT
From: ToddRoberts2001@aol.com
Subject: Re: [R-390] R-390 IF - Z501

If the Z501 adjusting screw top was broken off when it was in the correct position it should still work just fine. I think the adjustment screw setting is not too critical even if it is off slightly. Trying to repair or salvage Z501 with a broken off adjusting screw is going to be tough. I think Fair Radio has the Z501 IF transformer for $9.50. 73 Todd WD4NGG

Date: Sat, 16 Sep 2006 17:53:41 -0700
From: John Kolb <jlkolb@jlkolb.cts.com>
Subject: Re: [R-390] BFO Turns Counter (was RE: Spinner knob for R390

Do those devices actually provide a reduction drive? From the pictures I've seen, the just look like a turns-counting knob as would be used on a multiturn pot. If the standard pot knob, they would provide a 1-100 scale over 360 degrees of rotation, thus allowing the BFO to be returned to a precise setting, but not a gear reduction.

Date: Sat, 16 Sep 2006 20:48:11 -0500
From: Tom Norris <r390a@bellsouth.net>
Subject: [R-390] Staggertuned IF's and the 1956 TM

For folks that don't have a copy of the older manual to compare and contrast procedures, I did up a pdf of the alignment procedure from that year. It includes a couple real, honest to goodness halftones of the two versions of the if subchassis. That manual is chock full of photos that look like photos rather than bad photocopies like in many of the logsa manuals.

r390a.fernblatt.net/1956_IF.pdf

As far as R-390A's go, that's a pretty significant year. If you look in most of your later change lists, that year's Motorola contract - 0014-PH-56 - incorporated a majority of the listed changes*. 1956 was also the year after Collins' last R-390A contract**; Motorola would build only one more run under contract 14385-PC-58-A1-51. These two Motorola contracts introduced the new specification of fused B+ lines, with a production mod starting with s/n 2683 of the 1956 contract. None of this counts any of the special Navy mods and I'm sure folks that had to wrestle the things in the field can think of many more mods and changes. (not counting those in changes 1 through 4 to the TM) The basic theme of this email was "1956" so I just stuck to it.

Date: Sun, 17 Sep 2006 08:48:05 +0100
From: "Lester Veenstra M0YCM" <m0ycm@veenstras.com>
Subject: RE: [R-390] BFO Turns Counter (was RE: Spinner knob for

Actually, the "gear reduction" function is already there in the multi-turn BFO design. It's the larger knob amd the position readout that make the utility. And yes, when you get what you need from the discard pile, I could use two more. My the way, I think they are still available new as controls for ten turn pots

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Date: Sun, 17 Sep 2006 12:37:02 -0700 (PDT)
From: Masters Andy <nu5o@yahoo.com>
Subject: [R-390] Go figure

Good afternoon group. For the past day and a half I have been chasing down a problem in my R-390A. I made a mod to the AGC circuit to get AGC action more to my liking in the CW mode (Mine has the Lanksford AGC mod). I also relaced a few old caps on the IF deck while in there. Put it back together and started listening. Everything was lovely for about 2 minutes and then all signals disappeared. Hauled out the service monitor, counter, scope, voltmeter, etc and began scratching... A few minutes ago I decided to do something simple. I began with a visual inspection of everything with the receiver on and as I came to the oscillator deck, I noticed the 6AK5 was cold and had no filament light. So I pulled the tube, checked for filament voltage (which was present) and then replaced the tube. Presto-all works great again. Just because their is no correlation between work done and radio failures apparently doesn't mean that every once in a while something will happen concurrently just to teach you to keep your hands out of it if it is working!

Date: Sun, 17 Sep 2006 16:05:00 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Staggertuned IF Question

>Is it possible to switch filter covers between a straight-tuned deck and a stagger-tuned deck?

Only with a change in metal. Down at the base there is some metal that sticks out under the edge of the cover can. You need to cut some clearance if you swap covers.

Date: Sun, 17 Sep 2006 18:38:44 -0400
From: Mark Huss <mhuss1@bellatlantic.net>
Subject: Re: [R-390] Staggertuned IF Question

I suppose you could put a dimple cover on one that had a flat cover. The other way will probibily short out the trimmers on top of the filters. At least that is what I think happened. They needed more clearence, but did not want to extend the center mounting spacer, so the lengthened the height of the can, and dimpled the mounting hole.

And double check the alignment instructions on the old origional IF deck without the top trimmers. This was 40 years ago, and we were damn busy. As for the question of how you aligned for phase on the R-725. You absolutely used a sweep generator. Don't remember the nomenclature, but compared to nowdays, it was primitive. Had a big dial for tuning, and a pot to adjust sweep width. Had markers, though. And you had to use the X-Y of a seperate scope, along with a detector.

Never looked inside one, but it probibly had a wobulator for sweeping, it was that old. Anyway, you aligned it to be as flat as possable, and trusted to God and the Engineering to get the phase right. A final check was to take it out to a TRR-20 and check the direction and width of the lobe on the scope using a target transmitter. I suppose they had the equipment to do it right at Vint Hill Farms.

But us poor techs working out of the back of a Duce-and-a-half never saw it. And I never saw an example of one that was bad unless we deliberately mistuned the IF Deck. One thing I did notice, for what it is worth. You could easily get 6dB better S +N/N out of an R725 than you could get out of an R-390A. I always suspected that this was because that for all intents, the IF bandwidth after the mechanical filters was wide open. All the noise from the first IF amp made it to the detector. On the R-725/ R-390 IF decks, this is not the case. I think I remember Lankford adding a post amp filter and finding about the same thing. Also, the VFO has some extra stuff added to reduce phase noise.

Date: 28 Sep 2006 15:49:57 -0000
From: "n4buq@knology.net" <n4buq@knology.net>
Subject: [R-390] Staggertuning IF transformers

Still curious about the IF transformers in my current project. As I've mentioned, I can't seem to staggertune this deck although from all indications, it should be possible (dimpled filter cover with trimmers on both sides indicating a newer deck that should be capable of staggertuning). I see where there are resistors across the primaries of the IF transformers. I assume these are there to lower the Q of the circuit and thereby increasing its bandwidth. Is it possible the
non-staggertunable decks have transformers without these resistors (or perhaps some resistance values provide for a broader bandwidth)?

Date: Fri, 29 Sep 2006 19:30:00 +1000
From: "Bernard nicholson " <vk2abn@bigpond.net.au>
Subject: [R-390] IF Tran Resistors

If you snip the resistors in the IF transformers it will increase the gain like you wouldn't believe, but the signal to noise ratio will be lousy, I spent a couple of hours the other day repairing a 75A4 for a friend and there was an excess of gain, eventually I traced it to the resistor in the IF trannie, my friend was a 6 meter fanatic and was using it as a tuneable IF , and at some time he had done the deed and then forgotten.

Date: Fri, 29 Sep 2006 19:53:11 -0700 (PDT)
From: Perry Sandeen <sandeenpa@yahoo.com>
Subject: [R-390] Blocking capacitor question

It is almost universally accepted that the original C553 0.01mf 300 WVDC 20% paper should be replaced with a 600 volt "orange drop" type of film cap. My question is: can one use a .01 1KV volt disc ceramic as well or is there a "gotcha" that makes using ceramics an un-good idea? Thoughts appreciated.

Date: Fri, 29 Sep 2006 20:35:06 -0700 (PDT)
From: "Jon L. Turner" <ka0ofp@yahoo.com>
Subject: [R-390] AGC Problem

I have a R-390A by EAC. It is my favorite receiver of all the receivers that I own. A few Saturday mornings ago when I turned it on the signals were distorted and did a little check. I found that I had no AGC. I put another IF Deck in to see if I could isolate the problem and the receiver worked fine. What I have found is that the 180 volts that is to be on pin 5 of V508 is not there. The resistance of 65k is not there also. I am seeing the 65k the other side of Z503 transformer but not on the pin 5 of V508. Pin 5 of V508 is connected to one side of the transformer.

It is looking like Z503 has opened. The voltage and resistance readings are out of the Y2K Manual. Any thoughts would be appreciated.

Date: Sat, 30 Sep 2006 00:01:25 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] AGC Problem

These things can some times be fixed. The little wire breaks off in the can. The cans have large wires that go from top to bottom and make up the bottom terminal under the deck. In the can, the little coil wire comes out and is wrapped around this larger wire. Often the little coil wire opens. It hangs in free space between the coil of wire and the larger wire post. Vibration does the free hanging wire in. These things also do cold solder joints. Pull the deck out so you can get it under the magnifying glass. Pull the cover off the offending can. Give it the real eye ball and set what come loose. If you ohm it and find the coil open inside, you can still do a can transplant. That's a good after noon once you get a new to you used transformer. Just takes time to get er done. Not real hard just a long job.

Date: Fri, 29 Sep 2006 22:48:48 -0700
From: "Bill Feldmann" <n6py@qnet.com>
Subject: Re: [R-390] Blocking capacitor question

I'm using a .01 1000V disc ceramic in mine and it work great. Some fellows feel the film type caps are better at audio frequencies but at 455kc I don't think it makes any difference. Bill N6PY

PS: I just installed the after market 2.5kc and 6kc filters in my R-390A and they really work fine. But the insertion loss is a lot lower so to keep the carrier meter readings consistent between filters since I still have the stock 4kc and 8kc filters, I put a 27K resistor across the input of each of the new filters. I tested the filters with and without the resistors and no difference in receiver noise floor or 3rd intermod performance. I now have for filters 2.5kc, 4kc, 6kc and 8kc. This works out perfect for both AM phone under all conditions and SSB.

Date: Sat, 30 Sep 2006 16:45:49 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] BFO Turns Counter info

Would you please do the scan and put the pages on a web site for us. Many of the fellows would like to have the pages to add to their books. Hopefully we can get them into the updated web book.

Date: Sat, 30 Sep 2006 16:49:47 -0400
From: Rbethman <rbethman@comcast.net>
Subject: Re: [R-390] BFO Turns Counter info

No problem! I'll get it scanned this weekend, and put both side on my site for anyone to grab. I'll post the link as soon as I "Git R Done!".

Date: Mon, 02 Oct 2006 10:05:06 -0400
From: Rbethman <rbethman@comcast.net>
Subject: [R-390] BFO Counter info on my site

The following is the link(s) to the doc(s) for the Litton mdl 1309 BFO counter. * WARNING * THE BMP files ARE about 7MB in size!! This is up for the FEW that want the info for the NEW MANUAL!!

http://home.comcast.net/~rbethman/bfocntr1.bmp7MB
http://home.comcast.net/~rbethman/bfocntr2.bmp7MB
http://home.comcast.net/~rbethman/bfocntr1.jpg1MB
http://home.comcast.net/~rbethman/bfocntr2.jpg1MB

Date: Mon, 02 Oct 2006 10:43:14 -0400
From: Rbethman <rbethman@comcast.net>
Subject: Re: [R-390] BFO Counter info on my site

The counter info sheet is indeed LARGE for the "manual". IF it is too large, let me know and I'll reduce its size while TRYING to keep the image clean, clear, and

readable.

Date: Mon, 02 Oct 2006 10:51:17 -0400
From: Rbethman <rbethman@comcast.net>
Subject: [R-390] Pics of BFO COUNTER

And for "whatever" it may be worth, the price sticker on the end of the box: $16.00 . Pictures of the BFO Counter made by litton are ALSO available at:

http://home.comcast.net/~rbethman/1000.jpg
http://home.comcast.net/~rbethman/1001.jpg
http://home.comcast.net/~rbethman/1002.jpg
http://home.comcast.net/~rbethman/1003.jpg

Date: Mon, 02 Oct 2006 11:52:48 -0400
From: Rbethman <rbethman@comcast.net>
Subject: [R-390] Counter Base

After looking at the Litton counter closely, in particular the base, I would conclude that "making" one would be VERY difficult. This is especially true as the "locking" mechanism is built into it. This is a large "fender" washer insert that incorporates four spring elements that "lock" the counter and prevent it from rotating. It is a "pot metal" casting with precisely located holes for mounting the "head", and the above mentioned assembly. Without a lathe AND a mill, I would NOT tackle this myself. Another list member acquired a "used" counter from FAIR RADIO.

Date: Tue, 3 Oct 2006 08:57:16 +0200
From: "federico" <federico@dottorbaldi.it>
Subject: Re: [R-390] Pics of BFO COUNTER

Very interesting, I have some surplus that I got from a dismantled radar test equipment years ago. I never mount the microdials onto my R-390As but I think that it should be an interesting implementation to the "llook" of the Rx. I read that they were employed by NSA to have a better understanding of foreing languages or (in my personal opinion) for easiest RTTY tuning.

Date: Tue, 03 Oct 2006 11:23:48 -0400
From: <mfisch@kent.edu>
Subject: [R-390] BFO multi-turn knob+ Bourns near equivalent

check out: http://www.bourns.com/components.aspx?cmsphid=7631383|7163299|4657078, and click on the info for the ones that look similar to the figures we've seen, Might this work?

Date: 3 Oct 2006 18:08:10 -0000
From: "n4buq@knology.net" <n4buq@knology.net>
Subject: Re: [R-390] BFO multi-turn knob+ Bourns near equivalent

Maybe a little circuit that counts the BFO and shows the +/- difference between the current setting and 455kc, perhaps in 100cps increments and fed to a small LCD

display?

Date: Tue, 3 Oct 2006 13:26:21 -0500
From: mikea <mikea@mikea.ath.cx>
Subject: Re: [R-390] BFO multi-turn knob+ Bourns near equivalent

Sounds good. I think I could do that in between 30 and 100 tubes. To do it all Glowbug-style, wecould use some of those fancy Burroughs decade-counter tubes.

Date: Tue, 3 Oct 2006 13:51:58 -0500
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] BFO multi-turn knob+ Bourns near equivalent

While you are at it lets get rid of the rattling mechanical frequency display and put a real live digital display in it's space that shows the actual frequency one is on by counting the frequency results of the PTO and the various conversions..... that shouldn't take more than another 30 or 40 tubes huh? We'll call it the R-390B....I guess that would stop the "Non-A" description because we would actually have to use the radio's nomenclature to communicate which one were talking about...

Date: Tue, 3 Oct 2006 15:30:58 -0400 (EDT)
From: John Lawson <jpl15@panix.com>
Subject: Re: [R-390] BFO multi-turn knob+ Bourns near equivalent

Y'all keep yore cotton-pickin' hands OFF my Veeder-Root! Wouldn't be a '390' if it didn't make that lovely, complex machine-y "sound" while idling thru the bands, looking for an SSB/QRM-less window in the AM window. Although the previous suggestion of an all-vacuum tube BFO pitch display might be alluring... and I think it could be done nearer the 30-tube figure, counting the Nixies for display.

Date: Tue, 03 Oct 2006 16:43:05 -0400
From: shoppa_r390a@trailing-edge.com (Tim Shoppa)
Subject: Re: [R-390] BFO multi-turn knob+ Bourns near equivalent

The HP counter modules used 4 tubes (twin triodes) per decade. They also had a bunch of neon bulbs and (if a nixie display) used CdS photocells for reading the neon bulbs and turning them into a nixie readout! Really massively clever! I'm guessing a BFO readout would usefully display to the nearest 10Hz and max out at a few kHz, so you'd want two or three decades of counting. That's only 8 or 12 tubes for the counter and maybe a couple more for the gating etc. Of course the reference for the 10Hz count window would be done with a tuning-fork reference and a electromechanical divider (think of the old humming Bulova Acutrons). In fact lots of 60's-milspec-space-age instruments used these sorts of references. I suspect that even harder to find than 4kc mechanical filters would be the Bulova Acutron modules!

Date: Tue, 3 Oct 2006 16:01:31 -0500
From: Tom Norris <r390a@bellsouth.net>
Subject: Re: [R-390] make knobs for R-390 series?

Hank Arney here on the list already offers such a thing, he has all three sizes, CNC machined, powder coated and pretty much at what it cost to have them done - it's not a project he's making any money on. If the students are going to do them as a fund raiser, I'm not sure they'd offer them for much less. He has machined gear clamps, oldham coupler disks, and R-390 "green gears" as well. (unless he's out of some of them) One thing I don't think he has are oldham coupler disks for R-390 crystal decks and the odd coupler the R-392 uses for it's bandswitch shaft. Those might some good short-run projects. Maybe.

Date: Tue, 3 Oct 2006 16:38:57 -0500
From: "Bill Hawkins" <bill@iaxs.net>
Subject: RE: [R-390] BFO multi-turn knob+ Bourns near equivalent

I still have some IBM 704 plug-in tube units, about 8" high by 10 wide by 1.5 deep, with eight 9 pin sockets and many terminal points. No sockets for the PIU, though. Some even have IBM brand tubes, almost all twin triodes. Don't have room for them in the 390, but it would be equipment from the same period.

Date: Tue, 03 Oct 2006 17:52:55 -0400
From: Mark Huss <mhuss1@bellatlantic.net>
Subject: Re: [R-390] BFO multi-turn knob+ Bourns near equivalent

Anybody know how fast a Dekatron would count? These were tubes with a circle of neon dots on the front. You fed it pulses, and it would move the lighted dot around the circle. A divide by ten counter and display in one!

Date: Tue, 3 Oct 2006 18:04:35 -0400 (EDT)
From: John Lawson <jpl15@panix.com>
Subject: [R-390] Dekatron counting speed

I'll need to get home and pull the datasheet - IIRC the usual Sylvania or RCA Dekatron had a transfer-rate of about 400 - 500 KC, ie. you could drive them at 500KC and get a divided-by-ten pulse of 50 KC. I have upwards of 40 of 'em, (none for sale/trade currently) and sockets and biasing networks too. Someday I'll make a Grand Project out of them - or a few, at any rate.

Date: Tue, 3 Oct 2006 18:57:13 -0500
From: Tom Norris <r390a@bellsouth.net>
Subject: Re: [R-390] BFO multi-turn knob+ Bourns near equivalent

Well, the nomenclature would depend on which of the two radios that would be converted, so the R-390 would end up being the R-390B and the R-390A would end up as and R-390C, then there are things such as fully synthesizing it - internally, not like the GRC-129, so I suppose that would add another letter. Then there is the Keilbasa ballast mod...

Date: Tue, 03 Oct 2006 22:42:15 -0400
From: Mark Huss <mhuss1@bellatlantic.net>
Subject: Re: [R-390] BFO multi-turn knob+ Bourns near equivalent

For the counter, you would have to use NIXIE tubes, of course. 2.6 by 0.5 inches, 6 digits (100 Hz). About the smallest NIXIE you can buy is an IN-17. It is 0.56" wide, so you need at least 3.4" for display width. You are going to have to rework the front panel for this. But it would be beautiful!

Date: Tue, 03 Oct 2006 22:50:54 -0400
From: Mark Huss <mhuss1@bellatlantic.net>
Subject: Re: [R-390] BFO multi-turn knob+ Bourns near equivalent

You know, if you actually sat down and designed it from scratch, you could probibily get away with a lot less tubes than you think. Using mixers to derive a single frequency that is the sum of the three oscillators, Simple ring counters using decimal rather than binary logic, etc. Trying to get it into the case, though....

Date: Wed, 4 Oct 2006 15:22:42 -0500
From: Tom Norris <r390a@bellsouth.net>
Subject: [R-390] New Counter Dials Available

Bourns still makes counter dials, and they aren't that expensive. Allied and Newark appear to carry most of their line and others. Here's the Bourns counter dial catalog -- http://tinyurl.com/fnodk

The "odometer" style, their p/n CT23 is a smidge over $22.00 from Allied, probably a similar price in the Newark catalog. This style knob is close to the older Veeder-Root, though I'm not sure if it has a "-" after 00.0, it's probably 00.0 - 24.9. Both Allied and Newark have the analog sort of dial, as well as some very expensive dial and counters that are mostly identical to the Bourns. There is also an inexpensive single turn calibrated dial carried by Allied, Digi-key, Farnsworth and others made by Kilo International. (on this page)

http://pdfcatalog.digikey.com/T063/1459.pdf

Plain old analog dial, but only 1 turn instead of 10. Around $13 Just some options since I've not heard back from Fair Radio this most recent email query.

Date: 16 Oct 2006 14:29:03 -0000
From: "n4buq@knology.net" <n4buq@knology.net>
Subject: [R-390] Latest R390A Project (long)

I replaced the capacitors and resistors in the IF transformers with little (if any) improvement to the IF alignment this last weekend. I mentioned earlier that it appeard one of the slugs was at or near it end of travel before I got to the peak point. Thinking it could be an out-of-tolerance capacitor(s), I replaced them. After replacing these components, the slug peaked in about the same position as before. Determined, I cranked down on it just a bit harder and noticed the coil form was turning just a bit. Fortunately, there is sufficient slack in the Litz wires so they weren't damaged. I epoxied both of the coil forms in T501 and T502 so they shouldn't be going anywhere soon. I can crank the slug sufficiently now to get to both "sides" of the peak so it looks like I'm "done" in that area. Still can't stagger-tune the thing,

though.

I did notice I got a much strong Diode Load reading when in the 2kc position as opposed to the other filter settings. Turned out that the lower trimmer caps were way out of position. After setting them, the various filters now have close to the same Diode Load reading. There's a little variation, but I assume that's expected as each filter ages differently.

I then started looking at the AGC action. I've mentioned before that SLOW AGC produces an increase in gain than the other AGC settings. I hooked the scope to the IF output and monitored it in all three settings. The MED and FAST settings seem to keep the IF output level fairly close to the same values when receiving a strong station. Switching to SLOW causes the IF voltages to increase substantially (maybe a factor of 3 or 4 times that of MED or FAST). It seems to distort just a little on SLOW mode as well, particularly on strong BC stations.

I then watched the AGC voltages last night. All three postitions yield very close to the same value (about -2.5V if I recall correctly). Switching to AGC causes the voltage to climb nicely to that point. If I switch from FAST to MED, the voltage stays nearly the same level. Switching from MED to SLOW causes the AGC voltage to drop considerably (nearly zero) and slowly climb back to -2.5V (assumably as the 2uF cap charges). Switching from SLOW to MED or FAST causes the AGC voltage to spike as the cap discharges and then the voltage settles back to -2.5V. I would think the AGC voltage action above seems normal, yet I'm getting the distortion on SLOW AGC with the IF output being too high in that postition. Any ideas what might be wrong? I assume this isn't the correct behavior.Thanks! Barry - N4BUQ

Date: Tue, 17 Oct 2006 16:39:45 -0400
From: "Drew Papanek" <drewmaster813@hotmail.com>
Subject: [R-390] Re:Latest R390A Project

>Switching to SLOW causes the IF voltages to increase substantially (maybe a
>factor of 3 or 4 times that of MED or FAST). It seems to distort just a
>little on SLOW mode as well, particularly on strong BC stations.

The classical cause of that problem is leakage in the 2uF chassis-mounted AGC integrator capacitor. I experienced that problem; replacement with an under-chassis mounted new film type cap cured it (left old disconnected cap in place on chassis for appearance sake).

[*see rebuild tips in Capacitors]*.

>I then watched the AGC voltages last night. All three postitions yield
>very close to the same value (about -2.5V if I recall correctly).

How close is "very close"? Because of the large number of gain-controlled stages in the R-390A, a small change in AGC voltage has a relatively large effect on gain. It doesn't take much leakage to drag the AGC voltage down just a smidge thereby causing the problem you report.

Date: 17 Oct 2006 21:00:13 -0000
From: "n4buq@knology.net" <n4buq@knology.net>
Subject: Re: [R-390] Re:Latest R390A Project

Probably less than 0.2V. I figured a badly leaking cap would have made a greater change than that but maybe not. I plan to replace it. Thanks,

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Date: Mon, 27 Nov 2006 13:58:34 PST
From: Gary Gitzen <r390a@uwave.com>
Subject: [R-390] R-390 <> R-390A IF decks?

I _may_ have the opportunity to obtain an R-390 IF deck. I'm wondering if it is a "drop in" to an R-390A? What (any?) changes are needed, other than possibly tubes and fil wiring? Is this a "good thing to do"? While I love the steep skirts of the 390A IF deck's filters, I've heard Very Good Things about the R-390 IF deck's L-C sound. Thanks for any help/info/insights.

Date: Mon, 27 Nov 2006 14:46:50 -0800 (PST)
From: "Tom M." <courir26@yahoo.com>
Subject: Re: [R-390] R-390 <> R-390A IF decks?

I wrote a procedure to do what you're asking. To answer your questions simply, it's not a drop in, but it's not rocket surgery either. See this link:

http://www.geocities.com/courir26/r725conv.htm

Date: Tue, 28 Nov 2006 09:31:35 -0800
From: "Dan Merz"
Subject: RE: [R-390] R-390 <> R-390A IF decks?

Gary, I used Tom's instructions for putting the 390 IF deck in my 390a. It worked well and is still in my receiver. I wouldn't classify it as a casual job because of the tight quarters for moving connections around on the bottom side of the chassis, mostly to get the filament circuitry rewired. The instructions were very clear about what to do and I was happy with the result. Good look on getting the R-390 deck - it took me a year or more to find one. <snip>

Date: Fri, 15 Dec 2006 14:43:17 -0600
From: "Dave Faria" <Dave_Faria@hotmail.com>
Subject: [R-390] Spectrum Analyzer For trade

GM List. I have for trade a Panoramic Spectrum Analyzer Model SB-15A by Singer. It was a project I started abt 5 years ago. All I have done is clean the unit. I have the depot aintenance manual(copy from Fair Radio). The analyzer will power up and take a signal from a signal generator but, there is a problem with the gain. The tuning for the center frequency is off and probably the sweep width as well. Calibration may just be the problem but, I doubt it, there are probably other problems. The center frequency is tunable from 0 - 500khz from manual(name plate says 100 to 600khz) and sweep dial 1 to 200khz. Anyway, what I'm looking for is a R-390A I can use to build a R-725. The radio does not have to work but, the modules need to be

complete with no corrosion. Grease is OK - I can clean the radio and rebuild the gear train. It would be nice if the panel is engraved or in good shape if silk screened. I can provide pictures of my Analyzer. Thanks for your interest. Dave Faria Austin, Tx

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Date: Sat, 16 Dec 2006 05:55:26 -0500
From: "Bob Young" <youngbob53@msn.com>
Subject: [R-390] unstable BFO note on R-390A

I use the BFO frequently to zero beat the carriers on BCB. It is off by maybe 200 CPS for one thing after moving the BFO knob as much as it could go to one side, is this an easy fix to align the BFO? Also although I feel no backlash it is jumpy when tuning with it on. If I move the tuning knob up and down the BFO will jump to differing frequencies and sometimes stay off center. One of the springs on the split gear is shorter than the other, could this cause this problem, or is this more indicative of worn gears maybe? Any other ideas? thanks, it is worse when warm.

Date: Sat, 16 Dec 2006 05:48:30 -0800
From: "Dan Merz" <mdmerz@verizon.net>
Subject: RE: [R-390] unstable BFO note on R-390A

Bob, yes it's an easy fix to "align" the bfo. Loosen the set screw on the knob, remove the knob, set the bfo at the correct frequency of the center of the i.f. by "zero beating" the noise (or on a signal that you know is coming down the center of your i.f., for example thru the xtal position) and then without moving the setting, reinstall the knob with the indicator at the top zero position. I'm not sure what gear you are talking about as the bfo shafts on my radios go straight into the coupling to the bfo bellows and turn the pto directly. Perhaps you were referring to some interaction of zero beat when you were using the main tuning knob, which has gears. Or maybe you radio is different than mine and has a geared bfo. There may be a problem with either the coupler on the shaft directly behind the panel or with the bellows coupler within the i.f. chassis. Can you peek into the radio from the top and see if the coupler behind the panel is secure. I've had one of mine fail by cracking and it couldn't be tightened enough to be secure. Or perhaps the bfo tube is bad. If you are using the bfo to zero beat broadcast stations at known frequencies, there is no guarantee that the tuning indicator will indicate the correct frequency unless you calibrate the main tuning to indicate correctly on the band of interest and near the frequency of interest, which is a process separate from the bfo alignment. I would guess the usual 390a will not indicate frequency to within 200 cps (1 division on the wheel) without calibration on each band even if you align the bfo perfectly, at least mine won't. I'm happy to be within 1000 cps in going from one tuning range to another without re-calibrating the tuning indicator on a nearby signal of known frequency or using the internal calibration oscillator. I recall that my set is only within about 500 cps in going from one end of the range to the other if I calibrate it at the middle of the band. And that was after opening and adjusting the range of the main tuning pto. Old is good but not necessarily as good as it was. Dan.

Date: Sat, 16 Dec 2006 17:18:11 -0500
From: "Bob Young" <youngbob53@msn.com>
Subject: RE: [R-390] unstable BFO note on R-390A

Thanks, but the problem is that there is a flat part on the shaft where the set screw goes which only allows a little leeway either way for the knob. The gear I'm talking about is the split gear that is right behind the main tuning knob if I remember right. It is supposed to eliminate backlash I'm pretty sure. When I wiggle the main tuning knob with the BFO centered and on I can knock it off zero beat by wiggling the knob, sometimes it goes back other times no. This is without turning the knob at all, it will jump all over the place. I'm wondering if this could be in the VFO or is something in the gearing mechanism or maybe because the springs are not equal the split gear is not functioning properly? not sure, oh also when tuning in a station with the .1 khz position it is also very hard to keep it peaked and tuned it jumps all over the place also along with the BFO if that helps.

Date: Sat, 16 Dec 2006 17:46:24 -0500 (EST)
From: John Lawson <jpl15@panix.com>
Subject: RE: [R-390] unstable BFO note on R-390A

Bob - it might be a Good Thing to check the output of the PTO for any unstable FM - if the radio cannot hold a stable setting in the 0.1 Khtz BW position, with the BFO off - the problem is maybe in the main frequency determining circuits, I would think... However if the tuning is stable with the BW set to 0.1, and the BFO off - of course this can be checked against WWV - but starts jumping around when the BFO is turned on, then it's as you surmise - the BFO itself has gone wonky on ya. Could there be gunk in the BFO variable capacitor?

Date: Sat, 16 Dec 2006 14:48:10 -0800 (PST)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] unstable BFO note on R-390A

No, maybe not. Have you adjusted the frequency readout with the ZERO ADJUST knob yet? It disconnects the gears from the KC CHANGE knob, that may be where your 200 CPS error is coming from.

>is this an easy fix to align the BFO? Also although I feel no.....

Is there a spring on the Oldham coupler on the PTO shaft? While you're looking in there clean the flat pointed spring that rides on the PTO shaft, but don't oil it, leave it so it can make an electrical contact to the shaft.

>One of the springs on the split gear is shorter than the other, <snip>

Make sure you do this after at least a one-hour warm up so everything is as stable as it can be. Some frequency change while warming up is,..... acceptable, ... I guess. Ok, its tubular, it happens with tubes!

Date: Sat, 16 Dec 2006 15:21:55 -0800 (PST)
From: Joe Foley <redmenaced@yahoo.com>
Subject: RE: [R-390] unstable BFO note on R-390A

> Thanks, but the problem is that there is a flat part <snip>

You need to look behind the front panel for a coupling in that shaft, it has one of those clamps you find on the gear shafts, you'll need a Bristol wrench for the set screw.

> The gear I'm talking about is the split gear that is <snip>

Check the setscrews on the Oldham coupler sections, they may be loose.

>When I wiggle the main tuning knob with <snip>

Also, look at the back of the BFO knob, it has a detent lug that keeps it from being turned more than one full turn, that has to engage the stop at the bottom of the shaft hole, that knob has to be slid on far enough to engage that but not so far as to rub the panel.

Date: Sat, 16 Dec 2006 16:25:08 -0800
From: "Dan Merz" <mdmerz@verizon.net>
Subject: RE: [R-390] unstable BFO note on R-390A

"Thanks, but the problem is that there is a flat part on the shaft where the set screw goes which only allows a little leeway either way for the knob."

I forgot about the flat on the shaft which means you have to make thadjustment I mentioned using the coupling between the shaft sticking out the front panel and the shaft going into the i.f. chassis, by disconnecting this coupling behind the panel, adjusting the bfo frequency with the shaft going into the i.f. chassis and then reconnecting with the knob pointing at zero. But it sounds like you have a problem with the main tuning so this adjustment should probably only be done after you clear up the main tuning problem if that's the cause of what you're experiencing. You need an independent way of monitoring the bfo frequency to see if it's actually changing or whether the change in beat note frequency is due to change in the main pto jumping around in frequency. I seem to recall that I used a signal generator to see what my center i.f. frequency was and then I set the output of the bfo to that using a frequency meter and then connected the front shaft with the bfo producing that frequency. Without the signalgenerator/freq meter, zero beating the noise is about as good a method to get the bfo at the right frequency before tightening the clamp between the two shafts behind the panel. Dan.

Date: Sat, 16 Dec 2006 18:25:54 -0800 (PST)
From: Joe Foley <redmenaced@yahoo.com>
Subject: RE: [R-390] unstable BFO note on R-390A

> what exactly is the Oldham coupler anyway?

If you turn the radio upside down and remove the bottom cover you will see the PTO. If you follow the operating shaft toward the front panel you will see a coupling that allows some deflection of that shaft, that is the Oldham coupling.

It has three parts, four if you count the spring, which is sometimes missing. The

spring is to keep backlash out of the coupling sections, it SHOULD be hooked to the two pins that stick out of the outer sections of the coupler.

There should also be some gap between the three sections, about 1/32" should be enough. NOTICE: If that gap is not there it could cause just the problem you have, jumpy tuning, because it is putting pressure against the insides of the PTO. I just remembered that from one of Nolan's posts from the past. Also, check the mounting of the PTO,.... just because.

Date: Wed, 20 Dec 2006 21:18:53 -0500
From: "Bob Young" <youngbob53@msn.com>
Subject: [R-390] warbling BFO problem solved

>2. Now for the warbling of the beat note. There is a small strap that is mounted..... the BFO centering procedure is on Chuck Rippels web site www.r390a.com.....there is also a lot of information at
http://www.r-390a.net/Pearls/ concerning VFO/BFO

I tried this and it worked like a charm, the BFO note is now clear, louder and best of all smooth into and out of zero beat, no more jumping around. It did sound like a bad connection which is why I tried this first. I'm now waiting for a whole set of Bristol wrenches so I can loosen the little clamp behind the face of the radio to center the BFO and I'll be all set, thank you all for your help.

Date: Wed, 20 Dec 2006 18:27:42 -0800 (PST)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] warbling BFO problem solved

One more thing to do while you're in that area, Bob.

Loosen the bushing on the KC CHANGE shaft where that shaft goes through the front panel, there are three bushings on that shaft, it isn't easy to get all three to line up perfectly, two wouldn't be so hard.

Also, that shaft may have some bend in it, so what we usually do is to leave the one on the front panel "just snug".

Date: Fri, 2 Feb 2007 12:04:59 +1100
From: "pete williams" <jupete@bigpond.net.au>
Subject: [R-390] Transplanting R-390 IF modules to R-390A

Convention has it that directly substituting the R-390 IF module to a R-390A to simulate a R-725/URR wasn't possible without making changes to the heater wiring. Reason being the original R-390 module was wired for a 25V heater and the R-390A used 6.3 V. It was further assumed that the transformer of the R-390A had insufficient capacity if its 26V secondary was used.--- the 6.3 V line was ample. Not impressed with the work needed to rewire in a cramped environment, a look at the heater layout for both receivers in the IF area, showed the following. The R-390 needed 25V on pin #20 from the plug P-117 . On the R-390A, pin #20 had 6.3 V.also, the R.390 needed 6.3V on pin#8 from the plug P117.. On the

R-390A, pin #8 had 25V.

Question..1.. why not transpose wires on pin #20 and #8 and satisfy the voltage requirements without the hard work?

Question 2.. would the xfmr in the R-390A handle the extra demand?

Doing it and measuring the results gave the following.....Total current from the 25V tag on the xfmr was 1.2 A with 12BW4 tubes as rectifiers, and 3TF7 in use.---just on the maximum continuous rating for the xfmr. Obviously would be less if SS diodes used in lieu of tubes. Current drain on switching to CAL rose to 1.45 A but well within the 4.6 A allowed on a 70% duty cycle (see xfmr specs) RESULT.. No problems experienced with Xfmr heating or drop in voltage... and the radio performs. Changing the pin connections as outlined in P -117 not too difficult. These results do NOT include the use of the switched ovens but it's your choice.

NOTE.. further reduction of the 25V current drain could be achieved by removing the ballast tube , running a connecting wire from pin#8 to pin #19 and chassis grounding pin 7 of the ballast tube socket. This the allows 6.3 V to be applied to the BFO and VFO tubes .You'll need to be running 6BA6. The army specs would, no doubt be exceeded but then as casual users we don't run 24 7 365!-- do we.? Maybe it's a reinvention of the wheel, but if so I haven't had it rotated here. Thanks to Gary Gitzen and Tom Marcotte who have both been across these developments. Any questions?

Pete D..Williams
METUNG, 3904 AUSTRALIA
jupete@bigpond.net.au

Date: Fri, 2 Feb 2007 09:42:54 -0600
From: mikea <mikea@mikea.ath.cx>
Subject: [R-390] Re: [Milsurplus] Transplanting R-390 IF modules to R-390A

>..... but why would you want to substitute a IF deck with mechanical filters to one without?

The mechanical filters tend to "ring" a bit, in my experience, where the LC filters don't. If you need better phase-flatness across the filter passband, the LC filters are preferable to the mechanical ones, and it's my understanding that that's why the R-725 RDF receiver used the R-390 IF deck in the R-390A chassis. I could be all wet, of course; it wouldn't be the first time.

Date: Fri, 02 Feb 2007 12:18:11 -0500
From: Mark Huss <mhuss1@bellatlantic.net>
Subject: Re: [R-390] Re: [Milsurplus] Transplanting R-390 IF modules to R-390A

Indeed, as an experiment I once dropped an R-390A into a TRR-20 (a DF set that used a commutated ring of vertical antennas for DF). Result was a much wider propeller, I.E. the resolution was not anywhere near as good. I was later told that was because (1) phase-shift in the mechanical filters, and (2) phase noise from the PTO.

The R-725 addressed both these issues. And Ray, One thing we noted, having aligned both R-390A's and R-725's, was that as a rule the R-725's almost invariably had a better S/S+N sensitivity rating. We always suspected this was because the R-390A's noise floor is determined by the IF deck, not the First RF amp, as is usual. And the R-725, with it's R-390-style IF Deck had bandwidth filtering throughout the chain, not just a lump at the input. That they also decoupled just about every line out of the PTO and into the IF Deck with ferrite beads probably did not hurt either.

Finally, we used the Shop R-390A as a Shop Radio, with a used stereo speaker. On someones suggestion, we tried an R-725. And it sounded a lot better, to us, at least. Enough better that we put an R-390 IF deck on order and modified it to drop into the Shop R-390A. Could have been our imagination. But Ace, a SSG Hog, often said he could copy in-the-noise code better on an R-725 or old R-390 than on a R-390A. Said it sounded cleaner.

Date: Fri, 2 Feb 2007 11:50:06 -0600
From: mikea <mikea@mikea.ath.cx>
Subject: Re: [R-390] Re: [Milsurplus] Transplanting R-390 IF modules to R-390A

Phase noise problems with the PTO? As in just junk on the PTO output line, fixable by ferriting it, or other problems that required changes to the PTO other than just ferrites? Would decoupling the PTO stuff make any audible changes, or is this just changes in the DF propeller sizes from field measurements? Because if the R-390 PTO has phase issues, the R-390A PTO probably does, too, and I can see a purchase from Amidon or an Amidon supplier in my near future.

> Finally, we used the Shop R-390A as a Shop Radio, <snip>.....

I've noticed that as the bandwidth gets narrower, the signals seem to be smeared out a little bit in time, on the R-390 *and* R-390A, but that effect seems to be a little exaggerated on the R-390A when I've got the mechanical filters switched in. I think it's not all due to ringing in the filters, but that there's some analog to Heisenberg's Theorem that defines a frequency-time product uncertainty that you have to live with -- something like the product of certainty-in-frequency and certainty-in-time > some constant K where K is big enough to get bothersome for really narrow bands.

>But, again, I could be all wet.....

Certainly I do better copying code down in the grass on an R-390 than on any of my R-390A, and it beats my riceboxes (Yaesu FT-857, FT-857D and FT-897D) all hollow, even with DSP wound down to 60 Hz. It also helps keep the bedroom warm at night, which is a big bonus in winter, but not so much in summer.

Date: Fri, 02 Feb 2007 12:59:30 -0500
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] Re: [Milsurplus] Transplanting R-390 IF modules to R-390A

Noise on an output that is fixable by "ferriting it" is not usually called "phase noise". Usually phase noise in a MW radio context refers to "close-in phase noise". Ferrites

are usually used to reduce EMI susceptability and/or EMI emissions at a frequencies far away from the desired frequency. Several of a 390A's oscillators exhibit FM under B+ and AGC variations. But again that's usually called FM and not "phase noise". I hesitate to send this e-mail to the list at all because I just make matters worse by mentioning actual problems in an attempt to get someone to define their mythical problem.

Date: Fri, 2 Feb 2007 14:17:55 -0500
From: <kirklandb@sympatico.ca>
Subject: Re: [Milsurplus] Transplanting R-390 IF modules to R-390A

Use a filter with a Gaussian response (to 6 or 12 dB points) for minimum ringing, i.e. for CW. If you design a narrow flat passband, linear phase filter, it will ring for quite a while. (due to the sharp cutoff corners). I suspect that the tuned circuit IF lent themselves better to a Gaussian shape unless they were staggered tuned to get a flat passband.

For CW, a filter with non-linear phase is not that much of an issue. However go to digital or RTTY, the phase response of the filter becomes more important.

Date: Fri, 02 Feb 2007 11:23:06 PST
From: Gary Gitzen <r390a@uwave.com>
Subject: [R-390] R-390 > R-725 IF filament conversion

Pete forced my hand on this one. I was asleep at the switch.

The following words are musings and ramblings about replacing the IF deck in an R-390A with the deck from an R-390; in effect recreating the R-725/URR. It mostly focuses on the widely held belief that major IF deck filament rewiring is needed for this change. If this doesn't interest you, please punt now. I recently acquired an R-390 IF deck (thanks, Pete), with the intent of converting and installing it in one of my two R-390A mainframes. This would give me one Rx with the mechanical filters, and another with L-C filters. Upon inspection of the "new" IF deck, I quickly saw why I'd been warned that "it gets real tight in there" when rewiring the filament string for 6.3V operation. Not a project to be undertaken without some careful thought and planning. "Why," I asked myself, "does it need to be rewired?" And I answered myself with "Everybody knows, dummy, that the R-390A power transformer doesn't have enough 25.2V current to power the non-A deck in 25.2V mode. You read Tom Marcotte's excellent writeup on "rolling your own R-725" with a non-A IF deck on his web page, and others have written about this issue. Shut up, get out your soldering iron, and start working!" But since "everybody knows" has always triggered my curiosity, I thought I'd take a better look. I came up with the following 25.2V fil requirements for the non-A IF deck:

0.15A 4X 6BJ6
0.15A 2X 12AU7
0.15A 2X 6BJ6 + 1X 12AU7
0.3A 3TF7 + PTO & BFO 6BA6's = 0.75A @ 25.2V

Additionally, 0.15A@6.3V 1X 6BJ6, needed from somewhere.

Yeah, I thought, that 0.75A might overload the 25.2V winding on the xfmr. But wait a

minute: the 390A also has a 3TF7 and its 0.3A load in its IF deck, so we can eliminate that as an "extra power needed" item. That leaves us with .075A - 0.3A = 0.45A of "extra" 25.2V current needed for the non-A IF deck. Then I started looking closer at actual numbers, and how I configure my
R-390As.

First, I never use 3TF7s. I replace the PTO & BFO 6BA6's with 12BA6's, which reduces the 25.2V filament drain by another 0.15A. It's now down to 0.3A "extra" needed. Second, I don't use 26Z5s. I replace them with solid-state diodes. 26Z5's have a filament current of 0.3A each, or 0.6A for two. Hmmmmm..... That's twice the "extra" filament power I now need for that non-A IF deck. I appear to have 0.3A of "extra" 25.2V available. I may not need to follow the rewiring instructions after all.....

I took a look at the power transformer. The 25.2V winding is rated 1.2A continuous, plus 4.6A at a 70% duty cycle for the ovens. But I never use mine in an Alaskan igloo with the ovens on. I turn the ovens off, as do most owners of R-390As. This makes that 70% of 4.6A available; about 3.22A. With that other "extra" .3A, I have over 3.5A of "excess" 25.2V available.

Conclusions: Simply replacing the 26Z5s with silicon diodes frees up enough 25.2V current to power a non-A IF deck in an R-390A. Even without that change, the total 25.2V load appears to be easily handled, within spec of the transformer, unless it is operating at minimum rated temperature with the ovens on. Turning off the ovens frees up more than enough 25.2V current, even with 26Z5's and 3TF7/6BA6's.

So where did this "everyone knows" come from? Tom Marcotte appears not to know. He simply duplicated the original R-725 mod as closely as he could. My _suspicion_ is that everyone just assumed it had to be done that way.

The major benefits of not rewiring filaments for 6.3V appear to be:
1: The risk of damaging the non-A IF deck is reduced.
2: If ever needed, it will be much easier to restore the non-A IF deck so it can run in a non-A radio. All in all, both of the above could have been a major PITA.

Question for the list: have I missed anything here? Made any incorrect assumptions? If so, please let me know before I do this. Or stick my foot deeper in my mouth.
****
"That was Yesterday"; now fast forward:

I exchanged mail with Pete Williams, David Wise, and Tom Marcotte a while back, sending them an earlier version of the above.

Since then, Pete has actually tried it, using an adaptor/extension cable which flips pins 20 & 8 on the main connector. He reports good/excellent results. I've taken a cursory look at the connector on the non-A IF deck, and it looks possible to make the flip there. I'll be trying that "in the near future". More info as I think I know it, although Pete may beat me to it. Pete also forwarded to me a scan of the filament wiring schematic from hist R-390 manual. Thanks, Pete!

Tom M suggests adding a B+ dropping resistor inside the non-A IF deck to reduce B+

to R-390 voltage. Measurements and more research needed.

Thanks to Tom Marcotte for both the excellent R-725 documentation on his web site and for his encouraging words re the above in private communication. My compliments and thanks to Pete for once again taking theoretical musings, doing further research to identify the pin 8 & 20 flip, then actually doing it on his bench. More kudos for caring enough to take the time to report his findings.

Date: Fri, 2 Feb 2007 11:30:48 -0800
From: "David Wise" <David_Wise@Phoenix.com>
Subject: RE: [R-390] R-390 > R-725 IF filament conversion

When the R-725 was created, the ovens were still a requirement. I speculate that it didn't occur to Tom that leaving them off opened up the options. This is not a criticism - it never occurred to me either. I'm glad someone was more awake.

Date: Fri, 02 Feb 2007 15:15:37 -0500
From: Mark Huss <mhuss1@bellatlantic.net>
Subject: Re: [Milsurplus] Transplanting R-390 IF modules to R-390A

Yes, the beads would not do anything about PTO phase Noise, it was just to keep garbage from getting into or out of the PTO. If memory serves, there was also a wiring change to the tube, and a few cap changes to try to reduce the phase noise. The thing I remember the first time I looked under the hood of an R725 was what seemed like hundreds of those beads everywhere. There were also contact fingers on the bottoms of the RF and Xtal osc chassis. I do know that the mechanical filters do have a very adverse effect on what is called Doppler effect DF'ing systems, such as the TRR-20. And though comparatively, the R-390 and R-390A PTO's do not have that much phase noise, it was really getting bothersome by the early eighties for the techniques being developed then. I also know that they went through a whole s**tpot of receivers, including Collins, trying to find one that had synthesis but less phase noise than the R-390A. Racal finally came through, but just barely, which is why they won the contract to replace the R-390A. As to the rest of it, like I said, it could have been our imagination. It is a fact that getting an R-390A under 1uVS+N/N at 8kc BW would take a while, and getting the R725 to the same S+N/N was normal after the first alignment run-through. Mind you, we swept the R-725 while the R-390A just got three-point alignment, but what difference that would make, I don't know. Like I said, the general consensus was that the R-390A IF Deck had a higher noise floor because from the second IF tube on, the thing was as wide as a barn door. And yes, we did align them for the full 16 kc bandwidth.

Date: Sun, 4 Feb 2007 04:11:00 -0800 (PST)
From: "Tom M." <courir26@yahoo.com>
Subject: [R-390] R-725 Procedure

Gene, here is the text.Conversion of the R-390 IF Deck for Use in R-390A For Improved Audio,

Or

Make Your Own R-725

Thomas F. Marcotte, P.E., N5OFF courir26@yahoo.com

As many of the readers of Electric Radio know, the US Army created a modified R-390A version for direction finding known as the R-725/URR. I wrote about this modified radio in this publication a few years ago. The main difference between a R-725 and the R-390A is that the R-725 utilizes a custom built IF deck that is very similar in construction to the R-390 IF deck. It has tuned circuit selectivity instead of mechanical filters. The mechanical filters of the R-390A created distortion when that radio was employed for radio direction finding use. In an internal Collins engineering report published in 1952, Lou Couillard wrote of the improved R-390A, which at that time was called the R-390(XC-3), "Although the superior shape factor of the mechanical filter IF is desirable in most applications, consideration should also be given to an alternate tuned circuit design for use in special applications. The excellent shape factor of the mechanical filters precludes the possibility of linear phase shift across the passband. Where a linear phase characteristic is desired such as in direction finding equipment, a tuned circuit IF is necessary."

Employment of the tuned circuit IF is exactly what was done in the R-725. In addition to the new IF deck, the R-725 was given a new filament transformer and a minor modification for the PTO to provide improved stability. Motorola was awarded a contract in 1956 (476-PH-56-91) to prototype the R-725. I know of a couple of these Motorola sets existing today.

Packaging of modified sets for quantity DF use were handled by ArvinIndustries and Servo Corporation of America. Approximately three hundred R-390A's were modified to the R-725 configuration. These sets are relatively tough to find today. New IF decks were manufactured by the modification companies (actually salvaging some of the components from the now junker R-390A IF decks) and installed in existing R-390A's. The new IF decks were named "SERIES 500 IF STRIP ASSY." They looked almost just like R-390 IF decks (see the comparison photos), except that the IF connectors were relocated to match the cables and connectors in the R-390A chassis. The circuits were designed to plug and play in the R-390A instead of the R-390. The decks are not interchangeable (until now that is, after performing the modification described herein).

Notwithstanding DF capabilities, a side benefit of the SERIES 500 deck is thatit provides a smoother sound than does the stock R-390A IF deck. Mechanicalfilters are said to "ring" and after a while can be fatiguing to the listener. The purpose of this article shall be to describe how one may "roll his own" SERIES 500 IF deck from a surplus R-390 IF deck. Please note that I don't advocate trashing of a good R-390 to do this mod. The IF deck I started with came from a Motorola junker. I would urge you to likewise find a junker R-390 as a source of an IF deck for this project . Make sure that the deck is in working condition prior to beginning the modification.

The R-390 IF deck was designed to operate with one 25V filament supply (unfortunately the 25V supply available in the R-390A is insufficient to power all of the filaments in the R-390 IF deck). The R-390A deck was designed to operate with a combination of 6.3V and 25V filament supplies. The task involved in this conversion is to rewire the R-390 filaments to comply with the voltages available in the R-390A and provided at the main IF deck connector, plug and play, without the

addition of any new power transformers. Each of the twelve tubes in the R-390 IF deck must be addressed for full compliance with the voltages available from the R-390A. Refer to the schematic in Fig 1 as to the final filament wiring configuration. We will also drop the B+ a bit.

Plug P112 of the R-390A shall be plugged-in to the R-390 IF deck at jack J517.

There is much commonality here, except for the connections mentioned herein.

In general, you will be converting 25V series connections into 6.3V (herein referred to as 6V) parallel connections for most tubes, and moving the connections of the BFO/PTO/ballast tube series to a different connection point in jack J517. The 6V filament supply shall be provided to the R-390 deck by pin 20 of P112 from the R-390A.

General instructions: Refer to the schematic for the original R-390 as the "before" schematic, and Figure 1 as the "after" schematic for filaments. Use the best soldering technique you can in this limited access space. Don't insulate or bind any wires until instructed to do so. You will be utilizing some of the new 6V supply connections more than once. Make sure you can recognize your new wires. I used black wire for the 25V supply, red wire for the 6V supplies, and green wire for new grounds.

The first task is to install a B+ dropping resistor to better match the 180V B+ that the R-390 IF deck is expecting. To do this, locate inductor L503 under the IF deck. This will be found snapped into a holder right above pin 2 of J517. Disconnect one end of the coil, and install in series with it (the equivalent of) a 470 ohm 2 watt resistor. This will tame the B+.

The first tube circuit we'll work on is the ballast tube circuit.

V508 (5749) and RT512 (3TF7) These must be supplied by the R-390A 25V filament supply. To do this, sever the connecting wire at pin 8 of jack J517 (underneath the deck) to free this slot up (hint: save access to the connector end of the wire as you will use it to wire supply to V509). Then, sever the connection at pin 2 of RT512 and wire this pin to pin 8 of J517 of the R-390 deck with a long piece of new wire. The filament return connection remains unmodified. This modification will make the BFO/PTO/ballast tube series connections identical to the R-390A 25V filament supply connections. As mentioned above, this 25V supply is insufficient to supply the remainder of the tube filaments, thus the need to employ the 6V supply for this task.

The following 6V tubes shall have filaments wired from the 6V R-390A supply. The filament pins of these tubes are pins 3 and 4. Don't sever any connections unless instructed to do so. The modification will use as much existing R-390 IF deck wiring as possible (and thus may seem a bit screwy to you until finished).

V504 (6BJ6) 6V will come from its existing connection at pin 4. Ground will come in the next step.

V503 (6BJ6) Wire pin 3 of V503 to pin 4 of V504 for 6V supply. Ground V503, pin 4.

V502 (6BJ6) 6V supply will come from an existing connection at V503, pin 3. Ground V502, pin 3.

V501 (6BJ6)Sever ground connection at V501, pin 3 and wire pin 3 to V502, pin4.

V505 (6AK6) 6V supply will come from existing connection at pin 4. Ground will come in the next step.

V506 (6AK6) Ground pin 4 of V506. Wire pin 3 of V506 to pin 4 of V505 for 6V supply.

V509 (6BJ6) Locate the free wire which was cut from underneath J517, pin 8, and connect it to the 6V filament supply at J517, pin 20.

The following tubes are 12AU7's wired in various series schemes in the R-390. They must be rewired according to their 6V option for use in the R-390A. Note two of the connections require dropping resistors on the 6V source of V507 and V510 to obtain the desired 5.3V filament voltage.

V511 Sever ground connection at pin 5. Connect pins 4 and 5 together for 6V supply, ground pin 9.

V507 Sever connections at pins 4, 5 and 9, including the two resistors (one 120 ohm and one 22 ohm). Wire 6V supply from your previous work at V505, through the deck opening for variable capacitor C525, to pins 4 and 5 through a 3.9 ohm, 1 watt resistor. Ground pin 9.

V 510 Sever connections at pins 5 and 9. Ground will come from existing pin 4 connection. Remove 120 ohm resistor between pins 4 and 9. Wire pin 5 to pin4. Wire 6V supply from J517, pin 20 to V510 pin 9 through a 3.9 ohm, 1 watt resistor.

There are no changes to any of the other connections in the R-390 deck.

Prior to installing the modified R-390 deck in your R-390A, you must check your work.

Perform continuity checks from J517, pin 8, with RT512, pin 2.

Perform filament supply and ground continuity checks as follows. Note: There will be more than one ground connection at various tube sockets, but the filaments should have continuity exactly as shown.

Filament supply is checked from J517, pin 20.

V501, filament, pin 3; ground, pin 4.

V502, filament, pin 4; ground, pin 3.

V503, filament, pin 3; ground, pin 4.

V504, filament, pin 4; ground, pin 3.

V505, filament, pin 4; ground, pin 3.

V506, filament, pin 3; ground, pin 4.

V507, filament, pins 4 and 5; ground, pin 9.

V509, filament, pin 4; ground, pin 3.

V510, filament, pin 9; ground, pins 4 and 5.

V511, filament, pins 4 and 5; ground, pin 9.

Now insulate any bare connections, and use mini-tie wraps to secure the new wires to sturdy nearby points. To enable final installation of the deck in your R-390A, you'll need to make two adapter cables. These cables shall consist of jumpers (RG-59 is OK, approximately eight inches in length) with BNC's on each end. You'll also need two adapters of the type found on the back of the frame of the R-390A at the IF OUT jack (AMPHENOL 47200). This will provide crossover from MB connection (R-390A standard)to BNC (R-390 standard). Connect P-218 of the R-390A to J-526 of the R-390 IF deck with one of the cables. Connect P-213 of the R-390A to J-525 of the R-390 IF deck with the other cable. It is a good idea to label these cables. See the photo for reference.

Install the deck in your R-390A. You will notice that the screw holes are the same as for the R-390A IF deck, however the screws of the R-390 deck are of larger diameter. I did not change these screw as they are captive into the deck. The BFO, BANDWIDTH, and power connector of the deck will hold it in place, however I would not install it in a Jeep this way. Changing these screws is optional.

When you turn on the power, make sure your dial lamps light up normally. If they don't, you have a filament supply problem so turn off the set immediately and troubleshoot.

For great sound, instead of using the built in audio deck, I prefer to tap the audio from the diode load jumper at the back of the set. Through a 0.1 uF or larger capacitor, feed this signal into your line audio amp of choice, and enjoy the tuned circuit audio of the new R-725, errrr, R-390A with tuned circuit IF. You'll get the smooth sound of the R-390 and R-725, but have the parts availability and support common to the R-390A for the balance of the set. I've used my modified IF deck in two different R-390A frames, and it worked equally well in both. In my opinion, it makes the long term listening experience much more enjoyable. If you have any questions about the mod, please feel free to write. References:

Cost Reduction Program for Radio Receiver, R-390/391( )/URR, L.W. Couillard, Collins Radio, 1952.

TM 11-856/TO 31R1-2URR-154, RADIO RECEIVER R-390/URR, January, 1955.

Servo Corporation of America drawings for R-725 series 500 IF deck, Order No. 36-039-N-5-00093(E), September, 1965.

TM 11-5825-231-24, DIRECTION FINDER SETS AN/TRD-23, AN/TRD-23A AND DIRECTION FINDER SETS AN/TRD-15 AND AN TRD-15A, August, 1973.

TM 11-5820-358-35, FIELD AND DEPOT MAINTENANCE MANUAL, RADIO RECEIVER R-390A/URR, May, 1980.

Special thanks to Wally Chambers and George Rancourt.

Date: Sun, 4 Feb 2007 14:50:08 EST
From: Flowertime01@wmconnect.com
Subject: Re: Transplanting R-390 IF modules to R-390A

It was not that the R390/A rang in the Radio Direction Finding System.The system used a motor driven relay that switched the ring of antennas into the receiver. the motor driven relay also provided a circular sweep signal for the CRT display. The R390/A filters let a lot of hash noise from this switching unit into the signal.

The R390 IF deck swapped into the R390/A receiver produced a cleaner display than using a R390/A in the setup. The R390's were all tied down and were not available to use. Folks with R390's were not even acknowledging that the even existed. Radios or people. The R390/A were cooler than the R390/A. This was a consideration in the air conditioned trailers most of the DF site people worked in. Roger. AI4NI

Date: Sun, 4 Feb 2007 14:53:14 EST
From: Flowertime01@wmconnect.com
Subject: Re: Transplanting R-390 IF modules to R-390A

I had a lot of op's claim the R390 was a better CW receiver for working in the noise.

Date: Wed, 7 Feb 2007 11:02:50 EST
From: DJED1@aol.com
Subject: [R-390] Strange modulation on carriers

I finished tweaking all the adjustments on my newly recapped IF stage and started checking on the PTO runout. When I would tune through the calibrator signal with BFO off I get a modulation, which varies somewhat with where in the passband I tune. It's there for all bandwidths, and I'm not sure if it was there before I took the IF module out. Strangely, it occurs on all the bands below 8 MHz, but not above. I assume it's modulation of the 17 MHz
oscillator, and will check it out when I remove the RF module for recap. Has anyone seen a symptom like this? Any suggestions for troubleshooting it? Other than that, the project is going as planned.

Date: Wed, 07 Feb 2007 11:34:14 -0500
From: "Tim Shoppa" <tshoppa@wmata.com>

Subject: Re: [R-390] Strange modulation on carriers

FM'ing of the 17 Mc oscillator, with the deviation strongly correlated to the AGC action (thus you noticing it as you tune through the calibrator), is commonly noted. In my experience it is a few hundred Hz in the "bad" cases but maybe it's more or less for you. It is partly a design flaw but for example a flaky 17Mc crystal will be more pulled than a good strong 17Mc crystal. This is probably at least one of the reasons why surplus 17Mc crystals are hard to find!

Some blame this on B+ regulation (or lack thereof) and this is possible too. You can determine whether it's B+ regulation or AGC action by turning off AGC.

In one of my particular 390As, replacing R211 (which was high by several hundred percent) and R209 (which was charred black) made the problem much less evident. Yeah, I still hear some whoop-whoop on strong CW with AGC on, but it's a reminder that I don't like AGC on CW anyway!

Unfortunately I did not independently replace R211 and R209 to see which one was responsible for the fix. Yeah, guilty of shotgunning, but resistors that are high by several hundred percent or already burnt to a crisp deserve a lot more than a shotgun!

Date: Wed, 7 Feb 2007 11:06:32 -0800
From: "David Wise" <David_Wise@Phoenix.com>
Subject: 17Mc crystal (was RE: [R-390] Strange modulation on carriers)

Just to fill in some background, I believe that this is mentioned in the Cost Reduction Report. The maximum frequency of crystals of the desired characteristics had just passed 17Mc. They didn't want to use it, but other considerations won. I'm working from rotted-out memory here; if anyone knows the story more correctly, please follow up.

Date: Wed, 7 Feb 2007 14:53:54 EST
From: DJED1@aol.com
Subject: Re: [R-390] Strange modulation on carriers

Tim- Thanks for the information- at least I know I'm not dealing with gremlins. I was going to pull the RF module anyway, so I'll check for burnt resistors. I've got one spare crystal so I can try that also.

Date: Wed, 7 Feb 2007 15:31:40 EST
From: DJED1@aol.com
Subject: Re: [R-390] Strange modulation on carrier

Strange- I went down to the workshop to try a few measurements based on Tim's suggestions. But in order to check performance without AGC I had to use the signal generator, rather than the calibrator. Wow- no modulation at the same signal levels. So it seems to be an interaction between the calibrator and the 17 MHz oscillator. I reconfirmed that the modulation exists on the Cal signal. Guess I've got a mystery to solve, unless someone has already done that. Ed

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Date: 13 Feb 2007 14:42:26 -0000
From: "n4buq@knology.net" <n4buq@knology.net>
Subject: [R-390] R390A Update

Many weeks ago, I posted some pictures of the replacement AGC capacitor:

http://www.knology.net/~thelanding/R390A/AGC/AGCReplacement1.jpg
http://www.knology.net/~thelanding/R390A/AGC/AGCReplacement2.jpg
http://www.knology.net/~thelanding/R390A/AGC/AGCReplacement3.jpg
http://www.knology.net/~thelanding/R390A/AGC/AGCReplacement4.jpg

I finally got around to reinstalling the IF deck into the radio and tested it. It works great. Almost no differences in Carrier Level readings when switching between the AGC settings.

Also, a few weeks ago, I asked about a good replacement for the 100-ohm carrier-level pot. I had a 100-ohm ten turn pot, but the connection pins were rather small and it was going to be a pain to mount the 22-ohm resistor along with the other wiring. I started searching for another replacement and found a 20-ohm single-turn wire-wound pot made by Clarostat. This pot works fine and eliminates the need for the 22-ohm parallel resistance. The drawback (it always seems there's one) is it has 1/4" threads instead of 3/8" so you have to shim it with some appropriate washers. It has a locking tab that doesn't match with the original so you either have to shim it underneath, clip the tab off, or drill another locking hole. I opted to shim it for now with some 1/4" stainless steel washers. I plan to make an adapting collar for it that will accomodate the existing locking-tab's hole and center the 1/4" shaft in the 3/8" hole, but for now it works fine. Just thought I'd pass this along as another possible solution for the carrier-level adjustment issue.

Date: Sun, 18 Feb 2007 14:32:59 -0500
From: "Jim M." <jmiller1706@cfl.rr.com>
Subject: Re: [R-390] Strange modulation on carriers

I have been chasing a whoop-whoop "chirp" on CW (with BFO turned on) heard when received on this 390a, but not on the actual signals. The CW note would tend to chirp on strong signals with AGC on. I measured the frequencies of all oscillators with a calibration signal into the receiver, keying it on and off so the AGC would jump. This caused the chirp, but it appeard to be the BFO frequency that was being pulled with AGC, not the other oscillators. I noticed the B+ to the IF stage varying a few volts with AGC action. (Changing AGC causes other tubes to draw more or less current, hence causing slight fluctuations in the B+). Changing out the 6BA6 BFO tube V505 reduced the chirp considerably. I believe that the older 6BA6 tube may have been more susceptible to instability caused by B+ variations. Jim N4BE

Date: Sun, 18 Feb 2007 22:07:41 -0500
From: "Jim M." <jmiller1706@cfl.rr.com>
Subject: Re: [R-390] Strange modulation on carriers

More theorizing: I notice the pulling of the BFO frequency (causing the "chirp") tends

to be more noticable when the BFO is tuned very close to the signal frequency in the IF (near zero beat). I have read of a phenomenon in older radios where a very strong signal in the IF, coupling back into the BFO, can cause the BFO to pull in toward the frequency of the strong signal (sort of a phase lock effect). During the AGC attack time, a few milliseconds, the IF stages are still at max gain resulting in a very strong IF signal coupling back into the BFO, hence pulling its oscillation frequency slightly toward the strong signal. I notice this only on one of the two 390a's I have here - in a Motorola IF module. If I tune the BFO way off the signal (for a high pitch tone, or a BFO frequency further removed from the strong signal), the chirp is less noticable. So if this is happening I am not sure what the cure is, other than reducing the BFO coupling capacitor (which is now 12 pf between the BFO tube and the detector tube) - which would further reduce BFO injection and hurt product detector performance. Some older "valve" receivers even ran the BFO at half the IF frequency, using the 2nd harmonic for injection, to reduce pulling by strong signals. Just some random thoughts.

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?

<snip> BTW, ER also recently printed an article on a mod to the AGC system of the R-390A. The result is an almost perfect AGC system with no overshoot, and almost instantaneous rise time. It requires no added holes and only a few added components. It makes the R-390A an extremely good SSB and CW receiver, yet doesn't change its AM characteristics. The system and associated ideas are also applicable to many other receivers. I'll try to dig out that one too.

Date: Fri, 09 Mar 2007 14:28:44 -0800
From: "Kenneth G. Gordon" <kgordon2006@verizon.net>
Subject: Re: [R-390] REALLY SNAZZY AGC mod for R-390A

> > > BTW, ER also recently printed an article on a mod to the AGC system
> > of the R-390A. The result is an almost perfect AGC system with no
> > overshoot, and almost instantaneous rise time. It requires no added
> > holes and only a few added components. It makes the R-390A an
> > extremely good SSB and CW receiver, yet doesn't change its AM
> > characteristics.
> > If you happen to scan any schemtatic of that, please share it with the 390 list.

The entire article is important. The schematic alone won't be of much help, as there are things you must do that can't really be shown on a schematic. The ER in question is Number 208, September 2006, page 30, entitled, "A High Performance AGC for the R-390A" and written by Clark Hatch W0BT of Topeka, KS. Ray N0DMS the editor writes: "I have installed Clark's AGC circuit in my R-390A and it is a "keeper"!. My receiver has been used almost daily for nearly 30 years and I highly recommend this modification because it is the best performing AGC circuit I have ever used." In ER a few issues before this one, Ray published a two part article on some upgrades and mods he had made to his own R-390A, including one on a better AGC system. But Clark's works so much better than is own, that he removed his, and installed Clark's. Ray shows an accompanying test and a photo of an oscilloscope screen. When he

switched his sig gen from Off to On with a 0DB signal (224 mV) the rise time of the AGC system was measured at 611 microseconds, and there is NO overshoot or ringing.

For a second test, he used a +20Dbm (2.2 Volts!) input signal. Rise time was unchanged and total harmonic distortion was 4%.

Further, the annoying receiver blocking that occurs when switching from SLOW to MEDIUM is gone because C-551 can no longer discharge into the AGC line.

The earlier articles also show o'scope photos of the ORIGINAL AGC system, and there is really terrible overshoot and ringing.

Date: Sat, 10 Mar 2007 10:17:54 -0800
From: "Kenneth G. Gordon" <kgordon2006@verizon.net>
Subject: RE: [R-390] REALLY SNAZZY AGC mod for R-390A

> I've seen the articles and I have the receivers but I need to talk
> with someone who has actually done the mod.

I would suggest talking with Ray Osterwald, N0DMS. He is not only the editor of ER, but is a very competent tech and VERY easy to talk with. The telephone number for ER is on their website at: http://www.ermag.com/

>One of my receivers was modified with what was to have been the best of the
>best mod but it works after a fashion with all the AGC and then some.

I don't understand this statement. Sorry. I DO know that there have been many, many attempts to incorporate a really excellent AGC into the R-390 series. Some work better than others, some aren't really any better than the original, and some are actually worse. However, Clark Hatch's appears to be a real winner.

> > I use 390As. in fact I got rid of my 51j-4 and the R-725 beats it hand
> down. Question is have you modified any units relative to the two
> articles involved?

Not yet, but Clark's is certainly on my list. I have a really excellent R-390A which one of our list members sort of traded to me a while back, which I have never yet turned on since I don't want to lose any filters. I intend for that one to become my main station receiver. Now, many years ago, I DID modify the AGC system in an R-390A to my satisfaction for use when doing AFMARS phone patching into Vietnam, and I have also modified an R-390 by adding a triode product detector to it. I used 1/2 of that dual triode which ordinarily feeds the IF out to a jack on the back, so I didn't add any holes or extra tubes. It made a big difference in recovered audio and signal-to-noise ratio on SSB.

Date: Wed, 14 Mar 2007 21:50:55 -0600
From: "Barry" <n4buq@knology.net>
Subject: [R-390] Distortion in MGC on strong signal

When tuned to strong stations in MGC mode, my R390A is driven into distortion. Monitoring the Diode Load, I'm seeing approximately -60V when tuned to a strong station. Backing the RF Gain control to where the Diode Load reads more around -30V causes the signal to sound normal again. Switching to AGC (any AGC speed) causes the Diode Load to drop to about -30V and the signal sounds normal as well. I can reduce the IF Gain to almost zero and cause the Diode Load in MGC mode to be around -30V with the RF Gain at "10", but I'm sure this is too low of a setting for the IF Gain Control. I've followed the manual's procedure (150mV into the IF deck and set for -7V Diode Load) as well as backing it off slightly for Chuck Rippel's procedure so setting i far enough back to keep the Diode Load down to an acceptable level when the RF Gain is at
"10" is not the correct solution. I assume the radio should not be acting this way, right? If not, any suggestions on where to look for problems?

Date: Wed, 14 Mar 2007 23:17:27 -0400
From: "Jim M." <jmiller1706@cfl.rr.com>
Subject: Re: [R-390] Distortion in MGC on strong signal

My radio is also driven into distortion in MGC unless I back off the front panel RF gain. What you describe seems to be normal behavior on strong signals. Things work much better with AGC on, that's why there is an AGC circuit. In fact I leave my AGC on all the time.

Date: Thu, 15 Mar 2007 05:58:58 +0000
From: eldim@att.net
Subject: Re: [R-390] Distortion in MGC on strong signal

I find that this seems to be NORMAL BEHAVIOR for any receiver that operates without an AGC circuit, with the audio being distorted in the presence of strong signals. Thank goodness for AGC, for without it you would always have to fiddle with the RF Gain Control to deal with varying signal levels. I do find the MGC Mode to have it's advantage when trying to pull in very weak signals. My nickels worth.

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

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

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

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

Date: Sat, 14 Apr 2007 20:22:16 -0700 (PDT)
From: Masters Andy <nu5o@yahoo.com>
Subject: [R-390] W0BT and N6PY mods in ER Magazine

Good evening list. Recently, I decided to modify my R-390A based on the September 2006 issue of ER magazine.

I made the following mods: <snip> 2. N6PY's detector mod. This was a bit more challenging but well worth the effort. SSB sounds fabulous now on the receiver. I initially ended up with increased distortion on AM but, based on the advice of Ray, N0DMS, I changed out the disc .01 cap I was using as C2A to a mylar and then changed its value to .022 which worked better for me-passing more low end audio. The distortion went away.

3. W0BT AGC mod. A big step but also well worth the effort. My R-390A came to me already with the Rick Mish SSB AGC Mod on the back terminals and the Langford AGC mod. Removing the Mish mod was no big deal but moving from an undocumented Lankford mod to the new circuit was tedious. There is a typo on page 32, item 6 (should always read 0.1uf) but the article is very easy to follow and mine worked the first time.

I did have a few questions about the alignment procedure but Clark and Ray wrote the procedure out correctly and my issues were a short between the headsets...

In aligning my unit, I used my TEK 2465A scope to monitor the IF output waveform and the audio out waveform at the speaker while using a RMS Voltmeter to measure the line output on the top side of the line out pot. I looked for symmetry in the modulated signal and tuned T503 and Z503 as suggested in the article. It does make a difference. I made a serious mistake of trying to tweak T501 and T502 on my IF board. My slugs on these two transformers are tight and when I applied lug nut torque to T501, I promptly twisted the coil form right around ripping the transformer wires right off the vertical wires that hold the caps and resistors in place on the coil forms. If you have never resoldered
those thin wires-it is no fun.

Over all result is a much better AGC system, a noise limiter that functions better, and a nice SSB product detector that sounds really good. <snip>

Date: Thu, 19 Apr 2007 11:18:37 -0500
From: "Bill & Becky Marvin" <wmarvin@hickorytech.net>
Subject: [R-390] R 390A Work in Progress (Long)

I recently bought a Collins R390A that has or had many issues but in great physical shape. I recapped the IF module so far, AF & RF decks to go. I seems to receive well however but overloads on moderate to strong signals.....yes the AGC jumper is on the rear. Reducing the RF gain corrects this overload,, all tubes tested fine. My question is this.....I haven't aligned any modules or recapped the AF,RF decks could

this be the problem?? I have tried turning the IF Gain lower. I am unable to work with the IF in the radio (no jigs).

Date: 19 Apr 2007 16:36:50 -0000
From: "n4buq@knology.net" <n4buq@knology.net>
Subject: Re: [R-390] R 390A Work in Progress (Long)

Silly question, maybe, but you are in AGC mode, right? If it were me, since the IF module has been worked on, I would check the alighment there.

Date: Thu, 19 Apr 2007 09:39:48 -0700
From: "Craig C. Heaton" <wd8kdg@worldnet.att.net>
Subject: RE: [R-390] R 390A Work in Progress (Long)

Have you checked or replaced C551? It's the 2uF oil filled cap in a large metal can on top of the deck. Both of the two R-390/A that I've restored had bad C551's. Check this cap both for value and insulation resistance. If in doubt and you want to replace it, you could mount a new one under the deck. I've got lots of time and use a dremel tool with a cut-off wheel to open this cap on the bottom. Cut along the soldered seam close to the edge, use a wood screw to pull out the old foil & paper. I've seen two types of connection to the rubber mounted solder posts. Some are crimped; these will have to be drilled & tapped to add a screw and solder post. Another was real easy with holes where the lead of the cap passed through to the outside and soldered. A NTE MLR205K630 fits inside perfectly, values are 2uF @630 volts.

Date: Thu, 19 Apr 2007 22:07:17 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] R 390A Work in Progress (Long)

Check the tube types once more to make sure you do not have a wrong type plugged in somewhere. There are a lot of substitutes that work or almost work accept for some side effects that vary with tube type and socket inserted into. We do not know all the wrong possibilities.

Most likely you still have a bad cap somewhere. As reducing the gain helps, the clue is that large signal voltages get distorted. As you check caps solder joints and out of range resistors, there are some better values that can be used in the replacement process for the caps. Read the pearls of wisdom for the specific caps that when replaced provide better audio fidelity.

Some tube plate resistors go bad. A tube gets run to the point of almost smoking a plate cap and then gives up and dies. The tube gets replaced when it died, the receiver returns to operation and no one looked at the toasted plate cap. Hay on visual they look OK. They are not charred.

You will just need to do some real time trouble shooting.

Divide and localize. Into the IF deck with 455KC and audio looking for that -7 volts on the diode load, the 1/2 watt out of the local on the back panel and that 30: 1 signal to noise difference.

If you have not got that in the IF and audio deck you know there is a problem in those decks and no amount of work on the Rf end will mask that IF and audio problems.

Good luck, You can fix it. It just will take you some time.

Enjoy yourself along the way.

Date: Fri, 20 Apr 2007 22:48:36 -0500
From: "Richard" <theprof@texoma.net>
Subject: Re: [R-390] R 390A Work in Progress (Long)

> ..... however but overloads on moderate to strong signals.....

I had the same problem and it was in the noise blanker circuit. If turning on the noise blanker clears it up look for a bad cap in the IF deck in that area.

Date: Sun, 6 May 2007 13:10:24 -0500
From: "Bill & Becky Marvin" <wmarvin@hickorytech.net>
Subject: [R-390] Re: IF Trouble (Making Progress?)

My progress has stopped after recapping it but the AGC wasn't working. I found that T503's secondary was open and R525 was cooked.. T503 and R525 were replaced and now my 390a has no receive not even IF hiss.

I checked my work many times.....can someone provide a .jpeg or two of the T503, L502 V504 area on the IF? I can hear some RF gain noise when turned full. All tubes are fine. Did receive before replacing T503 etc. The 390a sounds muted.

Date: Sun, 6 May 2007 20:06:09 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Re: IF Trouble (Making Progress?)

You may have to crank up the audio generator and RF generator and start injecting some where in the audio deck and work back to the IF one tube and cap at a time. Your current problem way not be the results of your work. Some other wire broke while you were working on your problem. Just the luck of the draw and some other parts wants some equal time and attention.

Date: Wed, 13 Jun 2007 12:29:06 +0000
From: "Gene Dathe" <dathegene@hotmail.com>
Subject: [R-390] dB loss when switching filters

One of my IF decks has a quite noticeable dB loss when switching to the 8 kc filter. I know this is a common problem; can't seem to find it in my archives... which mica cap am I looking for?

Date: Wed, 13 Jun 2007 19:50:20 +0000
From: "Gene Dathe" <dathegene@hotmail.com>
Subject: [R-390] dB loss when switching filters Problem solved!

Well, I set up the signal generator and was getting going, had the rig warming up, ready to go, took the cover off the filters, and PROBLEM DISAPPEARED! I found that when the nut on the cover was not tight, no problem, but when hand tightened that last half turn, suddenly output dropped.

Inside the cover I can see scratches where the cover contacts the leads that extend downward from the variable caps, where the mica caps are soldered on. Alternatively, perhaps the bundle of wires that are down on the bottom are being pinched when tighten fully. I removed some metal on the bottom of the cover to avoid any possible pinch point, then used some 3M heat tape to wrap around the exposed solder joints up top. Game over! Cover back on, will be enjoying the MN Twins tonight with the 8kc filter, sounds like your right in the Metrodome.... THANK YOU to all of you that responded for you helpful hints.

Date: Thu, 28 Jun 2007 01:01:14 +0000
From: "Gene Dathe" <dathegene@hotmail.com>
Subject: [R-390] overmodulation

I have noticed an overmodulation problem that has me stumped. When listening to the MN Twins, when they get a hit and the crowd noise rises in the background, the announcer's voice get distorted and over modulates. Hard to follow the game and the play at the plate! Usual AM talk show fare like Rush Limbaugh is perfect. The AGC is working fine, I've tried manipulating ALL the controls with no audio effect; reducing the RF has no effect, AGC or MGC. Might this be an AF problem, something a push-pull system might avoid? Thank you in advance for your valuable time.

Date: Wed, 27 Jun 2007 21:12:16 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] overmodulation

Are you reasonably sure the original signal is ok? The guy on the mix console may have had an extra beer or two ....

Date: Wed, 27 Jun 2007 20:25:31 -0500
From: "Bill Hawkins" <bill@iaxs.net>
Subject: RE: [R-390] overmodulation

You do remember that the Humphrey Dome is one of the loudest stadiums ever built, no? Now the team holds us hostage for a new stadium. Did I say the team? Incorrect, the owners hold us hostage and our Republican governor wants to accommodate them while reducing school and law enforcement resources. We have a Taxpayers League that wants their taxes reduced no matter what the effect on a once-great society. So it goes.

Date: Wed, 27 Jun 2007 21:13:49 -0500
From: "Rick Brashear" <rickbras@airmail.net>
Subject: RE: [R-390] overmodulation

Sometimes I have to turn the RF gain back a bit even when the AGC is in line to keep

from getting distortion on strong signals.

Date: Tue, 3 Jul 2007 22:54:41 -0500
From: "Barry" <n4buq@knology.net>
Subject: [R-390] C551 Replacement

A few months ago, I posted some pictures where I replaced C551 with an octal socket/plug combination. I really wasn't fond of the way that looked so I came up with another idea. Check out the following pictures:

http://www.knology.net/~thelanding/R390A/AGC/NewC551-1.jpg
http://www.knology.net/~thelanding/R390A/AGC/NewC551-2.jpg
http://www.knology.net/~thelanding/R390A/AGC/NewC551-3.jpg
http://www.knology.net/~thelanding/R390A/AGC/NewC551-4.jpg
http://www.knology.net/~thelanding/R390A/AGC/NewC551-5.jpg
http://www.knology.net/~thelanding/R390A/AGC/NewC551-7.jpg
http://www.knology.net/~thelanding/R390A/AGC/NewC551-8.jpg

Date: Tue, 3 Jul 2007 23:00:06 -0500
From: "Barry" <n4buq@knology.net>
Subject: Re: [R-390] C551 Replacement

I should add that this is a no-new-holes modification and, yes, I know the old cap can be restuffed, but I'm just not crazy about putting a torch to an oil-filled capacitor...

Date: Wed, 4 Jul 2007 10:40:43 -0700 (PDT)
From: "W. Li" <wli98122@yahoo.com>
Subject: [R-390] re: C551 replacement

Wow, that is a very slick solution, that fits right into the 60's design of our 390's. The machined Al box is beautiful!

Date: Wed, 04 Jul 2007 15:00:16 -0400
From: Barry <n4buq@knology.net>
Subject: [R-390] re: C551 replacement

I found the 1" x 2" x 1/16" wall rectangular tubing online so all I had to do was machine the top and bottom plates. Not too difficult, but just getting time on a mill is not that easy for me. I have a friend who has a very nice table-top machine with DRO, etc. Nice little machine, but I do limit what I ask him to let me do just because I hate to impose on his time. I sure wish I had room for one of those (or a Bridgeport!) in my garage...

Date: Thu, 5 Jul 2007 11:04:22 -0500
From: "Don Reaves" <don@reatek.com>
Subject: RE: [R-390] C551 Replacement

Nice work, nice photos, Barry.
Anodize your housing and it would look totally appropriate.

Date: Thu, 05 Jul 2007 12:19:09 -0400
From: Barry <n4buq@knology.net>
Subject: RE: [R-390] C551 Replacement

Thanks, Don. I'd like to have several small AL items I've fabricated for the radio alodined, but the folks who do that get lots of $$$ for their services. I had two R390A chassis alodined and it was pretty expensive. The bare AL does look stark in contrast, though.

Date: Thu, 5 Jul 2007 16:04:54 -0500
From: "Don Reaves" <don@reatek.com>
Subject: RE: [R-390] C551 Replacement

I have not tried these myself (yet!), but these kits might work for small jobs.
http://www.aircraftspruce.com/menus/cs/metalprepsupplies.html

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Date: Fri, 6 Jul 2007 17:59:45 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] C551 Replacement

Nice replacement job on the cap.
I like the photos,
So much easier to understand than any words.

Date: Wed, 25 Jul 2007 09:31:39 -0700
From: "David Wise" <David_Wise@Phoenix.com>
Subject: [R-390] Request for data: AGC voltage on R-390/URR

Can someone get me a bit of data?

I'm working on a writeup for a mod that allows one to use an ordinary (non-18-ohm) meter in the Carrier position. I have an R-390A, but not an R-390. I need to know the AGC voltage at 100dBuV, i.e. 0.1Vrms on the balanced antenna terminals. To keep it comparable to my R-390A data, please do this at 1450kHz, and measure the voltage at the antenna jack. If you have time, please also measure the no-signal voltage at 6AK6 pin 7, and the receiver-off resistance to ground. (The manual contradicts itself.) Most of the credit for this mod goes to Gary Gitzen and Pete Williams. Their results prompted me to develop it further.

Date: Sat, 11 Aug 2007 20:43:39 -0400
From: Scott Bauer <odyslim@comcast.net>
Subject: [R-390] Z503 repair

I am sure several out there have repaired Z503 in the " A " IF. Is that fine wire insulated? Will the soldering iron melt or strip the insulation for me when attempting to solder it? The core has broken of the transformer. Is Crazy glue the epoxy of choice? I want to be able to align it without worry of tearing those super fine wires off again.

Date: Sat, 11 Aug 2007 21:10:21 -0400

From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] Z503 repair

A *hot* iron will take the insulation off of the wire. Some of the new "controlled temperature" irons don't get hot enough to do the trick on some types of wire.

Crazy glue works fine, just be *very* sure you get everything lined up right if you are going to use it. You want the core to be dead straight when you are done.

Date: Sat, 11 Aug 2007 21:31:57 -0400
From: Scott Bauer <odyslim@comcast.net>
Subject: [R-390] Z503 repair / Thanks Everyone!!

Thanks to everone for the help. I have the information I need now.

Date: Sat, 11 Aug 2007 22:54:34 -0400
From: Scott Bauer <odyslim@comcast.net>
Subject: Re: [R-390] Z503 repair / Thanks Everyone!!/ 30 minute job

It took a total of 30 minutes to repair the torn off wires on Z503. It was a super easy job to boot. Thanks one more time everybody.

Date: Mon, 13 Aug 2007 15:20:16 +0100
From: "Graham Baxter" <graham@delphe.co.uk>
Subject: [R-390] Z503, AGC amplifier anode coil

I just had to rewind Z503 on my current project, EAC SN 162.

I was able to pick the coil and former out from above after desoldering the top paxolin plate. The glue used for assembly will soften and crumble with the heat from a soldering iron. The ferrite cup was fixed to the coil using the same glue. By running the iron around the top edge and gradually pulling and rocking the former it all pulled out without breaking the ferrite. It got too hot to hold with the bare hand though. The cup needed some patient scraping to remove all the glue debris.

The middle pie of the three had rotted and turned green. This explained the 700 ohm resistance instead of 17. In case anyone is interested I can confirm that Z503 has three identical pies, each wave wound with 120 turns of litz. The litz has 5 strands of 0.002" (0.05mm) enamelled wire. Since I was disinclined to use a wave winder (I do have one in the loft, but I have never understood how to use it!), I random wound it using rubber washers as spacers. The washers were lightly oiled before winding. As each pie was completed I soaked it in superglue to make it self supporting. On completion I removed the washers by melting a small hole through the edge of each one and picking them out with tweezers. I consider myself fortunate that my new coil will peak up with the original 82 pF capacitor; I was quite prepared to select a new value if necessary.

Date: Mon, 13 Aug 2007 11:46:05 -0400
From: Gord Hayward <ghayward@uoguelph.ca>
Subject: Re: [R-390] Z503, AGC amplifier anode coil

Good stuff Graham. I rebuilt mine using a different coil that I had in my junk box. I did have to change the capacitor to get it to resonate. The coil should have lots of inductance to get the Q up to give a good resonant plate impedance. Your experience with the glue was a lot better than mine. I couldn't get the ferrite cups off at all.

Date: Mon, 13 Aug 2007 14:32:15 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Z503, AGC amplifier anode coil

Your work is inspirational. It is nice to know we will be able to fabricate some of these parts as spare parts are truly depleted. Nice story

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Date: Thu, 16 Aug 2007 09:06:13 +0100
From: "Graham Baxter" <graham@delphe.co.uk>
Subject: [R-390] Re: [R390] R390A trimmers

I did manage to get all the trimmers working again. The problem was that the lower ceramic disk was no longer anchored by the rubber to the paxolin. I dismantled the trimmers and washed them in alcohol. I also polished the silvering where the spring contact will press. I was then able to reassemble them using a spot of cyanoacrylate adhesive either side of the rubber. This has worked well. One of the trimmers had a broken ceramic disk. I reassembled this with cyanoacrylate glue. I bridged the crack on the silvered part by soldering a piece of copper foil across it. I would have liked to use conductive silver paint but I didn't have any. This trimmer at least is scheduled for replacement when I have spares.

I found my 9MHz crystal was poor. I tried a cheap HC47 wired crystal, just poking the wires in the holder, and it worked fine on 7, 15 and 24 MHz. So I opened the old crystal, removed the blank and replaced it with the entire new crystal. I replaced the can and it looks great. Interestingly there was a tiny fracture at the edge of the old blank.

R390A s are not so common in the UK. I am fortunate to have a couple of friends who are enthusiasts. As well as two EACs I also have a Racal 1772. It is good but not as good as an on-song R390A. Thanks for your interest

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Date: Wed, 14 Nov 2007 17:40:25 -0500
From: wabate <wabate@verizon.net>
Subject: [R-390] Rice Krispies Exorcised from my 390A

Thought I was done with the restoration project. Even had the Cosmos tracking well when a lightning storm was heard in the speaker. Narrowed it down to the IF module. Thought I had it when I discovered a previous owner had substituted a 6AU6A for a 6BA6. Thought I killed two birds with one stone when it came back. Sometimes it took a few hours to occur. That's how I found it, I was doing an 8 hour burn in. Thought I had it a few times replacing some discs. Then I narrowed it down to the 3 resistors around V501. Seemed strange but I have come across resistors doing that. So I bypassed each resistor with another but got no noticeable change.

Then I noticed the plate choke. On a whim I bypassed the choke and the noise disappeared.
Dang! I replaced the choke (L505) with something from the junk box and the receiver has been quiet for 7 hours. I offer this up for anyone on a similar mission. Even though the choke is sealed there must have been some arcing between winding layers.

Date: Tue, 20 Nov 2007 10:44:16 -0500
From: Charles A Taylor <WD4INP@isp.com>
Subject: [R-390] 51J-4 IF gain set

Does anyone know of a reference in the Collins 51J-4 instruction book to setting R-187 IF gain-set? (in the cathode circuit of V108 (6BA6).

Date: Tue, 20 Nov 2007 12:08:18 -0500
From: Roy Morgan <roy.morgan@nist.gov>
Subject: Re: [R-390] 51J-4 IF gain set

I found the article in HSN about this: "Another potential cause of insensitivity on all bands is R187, a 10K ohm screwdriver adjustable pot with lock nut beside the BFO pitch shaft, which determines the gain of the 3rd IF amplifier. My manuals have no instructions for setting R187. I have assumed the correct setting is determined by the J4 (500 KC) IF performance test per paragraph 5.3.7. In my experience, the 500 KC IF performance criterion is met with R187 set near minimum resistance (nearly maximum gain of the 3rd IF amplifier). For J3's and R-388's this setting may be considerably different because the J4 has mechanical filters which in turn have considerable insertion loss. If anyone has any information or opinions on this, please write me so that we can share the information with other Hollow Staters. "

I found this in the HSN document called "Selected Reprints from The Hollow State Newsletter - Issues 1 through 30 Collins 51J's, Hammarlund & Other Receivers 2000" the first reprint is: [Lankford, Issue #20, pgs 3-6] which begins the compilation of articles:

HSN-Hammarlund.PDF Issue 20 can be found on the HSN wibsite http://www.hollowstatenews.com/ under Archives - Older Issues.

The direct link to that issue is: <http://site298.mysite4now.com/barryhauser/archives2/HSN-Issue20.pdf>

The compilation is on the HSN website under "Best of Hollow State", "<http://site298.webhost4life.com/barryhauser/archives/HSN-

Hammarlund.pdf>Hammarlund Also includes Collins 51-J & other receivers "

I see R-187 shown in a photo in the 51J-4 manual 4th Edition, 09-58.

This is titled "Communications Receiver 51J-4 ... Collins Radio Company" and has the dates 1957 - 1958 on the title page. Paragraph 5.3.7 in that manual can be summarized as:

... AVC-off. 500 Kc signal to pin 7 of V106. VTVM on Diode Load resistor to chassis. Input to pin 7 of V106 should be between 25 to 40 uV for 4-volt reading at diode load.

Date: Tue, 20 Nov 2007 12:22:26 -0500 (EST)
From: <wf2u@starband.net>
Subject: Re: [R-390] 51J-4 IF gain set

A long time ago I read somewhere - it may have been even in the version of the 51J-4 manual I have; I'll have to dig it out and look at it - that the pot is set for the compromise between maximum gain and minimum noise...

In my 51J-4 when I aligned it last about 8 years ago, I set it near the minimum resistance, just before the noise became perceptively more intense.

BTW I'm looking for the metal lever for the filter switch, as mine has a non-original concentric knob for the filter switch/phasing.

Date: Tue, 20 Nov 2007 12:56:58 -0500
From: Charles A Taylor <WD4INP@isp.com>
Subject: Re: [R-390] 51J-4 IF gain set

Thanks to everyone for the observations on the 51J-4 IF gain set pot. It's in the instruction book, and it took me a while to find it. Apparently it's not as critical as the IF gain set pot inn the R-390A.

Date: Wed, 26 Dec 2007 13:04:24 -0500
From: "Harold Hairston" <k4hca@alltel.net>
Subject: [R-390] R-390A BFO PROBLEM

Ever since the 3TF7 Ballast tube went out, I have had a BFO problem. I need to get to the BFO Tube socket beneath the chassis.

To do this safely, I need to pull the BFO drive shaft forward. But I can't get the coupling unit nearest the BFO Tuning Unit to release. I have removed both set screws and put a few drops of penetrating oil in the holes with no success.

However, I can hold the shaft coming from the tuning unit with long nose pliers and can turn the coupling unit with my hand.

I am reluctant to put more pressure in this area in fear of damagng the tuning unit or the "Bellows" type device between the two shafts. I must be missing some thing here. Right???

Thanks for any suggestions.

Date: Thu, 27 Dec 2007 11:14:13 EST
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] R-390A BFO PROBLEM

The problem is a burr on the shaft inside the bellows. Even though you have both spline screws out of the end of the bellows coupling the bur still has the shaft lodged into the bellows.

There are a couple things you can do.

Option one, if the IF deck bushing is installed with the nut to the inside of the IF deck, some are some are not, you can remove the nut from the chassis bushing, remove the spline screws from the BFO end of the bellows, compress the bellows off the end of the BFO shaft, tilt the shaft and bellows a bit, and work under it.

Option two, you can grip the bellows hub at the extention shaft end, with a pair of pliers, put a knob back on the shaft section and thus use the knob for leverage and the pliers to hold the hub. This should give you enough leverage to dislodge the shaft from the bellows coupler.

Once you get it apart you can clean the burs off the shaft with a file. You will likely need to clean a bur off the shaft from where you installed the knob. You need that end of the shaft clean as it goes back into the shaft extension bushing. When you reassemble the bellows coupling you will want to expand the bellows a bit (1/8" inch) so that as the BFO shaft screws in and out over the tuning range zero is in the middle of the bellows travel. There should be about equal stress on the bellows as it travels from -3 to 0 to + 3. about 270 degrees of rotation. New replacement bellows are available at a cost. Good used bellows are vailable. Getting out the acid core solder and a torch, the bellows can be rebuilt. The bellows will unsolder from the brass hubs and can be reworked if they have been abused.

But think ahead a bit, when you reassemble the parts. Clean all the burs off the shaft so it works nice in the bushing, fits nice into the extension shaft, and fits nice into the bellows hub. Some mechanical alignment may also be in order. The BFO can should line up with the shaft center line with no offsets of angle. Exact may not be achieved. But what you had did work and would still be OK. Just get it back to gather as nice or better than it was before you took it apart. You can grab the hub with a pair of pliers and apply force to the shaft to twist things apart. Just grip things on the correct end so you are not applying force across the bellows. Roger AI4NI

Date: Fri, 28 Dec 2007 13:53:01 EST
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] BFO Problem

I put this back out on the reflector to share it with every one for several reasons. First you have a real problem in your BFO and more input on solutions is always good. Second there are many more readers of the reflector that collect the wisdom and insight for their own knowledge. Third the reflector gets archived by date and subject. Many people who are not regular subscribers of the reflector will read the archives for days to find posting about a problem they are having and find tips and inspiration to help them solve the problem they are having. I hope you do not mind your subject being posted this way. Roger.

Harold, You sent me the following post.

I still have the BFO problem. I have determined that it is an intermittent problem that was running me crazy before I found that it is intermittent. It is more off than on. Problem is that at V-505, the BFO tube, should be 86 volts. From cold start it is OK but then it slowly climbs to 223 volts! I have been able to sectionalize to the IF sub chassis and that is about it. With a few exceptions, voltage and resistance measurements are OK. I need to follow-up on those that are out of limits. Obviously, some component is changing value with heat. I certainly appreciate your interest and assistance. Harold,

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Harold,
BFO problems are mostly bad tubes and cold solder joints. This gets followed by the old caps going leaky. This gets followed by more cold solder joints from the cap replacement. I have had the shaft in Z502 seize and thus fail. My other problems with the BFO have all been solder joints. Today the big plastic caps are getting leaky and causing problems. The small caps are holding up well. IF you suspect a small cap is going open with heat as the receiver warms up, you can just touch a cap across it for a test. If the circuit comes back to life you may have found an open cap. My schematic notes are that the BFO B+ feed line voltage is 220 volts. Your reading of 223 volts is well within reason. But you are reading this voltage on the plate of V-505, the BFO tube. As you say it should be 86 volts. From cold start it is OK but then it slowly climbs to 223 volts.

So the plate goes to B+. This tells you the tube has stopped conducting. Mostly experience is the tube has stopped oscillating the control grid has accumulated a charge that leaves it below the cathode voltage and the tube is thus cut off. Oscillators are some of the most problematic circuit in electronics vacuum tube or other stuff. First eye ball the filament. The R390A BFO tube has a filament in series with the ballast tube and the VFO. As you do not report the whole receiver loosing signals as it warms up we can expect the filament string is in operating order.

You get two choices for the next procedure. Option one is a tube extender. Option two is to set the receiver up on the IF deck end and swing the IF deck out so you can probe the BFO tube socket. This is where you were needing to remove the BFO shaft and bellows coupling so you could just get to the tube socket. Working with the equipment you own you do what you need to do. You are likely going to need to solder something around that tube socket anyway so you may as well get the receiver up on end and the deck swung out for inspection.

Second consider the cathode. If the cathode circuit is going open as it heats up. the tube will stop conducting and the plate will go to B+. We expect the cathode to be at zero volts and conducting some current. If the cathode has more than a volt or two when you meter it, you are looking for a cold solder joint on pin 7 of the tube socket, pin 2 or 3 of Z502 (BFO coil assembly) or at the ground lug where pin 3 of Z502 is grounded. Cold solder joints are the most common problems in the BFO circuit. The pins of Z502 do not take a tin well. The pins are a stainless steel and got tinned as part of their manufacturing. Sometimes some acid solder is in order to get a good bond. Remove the whole assembly, then tin the lugs and clean every thing up good before you reinstall Z502. You can then solder the circuit back to gather with proper solder and flux.

The ground lugs in the IF deck are becoming problems. They are causing all sorts of problems depending which lug and which circuit is faulting. The solution is to just loosen the hardware and retighten it a couple times to break up the oxide in the mechanical joint.

Check pin 2 of the tube socket. The suppressor grid is grounded. Again you are looking for a ground lug oxide problem. It will likely meter OK with an ohmmeter. But after you massage the hardware, the problem just goes away if that was the point of failure. Other wise the hardware massage is just one more inspection that is inconclusive.

Check that C533 and C534 have been replaced. If replaced consider a cold solder joint. If the caps are the original plastic devices of ill-repute, get then changed out. These caps are just B+ line filters. A larger value cap would be OK. A voltage of 250 volts would be OK. 600 volt orange drops are nice.

What's there is there and likely OK. But if you need to do a replacement consider a 0.1µFD versus the 0.033µFD. The replacements will be smaller than the originals and leave some room for test probes. Back on topic, if C533 is shorting it will pull the screen grid down in voltage and the tube to cutoff. The plate will go to B+. The shorted cap will not likely pull enough current char the resistors. IF C534 is leaking you would not expect to see B+ on the plate. It would pull B+ down some but again not necessarily enough to char resistors. Over time these leaks could get bad enough to cause resistors to char. This is what we see from receivers that have set for long times while the caps keep degrading from age. Then when the receiver is power up, the caps leak enough to char some limiting resistor. You bring a new to you receiver home and power it on. After a week or so it quietly dies. Inspection discloses a smoked resistor. You likely do not even detect the smoke or smell as it resistor gets slow roasted.

Next step is the grid circuit. Again a cold solder joint is likely. As Z502 works from a cold start we expect the problem is not in the can itsself. In young receivers (68 -75) a bad Z502 was an open coil and could be found with an
ohm meter.

First check all the mechanical connections at the ground lugs. Second check all the solder joints on Z502. Third check all the solder joints at the replaced capacitors. Forth of course replace the tube.

Before you go into Z502 you may want to just replace C526 and C527. One is 100pf and the other is 5pf. Theses are not known problems and getting good parts can be hard to do. If you need these parts, ask here on the reflector. Someone may offer you the parts in an envelope from their stock for a couple dollars back in the mail.

If all this fails, then remove Z502 and open it up. There are a some caps inside and solder joints to inspect. There could be a cold solder joint inside.

If this does not lead you to a solution, send some more mail, Let us know what you have inspected and found. Hang a meter on some of the grids and watch what happens as the tube warms up. You likely cannot hang a meter on the grid without

pulling the tube out of oscillation.

For sure send a post back with what you find the problem to be. Good luck and have fun.
Roger AI4NI

Date: Fri, 28 Dec 2007 19:50:01 -0500
From: "Harold Hairston" <k4hca@alltel.net>
Subject: Re: [R-390] BFO Problem

No sir, no problem. I am getting closer. I got off on a tanget for a while because I began to wonder if all the B+ was high. It is not.

I am back in the IF chassis. Most all resistances are ok. I am double checking one or two. Most all voltages are a little high but B+ on the BFO Tube, V-505, is about three times what it should be. I am assuming that the correct B+ for this chassis is 240VDC. The 150 V regulated is right on the money (Though it is not involved in this sub-chassis).

This problem really bugs me because with this much voltage discrepency, I would expect to find an obvious component failure. I fully appreciate your help. I sent this back to both lists.

Date: Fri, 28 Dec 2007 18:37:33 -0800 (PST)
From: "Drew P." <drewrailleur807@yahoo.com>
Subject: [R-390] Re: R-390A BFO PROBLEM

> Once you get it apart you can clean the burs ..... Good advice, Roger. To that I would add: when you reinstall the bellows and tighten the setscrews, they will raise a burr that will cause the problem to recur next time you try to diassemble. I ground the cup point off the setscrews before reinstalling. The new slightly rounded point grips the shaft with no problems and does not mar the shaft.

Date: Mon, 31 Dec 2007 12:26:20 -0500
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] BFO Problem

Do you mean B+, or do you mean voltage on the plate? Everything that Roger wrote is right on the money. I cannot improve upon it. If you have close to B+ on the plate, then the tube isn't conducting for any of the reasons that Roger suggests. Again, please clarify if you mean that B+ is three times too high (720V instead of 240V? cannot believe it but...)

Date: Mon, 31 Dec 2007 13:30:46 EST
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Re: R-390A BFO PROBLEM

Right on and good point. (pun intended) This is a good idea for several of the set screws. The knob on the antenna trim comes to mind. You can stick the set screw on the end of the spline wrench with a bit of grease and use that to hold the set screw

against the grinding wheel. You are not likely going to be able to file the end of the set screws by hand. Roger AI4NI

To that I would add: When you reinstall the bellows and tighten the setscrews, they will raise a burr that will cause the problem to recur next time you try to diassemble. I ground the cup point off the setscrews before reinstalling. The new slightly rounded point grips the shaft with no problems and does not mar the shaft. Drew

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Date: Sat, 19 Jan 2008 16:05:41 -0500
From: wabate <wabate@verizon.net>
Subject: [R-390] R-390A BFO

Just finished the cosmetic restoration of another 390A. Its looking pretty good. Turned it on and was able to hear some stations without doing an electrical alignment. I started to check the various functions when I found the BFO was not working right. I could go from zero beat to a 3 KC pitch on the minus side but on the + side it would only go to about 1 KC. I took the shaft off and spun the BFO shaft with my fingers and every revolution it would go low and then high repetitively. Finally figured out this had to be an inductance problem. So I took the BFO apart. Never saw the insides before. Sure enough, it appears that the slug (or something) is against the pivot point at the end of the coil form and it wont retract. If I turn the shaft counterclockwise I can see the bakelite disc support flex as the slug tries to move out. So I'm against the stop. When I turn the shaft clockwise, it just unscrews. So the slug is jammed or something. Are there any articles on BFO repair? I don't remember any. Anyone been down this road? I can't be the first. Its difficult to understand what is going on mechanically as there are threads inside of threads. One is left hand and the other is right. I don't want to destroy anything in my learning process if I can avoid it. THis BFO was serviced by someone before as there are pliers marks on the outside collar. So someone has messed with this. There may even be parts missing! AARRGGHHHH!!!!

Date: Sat, 19 Jan 2008 16:48:32 EST
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] R-390A BFO

I just have not been into that can since about 1970. The BFO shaft should have threads on it so that it moves into and out of the BFO face plate assembly as the shaft is turned. This is why there is a bellows coupler between the BFO extension shaft and the BFO can assembly. The slug is threaded on the inside. The shaft is threaded on the end in the BFO can and coil. The two parts go together and are glued together. Your glue has broken loose.

As the shaft turns it should screw in and out of the BFO can and move the slug in and out of the coil The slug spins with the tuning shaft inside the coil. It sounds like your slug has come unscrewed / unglued from the shaft. This can happen because the BFO does not have a stop washer under the BFO pitch knob. Or the knob is set to far forward and thus the skirt tap does not catch on the stop washer.

First the shaft was run to minus BFO pitch until the shaft screwed out far enough to pop the slug off the end of the shaft. Then the shaft was run to plus BFO pitch until the

shaft drove the slug to the bottom of the slug's tube. You may need to do some more disassembly just to clean some bit of broken slug fiber out of the slug so the shaft will run back in to the slug cleanly. As the shaft and slug are inside the coil core you may have to disassemble the face and shaft from the coil to get to the slug and end of the shaft where you need to glue the two parts back together. If you can get the back end off the assembly you may be able to shake the slug out the back end of the coil tube, clean up the parts and glue the slug back on to the shaft.

Run the BFO shaft out as far as reasonable.

Thump the BFO, shaft first into the bench and get the slug to move away from the far end of the assembly. Pry the slug to toward the shaft a bit. Turn the shaft and try to get the slug to re engage the threads on the BFO shaft. If at first you do not succeed then try some additional disassembly until you can get things to go back together. If you break it for real, post a note here and ask if someone will sell you a good used BFO can. Someone likely has one in a parts deck. If you fix it then post us some details as to what it took to get it done.

Date: Sat, 19 Jan 2008 17:15:30 -0600
From: "Barry" <n4buq@knology.net>
Subject: Re: [R-390] R-390A BFO

If you decide it's not repairable, Fair Radio sells new BFOs.

Date: Sat, 19 Jan 2008 18:10:36 EST
From: DJED1@aol.com
Subject: Re: [R-390] R-390A BFO

I did pick up a spare BFO coil at Fair Radio and they may have some left. They had NOS BFOs when I bought one. If all else fails, try there.

Date: Sat, 19 Jan 2008 18:12:45 -0500
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] R-390A BFO

Fair Radio currently has the BFOs listed at $32.50

Date: Sun, 20 Jan 2008 23:15:48 -0500
From: wabate <wabate@verizon.net>
Subject: Re: [R-390] R-390A BFO

Glad to report that I made a mountain out of a mole hill! The slug had only separated from the tuning shaft. Unfortunately you have to remove the rear bakelite disc to get at the slug.

After you unsolder the leads that attach to the disc you need to straighten the twisted ends of the metal supports. Once that is done, just pull it off.

The slug fell out. It appears to be epoxied to the tuning shaft. Rather than clean off the old epoxy, I just reversed the slug and epoxied it in place. There is a hole that

goes all the way through the slug that makes this easy.

Reverse the disassembly and calibrate the BFO per the manual. Not that difficult at all. The hardest thing was pulling the can apart. It was sealed with an O-ring which was stubborn. Guess the PTO disassembly made me expect the worse. Works great now!

Date: Mon, 11 Feb 2008 18:02:34 -0600
From: "Larry WA9VRH" <wa9vrh@dishmail.net>
Subject: R-390a question

I have a question about MGC vs AGC mode. On my R-390a there is a substantial jump in gain when switching from AGC to MGC while I am tuned to nothing but atmospheric noise. I measured it with the line meter and the jump is about 12db.

I also measured the AGC terminal on the back of the set and the AGC sits at -1.8 volts in the AGC position with the same signal. In MGC the AGC voltage goes to zero. Does this sound right? The reason I ask is that I have noticed that weak stations are easier to copy in the MGC mode. I thought the AGC delay was supposed to prevent this.

Maybe the Lankford SSB mod (2 diodes) affects this?

Date: Mon, 11 Feb 2008 19:33:36 -0500
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] R-390a question

The IF gain setting will make the radio behave any way you wish it to going from AGC to MGC.

Date: Mon, 11 Feb 2008 21:46:55 -0500
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] R-390a question

Following Bob's lead, I guess you might try backing the IF gain down some. I think this should cause the receiver to go less into gain reduction and I'd expect the front end to pick up some noise figure improvement. AGC voltage would become less negative and the receiver should behave more like when in MGC.

Another thought is the possibility of a soft tube somewhere in the lineup. That could upset the sought after AGC delaying characteristics.

Date: Wed, 13 Feb 2008 13:03:45 EST
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] R-390a question

This is a clue you maybe have some good tubes in your R390 or the IF gain control is set to high.

Find that sweet quite spot on the dial again.

Set the Function switch to AGC.
Back the IF gain down until the AGC voltage drops off to zero.

You may slide to zero very nicely or the AGC voltage on the terminal board jumper may just go over a cliff to zero. If so then set the IF gain with just a little voltage. Try this for a few days and decide if you like the way the receiver sounds. It depends on if you are doing easy listening or trying to pull a CW DX out of the crud. Some applications like more IF gain and MGC mode while other prefer a more balanced receiver setup. Play with the IF gain against the RF and audio gains. There are differences in output beyond just the meter levels. To each his own.

Date: Wed, 13 Feb 2008 13:09:02 EST
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] R-390a question

I read your mail again. Your receiver is set to copy that @RARE@ weak CW DX in the MGC mode. A typical @@SPOOK@@ way to set up the receivers. If you do back the IF gain down some to get a zero AGC on antenna noise you will lose that 12DB you measured and that you use to detect those weak signals. Your receiver is acting very normal and your knowledgebase from experience is increasing.

Date: Wed, 13 Feb 2008 12:05:11 -0700
From: "Tony Casorso" <canthony15@msn.com>
Subject: Re: [R-390] R-390a question

Thanks to everybody on this. I had already used Chuck Rippels method of setting the gain which sets it much lower than the manual does. Based on recommendations here, I tried to turn down the gain until the MGC and AGC modes sounded similar at a quiet spot on the dial. I couldn't quite get there with the gain all the way down. I ran the receiver that way for about 5 minutes but it just didn't seem right so I set it back where it was. It seems to me that moving the gain all over the place would have a big effect of intermod/overload performance (the gain control is in the 3rd IF) and that setting it by the book probably is correct from this perspective. Chuck set it in order to optimize sensitivity I believe. I guess it depends on what you are trying to achieve.

Date: Wed, 13 Feb 2008 16:06:42 EST
From: SHELLY199@aol.com
Subject: [R-390] R-390a question (Tony Casorso)

Hope this will give you an assist with your AGC vs. MGC for your Lankford modified IF deck. I personally prefer the Lankford mod over the stock IF. The SSB is so easy to tune it's amazing. The mod does alter the AGC characteristics. With the mod, the AGC voltage for a specified RF input level is approx. doubled that of an unmodified deck. Also, the AGC delay no longer exists. Here are some number's I found in my notebook. This data was taken comparing two decks. One with the mod and one without. Both decks had been setup to give -7 volts diode load voltage in MGC with 455 KHz into P513 and 4 KHz bandwidth. The signal level into the IF deck was varied and the AGC monitored. Results are below. Note the RF and mixer stages are not in the signalpath.

Unmodified deck

Input level	AGC	
145uv	-0.00	this level is threshold of delayed AGC
150uv	-0.21	
300uv	-1.09	
600uv	-2.46	
900uv	- 3.23	
1mv	-3.42	

Modified deck

Input level	AGC	Diode Load	Diode Load in MGC
150uv		-1.77	-3.32 -7.00
300uv	-2.96	-3,81	-13.86
450uv	-3.70	-4.13	-20.83
600uv	-4.28	-4.29	-27.98
900uv	-5.11	-4.76	- 41.42
1mv	-5.33	-4.85	-45.70

In answer to your question about a reduction of 12 db from MGC to AGC this is normal with this mod when a good antenna is connected. Checking on two separate rcvrs, both with the mod and an antenna connected to both rcvrs, switching from MGC to AGC decreased the line level meter by 11 dB. FYI, in the AGC mode the AGC was -1.9 VDC, the diode load was -1.8 VDC and the carrier meter 15 dB. Going a step further I measured the AGC and MGC at both rcvrs with no antenna connected. That gave a reduction of only 2 dB switching from MGC to AGC.

The measurements below were taken with the antenna disconnected and with and without the calibrator on and the rcvr tuned to 100KHz increment. The results are below:

67 EAC		Imperial	
Noise only		Noise only	
AGC	Diode Load	AGC	Diode Load
-0.62	-0.19	-0.55	-.47
Calibrator on		Calibrator on	
-6.3	-3.0	-6.5	-3.1

If you get similar readings you have the Lankford mod in the IF deck. Just one word of caution-watch the 1N4148 diodes. Switching the AGC time constant will deteriorate one of the diodes because of a fairly high voltage transient during the switch operation. I once measured it because I got tired of changing diodes but don't remember the transient voltage value. To evaluate the diodes you have to unsolder one end because of the parallel ckt resistances. I ended up with a 1N914 and a 1N5060. If you notice distortion on a very strong broadcast station check the diodes.

Date: Wed, 13 Feb 2008 14:24:39 -0700

From: "Tony Casorso" <canthony15@msn.com>
Subject: Re: [R-390] R-390a question (Tony Casorso)

Fantastic! Thanks so much for this information. Looking at the circuit I can see that the Lankford mod would affect the delay but it looked like there would still be some offset. I wasn't sure though. Your data tells the story. This matches up with my receiver to a Tee. I used 4148 diodes and promptly blew up the one across R547. I replaced it with a higher voltage type and it is OK so far. Yes it is a great mod for listening to SSB.

Date: Thu, 14 Feb 2008 07:43:07 EST
From: ToddRoberts2001@aol.com
Subject: Re: [R-390] R-390a question (Tony Casorso)

Thanks for the warning about blowing the 1N4148 diodes. It would be disappointing to take the time and trouble of installing the Lankford mod just to have the 1N4148 diodes deteriorate and give poor results.

Date: Fri, 29 Feb 2008 06:36:36 -0500
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] Litton Model 1309 Microdial ?

> At my radio club meeting tonight, a friend handed me a turns-counting dial,
> in the box. It looks an awful lot like the BFO dial on some R390(A)s.
> But it has no reducer. Given that the dial shows 100 units per turn
> (out of a total of 1,000) and that the R390A BFO knob only rotates through
> 180 degrees, how useful would this be? I would get 25 units on either side
> of BFO center frequency. Is this what the "real" counters do on the R390A?
> And why do some R390A's have the BFO counter dial, while others do not?

The Litton Dial used on R-390As is a THREE digit, two units AND one tenth of a unit. This is the Litton 1309-100. Is THIS what you are trying to describe?

Date: Fri, 29 Feb 2008 08:04:29 -0500
From: Steve Hobensack <stevehobensack@hotmail.com>
Subject: [R-390] Litton Model 1309 Microdial ?

Take a Bristol wrench and move your BFO knob out away from the chassis a small distance. You knob will then be able to move 360° and more. There is an interference tab and tang on the inside of the knob that stops rotation at 180° should the knob be mounted close to the chassis. In teletype service some of the BFO knobs had the VeederRoot dial to aid in splitting out the teletype signal. It merely shows the BFO offset at a precision setting.

Date: Fri, 29 Feb 2008 18:36:54 -0500
From: K3DX <k3dxLab@comcast.net>
Subject: [R-390] Re: Litton Model 1309 Microdial

Installing the micro dial will make a nice winter project. I did find a mention of the micro dial in the Pearls, but it was tangential to the issue at hand. The only other info

I had on the micro dial was one friend's comment that they were used by the NSA to tune in narrowband Russian transmissions during the cold war. Spook radios! Cool! I guess this means I have to paint the front panel black now. Or was that only the CIA? ;-)

Date: Sat, 1 Mar 2008 19:10:57 EST
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Re: Litton Model 1309 Microdial

The front panel was not painted black when the micro dial was installed. I think only the CIA wasted time on black paint. Real R390 operators know this. Considering the work to get a panel painted right, I would like some other color than black.

Only if you are going to place your receiver on the electronic place to pay for the education of one of your children would you want to paint the front cover black. It should take all of 20 minutes to install that dial and get a zero beat at zero. You just install the knob. Then loosen the coupling clamp on the BFO shaft between the front panel and the IF deck. Set the counter to zero. Grab the BFO shaft with a pair of pliers and zero the BFO. Hold the shaft with the pliers. Set the counter to zero. move the clamp collar around so the spline bolt is pointed up and easy to get the spline wrench in to the bolt. Tighten the bolt with the spline wrench.

You may get to change the BFO extension shaft bushing. The dial base plate gets mounted with the shaft bushing and bushing nut. The stock bushing may not be as long as the bushing provided with the dial. You can change out the bushing without dropping the front panel. You may need to pull the IF deck. Save the BFO knob, it has a set screw in it that you may need in another knob someday.

Date: Sat, 22 Mar 2008 13:44:17 -0500
From: Tom Frobase <tfrobase@gmail.com>
Subject: [R-390] [Fwd: Reconditioned Amelco R-390A Part Failure]

Last fall I had the rare opportunity to pick up two R-390A's at the Belton, Texas hamfest. I rebuilt the nicest of the units first, a circa 1962 Almelco, with the goal of putting it in my shack. I did the normal, completely dissembling and cleaning the radio. I completed the radio figuring it needed to run in the shack for a bit to discover and anomalies not found in its reconstruction.

After being in the shack for a couple of weeks the radio failed outright. I pulled it apart this morning to find the 2200 resistor R508 to be smoked. This is the dropping resistor that feeds the 12 MH choke L505 to the plate of the 1st IF driving the mechanical filters. I always change C558 which connects to the filters, you all have warned me many times!

My first thought was to check the .05 ceramic to ground, wasn't it, then I pulled the tube in case it was shorted, it was not. I thought of the irony of having a defective cap which I replaced to protect the filters but indeed it was good as well.

The problem ended up being the 12MH inductor L505, shorted dead to ground. Go figure in thirty years of repairing these things I have never seen that before, has

anyone else?

Date: Sat, 22 Mar 2008 15:15:52 -0400
From: Bob Camp <ham@cq.nu>
Subject: Re: [R-390] [Fwd: Reconditioned Amelco R-390A Part Failure]

Magnetics do indeed fail just as you describe. It's not uncommon in older gear. My guess is that eventually we will start to see power transformers fail in the same mode.

Date: Sat, 22 Mar 2008 15:29:17 -0400
From: "Al Parker" <anchor@ec.rr.com>
Subject: Re: [R-390] [Fwd: Reconditioned Amelco R-390A Part Failure]

We've been seeing that sort of thing in SP-600 chokes. They're big, heavy, potted, but some do short to the case. Some folks, living dangerously, have just mounted them up on insulators (I hope they insulated the case from fingers).

The potted pwr xfmrs have been pretty reliable. Audio xfmrs have gone, but usually due to leaving the secondary open when using fones or external amp, etc.

Date: Sat, 5 Apr 2008 23:51:18 +0300
From: takis perdikaris <sv1fjl2@hotmail.com>
Subject: [R-390] Bfo problem help .

Hello to everyone , I am newcomer in list. I want any help about a BFO problem. I have terrible distortion in SSB signals (I cant hear distortion in CW) , the voices are distiorted with a -lets call it -trembling sound .The sound in AM is OK .I check V505 tube voltages : PIN 5 ABOUT 45 VOLTS AND PIN 6 ABOUT 80 VOLTS . Any advice ? Thank you all in advance .

Date: Sat, 5 Apr 2008 18:09:25 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Bfo problem help .

Did this problem start happening in a receiver that you have been using daily? Is this a problem you now have in a receiver that you have just started to use after it has been setting turned off for a few months or more? Different problems with different things to look at.

Turn the lights off and look for a tube glowing blue in the IF or audio deck.

A gassy tube will distort.

Has your receiver had the plastic caps removed? These old plastic caps leak and cause distortion.

Run the receiver in MGC and AGC functions. Does it distort equally in both modes? The AGC circuits can cause distortion.

The R390 does not do SSB all that wonderful to begin with. Are you sure you also do

not have distortion in AM mode? CW is a beat at the BFO against any signal. You mostly do not get distortion of the CW tone through the audio deck. From your report, it sounds as if its time to test all the tubes in the receiver. One had gone over the edge and some more are likely close to the edge. Most likely it is just a tube problem. Any where in the chain. A tube gets marginal in emission with use. Then it gets all kinds of spurs. Mixers, and oscillators will get spurs. These extra spurs then mix up with all the good stuff and the audio output sounds poor. The tubes in the IF deck while not mixers will also produce lots of extra products. Tube bias will fall off the linear part of its curve and leave the tube operating on a knee. The stage will then produce poor output sounds because every thing is not getting equal treatment within the tubes stage. With the questions in mind, tell us a bit more about the problem and we can try to get specific for you.

Date: Sat, 5 Apr 2008 18:05:13 -0500
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] Bfo problem help .

The R-390 also requires you to reduce the RF gain to reduce distortion on SSB signals as well. It may be as simple as that. Try turning the RF gain down on your next try and see if that improves the audio quality.

Date: Tue, 19 Aug 2008 00:24:21 +0100
From: <ka4prf@peoplepc.com>
Subject: [R-390] GIMMIK

While reading my r-390A/urr manual, I came across drawings in pencil of coax connection diagrams to the circuits. One of the drawings was for a coax connection from the BFO line between V505 to C535 in the BFO V505, schematic diagram on page 69. These connections usually lead to an external jack. The title of the diagram seemed to be "GIMMIK". This was the title used for other diagrams to other circuits. There was no explanation telling what the actual mode did? Does anyone know what 'GIMMIK' means or what the designer was trying to accomplish. There are no "Jacks" sticking out the back of my receiver. Thanks Chuck Bolland

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Date: Tue, 19 Aug 2008 10:02:16 -0400
From: Gord Hayward <ghayward@uoguelph.ca>
Subject: [R-390] gimmik capacitor

> Does anyone know what 'GIMMIK' means.....

A gimmik is usually a small capacitor made by twisting two insulated wires together (no contact!). These are often used for BFO insertion. Does this seem reasonable in the context of your drawing as it just goes to a 12pF cap in my drawings.

Date: Sun, 31 Aug 2008 13:36:46 -0600
From: Transmaster <22hornet@gmail.com>
Subject: [R-390] Non functioning BFO

I have just discovered the BFO is no longer working in my '67 EAC R390A. I use a ELDICO SBA-1 SSB adapter so there is no telling how long it has been this way. I

have the great Y2K manual out and tube tester at the ready where would you suggest I start to get the BFO working again. I suspect it is a tube but is there other things to look at.

Date: Sun, 31 Aug 2008 17:23:24 -0400
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] Non functioning BFO

If you suspect a tube to be bad, try testing/replacing BFO tube V505 (5749/6BA6W). If that doesn't pan out, remove V505 and energize the receiver. Probe pins 5 and 6 with a Hi Z input voltmeter (VTVM) and you should see something on the order of +250 Volts DC. Make sure BFO is turned ON and receiver is set for normal operation otherwise.

With the receiver turned OFF and UNPLUGGED, probing pin 7 with an ohmmeter should show very nearly a dead short to GROUND (BFO coil). Probing pin 1 to ground should show about 150k ohm to ground (grid leak resistor).

These tests should turn up most problems occurring "right out of the starting gate" and if nothing turns up then we drill down from there.

Date: Fri, 26 Sep 2008 08:00:12 -0700
From: "Mike Hardie" <mike46@shaw.ca>
Subject: [R-390] Local Gain Control "Problem"

Yesterday the R-390A was fired up with an antenna attached for the first time in who knows how many years. It's been a long road to this stage, initially there was a waterline across the chassis/sub-chassis's, several cooked resistors and leaky caps, a broken bandswitch wafer, broken clamps, cam and bandswitch timing was non-existant, the list goes on. The repairs were a step by step learning process, but very worthwhile.

Here's the current problem, with a relatively strong station tuned in and the RF gain control at "10" the audio is about the right level with the local gain control all the way down. (Against the "0" stop) The local gain control functions normally, when it is turned higher the audio level becomes uncomfortably high. The RF gain control also functions normally, setting it to "5" results in the local gain control range being normal, or at least what I think is normal. It's as if there's too much gain somewhere. The IF gain pot was set as per the manual, although I haven't re-checked it. The meters are functional but not original, so they aren't really reliable for trouble shooting.

Anyone seen this before or who can offer advice?

Date: Fri, 26 Sep 2008 11:14:44 -0500
From: "Ed Wirtz" <ewirtz@hbci.com>
Subject: Re: [R-390] Local Gain Control "Problem"

From your description of the problem, I suspect that you do not have any AGC. You should not have to lower the RF gain control to reduce audio distortion unless the

AGC is either turned off or non functioning.

Date: Fri, 26 Sep 2008 10:14:02 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: RE: [R-390] Local Gain Control "Problem"

I've heard that a common reason for shorted AGC is the antenna trimmer.
The shaft has an insulating bushing which can go bad.

Date: Fri, 26 Sep 2008 13:52:05 -0400
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Local Gain Control

Is the AGC jumper in place on the rear terminal strip?

Date: Sat, 27 Sep 2008 09:44:06 -0400
From: Steve Hobensack <stevehobensack@hotmail.com>
Subject: [R-390] r-390 Gain

I had a similar problem once. There was still audio when the AF gain was at zero. I found a leaky capacitor or open capacitor in the AF module. I forget which one, but it was allowing audio to flow from the line audio section of the module to the local audio section of the module. It could have been one of those large filter capacitors on the dc line that failed. It let DC voltage pulsating at an audio rate to 'modulate' the local audio DC screen voltage.

Date: Sat, 27 Sep 2008 08:27:23 -0700
From: "Mike Hardie" <mike46@shaw.ca>
Subject: [R-390] AGC Voltage Continued

I think I'm onto something. The resistance at pin 6 of J512 was 22K when it should be infinity, by continuing on I found that the resistance on the outputs of the filters was zero, when it should also have been infinity. (The filter outputs are all connected together on one side according to the schematic) After moving the IF deck around a bit the resistances were normal - yep, one of those.

I can get the resistance on the filter output to change from zero to infinity by turning the IF deck over a couple of times. Likely there's something loose inside one of the filters. I can't figure out a way to isolate the faulty filter except by unsoldering the common wire to each filter one at a time, turning the IF deck over a few times while watching the ohm meter.

Date: Sat, 27 Sep 2008 23:04:55 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] AGC Voltage Continued

Hard work but the only way to do it right. You could just clip that wire into sections and then just replace it when you fix the filter problem. The "foam insulation" inside the filters has turned to crud at this age. That crud gets conductive. You can unsolder the filter cans (another subject) and clean them out and rebuild the filters.

You can also get used filters that may or may nor have problems after being bumped around in the mail or UPS truck on the way to your location. Just buying an another filter these days is not as nice as it use to be. There are some rebuilt filters out there that have had the crud cleaned out and new stuff inserted. For a price but cost effective.

Date: Sat, 27 Sep 2008 23:29:30 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Local Gain Control "Problem"

A good long wire or other antenna on a R390 and a strong local signal will put the receiver into over driven.

Turn the AGC on.
Set the RF gain to 2 or 3.
Set the Audio to a nice level.
Hang an AC volt meter across the speaker and find a mid scale reading.

Now as you turn up the RF gain the AGC should hold the audio level about the same value. Until you get the RF gain so high it over loads the AGC circuit. Remember R390's are for getting the QRP out of the noise. Real signals over drive the receiver. It may be time to get a signal generator on the receiver with a power meter so you can do some nice stage gain and signal to noise measurements. You can get some real "hot tubes" that will drive the receiver to high levels. Along with the high levels is high noise. This is OK for strong signals but not for working that DX stuff. I think your receiver is acting "normal" from your posting. It's not how the receiver responds to strong signals. It's how the receiver reponds to the weak signals.

Date: Sun, 28 Sep 2008 08:31:52 -0700
From: "Mike Hardie" <mike46@shaw.ca>
Subject: [R-390] AGC Voltage

First of thanks again for all the terrific suggestions. Yesterday (before seeing some of the suggestions) I unsoldered the top terminal wires from the 16 Kc filter and connected up the ohm meter to the other filters top terminal "common". Turning the IF deck over and over the problem did not repeat. To confirm the fault was in the 16 Kc filter the ohm meter was connected to it and ground, and the IF deck turned over repeatedly. There was infinite resistance, no fluctuations. The 16 Kc filter was reconnected and the filter output to ground short "had gone away". The AGC is working properly, at least for the time being. My guess is the fault will return. Mike

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Date: Mon, 29 Sep 2008 09:50:32 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: RE: [R-390] AGC Voltage

This is another well-known problem. The disk stack inside your mechanical filter was originally positioned and cushioned by foam inserts. The foam has disintegrated, and the stack occasionally contacts the casing. I couple of people have opened these up and repaired them. They have written up their experiences on the web.

Search the forum archive for "filter".

Date: Mon, 29 Sep 2008 22:00:32 -0700
From: "Dennis Wade" <sacramento.cyclist@gmail.com>
Subject: Fwd: [R-390] AGC Voltage

Yep. I've lost a 16kc and 8kc filter to that problem. Took a while for me to run it down, but the good news is it didn't take quite as long the second time..lol.

Date: Mon, 3 Nov 2008 21:24:50 -0500
From: "Al Parker" <anchor@ec.rr.com>
Subject: Re: [R-390] (no subject)

Yes, that's it: "It is C553 that keeps the 1st IF B+ out of the crystal filters. Inspect this cap to see if it looks like a 600 volt rated cap. You may want to replace this cap if it even looks like less than a stellar quality item in your deck. Some time now for peace of mind over the next 50 years is a small price and some quality time with your receiver." That from Perrier's chapter 9 draft, but it's been elsewhere.

Date: Fri, 5 Dec 2008 12:12:08 -0700 (GMT-07:00)
From: "Richard W. Solomon" <w1ksz@earthlink.net>
Subject: [R-390] R-390A Cable Connections

In the Y2K manual I see where P218 goes to J518. This came from Table 5-4 on Page 5-11. Is that correct ?? In my radio, I have P114 going to J518 and I cannot figure out where P218 goes. It's just hanging there !!

Date: Fri, 5 Dec 2008 14:42:43 -0500
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] R-390A Cable Connections

P214 should plug in to J514 (that's on the right-hand side of the IF deck towards the rear of the deck). It is the IF output. P114 is sometimes routed to J518 for aligning the IF deck and perhaps someone left it there (or they were feeding the IF deck with signals from another source and using the R390A's IF and AF chain?) BTW, my previous comments about the deck numbering were incorrect. Deck "#1" is the main chassis, deck #2 is the RF deck. The IF deck is #5 - hence the jacks are J5**.
Hope that helps,

Date: Fri, 5 Dec 2008 16:10:37 -0700 (GMT-07:00)
From: "Richard W. Solomon" <w1ksz@earthlink.net>
Subject: [R-390] R-390A Cable Confusion

Now I am really confused. Is there a correct list showing where all the coax cables are routed to ?? I have J518 jumpered to J514 via cable P114. Is that correct? If it is, then P218 is still an orphan looking for a home?I hope some well-meaning soul did not just connect the cables wherever they reached !!

Date: Fri, 5 Dec 2008 18:22:38 -0700 (GMT-07:00)
From: "Richard W. Solomon" <w1ksz@earthlink.net>

Subject: [R-390] R-390A Cable Confusion: Part II

Thanks to Foster, W4HCX, I got the answer to the connector problem. Of course, that leads to the next problem. Some misguided soul swiped the IF Output connector. If it were a plain vanilla connector no problem, but this one is a BNC to "mini-BNC" panel mount connector. Anyone have one in their junque boxe I can get ?

Date: Thu, 11 Dec 2008 09:59:26 -0700
From: ANTHONY CASORSO <canthony15@msn.com>
Subject: [R-390] BFO Drift?

I have been listening to lots of CW lately and it seems that there is quite a bit of drifting going on in my 67 EAC R-390a. Even after its been on for more than an hour I can hear the signal slide up in pitch over a several minute period. I am pretty sure (but not absolutely sure) that it is the BFO. In my set I have replaced the 3TF7 with a 12BY7. I was listening to beacons using a waterfall display (Argo) and I could see the carriers slowly angle off over a long period and then, within a minute, come back down. The excursions are over 100Hz. The oven switch is off. Has anybody seen this sort of thing before? I have a counter, so I suppose I should put it on the PTO and confirm that it is OK. Just haven't gotten to the point of opening it up.

Date: Thu, 11 Dec 2008 12:57:59 -0500
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] BFO Drift?

As to drifts, I know of at least 4 kinds:

1. BFO that you're postulating
2. PTO that you seem aware of as a possibility

But the kind that I hear most often on 390A's:

3. The band-switched crystal oscillator. There are a lot of crystals and having flaky contacts on the crystal or bandswitch can cause drift symptoms like you're seeing.

4. AGC-related pulling of the 17MHz oscillator.

#4 will appear on only the low bands (below 8MHz) and #3 often on one particular cyrstal (which is likely used on multiple 1-MHz wide bands). Some of the BFO tuning mechanical couplings can stick in funny ways and then "let go" resulting in shifts.

Date: Thu, 11 Dec 2008 11:13:19 -0700
From: ANTHONY CASORSO <canthony15@msn.com>
Subject: RE: [R-390] BFO Drift?

Thanks Tim. That is an excellent response. I am in fact operating on a low band. I can easily check to see if the symptoms track a specific crystal or if they go away above 8 Mhz. I can also check for AGC pulling by going to MGC. Having access to this kind of information is like having and extra brain at your fingertips. I could have poked at this for weeks without making any headway. I will let you know what I find.

Date: Thu, 11 Dec 2008 13:30:19 -0500
From: Roy Morgan <k1lky@earthlink.net>
Subject: Re: [R-390] BFO Drift?

If I remember correctly some of the local oscillator crytals operate on two frequency bands, and none on three. Some on only one. The right page in the manaul will tell you the facts. The 17 MC crystal is used only on the 7.00 to 7.99 band and below. Having another stable receiver handy is very useful for this kind of troubleshooting. A bit of wire slipped into the crystal oscillator tube shield or nearby the tube if no shield will let you listen to the LO signal.
Do let us know what you find.

Date: Thu, 11 Dec 2008 19:04:28 +0000
From: "Graham Baxter" <graham@delphe.co.uk>
Subject: Re: [R-390] BFO Drift?

Have you considered reinstating the 3TF7 ?

Date: Thu, 11 Dec 2008 12:34:46 -0700
From: ANTHONY CASORSO <canthony15@msn.com>
Subject: RE: [R-390] BFO Drift?

I have indeed, except that I don't have one. I have also considered trying one of the other 3TF7 replacement variants (including Dallas' voltage regulator idea). However, I think I need to do a little more digging first. I keep saying I am going to get a replacement 3TF7 but I have not been motivated to do so until now. My old one went bad about 1 week after I got the receiver. I thought that the 12BY7 was doing an OK job for me. Maybe not. We shall see.

Date: Thu, 11 Dec 2008 16:18:28 -0500
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: RE: [R-390] BFO Drift?

Tony, try to isolate the oscillator that's moving around. Roy's remark about using another known stable receiver is the way to go because it tells you a lot of info quickly. Lacking a second receiver, you may be able to "simulate" a one by using a stable signal generator and mixer to mix down to audio to then amplify and listen.

A Minicircuits type double balanced mixer would be nice if you could latch onto one, otherwise some arrangement using 1N34 type diode(s) might do the trick. Getting enough RF into the mixer to make it work will be the hard part. You may have to get creative to make that happen.

You can take a look at the heater/filament voltages to see if you can spot any variation over time. Another thought along the same lines is to operate the BFO heater on a separate supply. This is a complicated test though since I seem to recall that the BFO and PTO heaters are in series along with the 3TF7. Try to isolate which oscillator is doing the dance before getting into his kind of thing.

Date: Thu, 11 Dec 2008 15:43:34 -0600
From: "Barry" <n4buq@knology.net>
Subject: Re: [R-390] BFO Drift?

> operate the BFO heater on a separate supply. .....

Wouldn't it take considerable fluctuation in the AC supply to cause a significant shift in these oscillator frequencies? I ran one from the 12.6V supply from the power transformer and bypassed the 3TF7 altogether. I never noticed any drift, etc.

Date: Thu, 11 Dec 2008 17:15:41 -0500
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] BFO Drift?

Tony mentioned Dallas' "filament regulator" idea. If that's the Dallas article I think it is, I recall that he showed that the 3TF7 ballast wasn't really that effective at stabilizing heater current and therefore oscillator stability. Don't remember the details but I think he powered the PTO (and BFO?) filaments from a separate external source and then wiggled the AC line input to the receiver.

I recall that this showed that the freq stability of the receiver was considerably better than when the PTO - BFO - 3TF7 string was allowed to wiggle along with the rest of the receiver. Bottom Line - Most of the freq instability due to line voltage variation is due to the resultant current change in the PTO - BFO - 3TF7 string.

I THINK this is what I remember of Dallas' findings.

Date: Thu, 11 Dec 2008 15:27:44 -0700
From: ANTHONY CASORSO <canthony15@msn.com>
Subject: RE: [R-390] BFO Drift?

Thats the one I was referring to. He said that a 3 volt line variation produced a 6Hz shift. I know this is true because, when my wife fires up her iron while I have a steady tone in the speaker, I can hear the tone bounce quite clearly. Dallas just hacked in a 12 volt 3 terminal regulator and fed 12vdc to the BFO/PTO filament string through the 3TF7 socket. This made it immune to line fluctuations. When you are using someting like ARGO or SPECTRAN to listen to weak beacons, any shift is clearly visible in the waterfall display.

Date: Fri, 12 Dec 2008 06:15:11 -0800 (PST)
From: "Tom M." <courir26@yahoo.com>
Subject: [R-390] R-725/URR Docs

Linked below are documents concerning the R-725/URR including IF schematic, manual excerpts and roll-your-own instructions. Note: the extra transformer in the original R-725 is a hum-bucking transformer for the PTO and its inclusion is optional. The radio will run fine without it (for SWL purposes anyway). If the website says the docs are not available you should try later as my free bandwidth may have been exceeded.

http://www.geocities.com/courir26/R725_1.pdf
http://www.geocities.com/courir26/R725_2.pdf
http://www.geocities.com/courir26/R725_3.pdf
http://www.geocities.com/courir26/R725_4.pdf
http://www.geocities.com/courir26/R725_5.pdf
http://www.geocities.com/courir26/r725conv.htm

Date: Fri, 12 Dec 2008 15:08:16 +0000
From: "Bill Kirkland" <kirklandb@sympatico.ca>
Subject: Re: [R-390] R-390A IF Module Layout

>I have one SP-600 with all ceramic disks. One.....

I pulled the data sheets for the caps I use, both ceramic and film, and check the resonant frequency performance of the caps. From a data sheet point of view (reactance v freq) I didn't see much of a difference. (do watch the ceramic material type though. I don't use Z5U).

Date: Sat, 13 Dec 2008 04:32:53 -0800 (PST)
From: "Tom M." <courir26@yahoo.com>
Subject: [R-390] R-725 Docs, Direct email

Anyone wanting a copy of the R-725 Series 500 IF schematic and info from the manual, please email me directly. I will return a 3MB zip file to you.

Date: Sat, 13 Dec 2008 14:30:00 -0500
From: "Paul Anderson" <paul@pdq.com>
Subject: Re: [R-390] R-390A Pedigree

Yes, Col Ser Num means Collins serial number. There certainly are some units that came with serial numbers that matched or were close - I have a 67 contract EAC with modules that have serial numbers close to each other.

However, in the lifetime of radios like this, and many other things military, they were subcontracted, depot overhauled, field repaired, scrapped and retrieved, and many other things. The military surely received some equipment that had mismatching serial numbers because of how the production, ordering, spares and acceptance processes work. Just as surely, they had many that started out life with the same or similar, but over time, especially after overhauls, the modules would just be swapped out in random fashion, as that is the entire purpose of module oriented design in the first place. To me, a desirable radio is one that is clean and functions well and gives you enjoyment. The older ones (mid 50's) have older components, but sometimes had a higher standard of construction. It's kind of a wash. In the radios I have, I've noticed a tendency for R-390A's to have more likely been through an overhaul process, with R-391 and R-389's being seemingly a little more original. In my opinion, the R-390 and R-391 have a slight long term advantage in the sense that they have RLC filters instead of mechanical ones. But even the now failing filters can be rebuilt as many people are discovering. Enjoy what you've got!

Date: Sat, 13 Dec 2008 18:30:50 -0500

From: rbethman <rbethman@comcast.net>
Subject: [R-390] Pedigrees

The "pedigrees" of these "old girls" is all over the "map". You "may" get a tag of one manufacturer, and get either all modules of another, mixed modules, OR *IF* you are lucky modules made by the name on the tag. Consideration has to be given to their years of service, maintenance, and the number of hands they've gone through. I've only has a '67 EAC and a '51 Collins from St. J's come with ALL modules that matched the tag on front. Everything else I've seen is a "mix & match". However, with all that said, ALL have worked VERY well, aligned well, and have been a pleasure!

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: Thu, 26 Mar 2009 18:43:54 -0500
From: "RICHARD MC KINNEY" <pmcknney@bellsouth.net>
Subject: [R-390] SERIAL # 163

I have a R390a Serial @ 163. Problem is turning on the BFO looses all output. Rx is ok all bands with BFO off. I have a manual for thr R390a but I guess mine is an earlier model. The BFO in mine is nothing like the schematic. Mine has a small relay that is switched on by the BFO switch. I don't think this is any kind of mod as it looks factory wired. The BFO circuit is also very different then the schematic I have. The rig was given to me and I would love to see it work again properly. So far I've had to change the 17 mc crystal and a few tubes to hear it work again. Anyone have a schematic with a relay in the BFO switch? 73 Rich

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Date: Thu, 26 Mar 2009 19:10:05 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] SERIAL # 163

Who is the manufacturer? Just a serial number doesn't help with who made it. The collective wisdom is here amongst us, but I had a '67 EAC s/n 131. I also have a '51 Collins in the 3XX region.

Perhaps some pix of the IF section. Holler if you need a place to post them. I or others would be willing to put them up and provide you the link to post.

Date: Thu, 26 Mar 2009 16:21:22 -0700
From: Ren?e Deeter <k6fsb.1@gmail.com>
Subject: Re: [R-390] SERIAL # 163

I have a 390A from a Collins 51 contract, sn 122 with all early modules. there were many mfgs of the rcvr....so who made it? also check the rear for matching sn/mfg as the tags were/are interchangeable. go for the simple things first.....I understand loosing just BFO output? or entire radio audio output? if just BFO?

- 1 B+ voltage on the BFO tube (tube extender is good here)`if not how about dirty relay contacts.. or are they actually switching?
- 2. check all voltages the tube if 5749(6ba6) should be about the same no matter the circuit....
- 3. is the tube good? try a couple by substitution as it could have a short internally
- 4. visual for burned parts resistance and cap checks..... unless it is a mod it probably worked in the past...if it is a mod then the question becomes..did it ever work? If all the audio.....hmmmm short/open .... does the relay switch things other than B+? ie audio...remember back to simple first....lets not tear into it jsut to find the relay was ot switching and or making contact.

Date: Thu, 26 Mar 2009 19:27:35 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] SERIAL # 163

My '51 Collins is an earlier one than yours. That relay "may" look factory, but I have YET to see a relay in an IF deck that controls the power to the BFO.

Date: Thu, 26 Mar 2009 17:27:11 -0700
From: Ren?e Deeter <k6fsb.1@gmail.com>
Subject: Re: [R-390] SERIAL # 163

I should have stated that mine does not have a relay in the circuit. the BFO was standard (it now has a 7360). I apologize in raising your hopes and thinking that I had your circuit. I do not think that any units ever had a relay in the switching circuit, exception of one by someone that worked at the factory and it was a pet project etc... So how much resistance in the cathode? it does add negative feedback and may be the problem causing the oscillator to shut down, it also may be shifting the bias enough to do the same.

Date: Thu, 26 Mar 2009 20:50:00 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] SERIAL # 163

I wouldn't be too quick about betting the farm. I've had several R-390As, and EVERY single one of them has followed the circuit. None have EVER had a relay for the BFO, I have NOT heard of such on the group either. Most of the folks are VERY fastidious about their work on these. It is a "pride" sort of thing. It is extremely rare that a mod gets done without it "looking" like original.

Date: Thu, 26 Mar 2009 22:05:55 -0400
From: Roy Morgan <k1lky@earthlink.net>
Subject: Re: [R-390] SERIAL # 163

Yup. My first thing to do would be to clean the relay contacts. If it's a sealed relay like the ones used for the squelch in the R-390/URR, then get your ohmmeter out and measure closed contact resistances.

Date: Thu, 26 Mar 2009 22:21:05 -0700
From: Ren?e Deeter <k6fsb.1@gmail.com>
Subject: Re: [R-390] SERIAL # 163

Looks like what he has is a prototype Stewart Warner IF deck with the product detector.

> I just found the product detector mod and it looks like that is what has been done to this rig. >But my rig had a 6BA6 in the bfo slot and the mod calls for a 6BE6. So now I get a 6BE6 and go >from there.

Date: Fri, 27 Mar 2009 11:36:10 -0500
From: "RICHARD MC KINNEY" <pmcknney@bellsouth.net>
Subject: [R-390] SERIAL 163 FOLLOW UP

Thanks to this forum my R390A is now working on AM and CW/SSB. Yesterday I sat down and drew up a schematic of my bfo circuit and could see there is no way the 6BA6 that it came with in that socket would work. I was up against a brick wall. Then thanks to this forum I looked up the product detector mod and there was that schematic I drew up but it had a 6BE6 tube. I put in a 6BE6 and off she went working fine. I don't intend to remove the mod now but I do see a bunch of the old caps that need changed. Someone sure did a factory looking job on the mod and it REALLY had me fooled. <snip> . So thanks to all that responded and helped me thru my problem. 74 Rich

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Date: Fri, 27 Mar 2009 10:09:23 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] SERIAL 163 FOLLOW UP

This should remind us all to TAG OUR MODS. Guilty, Dave Wise

Motorola 363-PH-54 S/N 1014
- Adjustable PTO Tempco - Add F103 - Carrier Zero Redesign
- Inrush Limiter - 3DW7 - AGC Clamp
- Moment Of Silence

Date: Fri, 27 Mar 2009 21:02:53 +0100
From: Pedro Del Valle <ea2ig.pvr@gmail.com>
Subject: Re: [R-390] SERIAL # 163

I have two R-90A one EAC and the other a Capehart and a R-390 Collins. None had a relay. But I remember of an article in an old HAM RADIO MAGAZINE With a modification using a 6BE6 in sustitution of the 6BA6, for a product detector, and a relay to switch AM/SSB with the BFO ON/OFF swiitch. Excuse my poor English. Hope is of help. Pedro EA2IG

Date: Sun, 29 Mar 2009 13:58:33 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] SERIAL # 163

You own what you own and there is a relay in the BFO circuit.
Accept that this is not original and it is not stock.

As you have a serial number 163 and no one else has seen any of its brothers, accept that what you have is not some spook modification, because you have either the 163rd or 63rd one in the series. And again we have none other like it. There be only one R390 with manual and one R390/A with manual. The R390's were mostly built by Collins. R390/A were built by every-one and even Al Gore claims to have had a hand in the early contracts.

Mods may have been for either inboard or outboard changes. Likely BFO mods were for SSB. Grab a R390/A schematic and start doing a wire by wire pin by pin study of the BFO tube and circuit. You will find where the relay was inserted into the circuit. As we fellows are not familiar with BFO relays, Where is your critter actually mounted into the receiver? On the IF deck or some where on the front panel. I accept the relay looks like mil style. It would have the right voltages to operate with the receiver. Is the relay coil about 220 volts B+ or some other
voltage? The BFO operated on switched 220 volt B+ to the BFO tube switched by the BFO switch. If the relay coil is 6.3, 12.6, 24, 28 volts then the BFO switch has been rewired from B+ to the coil voltage. But 200 Volt relay coils do exist in mil style, so I can see one of those type relays being used.

I can see that as the relay is energized, something switches the a load onto the B+ line and drops the B+ to low for the receiver to work. Check the schematic, pick a B+ point on a RF deck tube and another IF deck tube and see how much the B+ drops when the BFO is switched on. If no drop go looking for the problem else where. If the B+ drops 10 or more percentage start tracing the circuit around the relay. Good luck with this problem.

No reason you cannot restore the receiver to original and operating condition with or without the modifications as you chose.

Believe the schematic you have in hand is good for original and there is no @RARE@ schematic out here some where you need to find.

Please do some digital photos if you can and save some hand drawn schematic if you can. Yo may just snap some pictures and have a digital disk done when you get them developed. You could then sent that disk to a Fellow here on the reflector that could get the pictures up on a web site for us all to view. Someone put some thought and work into getting that modification into your receiver. It may or may not have ever worked. But it could lead to some real insight and spark of creativity. A good SSB detector for the R390/A is a much sought after holy grail. Roger L. Ruszkowski AI4NI

Date: Sun, 29 Mar 2009 14:01:38 EDT
From: Flowertime01@wmconnect.com

Subject: Re: [R-390] SERIAL # 163

>Most of the folks are VERY fastidious about their work on these. It is a
>"pride" sort of thing. It is extremely rare that a mod gets done without it
>"looking" like original.

You are right on with this point.

Date: Sun, 29 Mar 2009 14:06:55 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] SERIAL 163 FOLLOW UP

Nice outcome, A R390/A with a well installed SSB mod.
Does it work well on SSB signals?
Let us know how you like it.

Date: Tue, 31 Mar 2009 10:46:13 -0500
From: "RICHARD MC KINNEY" <pmcknney@bellsouth.net>
Subject: [R-390] SERIAL 163 FOLLOW UP

I have two R390A's in my shop right now. One was GIVEN to me by a ham friend. The other is to repair for him. He is a big time collector /trader of old rigs. I have restored many old radios for him just for the love of doing it. He kept wanting to pay me for it...I felt I owed him for the fun of working on them. The serial 163 rig is mine, and it was the one that had the 6BA6 in the BFO slot. It really doesn't matter to me if the mod was factory or just well done. I know I'm not going to butcher it up just to convert it back to original. But in comparing the 2 rigs I see no difference in SSB reception. His has no product dector mod like mine. Seems to me like the mod is a lot of work for nothing. It might of interest to all in what I had to do to repair his. Problem was it was reading off frequency. I found the variable of V701 was tracking 3.455 to 2.472 and not 3.455 to 2.455 as it was supposed to. I do this by wrapping a coil of wire around the tube and feeding it to an Icom 736 to see its frequency. In the manual there is a fix for that and it worked fine. You have to remove the module and adjust a end point adjustment that allows for aging. So both rigs are now doing much better. Thanks to all that helped with input and I hope my info has helped.

Date: Thu, 02 Apr 2009 17:16:11 -0400
From: Gene Beckwith <W8KXR@neo.rr.com>
Subject: Re: [R-390] SERIAL # 163

I have a recently acquired Motorola...has relay non-stock...not sure yet why . .it's not a hack job. Did general up dates...caps etc...works great.. didn't check out why or what the relay does..it's just behind the BFO pitch control inside the the filter deck, unit still has a live ballast tube...and is in pristine conx, label on rear says Army Security Agency,no other history...

Date: Thu, 2 Apr 2009 23:31:49 +0100
From: Graham Baxter <graham@delphe.co.uk>
Subject: Re: [R-390] SERIAL # 163

It may have already been suggested but isn't this the Captain Paul Lee product detector mod? I recall that the HT current which feeds the BFO was used to energise a relay which switched the audio from the AM detector to the product detector. This saved one having to change the switch.

Date: Thu, 02 Apr 2009 20:49:39 -0400
From: Gene Beckwith <W8KXR@neo.rr.com>
Subject: Re: [R-390] SERIAL # 163

Tnx - good lead on why...in my case, performance on SSB is excellent...i.e. better than some of my stock 390As...of course they are quite good as original as we all know. I have only limited experience with this particular Motorola so far...but find it behalves quite well with RF gain close to full on ...plus sig meter seems to be functional with SSB . . rcvr is fully assembled and in use presently, but at the next tear-down will do some more investigation . . . your lead appreciated... will advise further if I find more details... Btw - serial is 906 . . . .

Date: Sun, 12 Apr 2009 16:39:13 -0600
From: "Tony Casorso" <canthony15@msn.com>
Subject: [R-390] R-390a AGC Issue/Observation

I have been annoyed for quite a while with the fact that I get a big drop in gain when I switch from MGC to AGC, even when tuned to just background noise.I checked the AGC bus voltage and found that it was about -.9 volts in AGC and 0 volts in MGC. I wasn't sure if -.9 was reasonable for the AGC with no signal but I suspected that it was not becasue of the big drop in gain and the fact that this radio is supposed to have delayed AGC. I first checked the resistors on the IF deck (R544, R545, and R546 if I remember correctly). They were fine. I also disconnected my 2 diode AGC mode (the Lankford mod). That made no difference. I could see a postive voltage on the plate of the AGC rectifier but negative on the AGC bus. When I pulled the AGC time constant tube (V506 which also doubles as the detector), the AGC bus went to +1.2. That surprised me since it is only the grid of V506A that is connected to the AGC bus. But we are trying to pull the grid positive so maybe it makes some sense. Anyway, I swapped the tube with another 5814A. It was a little better but not much. Still about -.7 volts. I stuck in a 12AU7A and got about -.3 volts. Finally, I put in a 12AX7A and the AGC bus stayed near +1.2 volts with no signal. With the 12AX7A in there, there radio acts like I expect. On weak signals, switching from AGC to MGC makes little difference. The radio seems livelier too. I'll have to try it this way for a while, but I think I like it. If anybody else is so inclined, I would like to hear what your AGC bus goes to with no signal. You can measure it on the back panel so you don't even need to open it up. Also, I would like to know if you hear a substantial drop in the background noise when you switch from AGC to MGC with no signal present. My radio is a 1967 EAC with all EAC modules.

Date: Mon, 13 Apr 2009 14:56:33 EDT
From: SHELLY199@aol.com
Subject: Re: [R-390] R-390 Digest, Vol 60, Issue 14

The no signal AGC voltages you see are OK. If you have the Langford mod you'll see it get quieter when going from MGC to AGC. If you turn on the

calibrator and measure AGC you should see approx.-5 to -6 Vdc The Diode Load voltage should be -3 Vdc with the calibrator on. I just measured a deck with the Langford mod.:

	diode load	AGC	meter
no signal in MGC	-.48	0.0	
no signal in AGC	-.46	-0.22	
Cal on	-3.27	-5.8	52 db

If you have the capability to put 150 uv @ 455 KHz into J513 on the IF deck and adjust the gain pot for -7 Vdc on there diode load you should see the above.

Date: Mon, 13 Apr 2009 13:51:31 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] R-390a AGC Issue/Observation

On my '54 Motorola, gain is exactly the same between AGC and MGC with no signal. Are R547-R549 okay? What's the no-signal plate voltage, V506 pin 1? I see about 25V. If you want to ship me that 5814A, I'll be happy to report back with measurements. It's normal for control grids to want to go negative. The effect is called "contact potential". The grid is swimming in a cloud of electrons surrounding the cathode, a few hit the wires. In AA5's this is how the 12AV6 gets its bias, contact current through that 10 meg resistor. But there should not be so much current that it overcomes the R544 delay.

I had the opposite problem; my AGC went positive with no signal. This is bad for the tubes, runs them too hot. When I installed V506, the positive voltage was reduced but not to 0.

The suppressor grids on the AGC line are an attempt to clamp it to ground without adding a diode or another 12AU7 wired as a diode, but they aren't spec'ed for this and individual tubes vary a lot. I added a silicon diode - problem solved. (Won't help you.)

I don't see how that 12AX7 you put in can have its grid at +1.2V, it should draw grid current at less than that. Unless the cathode is high. Where's pin 3? Should be 50-60mV with no signal.

Date: Mon, 13 Apr 2009 20:20:19 -0400
From: "Jim M." <jmiller1706@cfl.rr.com>
Subject: Re: [R-390] R-390a AGC Issue/Observation

I don't know if this was mentioned yet, but an AGC controlled tube with a "leaky" gris can cause the grid voltage to tend toward positive as I recall. This can mess up the AGC line. Check all the AGC controlled tubes for grid leaks if your tube tester does that. Or just trial-and-error replace tubes. Another thing that can happen is if you get oil on the antenna trip shaft, on the fiber insulating clamp. The antenna trim capacitor is on the AGC line. If you get oil or lubricants on that fiber clamp, it will show resistance to ground and affect AGC performance.

Date: Mon, 13 Apr 2009 17:27:11 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] R-390a AGC Issue/Observation

I believe in this case that the positive voltage is correct AGC Delay operation, coming from B+ via R544.

Date: Mon, 13 Apr 2009 21:35:58 -0600
From: ANTHONY CASORSO <canthony15@msn.com>
Subject: Re: [R-390] R-390a AGC Issue/Observation

I made a little mistake last night. I forgot to mention the fact that the AGC rectifier was removed (V509) when I made the measurements. With the AGC rectifier installed, the AGC voltage remained negative, even without V506 installed. However, the rest of the story was fairly accurate. I remeasured everything with a little more care, this time with V509 installed. The original 5814a in V506 shows -.82v at the grid with no signal (V506a). I swapped tubes around. I found one from another spot in the radio that reads -.35 on the grid in the V506A position. I checked both tubes on my old Hickok 546 and both read strong (Gm of 2200 vs 1400 on the roll chart). Neither tube is gassy. I then tried swapping around the AGC rectifier (V509). A different tube brought the AGC to about -.25 with no signal. The V506 plate resistor reads 78k (R549). R547 reads 212k. R548 reads 30 ohms. Plate voltage with the original tube was 35 volts. With the alternate tube, plate voltage was 37 volts. B+ is about 210. It seems to me that I have too much AGC. With a strong station tuned in, turning on the AGC reduces the signal so much that I have to crank the audio way up for normal listening. Even then, the audio sounds "compressed", lacking any punch. Actually it is even like this with not so strong stations. The radio sounds great in MGC with the RF gain turned down a little bit. As measured on the Line level meter, a modrate strength station drops the audio by 20db when I turn on the AGC.

Date: Tue, 14 Apr 2009 01:42:41 -0400
From: Roy Morgan <k1lky@earthlink.net>
Subject: Re: [R-390] R-390a AGC Issue/Observation

THIS clue sounds familiar from earlier posts on the list. Is the correct tube in the first RF stage? And all other stages, too. (A very high gain substitute, or one with a sharp cutoff characteristic will do this.) It could be that the AGC voltages are pretty much ok, but the response of the radio to them is wrong. Also, is the trouble possibly in the noise limiter stage? Pinched audio can come from things amiss there. There is a chart showing expected AGC voltages with RF input levels. It may simply show values from a table in the manual, but I can't remember if that's true. My copy is called AGCGRAPH.JPG and it plots four points:

RF input	AGC voltage
10uV	-.8
1000 uV	-4.
10,000 uV	-7.5
100,000 uV	-9

(These values are approximate - its a simple graph)

There is a specification for audio output increase (in dB) with RF input increase of a specified amount (from X to Y). Check this out, too. I think you did report the resistance to ground of the AGC line. There are expected values of that resistance, too. You may have a leaky cap.

Date: Tue, 14 Apr 2009 09:21:27 -0600
From: ANTHONY CASORSO <canthony15@msn.com>
Subject: Re: [R-390] R-390a AGC Issue/Observation

The RF amp is labeled as a 6DC6 (I had it out yesterday). I haven't pulled all the tubes recently but I did at one time and I didn't notice any that were wrong. I will check this. Mistakes happen. I know about the graph. I will have to check it out. AGC line resistance to ground on the IF deck alone is about 500K. With everything plugged in, it reads 350K-ish if I remember correctly. I did hook the signal generator up to the IF input and drive 455KHz into it. I was able to develop over 15 volts of AGC with the generator at about 1volt. I checked Z-503 and noticed that it did not seem to have a clear peak unless I drove it hard. In other words, with a modest input to the IF deck (say 150 microvolts) I couldn't locate the peak when adjusting z-503. I had to crank the generator up until I was getting -10 or so on the AGC bus before I could see a clear peak in the adjustment. I was looking for a peak by monitoring the AGC bus voltage. I don't recall it being like that the last time I looked. There seemed to be plenty of AGC voltage regardless of the adjustment of Z-503. I removed the z-503 cover and checked the coil. It reads low ohms, so it is not open. I wonder if I could have shoved an incorrect tube into the IF deck at some point. I doubt it though.

Date: Tue, 14 Apr 2009 10:37:33 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] R-390a AGC Issue/Observation

An open cap would let audio get onto the AGC bus, attenuating the envelope.

Date: Tue, 14 Apr 2009 15:28:36 -0700
From: Dennis Wade <sacramento.cyclist@gmail.com>
Subject: Re: [R-390] R-390a AGC Issue/Observation

This resistance to ground for the AGC line sounds too low...should be a lot higher.

Date: Tue, 14 Apr 2009 16:57:38 -0600
From: ANTHONY CASORSO <canthony15@msn.com>
Subject: Re: [R-390] R-390a AGC Issue/Observation

No. It is correct. Look at fig 38 on page 71 of TM11-856a. The path from the AGC line to ground in the IF deck is through R547 (220k), then R546 (180k), and then to ground through R545 100k.

Date: Tue, 14 Apr 2009 16:12:38 -0700
From: Dennis Wade <sacramento.cyclist@gmail.com>
Subject: Re: [R-390] R-390a AGC Issue/Observation

OK..my bad...its been a while since I troubleshooted my IF deck. That turned out to be a leaky mech filter. ...retreating back to the woodwork....

Date: Tue, 14 Apr 2009 18:46:49 -0600
From: ANTHONY CASORSO <canthony15@msn.com>
Subject: Re: [R-390] R-390a AGC Issue/Observation

Looks like it is fixed. The problem was a way too hot V508, AGC amplifier. The tube had a Gm of 4000 when the roll chart showed 2050. Here are the AGC measurements (generator terminated in 50 ohms applied to antenna input so the signal is actually a little weaker than indicated}

Signal	AGC	TM11-856
10uv	-3.3v	-2v
100uv	-5.6v	-4.5v
1000uv	-8v	-7v
10000uv	-11.1v	-9.5v
100000uv	-13.9v	not shown

After replacing V508 with a 6BA6 (old tube was 5749) I remeasured the 1000uv point and got -6v. On this radio, lower AGC sounds much better. The S meter was also too hot, reading 80db when it should have read 60. With the new tube, it reads 65db. Now to use it for a while. Thanks for the comments. It got me thinking about it the right way. I went for the AGC amp because it is the only gain in the AGC loop that is not in the signal path. If it is too hot, the audio will get weak. For all other stages, a hot tube will increase the signal along with the AGC.

Date: Tue, 14 Apr 2009 20:59:52 -0400
From: Roy Morgan <k1lky@earthlink.net>
Subject: Re: [R-390] R-390a AGC Issue/Observation

.....The problem was a way too hot V508,.....

'Glad you found it. That tube is odd for sure.. is it a normal brand? Sometimes a control grid can get knocked out of position and get too close to the cathode (I assume) and give you too-high gain. Maybe you can sell it on that e-place, touting "RARE! "R-390 tube found to be very high in gain ... go for the best for your radio!" "We've never seen one with such high gain!" (Leave out that you hope to never see one again.) heheh Thanks for posting the AGC vs. RF input measurements. This gives an indication of the variation we can expect.

Date: Sat, 02 May 2009 09:39:48 -0400
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: [R-390] 60 Hz Hum Output from R-390A IF Module

I've re-capped, tubed, etc the IF module of my 390A. It seems to have a 60 Hz output component greater than I would expect. Other than that it seems to be operating ok as best as I can tell. Here's the basic setup.

SETUP

1) Module operating outside of radio on extender cable.
2) Audio Output taken from "Diode Load" output. 56k ohm to ground to simulate Limiter input circuitry. Monitored with scope.
3) RF Generator drives transformer whose center tapped output drives IF module inputs J513 and J518.
4) Spectrum Analyzer monitoring IF Test Point J514.
5) IF Gain control set at mid-rotation.

And the basic results.

RESULTS
1) With No RF input, audio out appears to be clear of hum. Expected noise present on audio out.
2) As RF input level is increased, hum amplitude seems to increases linearly.
3) Hum amplitude increase stops at 600 mV p-p as module goes into gain reduction and carrier meter starts to read upscale.
4) For comparison, 30% modulation @ 1 kHZ provides 8.5 V p-p output
-- Hum level is only 23 dB below 30% modulate tone.
5) 60 Hz sidebands easily visible at IF Test Point with Spec An.
6) Generator verified clean - no 60 Hz sidebands visible on SpecAn. As further verification, 2nd Generator also tried with same results.
7) Swapped the 6BA6's around with spares - no change. Still need to swap 6AK6 V504. Have no spare for this one.
8) 60 Hz ripple on B+ measured at about 200 mV p-p

OBSERVATIONS, THOUGHTS
I keep searching for ground loops, isolating the radio, test equipment, etc but with no real change. To initially attempt to minimize this kind of problem, I peeled the Audio Out and Diode Load lines out of the extender cable as they come out of the connector to the module. Since the hum appears present both at Diode Load and IF Test Point, it seems that point-of-entry would precede this common point. Note that the Limiter circuit is not in the path. In regard to ground loops, I can't help thinking about the reactive current flowing to ground via the power line input filter. What part might this current play?

Date: Sun, 03 May 2009 13:16:12 -0400
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] 60 Hz Hum Output from R-390A IF Module

It turns out that the bulk of the 60 Hz hum is caused by the finite ground impedance extender cable itself despite the extender ground being a pair of #16 wires. Not surprising considering 20-20 hind site. The bulk of this appears to be the hum impressed Cathode Bias Line. Grounding this line locally at the IF module drops the hum level 10 to 15 dB. Touching a short piece of heavy ground strap between the radio chassis and the IF module reduces the hum further so something is still sensitive...

Date: Tue, 5 May 2009 17:58:52 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] 60 Hz Hum Output from R-390A IF Module

Are you having any luck with your hum in the If deck?

I am first going to suggest you drop the extender cable and get the IF deck back into the receiver. Back when, any test that was not all things in place was just a distraction. When being defined as 1968 to 1975. If you have to work on the IF deck live (yes you some times must do this) then set the receiver up on end and swing the IF deck out on the bench. Stick the knobs back on the IF deck shafts so you can twist the bandwidth and BFO. Get off the chair or get the receiver on the right height of bench that lets you look into the deck where you need to work.

If this still gets you 60 cycle hum (it may) then start swapping tube out. Always tubes were the first line problem. Second is clean the tube pins and shields. Third is all the ground points need to get unbolted and rebolted to get the crud out of them. Do not remove the bolt. Just loosen, deoxit bath, and retighten. Fourth is a leaky cap. One of the bypass caps have gone resistive and not doing a good filter job. These are not easy to resolve. The deck forms a big loop and finding source point is not an easy task. Let us know how the project is going. Roger

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Date: Tue, 05 May 2009 19:03:10 -0400
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] 60 Hz Hum Output from R-390A IF Module

Thanks for the good ideas on grounding. Some efforts to improve grounding on the extender have dropped the hum to about 33 dB below 30% modulation. Not too awful bad. My next step will be to put the module back into the chassis as you suggest and I expect hum level to improve from that. Guess I wasn't ready for the sensitivity to the extent that I'm seeing. I can only guess that it's mainly all that heater current finding it's way back to home plate any which way it can. I think the extender cable effort is worthwhile since I have been able to identify some sensitive hum entry points and this my lead to possibly doing some things to help desensitize the module to the hum. I'm guessing that the bypass caps are ok as I replaced all the usual suspects with orange drops. Ground point corrosion could still be an issue so I'll check into that.

Date: Tue, 5 May 2009 16:25:08 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] 60 Hz Hum Output from R-390A IF Module

Not to encourage you away from Roger's recommended environment, but an extender _would_ give you entre to substitute DC on the heaters etc. That would tell you Right Now whether it's heater, B+, or whatever other weird thing it might be. That wouldn't get you all the way home, but it would at least partition the problem.

Date: Thu, 7 May 2009 17:51:08 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] 60 Hz Hum Output from R-390A IF Module

You mention that you have found some points of sensitive where the hum may be entering the IF circuits. Please take some time and give us some details of what

you found and where. It could help someone else someday. These discoveries should not be left un-published. You work hard for this knowledge. Please share it.

Date: Thu, 7 May 2009 17:54:00 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] 60 Hz Hum Output from R-390A IF Module

>Not to encourage you away from Roger's recommended environment, but an >extender _would_ give you entr?e to substitute DC on the heaters etc. That >would tell you Right Now whether it's heater, B+, or whatever other weird >thing it might be. That wouldn't get you all the way home, but it would at least >partition the problem.

Right on, Dave. Just a bridge rectifier and a couple big caps in the filament lines of the extended cable could go a long ways and be useful.

Date: Thu, 07 May 2009 23:44:58 -0400
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] 60 Hz Hum Output from R-390A IF Module

I'm still working on the problem. Thanks to all for your interest. My plan is to isolate the IF module from the radio as much as possible. To that end I will hose in B+ and filament from a separate supplies and do it in such a way that heater ground currents will not flow through the radio and/or the extender cable when used. If I'm still seeing 60 Hz, then I'll call in Dave's big guns with a rectifier brick and capacitus gigundus on the filaments.

As luck would have it, the module has developed a new problem. The strip has started to oscillate. It will randomly burst into oscillation for a brief period and then stop. The recovered audio has somewhat the appearance of "motorboating" where there isn't enough decoupling on the B+ or AGC lines, etc. yet I can't see any action like that on B+, AGC or cathode bias lines. That's when I decided it was time to quite last night.

Tonight I "took the evening off" to fix a nagging problem with the scope. My bench area is rather small and I'll probably take another evening off to straighten up as I'm starting to trip over stuff at this point.

My plan is to publish what I learn. It's just right now things seem to be breaking faster than I can fix them! <G>. Also I used to work on high dynamic range wideband FM receivers where minimizing discrete responses in the recovered audio was a really big deal. When I saw the 60 Hz coming through on the audio I just thought, "Man, that's gotta go."

Date: Fri, 8 May 2009 04:19:08 -0400
From: Roy Morgan <k1lky@earthlink.net>
Subject: Re: [R-390] 60 Hz Hum Output from R-390A IF Module

NOTE: If you put a simple rectifier and humongus capacitor on a 6.3 volt AC filament supply, you'll get around 10 volts DC. That may blow out your IF strip tube filaments in short order.

Date: Fri, 8 May 2009 12:02:26 -0500
From: "Bill Hawkins" <bill@iaxs.net>
Subject: Re: [R-390] 60 Hz Hum Output from R-390A IF Module

Another note:

First, separate the problem into IF or Audio modules. With the IF module exposed, short pins 1 and 2 (they're connected) of the limiter V507 to ground AT THE AUDIO MODULE. If you still have hum, the problem is in the audio deck.

Seems like the main thing is that the IF module generates the lowest level of audio, from the detector. The audio deck, then, has high audio gain. Hum is generated in the resistance of the two ground IF extension wires, which also carry heater current.

You can avoid that hum by using a separate 6.3 volt transformer that is connected directly to the IF module, after disconnecting the 6.3 volt extension wire at J512 pin 20. No heater current will flow in the ground extension wires at pins 7 and 17.

The lowest level audio leaves on J512 pin 5, goes out to DIODE LOAD terminal 14, through a jumper to terminal 15 and back in through pin 3. Make sure the shields on those harness wires are grounded.

If you do want to try DC, use a separate supply, or put the diodes and cap at the radio. That way the cap charging current spike will not induce worse hum on the ground extension wire. Heed Roy's warning.

If the IF module oscillates, adjust its gain control as described in the manual. It's easy to get too much gain if you just set the pot in the center. This ought to be covered in the Y2K compendium of group knowledge.

Most of what I know about these fine radios came from this group. I learned the principle of solving a problem by halves back when I got over being a know-it-all college graduate, about 1962.

Date: Fri, 08 May 2009 15:21:33 -0400
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] 60 Hz Hum Output from R-390A IF Module

I responded to Bill's remarks inline. Not especially personal but maybe a little clearer at this point.

>First, separate the problem into IF or Audio modules.....

Actually I've been watching audio at the Diode Load output of the detector (V506B). I've disconnected the Limiter and replaced Limiter's load resistors (R526 and R527) with a 56k to ground. I've got a small RF bypass cap across the 56k resistor to bypass the remaining 455 kHz RF that shows up there.

>You can avoid that hum by using a separate 6.3 volt transformer.....

Sounds good to me. After isolating the filament transformer I could also isolate the B + supply if necessary. Controlling sneak paths could start to become confusing!

>If you do want to try DC, use a separate supply, ...

Don't want to go DC except as a last resort. The kludge factor is high considering transformers, rectifiers, capacitors and most likely a Variac to deal with Roy's warning. I'm already having problems trying minimizing the amount of cobbing needed to run these tests.

>If the IF module oscillates, ...

Initially I did observe the oscillation I think you're describing. Running the IF gain control to max clockwise rotation would send the strip into oscillation. Backing the gain down a little calmed it right down again. It's behavior was very "honest". I ended up arbitrarily setting the IF gain to mid-rotation for the time being. If you expect oscillation to occur at lower gain settings, perhaps there is a problem with the module and it does not have enough gain. Anyway, since then, something's changed. I now see continual but random bursts of oscillation at the IF test point. Somewhat similar in appearance the color burst signal in good old analog TV. Recovered audio appears as a negative going spikey sort of pulse for the duration of the burst. Appearance of this spikey pulse is reminiscent of "motorboating" behavior when AGC or B+ between stages is not decoupled well enough. Can't find evidence of this motorboating behavior on B+, AGC or Cathode Bias Lines. I'll also add that the bursting is not affected by the setting of IF gain control. The behavior is indeed NOT honest. It could be the fact that I disconnected the AGC line from the rest of the receiver it P112 and "tied back" the AGC to the IF module by connecting P112 pins 4 and 6. It's hard to picture this as a cause but I don't know at this point. Perhaps the "flailing" AGC in the
rest of the receiver is causing problems. Maybe I should ground it and stop it's flailing and also try reconnecting it.

>.....know-it-all college graduate, about 1962.

Have never considered myself the know-it-all type. The college thing doesn't replace experience. I know that dealing with equipment like these R-390 receivers does take a lot of finesse. Also realizing that it's so difficult to troubleshoot by remote control, I'm passing my observations along to the group as carefully as I know how so the group knowledge base can be as involved as possible. Hopefully some worthwhile ideas for everyone will come out of all this.

Date: Fri, 8 May 2009 19:30:09 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] 60 Hz Hum Output from R-390A IF Module

A thought has come to me that you may want to change the B+ caps for the audio and B+ in the audio deck. If you still have the original plug in cans or some other old caps, it could get you enough leakage to ripple through the IF and audio decks. How much hum are you getting? Most receivers will give you some hum when the RF and

Audio are set to max. Run 150 UV of 455 into the IF deck and look for -7 volts on the diode load buy setting the Gain pot on the IF deck. With modulation on you should get 1/2 watt out on the local audio pins of the rear terminal board. And 100 Mili watts on the line audio as read with the line level meter.

Turn the modulation off and you should get a 30 dB drop in the output on the local audio pins. Use an AC volt meter with a dB scale and a 600 ohm load resistor to measure the half watt of power and 30 dB down from that point with the modulation off.

If the receiver will do this for you, what ever level of 60 cycle hum you have is within bounds for the receiver. If your hum hold the noise level up so you cannot get the 30DB difference, then you do have a problem and do need to do some work to find the problem. Use the procedure in the Y2K manual or a PDF copy of the TM for setting the IF gain pot. Start reading there to set up the signal generator and the receiver for the test and adjustments.

Date: Fri, 8 May 2009 17:03:37 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] 60 Hz Hum Output from R-390A IF Module

I was thinking more along the lines of a high-capacity bench power supply.

Date: Fri, 8 May 2009 17:06:07 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] 60 Hz Hum Output from R-390A IF Module

What percentage modulation?
(Pardon me if the URM-25 is fixed-level, I'm not familiar with it.)

Date: Fri, 8 May 2009 19:25:23 -0500
From: "Barry" <n4buq@knology.net>
Subject: Re: [R-390] 60 Hz Hum Output from R-390A IF Module

Could the heater lines be run through shielded cable in the extender? Just a thought.

Date: Fri, 08 May 2009 20:34:45 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] 60 Hz Hum Output from R-390A IF Module

AN/URM-25s are NOT fixed ouput levels. They can be dialed down to WELL under 1 µV. These are what the R-39X series were worked over with. I still use one today. I've gotten my R-2000 to tweak in at the ZERO reading.

Date: Fri, 8 May 2009 17:42:32 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] 60 Hz Hum Output from R-390A IF Module

Modulation, not output.

Date: Fri, 8 May 2009 22:40:10 -0500
From: "Bill Hawkins" <bill@iaxs.net>
Subject: Re: [R-390] 60 Hz Hum Output from R-390A IF Module

Only if they were radiating hum within the cable harness. Which they do, but the high impedance (>>>50 ohms) audio lines are shielded from that effect. Heater current through the ground extension wires causes the problem. The current is about 2 amps. Say the ground resistance is 0.010 ohms. If the detector/limiter generates a very quiet zero volts, the audio module will see 20 mV of 60 HZ at its input. That's audible hum, which should go away if the extension harness is not used, or the heater current is removed from the ground extension wires.

Date: Sat, 09 May 2009 01:52:15 -0400
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] 60 Hz Hum Output from R-390A IF Module

Thanks for the reminder. I do have a bench supply squirreled away that will do the job.

Date: Sat, 9 May 2009 05:58:06 +0000
From: "Jim M." <jmiller1706@cfl.rr.com>
Subject: Re: [R-390] 60 Hz Hum Output from R-390A IF Module

What about a filament to cathode short in a tube? I have seen that cause hum before.

Date: Sat, 09 May 2009 11:54:25 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] 60 Hz Hum Output from R-390A IF Module

Modulation is adjustable on mine up to 50%. If you need something other than 400cps or 1Kc, input a tone generator into the AN/URM-25

Date: Sat, 09 May 2009 12:28:14 -0400
From: rbethman <rbethman@comcast.net>
Subject: [R-390] AN/URM-25

The NAVSHIPS manual is on BAMA.
It is NAVSHIPS-0967-187-5010.PDF.
This is for the -C, -D, and -G models.

If you can't get beyond 30%, as written on page 1-1 and others, it may be time for a poke inside. I just had to replace the tubs for the XTAL Osc. in mine. I am fortunate in that it is only off by 100 - 125 cps. Everything else is fine.

Date: Sat, 09 May 2009 13:47:55 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] 60 Hz Hum Output from R-390A IF Module

URM-25 Section 6 of the NAVSHIPS manual - Corrective action.

Hum on output - Tighten T-201, replace V-101.
You DID say no RF no hum?
I've just been re-reading and also digging into the URM-25 manual.

Date: Sat, 09 May 2009 14:47:43 -0400
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] 60 Hz Hum Output from R-390A IF Module

I installed new Power Supply electrolytics, and recapped the Audio and IF modules straight away when I first got the receiver. Haven't done the RF deck yet. Also I'm not in a position yet to accomplish the complete procedure that you've outlined here but from what I've seen of the raw audio output of the detector at the Diode Load, I'd say that I'm probably within the ballpark of the -30 dB of leftover hum and noise that you describe. Once I deal with the "bursting" oscillation that I've previously described I can move on in that direction. So perhaps hum output level really is "ok". If that's the case then it bothers me that the impressed 60 Hz hum is easily visible on the scope as a component riding on top of a recovered 1 kHz tone. I guess my mind set is that if I can see it on a scope, it's really NOT acceptable. So if I can determine the real entry point(s) of the 60Hz, perhaps something can be done to improve it.

Date: Sat, 09 May 2009 14:51:12 -0400
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] 60 Hz Hum Output from R-390A IF Module

Actually I using an HP8640B generator and I'm able to look at it's output spectrum close enough to see that it's output is pretty clean with respect to 60 Hz. To be absolutely certain I went through the same exercise with a 2nd 8640 and it was also clean. It's looking as though any possible generator problems that may exist are at least not adding to the hum.

Date: Sun, 10 May 2009 18:13:38 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] 60 Hz Hum Output from R-390A IF Module

I see your concerns. Stay with it and see what you can do. If you can find a point to stick in a couple extra filter caps, or change a resistor to reduce the hum let us know. A few good changes can always be in order. Most of us do not really get down into the subassemblies as we should. You could provide us some insight from your experience.

Date: Sun, 10 May 2009 20:29:02 -0400
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] 60 Hz Hum Output from R-390A IF Module

Something tells me it will take more than the addition of some parts... When I get the IF module behaving again (bursting oscillation) I'll try DC filaments straight away. Dave's remark about the bench supply reminded me of the semi-boatanchor Lambda I have squirreled away that will do the job nicely.

Date: Mon, 11 May 2009 10:15:30 -0700

From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] Second R-725 on ebay

The purpost of the transformer is to separate the PTO and BFO heaters from the main heater supply. (The main supply is grounded.) This allows the heaters to be floated up to a positive DC potential, which has a known beneficial effect in reducing hum. (It prevents filament emission.)

Date: Mon, 11 May 2009 13:21:43 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] Second R-725 on ebay

> This allows the heaters to be floated up to a positive DC.....

Back when I was trying to make VFO's by using hot pentodes I discovered the same technique. The problem I was having (and floating the heaters up solved) was a subtle 120Hz frequency modulation. It was sorta like a hum but more like a warble.

Date: Mon, 11 May 2009 15:26:04 -0400
From: "Tom Bridgers" <Tarheel6@msn.com>
Subject: Re: [R-390] Second R-725 on ebay

How does one "float" the vfo tube's filament up to a positive dc potential? Does that mean we should do the same thing to our R-390A's PTO tube's filament?

Date: Mon, 11 May 2009 15:28:31 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] Second R-725 on ebay

Dave is NOT talking about the FILAMENT. He is talking about the HEATING ELEMENT wrapped around the PTO inside the can. Thereby taking AC away from the PTO innards!

Date: Mon, 11 May 2009 14:37:19 -0500
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] Second R-725 on ebay

And just in case it's not been discussed...those heaters should be disabled anyway.... as a matter of fact the last one I rebuilt I removed the outer can, insulation and heater and discarded it....as it was banged up anyway.

Date: Mon, 11 May 2009 12:41:40 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] Second R-725 on ebay

Er, I _am_ talking about the filament, Bob. Frequently referred to as "heater" in indirectly-heated tubes. If the PTO was having FM hum problems, any AC in the area would certainly be anathema. It's the biggest source of residual FM in the General Radio 1009 Standard Signal Generator. There, the power transformer's magnetic field changes the tuning slug's permeability. I don't think the R-725 uses a DC oven,

so in that case I have to guess that the combination of inner shield and (incidentally) field-cancelling wrap-around oven winding design minimizes the effect.

Date: Mon, 11 May 2009 12:44:55 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] Second R-725 on ebay

I don't have the schematic in front of me, but I'm sure they simply added a resistive divider from B+ to ground, with resistances set up so that the tap is, say, +50V. Then just connect one side of the (isolated) heater supply to it. The voltage is not critical; it just has to be high enough to inhibit emission and low enough not to puncture the heater insulation. This is done in tube audio preamps that don't take the more effective (and expensive) approach of heating with DC.

It's also done, particularly in test equipment, where there's a cathode at high voltage; then you have to get the heater off ground to stay within the H-K breakdown spec. Check out the power supply in 500-series Tektronix scopes.

Apparently, hum modulation in the PTO was enough of a problem in the R-725 that they sought to reduce it. That's a special application. It's never occurred to me that it could matter in a straight 390A or 390.

Since oscillator amplitude has little effect on mixer output, I figure the problem was FM not AM. If you don't get any hum when you tune to the edge of IF passband on a CW signal, I'd say it's not worth the effort. And if you do, it's cheaper to just try a different tube.

Date: Mon, 11 May 2009 15:30:10 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] Second R-725 on ebay

Remember, Roger, Servo added a new transformer just to power the PTO and BFO filaments. Once the filaments are disconnected from the normal 25.2 infrastructure, they can do whatever they want. Including elevating to a DC voltage. Absolutely not worth the effort to retrofit, IMO. Lots of work for probably no noticeable improvement, and now it's not stock.

Date: Fri, 15 May 2009 18:34:12 -0700 (PDT)
From: David Elsea <dkelsea@sbcglobal.net>
Subject: [R-390] PowerSDR

A while back there were some post about using powerSDR with the R-390A? I am wondering what hardware was used to accomplish this.? I am at Dayton and don't know what to look for. Any help with is greatly appreciated.??? w6dke Dave

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Date: Fri, 15 May 2009 21:41:47 -0400
From: Roy Morgan <k1lky@earthlink.net>
Subject: Re: [R-390] PowerSDR

I find the following message in my file here: (not an archive search):

> From: dkelsea@sbcglobal.net
> Subject: [R-390] PowerSDR
>
> Date: May 15, 2009 9:34:12 PM EDT
> R-390A / SoftRock SDR IF
>
> http://www.w1vd.com/R-390ASoftRockdetails.html

The first part of that web page is:

> The R-390A / SoftRock setup has generated quite a bit of interest
> and a number of questions on the setup since first appearing on the
> AMfone website. This page is a collection of information that has
> appeared in various threads on AMfone plus additional measurements
> I've made on the R-390A alone and with the SoftRock SDR. The
> information presented here should be applicable to other receivers
> and other i-f frequencies with appropriate changes.
>
> The basic concept is to use the R-390A as a high performance 'front
> end' for a software defined radio (SDR) IF receiver. An R-390A
> provides the rf amplifiers, tracking filters, mixers, HFO, VFO, wide
> i-f filter and i-f amplifier stages and the SoftRock SDR setup takes
> over from there providing the final i-f filter bandwidth, detectors,
> AGC (if desired) and low level audio. The R-390A is tuned to
> frequency as normal, however control of the final i-f filter
> bandwidth, detector type, volume control, etc is done 'on screen'
> under the control of software. The software of choice seems to be
> FlexRadio PowerSDR, although other software can also be used.

Date: Sun, 17 May 2009 13:24:56 -0400
From: "Don Heywood" <wc4g@knology.net>
Subject: [R-390] R-390 IF Mod Identification

HI guys, I have an R-390/URR here which has an unknown mod in the IF deck.

Here is what I can see:

The BFO on/off switch has been replaced by a three position switch with three leads (in addition to the BFO B+ contacts).

These three leads enter the back edge of the IF deck through a three pin inline cinch connector so the deck can still be removed.

There is an R/C network tucked in around the base of IF transformer T505.

One of the three extra leads goes to what I think is the BFO coupling cap area.

This cap has been clipped and these leads attached to the above circuitry..

The second extra lead also connects to the extra circuitry around T505

The third extra lead has been placed in series with the original lead to pin 1 of V510.

Has anyone seen or have information on this mod?

My plans are to uninstall it and return the deck to original.

The benefit of your experience will be appreciated.

Date: Mon, 18 May 2009 06:00:44 -0700
From: Brian Vietri <bvietri@msn.com>
Subject: [R-390] R390A Non-working BFO fix

My R390A BFO never worked, all other functions normal, to make a long story short here is what I found: V505 plate/grid voltages started out at 225 VDC and went to about 40 volts on the plate/ 75 volts on the grid within 45 seconds from power on.(I believed the tube was on hard) no - feedback from BFO assy. Sure enough when I pulled BFO assy, after removing cover, two little brass screws were loose on the back, one was tap for 60 µh coil, resoldered connections, tightened screws ALL OK NOW. Hope this can help someone!

Date: Wed, 20 May 2009 09:03:14 -0400
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] 60 Hz Hum Output from R-390A IF Module

The saga continues in my attempt to characterize the 60 Hz component present on the audio of my R-390A IF module. The bursting oscillation I encountered previously has subsided for the time being. I've refined my test setup and that may be a factor in helping. Without going into a bunch of detail at this point, it's starting to look look like that the 60 Hz heater supply for the IF module does contribute to hum on the module's output. This is based on comparing hum output when alternately using the normal internal AC heater supply and an external Lambda linear DC supply for module heaters. No real surprise here I guess.

Of more significance is a marked change in hum output for certain mechanical filter selections. This hints that the hum could be entering the signal path both before AND after the mech filters such that the delay variation from filter to filter could either cause constructive or destructive interference when the hum components combine. As an example, hum level drops by about 11 dB just by changing from 8 kHz to 16 kHz filters. For this test, I had the IF module configured for normal operation, mounted firmly in the radio chassis with it's power plug (20 pin connector) plugged directly into the module (i.e. extender cable NOT used). More to come.

Date: Wed, 20 May 2009 09:16:46 -0400
From: Roy Morgan <k1lky@earthlink.net>
Subject: Re: [R-390] 60 Hz Hum Output from R-390A IF Module

> Of more significance is a marked change in hum output for certain

> mechanical filter selections.... <snip>

The filter action depends quite a bit on the filter skirts making good contact with the mounting surfaces. You might be getting "blowby" around some filters that is being modulated by 60 cycle hum. By the way, is it SIXTY cycle hum you are getting, or 120 cycle "hum"? 60 cycle would mean heater supply or transformer induced hum. 120 cycle noise would be coming from rectified B+ having too much ripple on it. Have you measured the ripple on the B+ supply? At various
points?

Date: Wed, 20 May 2009 09:30:52 -0400
From: "Tim Shoppa" <tshoppa@wmata.com>
Subject: Re: [R-390] 60 Hz Hum Output from R-390A IF Module

> Of more significance is a marked change in hum output for certain
> mechanical filter selections.... <snip>

Can you use an ohmmeter to check for leakage between filter can and terminals? The usual symptom is a false actuation in AGC action between different filters, but this could also I suppose manifest itself in terms of hum (maybe AGC action is hiding a source of hum?) Some of us with still working, but leaky filter cans, have isolated the can from ground to help alleviate this. But this is at best a workaround. The real solution is to open the can and clean out the foampucky. (I'm presuming that is the correct technical term for decayed foam!) The really adept have done this as well as repairing damaged filter coil winding, e.g. http://www.delphelectronics.co.uk/filter390a/

Date: Wed, 20 May 2009 11:11:42 -0400
From: Bill Kulze <wak9@cornell.edu>
Subject: Re: [R-390] PowerSDR

Hi Dave. I didn't post the original message, but I did make a reply post. I run the IF out through an attenuator then into my WinRadio, tuned to 455kHz. I can then use the winradio for demod. But winradio is limited in what can be displayed. You only get a panadapter. The winradio has a command line switch to disable its demodulator, allowing me to run powerSDR, or WinRad, both of which have more capabilities. Any one of these options gives you all the modes of demod available with that software, but you do need some hardware to get it into the PC, in my case the winradio. Hope this helps. Bill KC2SUO

Date: Wed, 20 May 2009 18:38:27 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] 60 Hz Hum Output from R-390A IF Module

> Can you use an ohmmeter to check for leakage.....<snip> I think yo are on to something here. Some of the foampucky could be doing a short to chassis. Not a dead short but enough to act as an input source for some hum. I have on easy way to test for such a condition. Unsoldering the filter inputs is a long grind to trouble shoot the problem. We do expect the input and output to be essentially open from the coils of the filter to ground. Once you lift the leads it is easy to get a meter reading. But to

undress all those leads on a witch hunt is work. At some point Jon may think it would be worth the effort.

Date: Wed, 20 May 2009 18:56:06 -0400
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] 60 Hz Hum Output from R-390A IF Module

I've verified all four mech filters when I removed them from the module to sweep their responses. Resistance-to-case for all eight transducer coils was greater than any of my ohmmeters could measure. Also as Tim had suggested in his off-list email, I checked the AGC line resistance to ground with the filters in-circuit and found just under 500k ohms which looks about right from how I was able to interpret from the schematic.

Date: Wed, 20 May 2009 19:23:28 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] 60 Hz Hum Output from R-390A IF Module

We are running out of easy things real quick. I missed the mail where you did isolate the filter cans and checked them all. Time to pull the back shells off the IF and Audio deck connectors and inspect for crud and good bonds on all the shields on all the shielded wires. You may want to go over the front panel and check the shielded wire bonds around all the switches also. I forget if you have an alternate receiver and have been able to isolate the problem to within a sub assembly or not.

Date: Wed, 20 May 2009 20:33:46 -0400
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] 60 Hz Hum Output from R-390A IF Module

Since I only want to see the effect if the IF module, I've been looking only at the Diode Load audio signal rather than the normal outputs of the audio module. With the IF module firmly mounted in the receiver in its normal configuration, here's what I'm measuring.

1) With the receiver's existing AC heater supply, I see 60 Hz levels between 33 to 44 dB below a 30% modulated 1 kHz tone depending on bandwidth selection of 4, 8 or 16 kHz. This is an 11 dB variation depending on mech filter selection.

2) With an external DC heater supply, the 60 Hz level I'm seeing is about 38 to 39 dB below the same tone when for bandwidth settings of 4, 8 and 16 kHz. Only a 1 dB variation depending on mech filter selection.

REMARKS: Since with DC heaters there is almost no variation in hum level across mech filter selection, I will assume for the time being that filter blowby isn't a problem. Roy pointed out this issue and reminded me that I do need to check the module's out-of-band responses now that I've reinstalled the filters into the IF module. So assuming for the moment that filter blowby is not a problem, why does the 60 Hz level change so drastically only when running on AC heaters and mech filter selection is changed? I'm starting to think about things like the fact that the power connector suppling heater power among everything else is located at the same end

of the module that the lowest level/most sensitive stages are located.

Date: Wed, 20 May 2009 21:10:19 -0400
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] 60 Hz Hum Output from R-390A IF Module

I understand the problem of which you speak. I've been making all my measurements relative to a 30% modulated 1 kHz tone to try and prevent those kinds of difficulties. I've also been pushing the IF module into AGC far enough for the carrier meter to read upscale to 20 dB. I've been using a real time spectrum analyzer to make the audio measurements so measurements really are the level of ONLY the the 60 Hz component relative to the 30% modulated tone.

Perhaps I should be using a smaller microscope to look at this stuff but it bugs me that I can still see on the oscilloscope the 60 Hz riding along on top of the recovered 30% modulated tone. It's just not right. The 120 Hz component from the B+ supply doesn't seem to be a real issue at this point but may become more prominent if I can beat down the 60 Hz some more.

Date: Sun, 07 Jun 2009 15:01:08 -0400
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: [R-390] R-390A IF Module 60 Hz HUM Update

Back again with some more info. Most recently I've done the following.

(1) I Built a test fixture to operate the IF module separate from receiver. Definitely worth the effort. The fixture duplicates all functions the IF module sees in normal operation when installed in receiver; limiter, AGC speed switches. RF Gain, Limiter level pots, etc. Care was taken in fixture design to minimize/eliminate ground loops and other sneak current paths that could affect results. Most notable is how I handled the two ground pins (17, 18) on J512. Filament/Heater return path is from pin 18 ONLY and all other signal and B+ return paths are from pin 17 ONLY. This was done to prevent AC filament current from being impressed upon the signal return paths via the fixture wiring. The IF module operates with the fixture in a stable manner with no unexpected behavior. Here are some pix of the fixture and IF module

http://www.vecnav.com/R-390A_IFmodule/IFmodFixture-001-small.jpg
Lambda DC filament supply sitting under Heath Regulated Supply

http://www.vecnav.com/R-390A_IFmodule/IFmodFixture-002-small.jpg
"DC Volts" Carrier Level meter reworked to 0-1 mA, 20 ohm movement.

(2) Re-tightened all ground lug hardware. No change in hum levels after this operation.

(3) Used DC from a regulated Lambda lab supply for filament power. Again and as expected, hum level became essentially unmeasurable. Hum seems to be strongly related to using AC filament power as opposed to DC.

(4) Sweeping the IF module (J513 to J514) showed that all four mech filter BW

selections were better than 75 dB down in their stop bands. Filter "blowby" is probably not an issue. Nevertheless, simply changing the selected mech filter caused a marked change in 60 Hz component levels. 16 kHz selection was the best and 8 kHz was the worst with 20 to 25 dB difference between them. It seems that this would suggest that hum is getting in through more than a single entry point.

(5) I'm now suspecting that currents from the AC filament supply within the module chassis to somehow be getting into the signal path. As a trial, I fed AC to the filament string from nearly the opposite end of the chassis, soldering a wire to pin 9 of V506. 60 Hz levels tended to "even out". The very low levels measured at the 16 kHz BW position came up and the higher levels at the other
three BW positions tended to come down. In a way, the more equalized
levels seemed "More Honest." **********
I'm now considering trying returning filament current of each tube through a separate wired path rather than chassis ground to get the current returned to the supply in a more controlled manner. I'm concerned about unintended interstage coupling since filaments would no longer be connected to hard ground. Many RF bypass caps would be needed. WHAT WOULD REALLY HELP is to be able to correlate the 60 Hz hum levels I'm seeing with how other receivers perform. I'm measuring 60 Hz levels from 30 to 55 dB below a 30% modulated tone at the diode load output of the IF module, depending on mech filter selection. This is a relative measurement that ideally should translate to the same measurement anywhere along the audio chain regardless of RF/IF path gain, etc. If anybody has this kind of info, I'd be very appreciative to receive it. Also as a note, I can see 60 HZ on the scope when the 60 Hz level becomes higher than about 45 dB below the 30% modulated tone. If an undesired component is visible on a scope, then it's too high as far as I'm concerned. Thanks to all for your help and for reading through all this stuff!

Date: Sun, 7 Jun 2009 19:43:45 -0700 (PDT)
From: Joe Foley <redmenaced@yahoo.com>
Subject: Re: [R-390] R-390A IF Module 60 Hz HUM Update

But did you tighten ALL of the bolts holding everything together?
Especially the bolts holding the tube sockets down.

Date: Mon, 8 Jun 2009 19:41:54 -0400
From: "Jim M." <jmiller1706@cfl.rr.com>
Subject: Re: [R-390] 60 Hz HUM Why AC filiments?

Personally I have never experienced a high hum level from a tube radio unless a connector or ground was amiss, a power supply was poorly filtered, or a tube was bad or going bad such that there was leakage from filament to cathode. Normally whatever hum is induced by a normally operating circuit is way below the signal level as to not be obtrusive, A filament to cathode short can induce hum. Start trying replacement tubes in all stages, if replacing one causes the hum to diminish, then you have a bad tube.

Date: Tue, 09 Jun 2009 15:30:04 -0400
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: [R-390] 60 Hz on Audio

Please check out these photos of the output of my R-390A IF Module. This first image shows the audio output from the Diode Load signal line. Input to the IF module is 455 kHz modulated 30% with a 1 kHz tone. The 16 kHz mechanical filter is selected in this image. The audio looks pretty clean. Any 60 Hz that might be there really isn't visible.

http://www.vecnav.com/R390A_IFmodule/DiodeLoadOut_16kHzMechFilter.jpg

This second image was made with the identical conditions as above except that the selected mechanical filter is now 8 kHz. A 60 Hz component is now easily visible. In fact it's about 25 dB or a factor of about 18 times worse than with the 16 kHz setting.

www.vecnav.com/R390A_IFmodule/DiodeLoadOut_8kHzMechFilter.jpg

Is this kind of behavior acceptable for these receivers? If not acceptable, what could be causing the distinct difference of 60 Hz level just by changing the BW setting?

Date: Tue, 9 Jun 2009 13:35:19 -0600
From: w9ya <w9ya@qrparci.net>
Subject: Re: [R-390] 60 Hz on Audio

I am going to go out on a limb here and answer your question: "If not acceptable, what could be causing the distinct difference of 60 Hz level just by changing the BW setting? " <- The filter.

Date: Tue, 9 Jun 2009 13:39:18 -0600
From: w9ya <w9ya@qrparci.net>
Subject: Re: [R-390] 60 Hz on Audio

And by this I mean the filter and circuit associations unique to the filter either by only being used with that filter setting as opposed to another filter that does not show such association OR because this particular filter is somehow accentuating this effect in other components that might be at fault. In any event, like ALL troubleshooting, keep narrowing down your focus until the answer is obvious. i.e. Keep taking measurements that you make sure are being taken properly.

Date: Tue, 9 Jun 2009 15:31:29 -0400
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] 60 Hz on Audio

Is it possible that since the filter is "mechanical", it's picking up a sympathetic vibration from the power transformer (or other source of 60kc vibration)? Have you tried dampening (physically) the 8kc filter? Just a wild guess...

Date: Tue, 9 Jun 2009 14:24:49 -0600
From: ANTHONY CASORSO <canthony15@msn.com>
Subject: Re: [R-390] 60 Hz on Audio

If you have already mentioned it, my apologies. Are you in MGC or AGC mode? If

AGC, what happens in MGC mode? I am thinking that the broader filter lets more noise through which generates more AGC, reducing the IF gain. If in MGC mode, then this is obviously not the case.

Date: Tue, 09 Jun 2009 16:25:09 -0400
From: Jon Schlegel <ews265@rochester.rr.com>

Thanks for your reply. Actually the 4 and 2 kHz filter show similar behavior as the 8 kHz filter does. All I can offer about the mechanical filters is that I had originally removed them from the module swept them and they all performed well inasmuch as their stopband attenuation typically was pushing 90 dB. After reinstalling the filters into the module I again swept the four bandwidths and found the stopband attenuation to be better than 75 dB.

Date: Tue, 09 Jun 2009 16:36:30 -0400
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] 60 Hz on Audio

I get the same behavior regardless of gain settings, AGC, MGC. When I switch OUT of AGC, I set the generator signal level appearing at the IF test point (J514) so that it is the same as when the receiver is into AGC (about -15 dBm). I can now also say that if I remove V502 and inject a 455 kHz signal at pin 5 on the socket (plate) I get a very clean audio signal out with virtually no 60 Hz present. It would seem then that it's getting in previous to that. Time to inject at pin 5 on V501.

Date: Tue, 9 Jun 2009 17:58:35 EDT
From: Flowertime01@wmconnect.com
Subject: [R-390] R390: 60 Hz on Audio

It is clean and good on the 16KHz filter.
V502 confirms the problem lies prior to the plate output of V502.
It is back to the band switch and filter sections.
It is not V501 as it does not appear in the 16KHz switch position.
A wire for 2, 4, 8 is laying to close to a 60Hz source.

S503 rear is not giving you the ground you expect on the 2, 4, 8 filter when you are selecting those filters. The switch section is not grounding the other filter sections as expected. The other filters are floating, picking up AC and passing it down the line.

At 16KHz, either the switch section is working. Or the other 3 filters are not getting enough 60Hz coupled into them to present the problem.

I think the 16KHz filter is picking up the 60 Hz and passing it down the wire when you are using 2,4,8. At 16 you change the switch setup and thus do not see any 60 Hz. Keep testing.

Date: Tue, 09 Jun 2009 18:58:07 -0400
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] R390: 60 Hz on Audio

Thanks Roger, I'm beginning to question the grounding arrangement that I used when I reinstalled the filters into the chassis after measuring them. I will also look closely at the grounding accomplished by S502/503 rear.

ADDITIONAL INFO: I removed V501 and injected 455 kHz to pin 5 (plate) of the V501 socket and still see 60 Hz on recovered audio as previously described. This does suggest the 60 Hz is getting in through the filter/switching/grounding arrangement as you suggest. Exactly how the mechanical filters would be sensitive to 60 Hz is still a mystery.

Date: Tue, 9 Jun 2009 19:15:50 -0400 (EDT)
From: larrys@teamlarry.com (Larry Snyder)
Subject: Re: [R-390] R390: 60 Hz on Audio

Well, the mechanical elements are driven and sensed magnetically.
Just a data point.

Date: Tue, 9 Jun 2009 19:25:24 -0400
From: Steve Hobensack <stevehobensack@hotmail.com>
Subject: Re: [R-390] R390: 60 Hz on Audio

I have a small amount of hum on my 63 Imperial. I found it was coming from he PTO signal. As a test, I dismounted the PTO canister, and the hum went away. It was mechanical coupling to a vibrating chassis. The vibration was coming from the power transformer. I greatly improved the hum situation by loosely mounting the power supply.

Date: Tue, 9 Jun 2009 18:25:47 -0500
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: Re: [R-390] 60 Hz on Audio

Now this is way out in left field:

How about magnetic coupling from the power transformer that is mounted directly below the IF deck? If you have eliminated all 60 Hz sources on the IF deck (using DC rectified filaments, etc...) you may be picking up something inductively coupled.

The aluminum chassis will pass a magnetic field and when the IF deck is mounted in the chassis it is really in close proximity to the power supply (less than 1/2 of an inch away). You could have a power supply fault that is generating a strong 60 Hz magnetic field.

Or maybe there is something in the wiring harness (ground returns that are shorted together, creating a weird current loop). I have seen this happen in process control instrumentation and have ended up chasing down ground loop hum.

You may need to physically separate the IF deck from the radio to see if it is magnetic coupling. Or you can get a piece of Mu-Metal and put it under the IF deck to make

sure there is not magnetic coupling.

Again, these suggestions are way out in left field but we are talking about the amplification of extraordinarily low signal levels and trying to hunt down something that is probably measured in micro-volts at the source.

Date: Tue, 9 Jun 2009 19:26:58 -0400
From: "Jim M." <jmiller1706@cfl.rr.com>
Subject: Re: [R-390] R390: 60 Hz on Audio

Some questions: Is the shield cover installed over the filters? I have seen the top mounting screw come loose causing some erratic behavior. Have also had the cover short against one of the filter lugs causing weird things (but I don't recall getting hum).

Date: Tue, 09 Jun 2009 20:37:36 -0400
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] R390: 60 Hz on Audio

Wow Steve, When I saw "63 Imperial", I immediately thought of the car! I think that was about the time of the suicide doors in the back? Anyway, I'm running the IF module disconnected from the receiver using a purpose built fixture powered by one of the Heath regulated lab supplies. Here're some pix of the setup.

<http://www.vecnav.com/R-390A_IFmodule/IFmodFixture-001-small.jpg>
<http://www.vecnav.com/R-390A_IFmodule/IFmodFixture-002-small.jpg>

I can see it happening with the vibration of the power transformer modulating the PTO. Wonder how common an occurrence that world be.

Date: Tue, 09 Jun 2009 21:44:35 -0400
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] 60 Hz on Audio

Actually I do have the module separated from the receiver. Here's the setup.

<http://www.vecnav.com/R-390A_IFmodule/IFmodFixture-001-small.jpg>
<http://www.vecnav.com/R-390A_IFmodule/IFmodFixture-002-small.jpg>

This is turning into a mystery. Here's the rundown so far.

(1) B+ is clean.

(2) Tightened chassis ground connections.

(3) Replacing/Swapping tubes did not help. 60 Hz still present.

(4) DC Heaters/Filaments eliminates the 60 Hz from recovered audio completely.

(5) Thinking Heater return current in chassis was inducing hum somewhere, I

removed heater returns from chassis at each socket, wired them together and brought the return out to connect to the heater supply externally. This at least goes part way towards Don's twisted pair heater distribution. To my surprise - NO CHANGE

(6) Removed V502 and injected 455 kHz to pin 5 (plate) of socket. 60 Hz eliminated from recovered audio completely.

(7) Removed V501 and injected 455 kHz to pin 5 (plate) of socket. 60 Hz present with level depending on BW selection. See my post of today at entitled "[R-390] 60 Hz on Audio" at time 0330 EDT as an example of what I saw for this test..

(8) Had previously removed and swept the four filters on a network analyzer and found that all showed excellent stopband attenuation.

(9) Swept the entire module, Input to IF Test Point Output in all four mechanical filter positions and found stopband attenuation to be nearly as good as above.

(10) I Questioned my wiring of the filter compartment, bottom side of chassis. Rewired filter grounding to eliminate possible ground loops. Followed an example photo on Chuck Rippel's page of correct wiring arrangement. 60 Hz still present.

(11) Verified that input and output of unused filters are being grounded correctly at each position of the BW switch as Roger suggested. All ok.

This all seems to focus on the mechanical filters but how? Larry pointed out that the filters are magnetic devices but for this kind of behavior it would seem the filters would at least need some gross spurious response around 60 Hz. It's hard to picture. I was certain that getting the heater return off of the chassis would do something but no change at all.

Date: Wed, 10 Jun 2009 23:47:31 -0400
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] 60 Hz on Audio

Yes. Both are free of 60 Hz.

Date: Thu, 11 Jun 2009 17:44:25 -0400
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] 60 Hz on Audio

I'm still drilling down on this 60 Hz thing. I've received some off list requests for the IF module test fixture schematic so for those interested, you can download it here.
<http://www.vecnav.com/R-390A_IFmodule/R-390A_IFmodule_Fixture_Rev_B.pdf>

Date: Tue, 16 Jun 2009 22:22:04 -0400
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: [R-390] 60 Hz on Audio - Cause Begins to Reveal Itself

After much experimentation, it's beginning to appear as though a large part of the 60

Hz I see on my IF module is related to coupling of AC heater power into the signal path within the tubes. Heater-cathode shorts don't seem to be at issue. It also may not be simple heater-cathode leakage either. I don't have enough experience to make this kind of call. All I can say is that of the tubes I have, none showed heater-cathode problems when I tested them.

DC heater power without doubt eliminates the 60 Hz problem so AC heater power is clearly at issue. Generally, what I've observed beyond that is that the 60 Hz level stays reasonably low until the IF module starts to go into AGC. Nevertheless, I haven't been able to find any 60 Hz on the AGC bus. Under these conditions then, the 60 Hz can increase to a level as high as almost 30 dB below a 30% modulated tone. It's clearly visible riding on top of the tone as
shown in the example scope photo.

<http://www.vecnav.com/R-390A_IFmodule/DiodeLoadOut_8kHzMechFilter.jpg>

After going through a lot of effort to eliminate possible heater wiring issues; return current in the chassis, heater supply wires in wiring harness bundles, apparent sensitivity of mech filters to AC heater power, etc, I realized that 60 Hz level was really dependent on the specific 6BA6 tube in V502 and V503. My setup at this point had evolved as described and I used it to gauge the sensitivity of the 6BA6 tubes that I have on-hand to AC heater power. All on these tubes are old and no doubt well used. Two checked poor on transconductance but the remaining seven checked ok.

Here's the setup.

(1) IF module run separately from receiver via test fixture and regulated B+ supply.

(2) 30% modulated 455 kHz signal injected into V502 Grid via a network that simulates the mech filter normally driving the grid. Network also allows for injection of normal AGC voltage into V502 Grid. This eliminates the mech filters, switching/ grounding circuitry and any influence they may have. Set 455 kHz RF level for about negative 5 VDC on the AGC bus.

(3) DC heater power supplied to V502 only. Normal AC heater power supplied to all other tubes in module. This hopefully eliminated any 60 Hz contribution by the V502 stage.

(4) V503 socket on IF module used to test each of the nine on-hand 6BA6 tubes for sensitivity to AC heater power. Each 6BA6 was plugged into V503 socket and then a relative measurement was made of the 60 Hz level referenced to the 30% modulated tone.

Here's the list of each tube's 60 Hz level relative to the tone.

-59 dB
-62
-43
-42
-39

-33
-42 (Poor Gm)
-38
-44 (Poor Gm)

Seven tube samples are grouped in the -33 to -44 range while two of the samples are around -60. On the average, these two are 20 dB better than higher valued group. (Surprisingly, the best of the bunch at -62 has the name "Delco" printed on it!)

****
Can heater/cathode leakage be blamed on the seven poor performers or is something else happening? Is there some sort of cross-modulation thing going on? A clue here may be that the 60 Hz really only shows up when the module goes into AGC despite the AGC bus being clean. Can NOS tubes be had that aren't beat up like all of my samples?

****
Thanks for the effort of reading through all this gobbledy goop . I did my best to keep it as short as possible but still make sense (I hope!).

Date: Tue, 16 Jun 2009 21:45:49 -0600
From: w9ya <w9ya@qrparci.net>
Subject: Re: [R-390] 60 Hz on Audio - Cause Begins to Reveal Itself

I *really* think you have a ground loop issue. To 'see' this, use your scope probe to look at signals between various measuring points ALL of which are supposed to be at ground potential. When you see signal between two parts of the cirucuit (and/or chassis/chassis connected parts) that are suppose to have the same signal, you are 'looking at' a ground loop.

And you are propagating this signal just like it was an intended part of the signal path. And go from there.

Date: Wed, 17 Jun 2009 04:29:17 -0400
From: "Jim M." <jmiller1706@cfl.rr.com>
Subject: Re: [R-390] 60 Hz on Audio - Cause Begins to Reveal Itself

This is a stab... check for poorly soldered or unsoldered connections especially on tube sockets. I once fought with an IF deck misbehaving and discovered several "forgotten" solder joins in the deck - wires were crimped onto the lug but never soldered! Either poor QC or poor eyesight on the part of the mfgr (which was non Collins).

Date: Wed, 17 Jun 2009 04:33:50 -0400
From: "Jim M." <jmiller1706@cfl.rr.com>
Subject: Re: [R-390] 60 Hz on Audio - Cause Begins to Reveal Itself

Also check all resistors for correct value - they drift with age. Especially cathode resistors, or screen and plate. Doesn't sound like the cause but I have seen weirder things happen (per my previous email about missing solder).

Date: Fri, 19 Jun 2009 14:04:58 -0700
From: "Craig C. Heaton" <wd8kdg@worldnet.att.net>
Subject: Re: [R-390] 60 Hz on Audio - Cause Begins to Reveal Itself

I've been following this thread for a while, thought the quest for a quiet radio would have been solved by now. So, your first post, you stated the receiver has been recapped? Ok, what did you recap? What type of caps?

My stab at fixing this pest, did you replace C103? In the past, it is referred to as the bathtub cap. This item is mounted on the inside back panel inside a little metal container shaped like a bathtub, 50mF @ 50V. One end is connected to ground and the RF gain pot, the other end to terminal 1 of TB102. The little beast is on the cathode bias line of a bunch of toobs.

Date: Fri, 19 Jun 2009 23:42:35 +0000 (UTC)
From: odyslim@comcast.net
Subject: Re: [R-390] 60 Hz on Audio - Cause Begins to Reveal Itself

I think it is your power transformer.. I have a lot of EAC transformers that work fine but really hum along.

Date: Mon, 22 Jun 2009 13:32:15 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: [R-390] WTB BFO module

I'd like to borrow or buy a BFO module. Yes, I know Fair has them; I thought I'd ask here first, in case you have a surplus. I'm in Hillsboro Oregon, which is near Portland. My BFO flatlined this weekend. It's not the tube, I tried half a dozen subs. B+ is getting through, the tube's just failing to oscillate. It's not the resistors, they're all in spec at operating current. It's not the external caps, not even the two micas. The only caps I haven't checked are the two 50pF temperature-compensating ceramics inside the housing. (The 1600pF "doorknob" reads perfect on my impedance bridge.) When I inject a swept 455kHz signal at the cathode and monitor the grid, I can see a peak, with a voltage gain of about 25, and when I turn BFO power on, it sharpens noticeably as the tube regenerates. But it looks like the Q is too low to meet the Barkhausen criterion. I resoldered all connections and loosened and tightened the two screws that form part of the tank circuit wiring, no change. I think the 60uh fixed autotransformer has shorted a turn.

Date: Mon, 3 Aug 2009 19:09:26 -0500 (CDT)
From: Jim Haynes <jhhaynes@earthlink.net>
Subject: [R-390] A bug and its fixing under way

I have an R-390A that was making a lot of popping and crackling noise. Traced it to the inductor in the plate circuit of the 1st IF amplifier, which seemed to be going open intermittently. After messing around and heating the solder lugs a bit it quit going open and the noise stopped. But then the receiver was very insensitive. So it looks like now the inductor is shorted solid. I've ordered a few 12 mH chokes so I can replace it and hopefully fix the problem. While I was working on this I noticed the

crystal oscillator output is low. Considering how hard it is to get the oscillator out and work on it, I wonder how important this output level is.

Date: Mon, 3 Aug 2009 22:39:27 -0400
From: Roy Morgan <k1lky@earthlink.net>
Subject: Re: [R-390] A bug and its fixing under way

> ....Traced it to the inductor in the plate circuit of the 1st IF.....

Out, OUT, damned inductor! (Apologies to McBeth)

> ... I've ordered a few 12 mH chokes so I can replace it .....

Are they twelve millihenries? (I've not replaced any, yet, and don't have the parts list at hand.)

> While I was working on this I noticed the crystal oscillator output is low.

Did you measure it at the oscillator test point? With an isolating resistor at the probe tip as in older VTVM's? A modern DMM test lead will load down the oscillator and give you a low reading. Is it low on all/many bands, or just one or two?

Date: Mon, 3 Aug 2009 21:52:46 -0500 (CDT)
From: Jim Haynes <jhhaynes@earthlink.net>
Subject: Re: [R-390] A bug and its fixing under way

>.....twelve millihenries? .....

Yes, a part I found at Mouser, which is nothing like the original epoxy-cased toroid but is 12 mH. Will have to figure some way to mount it, since the original toroid serves as tie points for the connections.

>> .....A modern DMM test lead will load down the oscillator.....

You're probably right that the DMM loaded it down. And I didn't measure all bands, just one, as a quicky test to decide it was not the real source of the problem.

Date: Tue, 04 Aug 2009 13:41:16 -0400
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] A bug and its fixing under way

At one time I measured one of the stock 12 mH inductors and found that it was near self resonance 455 kHz. That plus the rather high published plate resistance of the 6BA6 type tube of 1 Meg (I think) shows they want the input Z of the mech filter to be the only significant load on the plate of that stage. Consequently the mech filter input* will be looking into a very high source Z.

If you find an inductor that is self resonant higher than 455 kHz, you could likely just resonate it to 455 with some extra shunt C. The higher the Q of the inductor the better. Can't remember what the resonant Z of the stock 12 mH inductor was other

than it was "up there."

* I had measured the in/out Z on the filters I had on hand to be around 20k to 50k ohms.

Date: Tue, 18 Aug 2009 01:03:58 -0400 (EDT)
From: larrys@teamlarry.com (Larry Snyder)
Subject: [R-390] growly BFO

I appear to have some 60 Hz FM on the BFO (12BA6 mod). Has anyone else run into this?

Date: Tue, 18 Aug 2009 15:35:58 -0400 (EDT)
From: larrys@teamlarry.com (Larry Snyder)
Subject: Re: [R-390] growly BFO

I found the ground strap cleanup procedure, but I think that would be fixing the wrong problem. This is hummy without even looking at the PTO, but only when the BFO is on.

> I have learned by cleaning the ground strap and spraying it with a bit of
> de-ox it will clean up a lot of the warble but I have 2 or 3 that I have the
> same problem as you. I am using the same mod as well

Date: Tue, 18 Aug 2009 15:49:47 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] growly BFO

Then you back up to the BFO, and begin the hunt for its source of the "hum".

Is it adjusted properly? There is an adjustment on the left side of the IF module to attempt to clean up the waveform.

How about the BFO oscillator? Got a leaky cap in that arena?

The OLD method(s) - Divide, (the circuit into sections), and conquer. Isolate and contain. (Use a signal generator in lieu of the BFO and see if this changes the situation. Could even be a need to change a tube. Though it may not be obvious. It can and will take time, although it is "kind" of trivial, it is an extremely annoying problem.

Date: Thu, 20 Aug 2009 16:36:22 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] growly BFO

The BFO, PTO can has a grounding clip on the shaft like the VLF. Either of both can give you problems if they get dirty. If the 12BA6 has been in place for a while and just started to hum I would suspect the tube has flaked some crud from filament heater to cathode. The crud being high resistance and not well connected could be more of a capacitance coupling than a resistive coupling. Ground lug problems are likely in the

IF deck in general these days, 50 years with no maintenance of bonds on those lugs is not bad performance. The 12BA6's are not mil spec but only commercial grade. Your results may very from tube to tube and manufacture. But I suspect a bad tube or a corroded ground point in the BFO circuit.

Date: Tue, 08 Sep 2009 01:03:05 -0500
From: Steve Kent <steve.kent@att.net>
Subject: [R-390] Parts Needed, new R-390A owner & questions..

<snip>..... Upon removing the IF deck I discovered a blackened area with L505 fried and R508 blown up. C553 tests OK but I am replacing it; I expected it to be shorted. Now I hope that the mechanical filters aren't toast. What is the best way to test them? Take them out of circuit and measure the coil resistance and measure each terminal to ground? Any ideas what typical values would be? <snip>

Date: Tue, 8 Sep 2009 09:53:18 -0400
From: Paul Anderson <paul@pdq.com>
Subject: Re: [R-390] Parts Needed, new R-390A owner & questions...

<snip> .....So you need to find out why the coil fried - there is probably a shorted cap nearby in the circuit - test everything with a VOM, resistors and caps both (resistors simply due to the heat and stress in the immediate vicinity)..... <snip>

Date: Fri, 2 Oct 2009 22:08:55 -0400
From: Roy Morgan <k1lky@earthlink.net>
Subject: Re: [R-390] S&W R-390A, It's ALIVE! AGC issues

... when switching between AGC and MGC, the RX goes quiet .....

You will get more precise help with this trouble, but I suspect things amiss in the AGC system, and for some radios, this is kinda normal. The capacitor that's put into use in the AGC SLOW mode is involved with a tube section to in effect mulitply the value of the cap. Read the manual on this. Any leaky caps in the AGC system can cause trouble. Best route is to replace them all. Better yet, do the AGC modification that was not long ago described in ER. It solves ALL the problems with the R-390A AGC system.

Date: Tue, 5 Jan 2010 09:32:00 -0800
From: "Michael Hardie" <mike46@shaw.ca>
Subject: [R-390] Audio and BFO

<snip> .....Now there's a BFO problem that might be related. The BFO only works with very strong stations, and seems weak then.

Date: Tue, 5 Jan 2010 10:13:20 -0800
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] Audio and BFO

<snip> .....Recenyly my BFO faded out after being weak for a long time. (I hadn't noticed because I use an outboard detector with its own BFO.)

Resistors, caps, B+, and tube were okay. Apparently the Q of the BFO coil has deteriorated over the years and is now too low to sustain oscillation.

The injection tap is very low impedance - almost a short - compared to the cathode. I added an "emitter follower" transistor circuit to supplement the drive from the tube, and now it's loud and clear. This mod is simple and reversible.

Date: Tue, 5 Jan 2010 14:33:09 EST
From: DJED1@aol.com
Subject: Re: [R-390] Audio and BFO

Don't know about the BFO- could be a lot of things. Start with checking/substituting tubes, then go on to checking voltages at the BFO and detector. <snip>

Date: Mon, 1 Mar 2010 20:33:47 -0500
From: "John L. Ahrens Sr." <kc2fxe@gmail.com>
Subject: [R-390] r390a CHOKE L502

I need to find a replacement choke for L502; it is a 12mh choke . Can any one help ?

Date: Mon, 1 Mar 2010 23:36:04 -0600 (CST)
From: Jim Haynes <jhhaynes@earthlink.net>
Subject: Re: [R-390] r390a CHOKE L502

Yeah, if you had been around last August I was dealing with the same problem. I found a 12 mh inductor in the Mouser catalog and used that as a replacement and the overall gain test came out fine. Now I had a lot of discussion with another list member who believes that the 12 mH toroid originally used is self-resonant around 455 KHz, whereas the one I used is self-resonant at a somewhat lower frequency. I'm still skeptical that the frequency of the toroid is that high, because it works out to an awfully small amount of distributed capacitance, especially when you consider the output capacitance of the tube it is feeding.

One thing we both thought of is that Mouser has some parts with lower inductance and higher self resonant frequencies, so you could use several of those in series to get both the desired inductance and the desired self resonant frequency. Since the 12 mH part seems to work satisfactorily I didn't pursue that any further.

Date: Sat, 1 May 2010 07:49:06 -0400
From: Steve Hobensack <stevehobensack@hotmail.com>
Subject: [R-390] Intermittent

I have been troubled with an audio intermittent for a quite a while. The audio will jump to a low level and snap back a minute or so later. This will happen many times a day. The carrier level is not affected. I have traced the problem to IF transformer T-503. It is the transformer that couples the last IF tube (6AK6) to the detector (5814A). When the audio is low, pulling the cover from T-503 will increase the volume. I can momentarily touch a clip lead across the primary, and the radio will snap back to normal and maybe stay that way the rest of the day. There are three

components shunted across the primary. Those are a Q swamping resistor, a pink colored square mica cap, and a brown encapsulated tubular ceramic cap. Before I do micro surgery, which one of? those components might be the culprit? What are the values of those capacitors?

Date: Sat, 01 May 2010 07:46:30 -0500
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Intermittent

I would assume that a resistor would not behave that way. It sounds more like capacitor issues. I know the silver mica caps in the older-style IF cans can be a problem. I had one go bad and when I opened it up, it was obvious the silver had "migrated" (I believe that's the term). Replacing it with a dipped silver mica fixed the problem for me. As for values, I'm sure they vary, but I *believe* they're around 100pF. Perhaps someone else on the list can confirm.

Date: Sat, 01 May 2010 09:29:03 -0400
From: Jeff Adams <physicist@cox.net>
Subject: Re: [R-390] Intermittent

Steve, that tubular cap isn't one of the "brown beauties of death", is it? I might be tempted to change that one first.

Date: Wed, 9 Jun 2010 23:49:35 +0000 (GMT)
From: <g4gjl@btopenworld.com>
Subject: [R-390] R390-URR BFO Problem

Im looking for group wisdom and experience with an intermittent BFO in my R390-URR. The set is in average condition but is very hot, much better than either of my R390A-URRs. The problem is that the BFO is intermittent.

The failure mode is a slow fade out of BFO signal, though no audible change in BFO frequency, until just before it drops out completely. This occurs about 30 mins to 1 hour after initial warm-up. I have found that removal of the tube will re-start the oscillator. Power-cycling the BFO switch will not re-start the oscillator.

My actions thus far are as follows:

1 Changed valve (tube) for a NOS British equivalent. Result: No change in nature of fault.

2 Inspection of valve holder reveals no visible sign of tracking.

3 Inspection of valve holder reveals no obvious dry joints.

4 Inspection of valve holder reveals no obvious bent pins or loose pin sockets.

5 Last night I replaced all three HT feed resistors. Result no change in the nature of the fault.

6 Today I removed the BFO PTO and built a new oscillator to test the PTO on a separate chassis. I used the same valve but all new resistors and capacitors. I ran the oscillator into my HP frequency counter and it remained on and stable at 455.03 kHz for 30 mins., it then 'failed'. Interestingly the 'failure' resulted in the oscillator squegging at about 84MHz. So I guess that is exactly what is happening when the PTO is installed in the IF strip.

One faulty BFO PTO.....

Now the questions.
Does anyone have similar experience with this PTO, or any suggestions as to how they might fail?

How I should set about opening and repairing the PTO?
Does anyone have any pictures or text description of the opening procedure?
Looking forward to replies and thanks in advance for any help.

From: Jon Schlegel <ews265@rochester.rr.com>
Sent: Thursday, 10 June, 2010 2:17:03
Subject: Re: [R-390] R390-URR BFO Problem

I have an opened BFO PTO that I can photograph if that would help. Please let me know. L508 or L509 could be opening up. When it goes into squegg mode, check for continuity from BFO PTO pin 1 to earth. I'm reading virtually a dead short on my unit so anything above that is likely a problem. As you know, there is not much inside the PTO that can go bad. Unfortunately the parts are somewhat specialized and C555 and C556 are are selected for temperature compensation of the unit. The tempco values for the capacitors chosen for my particular BFO PTO are both N400 (negative 400 ppm/degree C). No doubt this is why the unit is "sealed". These capacitors are rather large thin wafers of delicate looking ceramic. I had to remove the slug tuned coil (L509) on mine to repair it and working around these fragile capacitors was a little nerve wracking.
"Fair Radio" in Lima, Ohio here in the states usually has these little PTO units if it comes to that.

Date: Thu, 10 Jun 2010 07:51:19 +0000 (GMT)
From: <g4gjl@btopenworld.com>
Subject: Re: [R-390] R390-URR BFO Problem

If it was easy for you to take a few pics of the interior of the PTO would be very helpful. I feared that the problem lies within the unit after all the HT feed resistors were changed. Those N400s sound a bit of a nightmare, but the failure (major change of frequency) is not consistent with failure of these rather small value capacitors...well I am banking on that! Thank you for the Fair Radio tip. I might get one as a safeguard. Do you happen to know if the R390 BFO PTO is the same as the R390A one?

Date: Thu, 10 Jun 2010 12:29:10 -0400
From: Steve Hobensack <stevehobensack@hotmail.com>
Subject: Re: [R-390] R390-URR BFO Problem

Be sure the screen voltage does not fade low due to a bad or intermittent screen cap. Check that the bfo to detector coupling cap is functioning. A bad drain resistor can cause voltage to build to the point of grid block.

Date: Thu, 10 Jun 2010 16:28:28 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] R390-URR BFO Problem

I restored my fading-out BFO by augmenting the valve with a transistor, an emitter follower driven by the cathode. Works great.

Date: Sun, 13 Jun 2010 11:45:59 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] R390-URR BFO Problem

I do not know if the R390 and R390A BFO cans are exactly the same. Maybe someone with a couple of parts manuals would look these parts up and let us know. The Chinese are making R390A reproduction parts including the BFO cans. I seen them on line one day while searching.

>From your mail, it looks as if you have determined the problem is inside the BFO can. yes the can comes open and can be serviced. Not a normal procedure as the bad can were just replaced as a single part. Inside is some solder joints and several parts beyond the moving slug in the coil. There could be a bad joint in there any where including a nicked coil wire that opens after some heating time. As the problem is related to "on time" it could be more of an RF heating problem than a DC current heating problem. As the BFO can are available as new and old used parts, You mite as well just find your self a new one either from some of the Fellows here on the Forum or from the usual commercial places. Fair Radio comes to mind.

Date: Mon, 14 Jun 2010 00:12:50 +0000 (GMT)
From: <g4gjl@btopenworld.com>
Subject: Re: [R-390] R390-URR BFO Problem

Jon, Thanks for your help and especially the pictures you sent. They gave me the confidence I needed to open up the unit and fix it!

I now have the BFO going and I have tested it several times today for up to 3 hours continuous.. The signal is steady and clean and has not failed.

The problem turned out to be a dry joint in the BFO PTO can. I cannot identify exactly which joint, as I re-soldered them all before putting the PTO back into my makeshift test oscillator on Friday. The BFO performed fine ever since, so I transplanted it back into the RX today.

I might get one approved by Art Collins from Fair Radio, and thanks for that tip, but as the set is ok now, I think Im happy it is fixed for the next 58 years or so!

Date: Tue, 15 Jun 2010 18:47:11 EDT

From: Flowertime01@wmconnect.com
Subject: Re: [R-390] R390-URR BFO Problem

I have not read of the Chinese reverse engineering the whole receiver and getting it back into production yet. But someone over there thinks there is at least a market for parts and is trying to get some items back into production and generate a cash flow on the parts to move the business along. I am watching for the mechanical filters to come into production. They may or may not. The units mite be form and fit of the can and modern ceramic filters inside. I have no real knowledge of what's driving the market. Happy to read that you were able to repair your unit and get your receiver going again nice to read good news.

Date: Sun, 15 Aug 2010 00:24:33 -0400 (EDT)
From: larrys@teamlarry.com (Larry Snyder)
Subject: [R-390] R-388 avc / product detector mods
To: R-390@mailman.qth.net

I just completed the mods as described on Phil Neidlinger's site with help from pictures on Al Parker's. It worked great on first powerup! Many thanks to them and Lankford, Orr, Lee, et al. -ls- WA8RRK

http://www.neidlinger.us/R388.htm
http://www.boatanchors.org/51J4sn3516.html

Date: Sun, 15 Aug 2010 08:31:56 -0500
From: Tom Frobase <tfrobase@gmail.com>
Subject: Re: [R-390] R-388 avc / product detector mods

I have a circuit board for this if any one is interested in the future. ... tom, N3LLL

Date: Fri, 27 Aug 2010 14:19:37 -0500
From: <ka9egw@britewerkz.com>
Subject: [R-390] IF transformers

Pretty dejected here--bad news--going through the IF in my 390A, it appears that T501, T502 and T503 all have at least one cracked [and frozen] core apiece. Now what do I do? Where does one go to find replacement IF cans with good cores?

Date: Fri, 27 Aug 2010 14:29:07 -0500
From: <ka9egw@britewerkz.com>
Subject: [R-390] IF cans again

Got 'em all from Fair Radio--a NOS T501 and used T502 and T503. Total cost $50 + shipping, and Gary agreed to check them for frozen cores before shipping. Whew!

Date: Fri, 27 Aug 2010 15:01:36 -0500
From: <ka9egw@britewerkz.com>
Subject: Re: [R-390] IF cans again

I'd be interested to hear from anyone who has ever replaced these cans in their IF

deck. There's not a lot of room to work in there around the other stuff.

Date: Fri, 27 Aug 2010 16:24:39 -0500
From: <ka9egw@britewerkz.com>
Subject: [R-390] C529?

OK, so I got started removing the bad IF cans. 2 hours later I have T503 half-disconnected without destroying anything else but one of the little standoff tie pointss on the IF can studs. Got 3 of those little standoffs coming from Fair Radio too... While I'm in there do I need to replace the 3 brown tubular bypass caps? Are those 'death caps'?

Date: Fri, 27 Aug 2010 17:13:53 -0500
From: <ka9egw@britewerkz.com>
Subject: [R-390] graphite lube?

Has anyone here ever tried a squirt of powdered graphite zipper lube for not-yet-seized-but-definitely-squeakyish IF can cores? I've got all 3 IF cans on order from Fair, but if I can get the little bit of squeakiness out of hte one I can avoid replacing it. Getting these things out of hte IF deck is a PITA

Date: Fri, 27 Aug 2010 22:22:31 -0500
From: Don Reaves <donreaves@gmail.com>
Subject: Re: [R-390] graphite lube?

Graphite might alter the slug characteristics. I seem to remember someone suggesting talcum powder (baby powder) as a dry lubricant.

Date: Fri, 27 Aug 2010 23:34:22 -0400 (EDT)
From: larrys@teamlarry.com (Larry Snyder)
Subject: Re: [R-390] graphite lube?

Talcum is what came to my mind as well.

Date: Sat, 28 Aug 2010 11:21:30 -0500
From: <ka9egw@britewerkz.com>
Subject: Re: [R-390] Thank you!

I'd be glad to. They're up on the server at www.britewerkz.com/R390A/IFDeckpix
You have to use the complete address; you cannot get there from www.britewerkz.com
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Date: Sat, 4 Sep 2010 18:57:11 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] the saga continues part 2

>Only [ahem] one question this time around--Z503 with it's single slug, is it
>normal for the slug to be almost all the way 'in' [bottomed] at 455kc?

Ok here. Z503 is the AGC trap / peak coil. You expect the tank to develop a maximum

votage peak that makes it into the AGC rectifier. It will peak where it peaks. Given 50 years of grim water and universe seeping into the parts, it can peak any where it wants to. Try not to read to much signifficance into the exactness of the AGC circuits. Since being introduced to the AGC circuit of R390/A I have found them to be the least exact part of the receiver.
You're good. <snip>

Date: Fri, 10 Sep 2010 18:19:31 -0500
From: Randy and Sherry Guttery <comcents@bellsouth.net>
Subject: [R-390] Question about Manuf. of IF module...

Well - good start on a new list! The message got stripped - happens on Greenkeys every-once-in-a-while as well - QTH doesn't seem to like Yahoo mail (which those of us on AT&T have no choice). Sorry - I'll try my message once again... Original msg.: I have finally gotten around to an R-390A that I've had in storage for more than 30 years- it needed a lot of work when I got it - just never got around to it until now. While the main tag on the front says Stewart Warner, most of the modules are Capehart (I'll provide S/Ns, etc. if someone is collecting those).

The PTO is Cosmo, the Crystal Osc. Chassis is EAC. The one chassis I can't identify is the IF - there are no markings other than some MFP stamps, etc. One date the shows is on the rear-facing side of Z-501 - which has "MFP 3-56" printed on it. Is / Are there any ways to "more positively" identify this IF chassis?

Date: Sun, 19 Dec 2010 19:22:55 -0800 (PST)
From: Gary Weddle <w1ghw@yahoo.com>
Subject: [R-390] Looking for details on an old mod

I experienced difficulty with the BFO circuit on my R390A some time ago. It would not inject any signal into the audio (I could not read sideband stations or CW signals) and the receiver audio would reduce in intensity. I recently began to troubleshoot the problem and discovered that my unit had been modified extensively on the IF sub-chassis. I traced the circuit as best as I could, but feel there yet might be more I have missed. What follows is a description of the mod as I see it; what I am asking for is a reference to the article that covers the details of this particular mod. During the preliminary search of the archived resources, I found references to articles written in Ham Radio Magazine in the mid 70's concerning the BFO and modifications. Ham Radio Magazine is hard to find anymore. I describe the changes I observed:

1. The BFO circuit, V505, has had a 10K resistor inserted into the plate circuit (common cathode configuration) and the signal on the cathode picked off the top of the resistor is passed through a 5 pf 1000V cap to pin 7 of the detector tube, V504B, in place of the signal injected at the same point from the plate circuit as in the original schematic.

2. The original plate signal is now passed through a 0.02uF cap to the N.O. relay tap of a Potter & Brumfield relay, PW5LS, which is also lifted through a 33K resistor to pin 6 of the RT510 (which has been solid-stated with two diodes and a ballast resistor). I assume that this is a supply line.

3. The N.C. tap of the same relay is connected to pin 1 of T503 and goes nowhere else. (In the original diagram pin 1 of T503 was passed through a 12 mH choke and out to the diode load terminal at the back of the rig.)

4. The center tap of the relay is connected through a choke (perhaps the 12mH choke that used to be attached to T503) to the diode load line out to the back of the rig.

5. The relay coil is activated by the BFO switch on the front panel. It is clear that when the BFO switch is off, the relay is not energized and the circuit is functioning as the original design schematic indicates. Engaging the relay places +/- 455 kHz on pin 7 of the detector and also applies the same signal (180 deg out of phase) from the plate to the diode load line, but the
original 455 kHz IF signal seems to be blocked from proceeding out that line. (At this point, I begin to doubt my ability to trace the circuit properly.)

I am also trying to make a determination as to the value of this mod. When engaged, the audio is reduced to an inaudible level. It is unclear to me what was being accomplished by the change. The modifier did a superb job of cutting a hole in the chassis and installing a tube socket for the relay. The soldering job looks good, but I will go over each joint depending upon whether I undo the mod or not. Again, I am looking for details on the complete mod, the theory behind why it was done and how it works. Thank you.

Date: Mon, 20 Dec 2010 04:51:16 -0800 (PST)
From: Gary Weddle <w1ghw@yahoo.com>
Subject: Re: [R-390] Looking for details on an old mod

No matter how hard I try, I cannot find it all in a timely fashion. This morning after posting my query last night, I re-searched the Y2K manual pdf for "relay" and found a different entry in the document which seems to have the diagram I am looking for. I apologize for the interruption and to anyone who is trying to spend time helping me find this information. <snip>

Date: Thu, 20 Jan 2011 09:28:19 -0500
From: Barry <n4buq@knology.net>
Subject: [R-390] Technical Question somewhat related to R-390s

I have an old radio that I'm trying to fix. The secondary of the 1st IF won't peak like it should. Thinking it could be caps in the can, etc., I pulled it and started testing it out of the circuit. I connected the function generator to the primary and the scope to the secondary. In this configuration, adjusting the primary core shows almost no effect; however, adjusting the secondary core shows a very nice resonance at the IF frequency.

If I reverse the setup, the adjusting the secondary core shows almost no effect and adjusting the primary core shows resonance at the IF frequency.

I think the transformer is fine but in the setup described above, why are there not

peaks on both coils? I expected to be able to adjust both cores and see each side resonate but that wasn't the case and since it does this in both setups (only the coil not connected to the generator peaks in each setup instead of both in the same setup) I assume it is the expected behavior but don't know why.

Is it possible the low impedence of the function generator is preventing the "primary" side from resonating? Would coupling it differently allow both circuits to resonate in the same setup?

Date: Thu, 20 Jan 2011 09:39:04 -0500
From: k2cby <k2cby@optonline.net>
Subject: [R-390] Technical Question somewhat related to R-390s

You've got the explanation exactly right. The function generator has a low impedance - probably 50 Ohms - maybe even less. This kills the Q of whatever side of the transformer it's connected to. To avoid this, connect a resistor (anywhere from 1k to 10k) in series with the function (or signal) generator. Of course, this will substantially reduce the input level to the scope.

Date: Thu, 20 Jan 2011 09:52:11 -0500
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Technical Question somewhat related to R-390s

It's funny. I was writing the original email and it wasn't until I was almost finished with it when the "aha!" moment occurred to me and I wrote that last paragraph. Thanks for the reply and confirming what I thought might be the problem.

Date: Tue, 25 Jan 2011 09:25:18 -0500
From: Barry <n4buq@knology.net>
Subject: [R-390] OT: Update on Blaupunkt

Since I posted some of the problems I've been having with the IF transformer in the Blaupunkt Verona I've been working on and since we've been discussing capacitor replacement, I thought I'd post an update. You might recall that I was having a problem getting the secondary of the 1st IF transformer to resonate. Pulling the transformer and checking it out-of-circuit showed the transformer was good so I reinstalled it and kept looking. I found that, when switch to AM, the screen voltage of the IF amplifier would go low (approximately 1/2 of what it should be) and then found that the control grid was also going slightly positive (which would cause the screen voltage to drop). Not finding any other source of a positive voltage influence on the control grid, the only thing left was a 4700pF dogbone ceramic(?) capacitor tied from the screen to the "low" side of the IF secondary. I lifted one end of that capacitor and put a temporary 4700pF disc ceramic in its place. Voltages are now restored to what they should be and the secondary resonates quite nicely and the culprit turned out to be a dogbone capacitor.

The dogbone ceramic would have been my last suspect. It's still hard for me to believe it could have been that leaky. The paper capacitors would have been the ones I would have shotgunned and left the dogbone alone. All that work and the radio would still not have worked properly.

Draw your own conclusions I suppose...

Date: Tue, 8 Mar 2011 12:11:44 -0600
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: Re: [R-390] R-390 Digest, Vol 83, Issue 19

<snip> > Micro Dial on BFO for ASA.....

*Sounds like a cool mod... wish they had came up with a retrofit kit to add crystal controlled LSB/ USB/ DSB selection in addition to the BFO... Have an interesting schematic and the right crystals... gives me ideas for a mod. Of course it would make the TMC SSB adapter sort of redundant. Too bad Collins did not jump on the SSB bandwagon back in the early 50's. <snip>

Date: Wed, 9 Mar 2011 18:00:43 -0600
From: Paul Staupe <pstaupe@qwest.net>
Subject: [R-390] R-390/URR Z-503?

I discovered why the AGC wasn't working today on my R-390/URR. C 542, a .1 uF oil cap failed to ground, and Z-503, the AGC tuned circuit became a fuse. No visible marks, but there's definitely no continuity. Does anyone have a spare Z-503, or a junker IF chassis that they would be willing to part out?

Date: Wed, 09 Mar 2011 22:36:34 -0500
From: Dave or Debbie Metz <dmetz@ntelos.net>
Subject: [R-390] Z503 Workaround?

Over the years, I have seen this problem posed many times on this reflector and it seems like Z503 is unobtainum. I gather the stash of cans from the original American Trans is long gone. There is a LOT of talent and creativity out there, and if we can beat the horse of the 3TF7 workaround for days if not weeks, surely there is something at Mouser that will hide inside the existing can with a bit of creativity. Hoping to start a new thread!

Date: Wed, 9 Mar 2011 22:16:30 -0800 (PST)
From: "Drew P." <drewrailleur807@yahoo.com>
Subject: Re: [R-390] Z503 Workaround?

If you will check out Wei-i Li's "Pearls of Wisdom" at r-390a.net, you will see an account of how a list member rewound a failed z-503. The posting was from August 2007 and will be found under the heading of "I.F. Deck".

Date: Thu, 10 Mar 2011 09:00:16 -0600
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: Re: [R-390] R-390/URR Z-503

It looks simple enough; Tuned Circuit, Intermediate Frequency: 455 kHz center frequency; Including L514 and C563, (13499) drawing no. 278-0235-00.

I have a spare good IF deck, this weekend I will open up Z-503 and unsolder a leg of the cap, take measurements of the capacitor and the inductor to get some values for what L514 and C563 are.

Date: Thu, 10 Mar 2011 10:26:38 -0500 (EST)
From: ToddRoberts2001@aol.com
Subject: Re: [R-390] R-390/URR Z-503

I have the parts from a Z-503 assembly that was taken apart years ago with a broken coil. I also have a spare Z-503 with a good coil.

I measured the inductance of the good coil coil L-514 as 1.38mH (millihenries)
The resonating capacitor C-563 measured 84pF.

A resonant frequency calculator shows the resonant frequency as 467KHz. The calculator shows the capacitor should be close to 88pF to resonate the coil near 455KHz.

The capacitor was taken from a different Z-503 assembly so it could be those parts are mixed and matched at the factory to resonate at 455KHz. There could also be some stray capacity in the circuit that needs to be accounted for.

If someone was going to replace the coil I would recommend using a ferrite shielded coil to minimize the effects of the shielding can.

Mouser Electronics has small ferrite shielded inductors in values of 1.2 and 1.5mH. If a 1.5mH inductor was used a capacitor of around 80-81pF should work. The 1.5mH inductor is part no. 432-02-152J and the current cost is $1.20 each.

Mouser has the small leaded Mica capacitors in 82pF values. One could also mix and match two smaller value caps in series to get close to the best value.

The original circuit seems to be fairly broad tuning so the Q does not need to be extremely high. A broadly-tuned resonant circuit around 455KHz should work with the 1.5mH inductor in the circuit.

Date: Thu, 10 Mar 2011 10:35:31 -0500
From: Gord Hayward <ghayward@uoguelph.ca>
Subject: Re: [R-390] R-390/URR Z-503 workaround

I used a loopstick type coil and a low capacitor, somewhere around 30 pF as I recall. The Q is important because I first tried a smaller coil which at resonance didn't have enough Q to give enough AGC gain. Small C big L gives good Q. After the transplant, the IF aligned as described in the manual and worked as specified in the manual.

Date: Thu, 10 Mar 2011 15:41:33 +0000 (UTC)
From: bavarianradio@comcast.net
Subject: Re: [R-390] R-390/URR Z-503

The problem with Z-503 is that the windings are encased in a powdered iron cocoon and then dipped in varnish. I expect that the coil will need to be soaked in acetone (or solvent of your choice) to get it apart. My Z-503 is currently behaving itself but has been intermittent. I "zapped" it with a high voltage arc and got it working, but I'm skeptical as to it's reliability. My intentions were to find a good replacement and then go experimenting with rewinding this one. As you suggested, this can't be brain surgery. BTW this coil does not exist in the "A" radios. (I already looked at my spare "A" IF deck... rats!)

Date: Thu, 10 Mar 2011 15:46:18 +0000 (UTC)
From: bavarianradio@comcast.net
Subject: Re: [R-390] R-390/URR Z-503

Hi Z-503 group, Just a note, my coil has 2 capacitors in paralell, one is a silver mica and the other is a ceramic dog bone. I didn't note the values, I disconnected them when I "gave it the juice"

Date: Thu, 10 Mar 2011 12:39:12 -0600
From: Paul Staupe <pstaupe@qwest.net>
Subject: [R-390] Z-503 repair

Thanks...In my original question, I refrained from using the "non-A" designation for my R-390/URR, but to eliminate the confusion, it's a non-A.

Z503 is also the AGC can in the R-390A model, so using the non-A description might have helped clarify my situation. Looks like Z-503 is a weak link in both designs.

A list member is kindly helping me out, but in the interim, I'm thinking about trying to rewind this one. Does the varnish respond to acetone or MEK or what's the best way of removing it? Also, what's the procedure to zap the coil, presuming that hitting it with HV won't do further damage.. Thanks again to all who've helped out.

Date: Thu, 10 Mar 2011 20:52:41 +0000 (UTC)
From: bavarianradio@comcast.net
Subject: Re: [R-390] Z-503 repair

Hi Paul, I used a variable power supply set to 350 volts DC and a 100 ohm 10 watt resistor. I desoldered one end of both capacitors inside the can and attached the ground lead from the supply to one lead on the coil. I then connected the + lead from the suply to the 100 ohm resister. Then you draw an arc to the other coil lead. I just held it for a few seconds and pulled away, then checked the DC resistance. I did this a few times until I got a low ohms reading on the coil.(about 30 ohms) This only worked for a few hours then died again. I did it again and it seems to be "holding" I just don't feel comfortable with it. I don't know what solvent will work best. I haven't tried any yet. I do hate MEK , it seems deadly!!!

Date: Thu, 10 Mar 2011 20:46:18 -0500
From: "James A. (Andy) Moorer" <jamminpower@earthlink.net>
Subject: Re: [R-390] R-390/URR Z-503

They must have had winding tables for L514 - and all the other inductors/ transformers in the unit. That would have been required for military usage, and certainly for outsourcing the manufacture of these units. Do I gather that such a document for the R-390/390A hasn't showed up yet? They have to be out there somewhere. I was recently startled to run across one for the SP-600.

Date: Fri, 11 Mar 2011 12:22:12 -0600
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: Re: [R-390] R-390/URR Z-503

Ref: Rewinding Tables; It would be great to find rewinding tables for the inductors on both the '600 and '390/A's.

Yesterday I found a seller (ePay) who is selling bunches of variable inductors for $1.99 for sets of 5. They have six or seven different sets (around 30 different inductor cans). With some detail on rewinding the cores. the lowest value listed is 1.7 uH but I can see how to make that a bit less to pull it into the range of Z-503. Of course the can does not match but the guts can be pulled out. As was mentioned earlier for a higher Q you would want more L than C. Might be interesting to run an existing Z-503 through a sweep generator to see what the Q/ shape factor is at 455 KHz.

Date: Sat, 12 Mar 2011 08:49:46 -0500
From: Steve Hobensack <stevehobensack@hotmail.com>
Subject: [R-390] Z-503 Repair

I was looking through my 1964 ARRL Handbook. There is a homebrew Q multiplier project. It uses a pair of 455 khz rf coils mounted 1 inch apart for coupling. L1 is 1000-2000uh slug tuned. L2 is 500-1000 uh slug tuned with 100pf cap in parallel. L1 part number is North Hills Electronics 120-K. L2 is part number North Hills Electronics 120-J. It might be worth an Ebay favorite search.

Date: Sat, 12 Mar 2011 23:40:12 EST
From: MillerKE6F@aol.com
Subject: [R-390] R390A Turns Counter BFO option?

I've had an R390A receiver for some years that has a big bug eyed turns counter on the BFO. There is also the remains of some NSA or other paper tag on the back. Otherwise the unit looks pretty normal as R390As go. Works well

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Date: Sun, 13 Mar 2011 11:25:46 +0100
From: federico@dottorbaldi.it
Subject: Re: [R-390] R390A Turns Counter BFO option?

Hi, as far as I know (but I can be wrong) the multiturn handle with counter was employed on some R-390A receivers in NSA so their specialists in foreign languages can match at best the foreign idioms. I have a couple of these multiturn knobs in my collection of spare parts. 73 de Federico IZ1FID
www.dottorbaldi.it/militaryradio

Date: Sun, 13 Mar 2011 14:37:06 -0000

From: "Lester Veenstra" <lester@veenstras.com>
Subject: Re: [R-390] R390A Turns Counter BFO option?

Used to get the four dots of the FRA-86 in the right place when copying 4 frequency M(ary)FSK Could do the same thing with the regular BFO knob but this was easier due to the larger diameter of the knob, and repeatable with the readout.

Date: Sun, 13 Mar 2011 13:14:02 EDT
From: Flowertime01@wmconnect.com
Subject: [R-390] R390A Turns Counter BFO option?

The bug eye counter is referred to as a micro dial after company that made the counters. It was used on receivers that were used to copy RTTY. The dial has no relation to BFO pitch and dial count.

But it offered a count that would let you dial the BFO with better resolution than the stock knob. Once you found the correct counter number to use for your receiver you could redial and thus retune for RTTY operation faster than without the dial. It was popular on a lot of receivers used in a lot of applications.

The signal corps used a lot of RTTY links and used the dial. The spooks used a lot of the dials also. NASA used a lot of the receivers as standard communication equipment to tie links into military nets around the world to communicate with the military for launch, recovery, tracking and weather information.

Enjoy your historical receiver.

Date: Sun, 13 Mar 2011 14:08:21 -0400
From: Nick England <navy.radio@gmail.com>
Subject: Re: [R-390] R390A Turns Counter BFO option?

FWIW -From "Cryptologic Collection Equipments" NAVEDTRA 10251 (1977)
http://www.navy-radio.com/manuals/crypto-equip.htm

BFO PITCH.-The BFO PITCH control varies the output frequency of the BFO above and below 455kHz. The normal R-390A BFO is designed to vary by 3kHz above and below 455kHz. Many of the R-390A receivers with which you will come into contact have a modified BFO pitch control, called a MICRODIAL. This modification enables the BFO to be varied over a 26kHz range (13kHz above and below 455kHz.)

Date: Sun, 13 Mar 2011 15:30:43 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] R390A Turns Counter BFO option?

I have a Litton Industries BFO counter, NOS/NIB.

I'd be highly interested as to what other modification is needed to expand the BFO range from 6Kc to 26Kc.

Date: Sun, 13 Mar 2011 15:24:36 -0500

From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] R390A Turns Counter BFO option?

Well...that must mean there are other circuit mods as well increasing the range of the BFO... isn't that beyond the range of the standard BFO? Interesting...

Date: Sun, 13 Mar 2011 15:52:09 -0500 (CDT)
From: nryan@mchsi.com
Subject: Re: [R-390] R390A Turns Counter BFO option?

The BFO range can be expanded by removing the rotation limiting tang under the BFO knob. Be advised that doing so risks damage to the very fragile powdered iron core inside Z502. Turn it too far and it will break.

A broken powdered iron core sometimes can be repaired with careful application of JB weld. Check that the repaired core is straight and true inside the coil.

If a MicroDial is added, zero it on 455 kHz and don't force it against the core's travel limit.

Date: Sun, 13 Mar 2011 18:12:43 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] R390A Turns Counter BFO option?

It would seem that *SOMEWHERE* there is a *documented* modification for the turns counter that gives the "expanded" BFO range.

I have mental reservations with *this* described method. I doubt Uncle Sam took *this* route to achieve the desired result.

Date: Mon, 14 Mar 2011 15:01:01 -0400
From: Steve Hobensack <stevehobensack@hotmail.com>
Subject: Re: [R-390] R390A Turns Counter BFO option

In the Navy Security Group, most maintainence men would simply mount the BFO knob a little shallow, so the stop tangs will not meet. This was done on R 390's used for TTY service. It was pretty easy to return the bfo knob back to home (455 khz) by tuning the receiver away from any signals, moving the bandwidth to 0.1 khz, and zero beating the noise. Otherwise one could be an entire rotation away from the zero mark.

Date: Mon, 14 Mar 2011 19:38:48 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] R390A Turns Counter BFO option?

>....what other modification is needed to expand the BFO range .....

None.

The range of the PTO in the BFO circuit is more or less 26KC around 455KC. YMWV.

The stock knob has a stop that limits the BFO pitch to about + - 3 KC. The micro dial will let you jam the PTO into both of its ends points and thus destroy the PTO if wrenched well.

Thus with the micro dial you can have the full range of the BFO to do what ever you can imagine with it. You can also remove the stock knob stop and achieve the same results. You can also just back the BFO knob out on the shaft a bit so the knob dog misses the stop. Same results. You can also chop the dog out of a knob to miss the stop. Same results.

The stock stop was installed, The knob twisted around. The findings were about plus and minus three. Someone suggested 1KC marking and a zero point. That was silk screened on the first R390s. It was a silk road and forever since been engraved in metal. Once you get that stop out of the way you jump the curb and go crashing into the forest. Why one would go off into the forest beyond the range of audio I know not. (OK so off to high audio frequencies I cannot hear.)

We had a lot of micro dials. They had no stops. I never had to replace a BFO PTO core because some operator just felt a need to dial one over to the point of breaking it. Watch the bellows coupler. As you drive the core from end to end you do screw the shaft in and out thus compressing and expanding the bellows. Lots of iterations where you run the bellows open can break the bellows. A poor adjustment can cause you to fully compress the bellows before you hit the full range of the PTO thus you may not think you are getting the full PTO range. You may also find that 455 is no where near the real center of the mechanical adjustment.

Date: Mon, 14 Mar 2011 21:50:05 -0700 (PDT)
From: Perry Sandeen <sandeenpa@yahoo.com>
Subject: [R-390] Z503 Question

Other than the fact that Art made it, it is failure prone, and unobtanium what makes Z503 so special? If it was a transformer that would make some sense. But other than perhaps having a high-Q why can?t it be replaced with another variable inductor and capacitor combination?

Date: Tue, 15 Mar 2011 09:53:49 -0500
From: Gord Hayward <ghayward@uoguelph.ca>
Subject: Re: [R-390] Z503 Question

I did and it works. But its not original. I put it in its original can like those who steam the ukkumpucky out of the GI electrolytic cans (I didn't go that far when I replaced those).

Date: Tue, 15 Mar 2011 15:09:54 +0000 (UTC)
From: bavarianradio@comcast.net
Subject: Re: [R-390] Z503 Question

I have been wondering this myself, If the coil/capacitor are resonant at or around 455 khz, as long as the dc resistance is close, why wouldn't it work?? I suspect that the powdered iron cacoon was there for radiation shielding, but we don't need to worry

too much about that (there are no tracking subs under this building...) any more. Why couldn't we take an IF can from an AA5 and remove one of the windings to make it a coil??? If I can find some time in the near future, I may try it and report back. Thanks Ross W1EKG

Date: Fri, 8 Jan 2010 16:37:25 -0600
From: "Bob" <rfay@charter.net>
Subject: [R-390] R390A alignment question

OK gentlemen, here is my first question for today. In TM 11-5820-458-35, section 72, (Alignment of Fixed Tuned IF) it states to align T501 to 467kc which I assume is setting stagger tuning. I have an old Stewart Warner R-390A and this transformer is currently set for 455kc. Do I just peak the IF strip at 455kc or do I set it up stagger tuned as listed in the book. Side note - The process for aligning the PTO to the RF deck with the freq counter went well just as everyone described.

Date: Fri, 8 Jan 2010 15:09:45 -0800
From: "Craig C. Heaton" <wd8kdg@worldnet.att.net>
Subject: Re: [R-390] R390A alignment question

A quick stab at the question/answer. Some of the first R-390A receivers had IF strips set at 455kc. The top cover of the mechanical filter was flat, no indentation where the nut to hold the cover is located. So, if your IF strip has that recess on the filter cover, stagger tune. I don't have the Y2K in front of me, Bob, keep one close by.

Date: Tue, 19 Jan 2010 20:18:19 -0800
From: John Kolb <jlkolb@jlkolb.cts.com>
Subject: Re: [R-390] R390A alignment question

Filters vary somewhat but the one I measured was only 9 kHz wide.
http://www.jlkolb.cts.com/site/curves/F455N801.PDF

Date: Sat, 9 Jan 2010 13:57:58 -0600
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: Re: [R-390] R390A alignment question

The stagger tuning is to maintain the bandwidth of the radio when operating with a 16 KC bandwidth setting. If you seldom use the 16KC setting like when listening to a nice, clean SW or BCB station then you "could" go with a more conventional alignment and just peak to 455 Khz. The IF gain will be higher with everything across the board at 455 Khz but the overall bandwidth will be reduced. The stagger tuning is to give the radio a more linear response across the maximum bandwidth. If sensitivity and selectivity were your only concern then the tank circuits could be changed to eliminate any Q-spoiler components. In a non-perfect world the Q would be so high that the radio would have absolutely no bandwidth and only be good for listening to CW. So it all depends upon how faithful you want to stay to the original design and intent of the radio or how much you want to modify it to fit your listening needs. I find that the 16 kc bandpass filter is just a bit too broad. I wish they had an additional 12 kc setting that would be a better fit for SW/MW listening.

Date: Sat, 9 Jan 2010 15:04:20 -0600
From: "Les Locklear" <leslocklear@cableone.net>
Subject: Re: [R-390] R390A alignment question

In actuality, the 8 kc filter is 11 kc wide.

Date: Sat, 9 Jan 2010 16:24:29 -0600
From: "Bill Hawkins" <bill@iaxs.net>
Subject: Re: [R-390] R390A alignment question

IIRC, increasing the gain of the IF strip makes it oscillate, or somehow detracts from overall performance. That's why there is an IF gain control pot on the module.

Date: Mon, 11 Jan 2010 18:38:45 EST
From: flowertime01@wmconnect.com
Subject: Re: [R-390] R390A alignment question

I find that the 16 kc bandpass filter is just a bit too broad. I wish they had an additional 12 kc setting that would be a better fit for SW/MW listening. This is where you wish you had a good sweep generator. You can set the band switch to 16 KHZ. then retune de tune mis tune the IF cans until you get a nice 12KHz band pass in the IF strip. Then you can just set the IF gain to give you needed overall receiver gain want to also get good short wave and AM signal to noise and sound.

Date: Tue, 12 Jan 2010 08:26:57 -0500
From: William A Kulze <wak9@cornell.edu>
Subject: Re: [R-390] R390A alignment question

This has been giving me some ideas. I've got a winradio that I've run the IF into via some attenuation, using the SDR for demodulation. I could probably use the panadapter as an aid to the alignment process. I've heard that some were stagger-tuned and some were 455kHz straight through, but didn't know about the indent in the top of the cans. Once I get done working on this old house and get settled in I hope to do the full-on alignment, including the mechanical on the RF deck. That should be fun! ;)

Date: Tue, 12 Jan 2010 12:52:43 -0600
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: Re: [R-390] R390A alignment question

Until I recently changed jobs I had access to the best Rohde Schwartz gear for radio alignment and a nice lab to work from Now I use my HP 3324A and an assortment of other HP devices to do "paying myself" radio work. I was able to use the sweep generator and a Hameg spectrum analyzer to build a roofing filter for the R-390A. The roofing filter uses one of the torsion Collins filters with impedance matching circuits on either side to improve the 3IP on the radio. I barely notice the difference when listening with the radio and the improvements only show up on test equipment. The Dallas Langsford document on roofing filters was my inspiration. It is really useful if you plan on going down this path.

Date: Tue, 12 Jan 2010 13:10:15 -0600
From: Ben Loper <brloper@gmail.com>
Subject: Re: [R-390] R390A alignment question

To help me understand, if each of the filters in a R-390A has a slightly different bandpass + or - 455 and the IF is tuned precisely to 455 won't you get some loss of gain anytime you select a filter slightly off of 455. I now understand why aligning a radio with one filter you tune for max using the center of the single filter. With the R-390A isn't the stagger tuning to account for the multiple filters giving ample gain for each filter? I ask this question because I don't have the equipment to stagger tune the IF and wondered exactly why it was stagger tuned in the first place.

Date: Tue, 12 Jan 2010 14:37:04 EST
From: djed1@aol.com
Subject: Re: [R-390] R390A alignment question

The IF bandwidth of the R-390A is determined by the mechanical filters. The only exception would be a case where the transformers have a narrower bandwidth than the mechanical filter. I expect this is the case with the 16 Kc filter. So the only reason to go through the stagger tuning process is to assure that the 16 Kc bandwidth is correct. Most of us don't bother because we don't use the 16 Kc much. But if you want to do it up right, I think you just have to offset the signal source to either side of 455, then peak up alternate IF transformers. I haven't done it, so I can't offer an exact procedure.

Date: Tue, 12 Jan 2010 13:43:23 -0600
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: Re: [R-390] R390A alignment question

On most radios the IF's are all set by peaking while injecting a signal into the receiver. If done right this usually results in all of the IF's being at the same frequency. Hopefully this is the same frequency as whatever filters the receiver is using (crystal, mechanical, LC, etc.. I have seen that not happen. ie, something has happened to the IF in a big way, either through a component failure or some well meaning person just "tightening down" those loose slugs (don't laugh, I did that on my first ever radio back in the 70's). You can end up with the IF strip set to one frequency (like all stages set to 460 khz) but the filters maybe at 455 khz . In the R-390A I have had a similar experience when I tried to use the BFO oscillator as my reference, only to find out that my adjustments made it all worse because the BFO in center position was 'not' at 455 khz (the frequency counter was on vacation that day). In general, you end up with horrible performance across the board. In a perfect world every filter would be dead on at 455.000000 KHz but we are talking about old radios. Things can happen inside of the mechanical filter that would either make it non-linear across it's passband or shift the frequency. There have been some dissections done on the mechanical filters used in the R-390A's and it appears that the foam falls apart and makes a mess of everything. Even on the manufacturing line there had to be some sort of +/- tolerance for what would be considered a good filter.

On the R-390A, since the radio was intended to provide a flat response at its widest bandwidth setting (16 KHz according to the switch) they had to stagger tune the IF to

give it a broader passband.

Just brainstorming here but you may be able to do the tuning without a sweep generator... Use a signal generator with an unmodulated carrier. Set the frequency of the generator spot-on the desired frequency and peak the first IF. Then the generator frequency to be slightly higher (without retuning the radio) and set the second IF, now set the generator to be slightly lower
than the center frequency and peak the third IF.

You will probably need to bounce back and forth a couple of times through the IF deck but as long as one IF is center, one IF is high and the other IF is low you should be able to accomplish the same thing. The +/- spread is shown in the manual.

Date: Tue, 12 Jan 2010 14:12:10 -0600
From: "Bill Hawkins" <bill@iaxs.net>
Subject: Re: [R-390] R390A alignment question

You don't need a counter to set the IF frequency, just a generator that doesn't drift. If the alinement isn't way out, select the 100 Hz crystal filter and peak the amplitude with the generator.

This is the center for that IF strip at that temperature. Then proceed to align on that frequency. Or not, as the spirit moves you.

Date: Wed, 13 Jan 2010 18:05:51 EST
From: flowertime01@wmconnect.com
Subject: Re: [R-390] R390A alignment question

>.....wondered exactly why it was stagger tuned in the first place.....

I think Tisha posted a good response to most of your question. The stagger tuned decks and straight tuned decks had different IF cans. While the schematic and part count are exactly the same in the stagger tuned and straight tuned decks, the actual circuit response and performance are different. You do not straight tune or stagger tune a R390/A deck on whim. Your specific deck is one or the other. It is not both. The question is how do you know which deck do you have.

Each mechanical filter will give you a different gain, but not because it is off frequency. If your filter is off frequency far enough to cause loss you would replace it. The trimmer caps were added to help "balance" the differences in gain between filters. Practice is not to balance gain but to "peak" each filter for what ever max signal can be achieved.

Once upon a time it was known which contracts were which. It was never cleanly printed in a TM, thus it is lost. We will not mention depot deck swapping to add to the mix-up. There was once a nice article in a monthly Army magazine that provided all the ugly details. I am sure some Fellows remember Connie. We could wish someone collected that publication and would cull the R390/A articles for us. Maybe in the next life time. (:, One clue is newer decks have trimmer caps on the mechanical filter. If your deck is new enough to have trimmer caps on one end or both ends, your deck is

new enough to be straight tuned. The square can with the indent for the nut was to get enough height under the square can to clear the trimmer caps. The indent was to keep the bolt and nut height under the top cover plate.

And I add some more thoughts.

- In the beginning long long ago:
- The mechanical filters were centered on 455KHz.
- Decks that were stager tuned had different parts than later decks that were all centered on 455KHz.
- Only one mechanical filter is used at a time.
- The whole IF strip and its cans are used all the time.
- Les just pointed out to us that the 8KHz filter is in fact 11KHz wide.
- Always has been.
- The IF cans without filters have a band pass wider than 16KHz. This in fact makes it hard to use a sweep generator to tune the cans when the 16KHz mechanical filter is slicing off the corners of the band pass before we can see the real band pass of the IF deck cans alone.
- The best we can do with the sweep generator is make sure the cans do not "crimp" the 16KHz band pass.

Because of the fact of circuit, it was always questioned why any one would even try to use the sweep generator to align the IF deck any way. We were hard put to find a deck that was stager tuned to start with. Any straight tuned deck was just easier to peak with a AN/URM25 set to 455 as determined with the frequency counter setting under it on the bench shelf. While any mechanical filter may not be exact on 455 we do not expect the 8KHz filter to be off by 4KHz or more. If it was you would replace it. The 4 and 2 filters can be even further off center and still not be outside the 16KHz skirts we expect from the cans. The cans in the straight tuned IF deck do not really come close to having 16KHz skirts. The cans perform more as impedance transforms than filter functions. The can peaks are way up above the flat filter tops. As you tweak a can slug around the metered receiver output goes up and down, not because you are just moving the band pass of the can around, but more because you are getting a better or poorer impedance transform between twostages.

Understand the tweak operation is dynamic, and multi faceted. It's not simple.

Roger AI4NI

Date: Wed, 13 Jan 2010 17:28:10 -0600
From: "Les Locklear" <leslocklear@cableone.net>
Subject: Re: [R-390] R390A alignment question

Aaaaaah Roger, You put it so nicely..... Your expertise far exceeds any of the techs I ran across in the Air Force while working for the DOD for over 30 years. All R-390's and R-390A's should have been so lucky as to pass through qualified hands such as yours. Unfortunately, such was not the case, witnessed by most of the jumbled, butchered nightmares left in DRMO facilities.

Date: Wed, 13 Jan 2010 16:01:59 -0800

From: "Craig C. Heaton" <wd8kdg@worldnet.att.net>
Subject: Re: [R-390] R390A alignment question

Now you have me scratching my scalp and trying to save what hair is left. So, what came first; straight tuned or stagger tuned? I seem to remember most of the threads hinted straight came first. Second question; the Y2K manual leans to stagger tuning the IF cans, is this because most of the R-390A's were modified with the trimmer caps or left the factory with such and thought to have IF cans meant for stagger tuning???? Guess without those ugly details in a monthly Army magazine the correct method might as well be try something and measure the results, then try the other method.

Date: Wed, 13 Jan 2010 19:43:10 -0600
From: "Cecil Acuff" <chacuff@cableone.net>
Subject: Re: [R-390] R390A alignment question

I guess one way to tell which deck one has, is to look at the components around the base of the cans. I'll need a little help with this because I usually forget which way is which but in one case Q spoiling components were added to reduce the peaky gain of the stage.

I'm thinking it was for the straight tuned decks. The stagger tuned decks could use the full gain because they didn't all line up on the bandpass.

Determining if you have those caps and/or inductors at the base of the cans could answer the question. You wouldn't want to mix them up....ie try to straight tune a deck that was designed to be stagger tuned because it would probably oscillate as someone mentioned... on the flip side stagger tuning a deck with the Q spoiling components would result in insufficient gain.

If I have this all wrong Roger please clear it up as I don't want to add any confusion to this discussion.

Date: Thu, 14 Jan 2010 10:14:40 -0600
From: Barry Williams <ba.williams@charter.net>
Subject: Re: [R-390] R-390A Alignment Question -- Tisha Hayes

You mean PM Magazine with Connie Rodd?

http://dig.library.vcu.edu/cdm4/results.php?
CISORESTMP=results.php&CISOVIEWTMP=item_viewer.php&CISOMODE=thumb&
CISOGRID=thumbnail,A,1;title,A,1;creato,A,0;illust,200,0;none,A,
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P1=all&CISOFIELD1=title&CISOBOX1=index&CISOOP2=all&CISOFIELD2=creato&
CISOBOX2=&CISOOP3=all&CISOFIELD3=illust&CISOBOX3=&CISOOP4=all&CISO
FIELD4=CISOSEARCHALL&CISOBOX4=&c=all&CISOROOT=%2Fpsm

That's a long adress that ends in 'psm'....just to be sure you get it all. This is the complete index of articles by year. This is a collection of all the magazines from 1951-1971. They did a good job on them. http://dig.library.vcu.edu/cdm4/index_psm.php?CISOROOT=%2Fpsm

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Date: Mon, 18 Jan 2010 19:38:53 EST
From: flowertime01@wmconnect.com
Subject: Re: [R-390] R390A alignment question

Les weighed in here with some mail. My server will not let me read it. Likely I am missing the best laugh in months.

I thought the short flat top can over the filter with no trimmers came first.
I thought these were stagger-tuned IF decks.

Today I am 61. Back then I was not real keen on trying to become a R390 history buff. I was just trying to keep a whole bunch of them running one dirty PM at a time. I tried not to think about these small details. My TM 11-5820-358-35 Dated 9 March 1962 Page 91 Section II Alignment. Paragraph 76. Alignment of 455-Kc IF stages, is a straight forward 455 alignment. Put the signal into the last Mixer of the RF deck at test point E210. Peak the generator through the 455 .1KHZ crystal. Set the band width to 16KHZ and peak all the slugs. Work the bandwidth down and continue peaking until you get the deck centered up on the 455 KHz crystal band pass.

I have no stagger tuning procedure in the original paper book I have in hand.

If you have the equipment and can measure the difference, try your deck both ways and see what the results are. As my mail from Les Lochlear will not open and I do believe in Murphy, I expect the real answer is in that mail.

Date: Mon, 18 Jan 2010 19:35:45 -0600
From: "Les Locklear" <leslocklear@cableone.net>
Subject: Re: [R-390] R390A alignment question

The only pertinent information I posted lately was the fact that the 8 kc mechanical filter was actually 11 kc that's why they sound good. The other was a response to your superb note on alignment. I have cut and pasted it below for you.

Aaaaaah Roger, you put it so nicely..... Your expertise far exceeds any of the techs I ran across in the Air Force while working for the DOD for over 30 years. All R-390's and R-390A's should have been so lucky as to pass through qualified hands such as yours. Unfortunately, such was not the case, witnessed by most of the jumbled, butchered nightmares left in DRMO facilities.

Date: Tue, 19 Jan 2010 20:18:19 -0800
From: John Kolb <jlkolb@jlkolb.cts.com>
Subject: Re: [R-390] R390A alignment question

Filters vary somewhat but the one I measured was only 9 kHz wide.
http://www.jlkolb.cts.com/site/curves/F455N801.PDF

Date: Fri, 12 Mar 2010 19:28:50 EST
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] R-390A help needed

Like all good things you start in the middle.

You need to put 455Khz at about 150uv into the IF deck. If you have good bandwidth you can down load TM 11-5820-358-35 as a PDF file. Then start with paragraph 73 adjustment of the IF gain pot. Para 73 just tells you how to hook things up for the test and gain pot adjustment.

Never has any one told you that you need 30 DB difference at this point to get the receiver to work. It is not in print.

To get 455 into the IF deck you remove the BNC to Mini BNC adapter from the back panel and the 455KHz IF output cable on it. You use these parts to patch the signal generator into J513. Ignore all the TM stuff about test adapters. Just use a BNC cable to get from the generator to the IF deck. If you coupler is missing. Just improvise a bit of wire from the coax into the IF deck jack and get a ground from the coax shield to the receiver.

You want a good analog DC volt meter (any VTVM) on the diode load. You want 600 ohms (2 1,200 Ohm 1/4 watt) across the local line output and another AC volt meter across the 600 ohm load.

You set the generator up for 150 uv CW into the IF deck.
You adjust the IF gain for -7 volts DC on the diode load.
You turn on the modulation at 30%.
The local audio AC voltage must be about 16 Volts AC (1/2 watt, 26DB) across the 600 ohm load.

Turn the generator back to CW. the local output should go to zero volts (drop down 30DB).

Until the receiver will produce 30 DB change in signal plus noise to noise in this test, it will never provide the needed signal to noise at the antenna. Nothing can be done in the RF deck to compensate for an IF and Audio deck that is not up to expectations.

Expectations being 150 UV sensitivity, 30 DB difference and 1/2 watt of audio out of the local audio into 600 ohm load. The exact level of 150 is not a holy grail. You just need to be at about this level. You can screw the IF gain around to get -7 volts. You will or will not have 1/2 watt out and you will or will not have a 30 DB change between the CW and modulation.

Swapping tubes will get you there. Alignment helps. Z501 has a 455KHz crystal in it.

Back up to test point E210 and inject 455 there. at 10UV you should get -7 volts and a 1/2 watt out. you can rock the generator through the crystal at .1 to get the generator to 455KHz. you can zero the BFO against the generator.

Once you get up to where you can get WWV at 10 or 20 MHz. you can use the BFO zero to null WWV into the receiver. Then you can go to CAL and pull the cal oscillator to null with the BFO. You can them drop the dial bezel and adjust the dial counter to read zero. If you have a counter and can count your signal generator the you start on the other end, You set the zero adjust to center. You adjust the dial to have equal over run on both ends (+ - 30). You adjust the cams to align at 7+000. You adjust the VFO to be 2,455,000 at +000 on the dial. You inject 32 Mhz and set the receiver to 31+000. you run the BFO to null. you set the receiver to CAL then you adjust the cal osc to null against the BFO.

Then you can go and do a mechanical alignment of the RF deck and start swapping tubes in the RF deck until you get the whole receive up to par.

Hope this get you going it the right direction. Check out the web pages at.

http://r-390a.net
http://r-390a.net/Pearls/index.htm
http://r-390a.net/Y2K-R3/index.htm

A must read is Wei-Li's Pearls of Wisdom. He has been collecting and categorizing the wisdom which flows through the R-390A mailing list. The Y2K manual is so much better reading than the original TM. You can pop it open in sections. If you are on dial-up like me, it is so much faster to access than the big PDF documents.

Date: Sat, 2 Apr 2011 08:37:52 -0700 (PDT)
From: Perry Sandeen <sandeenpa@yahoo.com>
Subject: [R-390] Z503 replacement

>....It is a Pi-wound coil, and has a resin.....

I was somewhat aware of the complicated construction. Is it possible that this was an extremely over-engineered part? My question really was: why can?t a satisfactory electrical equivalent be made out of components we can buy? After all it is a 455 KHz part. I?d rather make one or two up for spares now, even if I never need them, than to have to scrounge up a replacement for a dead one in the future. Has anyone on the list pursued an alternative replacement method or made one?

Date: Sat, 02 Apr 2011 11:48:27 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] Z503 replacement

I believe that these were "overbuilt" or "over-engineered" for a *REAL* reason. Remember that these were designed to be a cost reduction version of the R-390/URR. As such, they had tight specifications to engineer to. I would suspect that there would be *some* degradation of the circuitry *IF* replaced with a good PI-wound 455Kc IF transformer that did NOT have the same shielding. However, *WE* are NOT radio intercept operators that are trying to operate and get the results needed, such as those in Operation Boresight. YES I *know* some folks are shocked over the "formerly" classified program. It has however, been posted on the Internet for well over 5 years.

Date: Sat, 2 Apr 2011 09:16:29 -0700 (PDT)
From: Perry Sandeen <sandeenpa@yahoo.com>
Subject: [R-390] Z503 replacemnt

>I believe that these were "overbuilt" or "over-engineered".....

I have no argument that Z503 could have been made the way it was for very good reasons that we know nothing about. And that a ?homebrew? replacement may not be nearly as good as the original. But if we can?t buy a replacement, were stuck with an IF module that now is only good for parts. Thus arises the question of how to make a workable, albeit, lower performance substitute. If you know of a source of new or used Z503 units at a somewhat reasonable price I?d be delighted to purchase two spares rather than make a homebrew unit. Making a homebrew unit would be my very last choice.

Date: Sat, 02 Apr 2011 12:34:02 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] Z503 replacemnt

I would suggest TWO *likely sources of honest to goodness replacement parts:

1) Andy has a BIG stack of R-390/URR and R-390a/URR radios and parts
James A. (Andy) Moorer <www.jamminpower.com>

2) Matthew Parkinson [A former depot maintenance type.]
mparkinson1@socal.rr.com

I've personally bought from Matt. I'd buy from Andy *IF* I'm looking for another radio or part!

Date: Sat, 02 Apr 2011 13:34:28 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] Z503 ADDITIONAL SOURCE

Hank - Hope YOU do not mind!

>To the group! Sent to me by Dan Arney, <hankarn@pacbell.net> :
>I have around 50 r-390-A`s complete sans meter on about 1/2 of them plus
>about 75 or so frames with/without panels and some knobs no modules plus
>a pallet of RF decks plus a lot of modules from serviceable to parts or
>junk hihi plus covers top/bottom/Utah/AC covers with clamp plus tags.
>Hank KN6DI

Date: Sat, 02 Apr 2011 12:49:08 -0500
From: Randy and Sherry Guttery <comcents@bellsouth.net>
Subject: Re: [R-390] Z503 replacement

They can get over it. "Shock" is coming from the Silent Service - knowing things that were *never* to be known *ever* - then sitting down and reading Blind Man's

Bluff... I got over it - so can they.

Date: Sat, 02 Apr 2011 12:57:59 -0500
From: Randy and Sherry Guttery <comcents@bellsouth.net>
Subject: Re: [R-390] Z503 replacement

And I think you just hit the nail squarely on the head: that construction was probably (then) the least expensive way to accomplish "the spec.". As we know today - there are lots of new and exotic/precision/nifty parts that didn't exist back then. If we were to establish the parameters of Z503 (inductance,
capacitance, Q, bandwidth, etc.) then using modern components fabricate one that duplicates those parameters - I sincerely doubt there would be any measurable difference between the original and the replacement "in circuit".
Might cost a lot more - take more time to make; each have to be "hand tweaked" (rather than the economy of mass production) - but we're not needing production quantities, either. Collins wasn't out to be "different / cute / difficult to duplicate / oh gee whiz!" - they were out to get the job done for the least $$$.
just my .02

Date: Sat, 2 Apr 2011 15:45:07 -0400 (EDT)
From: ToddRoberts2001@aol.com
Subject: Re: [R-390] Z503 replacement

A replacement Z503 was discussed on this list about 3 weeks ago. I have a spare NOS Z503 that I recently measured. The inductance of the coil L-514 measured 1.38-1.39mH (millihenries) using an LCR meter. The resonating capacitor C-563 measured 84pF. The Q of the coil and capacitor inside Z503 measured a meager 25Q at 410KHz using an HP4342A Q-meter.

It would be recommended to use a ferrite shielded inductor for a replacement to minimize stray effects of the shielding can. Mouser has some suitable small shielded inductors of 1.2mH and 1.5mH at current prices of $1.20 each. I have a similar 1.0mH shielded inductor from Mouser and it measured with a Q of 170 at 455KHz. There was no change in inductance when I inserted the inductor inside the Z503 shield can. Unshielded inductors show a large change in inductance when inserted inside the metal Z503 can. Using a fixed inductor would require a small trimmer cap to adjust to resonance. Mouser has suitable miniature trimmer caps that will easily fit inside the Z503 can. The assembly could be peaked with the can off, then replace the shield can as there will be no change of inductance with the can on. To match the low Q of the original inductor a resistor could be placed in parallel with the Mouser inductor and cap tuned circuit to lower the Q down to the 25-50Q range which should work very close to the original Z503 circuit.

Date: Sat, 02 Apr 2011 15:57:40 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] Z503 replacement

Todd old son, This is ?great?. I pose it with question marks for several reasons.

1) What percentage have an LCR meter?

2) What percentage have an HP-4342A Q Meter?
3) How does this change the alignment?

I pose these for the members of the list that really do NOT have all the specialized test equipment. *THAT* is why I posted KNOWN sources for the
Z-503!

Date: Sat, 2 Apr 2011 13:06:31 -0700 (PDT)
From: "Drew P." <drewrailleur807@yahoo.com>
Subject: Re: [R-390] Z503 Replacement

As Roger had previously written, the AGC section is the least critical part of the IF system. By that point in the system, the IF amplifier bandwidth has already been established by the IF interstage transformers and the encountered signal bandwidth has been defined by funneling through the mechanical filters ahead of most of the IF amplifier. Also, Z503 is coupled to V590A, the AGC recifier, a relatively low impedance point, via an appreciable coupling capacitor. Z503 is therefore unavoidably heavily damped and would have a broad bandwidth, wider than that of the rest of the system. Remember, Z503, while adjustable, doesn't even have a hole in the can for adjustment; this shows the relatively "loose" nature of the part.

I believe that Z503's coil was "over engineered" with the pot core, pie windings, and epoxy simply for manufacturing convenience - to enable it to be built on the same production line as the already-proven IF transformers (which are also somewhat similarly constructed) and without incurring need for extra source component inventory.

Insofar as shielding provided by the pot core is concerned, Z503 is already in a can - how much more shielding do you need? I see little reason why the "guts" of Z503 could not be replaced with those out of a tube-type 455 KC IF can salvaged from an AA5, those from a detector transformer just to be proper.

It should also be practical to use here an inexpensive commercially available inductor, with a similarly inexpensive trimmer cap, perhaps paralleled with a fixed cap, for adjustment. IIRC, someone in this forum recently mentioned having done just that.

Date: Sat, 2 Apr 2011 13:29:27 -0700 (PDT)
From: "Drew P." <drewrailleur807@yahoo.com>
Subject: Re: [R-390] Z503 Replacement

Todd, this is good work you have done. You have called out the values and configuration required and this should make for easy duplication by those who would wish to fabricate an inexpensive Z503 replacement.

Date: Sat, 02 Apr 2011 16:37:49 -0400
From: rbethman <rbethman@comcast.net>
Subject: [R-390] Z503 and ALL IF 455Kc coils

Here is the quote drawn from the cost reduction analysis report:

2.3.7 Part 7 - RF Coils
Experimentation was started on the 16-32 mc band RF coil to improve its tracking. A considerable improvement resulted from changing the length to diameter ratio and using a smaller diameter coil. As soon as the design was complete steps were taken to put this coil in production receivers. 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. Coil frames have been redesigned for simpler assembly, and teflon terminals are used to maintain high circuit Q. Antenna links have also been redesigned to attain a more uniform antenna input impedance.

So, it can be determined that the IF Coils *WERE* given specific designs. I do not doubt that one or another proposed solutions "could" be used. However, particular attention was paid to this area. The same was true of the mechanical filters versus the R-290/URR L/C filters. To each his own! I'll be replacing *MINE* with a like part. Sources for components AND radios has been made.

Date: Sat, 02 Apr 2011 13:48:31 -0700
From: Dan Rae <danrae@verizon.net>
Subject: Re: [R-390] Z503 Replacement

> Remember, Z503, while adjustable,.....

In my R-390 I found recently that the coil in the Z503 had gone open circuit. It proved to be totally impossible to take the ferrite cup core apart to re-wind so I replaced it with another inductor from my junk box, also with cup core and adjustment from one end and was able to mount that into the original can with the same hardware. The original L as Todd points out was around 1.5 mH. My replacement at 0.5 mH needed more C to resonate, around 310 pF, but with a measured Q of 170 gives a nice peak at 455 kc/s and good AGC action. I am not sure why the Q was deliberately lowered seemingly in later radios, but my relatively high Q coil works fine, and I see no need to lower it with parallel R. The original C in my R-390 version Z503 was split into approx half silver mica and half ceramic, total 82 pF from the schematic. I'm guessing this was for temperature compensation.

> It should also be practical to use here an inexpensive.....

This was exactly what Todd was suggesting, just recently and also earlier; if I had not found a suitable inductor I would have tried to do it his way.

Date: Sat, 02 Apr 2011 17:00:08 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] Z503 Replacement

> Remember, Z503, while adjustable,.....

Then apparently one cannot read the alignment instructions properly, even in Roger's VERY recent series, nor can they follow the changes made over their service life. Holes were drilled in the top of the cans to allow for adjustment!

> I believe that Z503's coil was "over engineered" .....

Read the quotation from the cost reduction analysis report - on-line, provided by Bill Hawkins. Insofar as shielding provided by the pot core is concerned, Z503 is already in a can - how much more shielding do you need? I see little reason why the "guts" of Z503 could not be replaced with those out of a tube-type 455 KC IF can salvaged from an AA5, those from a detector transformer just to be proper. They had DEFINITE reasons for the design. Other home-brewed ones may well work. How much work and measurement equipment do we ALL need to have?

Date: Sat, 2 Apr 2011 18:05:56 -0400 (EDT)
From: ToddRoberts2001@aol.com
Subject: Re: [R-390] Z503 Replacement

I was hoping that posting the values of the components inside the Z503 will make it easier for someone to build a replacement. The next step will be to pick up some off-the-shelf parts from Mouser and put together a working Z503 so anyone can build one for a few bucks using matching part numbers and get consistent performance.

Date: Sun, 3 Apr 2011 15:50:54 -0500
From: Paul Staupe <pstaupe@qwest.net>
Subject: [R-390] Z 503... "non-A" vs. "A"

Thanks for doing the measurements of your Z-503 and sharing the results. It looks as though a much cheaper alternative might be built with modern components. After a lot of dead ends, I was lucky enough to find a non-A version from Fair Radio, however as you would expect, the price was high. ($45.00)

I'm the guy who originally asked the question about Z-503 a few weeks ago. There seems to be some confusion about the "A" version and the non-A version, since Z-503 does the same thing (AGC) in both designs. I noticed in the non-A schematic that there's no L or C designation as in the "A" model (L 514 and C 563). However, there is "82" next to the cap in the non-A schematic which I would expect means 82 pF. Since you measured 84 pF on your Z-503, I'm wondering if they could be substituted for each other?

I've got an Imperial from the '63 "A" contract, and the cans are close to the same size. I haven't taken the Z-503 apart from the Imperial, but from what others are saying, it's potted just like the non-A version, and also has a shield. There is a slight difference in that the ferrite adjustment in the "non-A" is done with a screwdriver, and with an insulated hex tool in the "A" version.

If the "A" version could be substituted for the non-A, that might be a solution for the

unobtanium non-A version, since there are so many more junker "A" IF decks out there. Just a thought....

Date: Sun, 03 Apr 2011 17:05:39 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] Z 503... "non-A" vs. "A"

Todd's solution is only good for the R-390A/URR. This is one of the Cost Reduction Changes that grew into the production of the R-390A/URR. The fact of the matter is, the R-390A/URR IF transformers are ALL identical with a higher Q than what they first went to the Signal Corps with. I'm interested in Todd's solution. If he can build it as a repeatable item, and it can work in ALL IF transformer positions, there will be a BIG sigh of relief!

Date: Sun, 3 Apr 2011 17:16:43 -0400 (EDT)
From: ToddRoberts2001@aol.com
Subject: Re: [R-390] Z 503... "non-A" vs. "A"

I have also noticed that some versions of the Z-503 have an adjustment hole in the top of the can and others have no hole for adjustment for some reason. I have an early Collins R-390A that has no hole in the can but a later version Motorola that does have a hole in the top of the can for slug adjustment. Someone could always drill a hole in the top of the can to allow for adjustment of the slug if they have the version without the hole and wanted to make sure the coil was peaked. The slugs in both "A" versions are the same - adjustable with a hex tool.

I think one could get a shielded inductor, small value mica cap and a small trimmer capacitor from Mouser and build a "new" Z-503 for under $5 bucks.
Instead of using an adjustable inductor use a small trimmer cap to "peak" the coil. Electrically the result should be the same.

Date: Sun, 3 Apr 2011 21:06:50 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Z503 Replacement

Don, your analysis is text book exact. I accept it as you stated it.How ever I am not sure I want the AGC response to be as wide as the IF response.

>....so you want Z503 to be at least as broadband .....

If I am listening with a 16KHZ response it is because I have an AM signal that wide. I would like my AGC to follow the fading of that signal. I think the AGC should capture the carrier of that signal and provide an audio level around that signal. I hate when my AGC goes chasing other signals mixed into the bandpass and putting more variation on the target signal. Maybe an AGC stage filtered narrower than the IF is not a bad thing. A lot of assumptions were made to get these receivers into production. Certainly most have proven to have been very good over the long haul. AGC operation has been a topic for a long time. Changing the bandwidth of Z503 may not be a wrong idea. It may not cure anything. But some experimentation, testing and comparisons could be in order. I agree that Z503 was made up the way it was is

because it was like other parts. Same fabrication process, materiel, and test methods. W.W.II construction, procurement processes have no relation to the way we manufacture things
today (Thank God). The part needed an isolation cover can. It needed a selected design Q. It needed to look like other parts and use as many other similar parts as possible. Same bolts same terminals same can cover same core tube blank same wire same coil winding machine. In early production the hole in the can cover was considered a point for contamination to get in. Possible destabilizing factor to tuning. Over time it was realized that hole was over-kill and left over W.W.II ridged mentality. If you have a deck with on hole in the IF cans, you just have early production parts. You also likely do not have the trimmer caps under and over the mechanical filters. I am not sure we need to keep Z503 exact as built.

Date: Sun, 03 Apr 2011 19:36:46 -0400
From: "Stephen M. Murphy" <murphys@comcast.net>
Subject: Re: [R-390] Z503 Replacement

Just curious: Is it known what causes this inductor to open-up?

Date: Sun, 3 Apr 2011 21:21:56 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Z503 Replacement

>.....Just curious: Is it known what causes this inductor to open-up?.....

Steve, in almost every wound wire case it is some small defect in the wire. The defect causes a concentrated current point. This translates to a hot spot. (very small) Over time it causes more burn and wire harding. This is higher resistance at the spot. In time the wire fails open. Eventually every coil in use will fail at its weakest most imperfect point. Some coils are near perfect and defect free so may not fail for several thousand years. Just look at the wire wrong between the wire drawing process and when you get the finished product and you can have a wire nick or kink. Any left over impurity from the smelting process and you had a defect.

Date: Sun, 3 Apr 2011 21:33:49 EDT
From: Flowertime01@wmconnect.com
Subject: [R-390] 16 KHz filter oscillates

I have a R390/A on the bench. As I peak up the 16 KHz mechanical filter it goes into oscillation. I get a nice audio tone out of the headphones. I can change that tone with adjustment and drive it beyond the audio range. The oscillation continues as it can be metered on the diode load. I can peak the level with the trimmer caps. I can back the trimmers back off the oscillation point and get a signal through the filter at almost the same level as the other filters. I do not know if the filter will ring at these trimmer settings with real world signals.

Is there a cure other than replacement? Will replacement cure the problem?

The deck is late production but still with the black beauties. The only change was to get the orange drop in before power was ever applied. Is there a wire dress layout

problem that leads to this problem?

Date: Sun, 3 Apr 2011 21:56:34 -0400
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] 16 KHz filter oscillates

I would advise against horizontally and vertically striped wires in the same module. That's a wire dressing mistake for sure.

Date: Mon, 04 Apr 2011 07:15:47 -0400
From: "Stephen M. Murphy" <murphys@comcast.net>
Subject: Re: [R-390] Z503 Replacement

That's what I was wondering, whether it is a manufacturing defect or an upstream failure causing the problem, since these things typically don't (can't) just fail on their own. I'm also wondering if it's an "across the board" problem, or just affects those radios that were subjected to outdoor storage.

Date: Mon, 4 Apr 2011 13:13:57 +0000 (UTC)
From: bavarianradio@comcast.net
Subject: Re: [R-390] Z503 Replacement

I have been kicking this question around as well. In several discussions with other techy types, we are surmizing that the varnish/laquor or whatever it is that it's potted in, becomes quite brittle and is actually breaking the wire where it passes through the material.This could be very likely enhanced by temperature change or temperature extremes like un heated/cooled storage.It would be interesting to carefully disassemble one that is open and try to find the break. FWIW mine is still working OK after the arc repair I performed on it almost 2 months ago. I don't expect it to last forever though. Ross W1EKG

Date: Mon, 04 Apr 2011 09:26:13 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] Z503 Replacement

I've torn one coil that was an excess part, since it had been damaged elsewhere. I have no idea what the resin was, but it showed no flexing remnants. I have gone as far as chipping off the ferrite cup, AND *still* have continuity. I believe that Roger has it correct. It would very likely be a flaw in the wire itself. Having wound transformers, it is NOT the easiest thing to do. You MUST remain vigilant and watch closely for some unusual twist or flaw in the wire as you go along.

Date: Mon, 04 Apr 2011 09:32:02 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] Z503 Replacement - Apology

I have screwed the pooch on Z-503. I kept mixing it up with *T-503*, a completely different animal. Things around here have been hectic due to family issues. I'll let it suffice to say that it has been chaotic to double the population of your house, with *little* warning. I can't even find my hard copy of the manual now. I'm trying by

opening up a PDF as I grope through the operation and circuits I won't go there, but it is what it is. Sorry I got wrapped around the
axle!

Date: Mon, 04 Apr 2011 09:52:16 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] 16 KHz filter oscillates

I would go with the ONE suggestion regarding grounds. I would believe that this would be the highest probability.You know enough about the capacitors. Unless you have some freak failure in ONE that bypasses. Best of luck!

And thanks for your very in-depth knowledge that you have shared!

Date: Mon, 4 Apr 2011 12:26:31 -0500
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: [R-390] Z503 Replacement

Randy makes a great point. None of the constituent components that make up a coil form have the same coefficients of expansion due to heating/ cooling.
If you mechanically stress any wire it will eventually "cold work" at a
stress point and fracture.

It is not as if these receivers have never been exposed to vibration,
dropping, hot environments or transient voltages. There have been problems
in the past with the power and audio transformers where the wax/asphalt/tar
hardens and eventually the transformer fails.

We are all doing things to pieces of equipment that are well beyond their
design lives. Obscure failure mechanisms will begin to pop up. Another
example of that is the gooey mess that the foam inside of the mechanical
filters turns into. Then again, sometimes "stuff" happens. The particular failure of this one inductor does not seem to be a widespread problem that we all are
experiencing. If we dedicated as much effort into the analysis of every
single component in the receiver as we have to Z503 then we have at least
another 30 years of discussions to hold.

It was interesting to see how folks figured out the L, C and Q values of
Z503. We have even bounced around the ideas of why the Q should be where it
is at. All great discussions but at the end of the day, 85% of us who may
have a failure of Z503 will just pull one off of a junker IF deck that are
flooding the auction sites.

Date: Mon, 4 Apr 2011 19:24:31 +0100
From: Graham Baxter <graham@delphe.co.uk>
Subject: Re: [R-390] Z503 Replacement

I had an open circuit Z503 in an EAC R390A. I gently heated the ferrite cup and managed to pull it off the former. The coil, which if I recall correctly was wound with the type of fine litz you often see on a ferrite rod long wave coil, had gone rotten.

I cut off the pie which was wave-wound. I made a pair of cardboard cheeks and glued them to the former. I then pile wound some new wire of a similar but not necessarily identical type until I had achieved roughly the same dimensions. I varnished the winding, and once the varnish had gone off I picked out the carboard cheeks. On reassembly, it peaked up within range of the slug and has now been working for several years. So there is hope!

Date: Mon, 4 Apr 2011 20:53:53 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Z503 Replacement

I do not think it was the out door storage problem. Back when 68 -75 we would see coil failure on a regular basis. Not a lot but it did happen. We thought we had weeded the early failures out. Now we are getting to the mid life group. Having watch coils go open in all kinds of equipment since I started in electronics, I do not read to much into any one coil going bad. It's just natural entropy at work. OK so Murphy is leaning on it a bit.

Date: Mon, 4 Apr 2011 21:08:31 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] 16 KHz filter oscillates

If we cannot live with dress codes, we have no business in this endeavor. I expect this and look forward to reading it. It is some of what makes this reflector fun.

I do not see any striped wires about the filter sections. This is a later production and most of the wires are dressed in plain pastel. Some are in see thru translucent white. Nice silver body wire. Still no tarnish / tan / rust.

I am collecting it all and will let you know what I find. I see the points real quick on the ground lugs and those black caps. I have posted on the topic myself. I just am not ready to be victimized by a receiver my self. I kind of thought that as only the 16 was doing it, the problem should be around that filter. But I accept the input and understand what you Fellows are saying to me. I will go exploring and find the problem. Love the humor and the help.

Date: Mon, 4 Apr 2011 21:21:39 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Z503 Replacement

My point exactly, mail to read. If we dedicated as much effort into the analysis of every single component in the receiver as we have to Z503 then we have at least another 30 years of discussions to hold. Are we sure about the cat? <snip>

Date: Mon, 4 Apr 2011 21:40:19 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Z503 Replacement

I see what you are saying. I know why I have stayed a repairman and never went off to be an engineer.

Design is a science and best practiced by committee. One can do it alone but you do get better results from a group activity. I become more appreciative of the engineering and design in these R390 receivers every time one of these threads materialize. From time to time Fellows say nice things about me. I thank them. I think I do not say enough good things about all you Fellows. The stuff I have learned just reading the mail over the years is a lot. I have to read what is posted. I have to think about it. But knowledge is certainly put forward and I try to gain from it. I think the spirit of the R390 reflector is why this reflector continues as robustly as it does. Sure there is a lot of trivia on models, production runs, part numbers. But we open a lot of serious engineering design topics. We surly have no idea what those engineers were thinking back then. But we look at what was produced and ask why, and what can we understand from this or that problem. We post a lot of things about a lot of experiments we have performed. That experiment may have not been what someone else would do. But things get shared and lot of learning takes place.

Date: Wed, 6 Apr 2011 15:00:30 +1000
From: "bernie nicholson" <vk2abn@bigpond.net.au>
Subject: Re: [R-390] R-390 Digest, Vol 84, Issue 11

Hi To all regarding Litz wire in IF Transformers , I recently was re-aligning an IF in a Racal RA17 and wasn't able to get anything like the band pass characteristics that I know they are capable off , upon further investigation , after removing the transformers I found that over many years of heating cooling cycles some of the strands of litz wire had gone open circuit at the terminations after running more solder into the terminations and burning off the enamel A normal bandpass characteristic was achieved, and this receiver had also been very noisy, lots of extraneous clicks etc , This stopped after the treatment , Also recently I had a 390A with a very noisy IF module That was similarly afflicted with noise clicks , this was traced to an insulation breakdown of the foam in one
of the Mechanical filters ,it measured 150K Ohm to the case when Meggar tested , after replacing the filter it was nice and quiet , Quiet often I find that Litz Wires within IF transformers are Terminated under tension, and after many years of heating and cooling Metal fatigue sets in and they are open circuit Or partially open circuit as previously noted Regards to all Bernie VK2ABN

Date: Thu, 7 Apr 2011 19:05:18 +0000 (UTC)
From: bavarianradio@comcast.net
Subject: Re: [R-390] Z503 Replacement

Well, The AGC seems fine!! My problem with the limiter is still there, but I'm getting closer to resolving it. I found the mounting stud for T 506 was broken allowing a ground lug to make intermittent connection. I replaced it with a piece of 4/40 threaded rod. It's much better but I have audio distortion when the limiter is shut off. If I turn the limiter on but don't advance the pot, it sounds fine... Before I started, the audio cut off completely with the limiter off. This is progress!! I'm going to shotgun replace the mica cap connected to the lug, it looks like the wax has melted a bit.

Date: Thu, 07 Apr 2011 15:11:32 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] Z503 Replacement

It is good to hear that Z-503 from a R-390 *WILL* work in a R-390A!

Date: Thu, 7 Apr 2011 20:52:07 +0000 (UTC)
From: bavarianradio@comcast.net
Subject: [R-390] Fwd: Z503 Replacement

----- Forwarded Message -----
From: bavarianradio@comcast.net
To: "Don Heywood" <wc4g@knology.net>
Sent: Thursday, April 7, 2011 4:31:36 PM
Subject: Re: [R-390] Z503 Replacement

Hi Don,& the group, Replacing the 3 micas in the limiter circuit took care of the distortion. THANKS!!! By the way, this problem started out as a heat problem. The radio worked OK till it warmed up,then the distortion would creep up. Eventually the problem was there all the time. Now it's OK and the AGC is OK too!! I guess the Z-503 question is somewhat answered, at least we know that the 390A coils will work on the 390. I surmize that the opposite may be true as well. At least we know that the radio doesn't burst into flames while trying....
I think that a replacement would be a popular item here if someone were to come up with a "cheap and dirty" option to cannibalizing all the 390A's for their Z-503's. I now have a working(albeit temporarily) 390 Z-503 to rebuild or just examine. Thanks to all who posted, Ross W1EKG
----- "Don Heywood" <wc4g@knology.net> wrote:

Distortion with the LIMITER off is a common problem in the R-390/URR, the fix is to change out a couple of mica caps in the limiter circuit. I think the "A" version is similar. I'll bet that if you change the mica caps like you are going to do, you will be good-to-go.

Date: Sat, 14 May 2011 11:05:49 -0400
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: [R-390] R-390A Heater Dropping Resistor

I'm working on my R-390A IF module and was reminded of the heater dropping resistor R 536 feeding V507 (Limiter). Looks like this drops the heater voltage to V507 by about 1.2 volts. What's the purpose for the dropping resistor?

Date: Sat, 14 May 2011 20:59:44 -0400
From: "Shoppa, Tim" <tshoppa@wmata.com>
Subject: Re: [R-390] R-390A Heater Dropping Resistor

The limiter is an "oddball" stage in the radio because its cathode is operated at a high impedance (390K) and a voltage not as close to ground as the other stages. Contrast with every other stage where the cathode resistor is 1K ohm ballpark or lower. There's a good reason for V507 to be configured this way so that it does

operate as a limiter :-).

In this situation a concern is to reduce heater-to-cathode leakage, and operating the heater at a lower voltage helps here.

Despite this amelioration, it is in my experience not rare for V507 to show leakage/ hum and require replacement. (Or more realistically just swapping to any other 5814A socket that isn't running the cathode at such a high impedance.)

I'm not saying that V507 is in any way a magic stage requiring some super-hi-spec specimen in its socket. Just that tubes with some cathode-heater leakage will work well in nearly every other socket, but not in V507 :-)

Date: Sun, 15 May 2011 11:30:46 -0400
From: Jon Schlegel <ews265@rochester.rr.com>
Subject: Re: [R-390] R-390A Heater Dropping Resistor

Because of the high value cathode resistor, copious electron emission wouldn't be necessary and could tolerate the lower cathode temperature.
Thanks again,

Date: Wed, 18 May 2011 10:38:44 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] R390 NON A IF deck mods in ER

Somebody on the list (I'm too busy to search the archive) analyzed the situation and concluded that, provided you leave your oven heaters off (which you should do anyway), the R-390A power supply can easily handle the native 25.2V load of the R-390 IF deck. You only have to change some connector pinouts. Much easier than a 6.3V rewire.

Date: Wed, 18 May 2011 17:44:36 -0700 (PDT)
From: "Tom M." <courir26@yahoo.com>
Subject: Re: [R-390] R390 NON A IF deck mods in ER

I wrote that article. My objective was to replicate the R-725 wiring. It can be done an alternate way as pointed out but this is how Motorola did it. 73 Tom

Here is the conversion procedure. I use one of these in my 390A. I have not tested the alternate method.

73 Tom

---------- cut here

Conversion of the R-390 IF Deck for Use in R-390A For Improved Audio,
Or Make Your Own R-725

Thomas F. Marcotte, N5OFF

As many of the readers of Electric Radio know, the US Army created a modified R-390A version for direction finding known as the R-725/URR. I wrote about this modified radio in this publication a few years ago. The main difference between a R-725 and the R-390A is that the R-725 utilizes a custom built IF deck that is very similar in construction to the R-390 IF deck. It has tuned circuit selectivity instead of mechanical filters. The mechanical filters of the R-390A created distortion when that radio was employed for radio direction finding use. In an internal Collins engineering report published in 1952, Lou Couillard wrote of the improved R-390A, which at that time was called the R-390(XC-3), "Although the superior shape factor of the mechanical filter IF is desirable in most applications, consideration should also be given to an alternate tuned circuit design for use in special applications. The excellent shape factor of the mechanical filters precludes the possibility of linear phase shift across the passband. Where a linear phase characteristic is desired such as in direction finding equipment, a tuned circuit IF is necessary."

Employment of the tuned circuit IF is exactly what was done in the R-725. Motorola was awarded a contract in 1956 (476-PH-56-91) to prototype the R-725. I know of a couple of these Motorola sets existing today.

Packaging of modified sets for quantity DF use were handled by Arvin Industries and Servo Corporation of America. Approximately three hundred R-390A's were modified to the R-725 configuration. These sets are relatively tough to find today. New IF decks were manufactured by the modification companies (actually salvaging some of the components from the now junker R-390A IF decks) and installed in existing R-390A's. The new IF decks were named "SERIES 500 IF STRIP ASSY." They looked almost just like R-390 IF decks (see the comparison photos), except that the IF connectors were relocated to match the cables and connectors in the R-390A chassis. The circuits were designed to plug and play in the R-390A instead of the R-390. The decks are not interchangeable (until now that is, after performing the modification described herein).

Notwithstanding DF capabilities, a side benefit of the SERIES 500 deck is that it provides a smoother sound than does the stock R-390A IF deck. Mechanical filters are said to "ring" and after a while can be fatiguing to the listener. The purpose of this article shall be to describe how one may "roll his own" SERIES 500 IF deck from a surplus R-390 IF deck. Please note that I don't advocate trashing of a good R-390 to do this mod. The IF deck I started with came from a Motorola junker. I would urge you to likewise find a junker R-390 as a source of an IF deck for this project . Make sure that the deck is in working condition prior to beginning the modification.

The R-390 IF deck was designed to operate with one 25V filament supply (unfortunately the 25V supply available in the R-390A is insufficient to power all of the filaments in the R-390 IF deck). The R-390A deck was designed to operate with a combination of 6.3V and 25V filament supplies. The task involved in this conversion is to rewire the R-390 filaments to comply with the voltages available in the R-390A and provided at the main IF deck connector, plug and play, without the addition of any new power transformers. Each of the twelve tubes in the R-390 IF deck must be addressed for full compliance with the voltages available from the R-390A. Refer to the schematic in Fig 1 as to the

final filament wiring configuration. We will also drop the B+ a bit.

Plug P112 of the R-390A shall be plugged-in to the R-390 IF deck at jack J517. There is much commonality here, except for the connections mentioned herein. In general, you will be converting 25V series connections into 6.3V (herein referred to as 6V) parallel connections for most tubes, and moving the connections of the BFO/PTO/ballast tube series to a different connection point in jack J517. The 6V filament supply shall be provided to the R-390 deck by pin 20 of P112 from the R-390A.

General instructions: Refer to the schematic for the original R-390 as the "before" schematic, and Figure 1 as the "after" schematic for filaments. Use the best soldering technique you can in this limited access space. Don't insulate or bind any wires until instructed to do so. You will be utilizing some of the new 6V supply connections more than once. Make sure you can recognize your new wires. I used black wire for the 25V supply, red wire for the 6V supplies, and green wire for new grounds.

The first task is to install a B+ dropping resistor to better match the 180V B+ that the R-390 IF deck is expecting. To do this, locate inductor L503 under the IF deck. This will be found snapped into a holder right above pin 2 of J517. Disconnect one end of the coil, and install in series with it (the equivalent of) a 470 ohm 2 watt resistor. This will tame the B+.

The first tube circuit we'll work on is the ballast tube circuit.

V508 (5749) and RT512 (3TF7) These must be supplied by the R-390A 25V filament supply. To do this, sever the connecting wire at pin 8 of jack J517 (underneath the deck) to free this slot up (hint: save access to the connector end of the wire as you will use it to wire supply to V509). Then, sever the connection at pin 2 of RT512 and wire this pin to pin 8 of J517 of the R-390 deck with a long piece of new wire. The filament return connection remains unmodified. This modification will make the BFO/ PTO/ballast tube series connections identical to the R-390A 25V filament supply connections. As mentioned above, this 25V supply is insufficient to supply the remainder of the tube filaments, thus the need to employ the 6V supply for this task.

The following 6V tubes shall have filaments wired from the 6V R-390A supply. The filament pins of these tubes are pins 3 and 4. Don't sever any connections unless instructed to do so. The modification will use as much existing R-390 IF deck wiring as possible (and thus may seem a bit screwy to you until finished).

V504 (6BJ6) 6V will come from its existing connection at pin 4.
Ground will come in the next step.

V503 (6BJ6) Wire pin 3 of V503 to pin 4 of V504 for 6V supply.
Ground V503, pin 4.

V502 (6BJ6) 6V supply will come from an existing connection at V503, pin 3.
Ground V502, pin 3.

V501 (6BJ6) Sever ground connection at V501, pin 3
and wire pin 3 to V502, pin 4.

V505 (6AK6) 6V supply will come from existing connection at pin 4.
Ground will come in the next step.

V506 (6AK6) Ground pin 4 of V506.
Wire pin 3 of V506 to pin 4 of V505 for 6V supply.

V509 (6BJ6) Locate the free wire which was cut from underneath J517, pin 8, and connect it to the 6V filament supply at J517, pin 20.

The following tubes are 12AU7's wired in various series schemes in the R-390. They must be rewired according to their 6V option for use in the R-390A. Note two of the connections require dropping resistors on the 6V source of V507 and V510 to obtain the desired 5.3V filament voltage.

V511 Sever ground connection at pin 5.
Connect pins 4 and 5 together for 6V supply,
ground pin 9.

V507 Sever connections at pins 4, 5 and 9, including the two resistors (one 120 ohm and one 22 ohm). Wire 6V supply from your previous work at V505, through the deck opening for variable capacitor C525, to pins 4 and 5 through a 3.9 ohm, 1 watt resistor.
Ground pin 9.

V 510 Sever connections at pins 5 and 9. Ground will come from existing pin 4 connection. Remove 120 ohm resistor between pins 4 and 9. Wire pin 5 to pin 4. Wire 6V supply from J517, pin 20 to V510 pin 9 through a 3.9 ohm, 1 watt resistor.

There are no changes to any of the other connections in the R-390 deck.
Prior to installing the modified R-390 deck in your R-390A, you must check your work.

Perform continuity checks from J517, pin 8, with RT512, pin 2.

Perform filament supply and ground continuity checks as follows. Note: There will be more than one ground connection at various tube sockets, but the filaments should have continuity exactly as shown.

Filament supply is checked from J517, pin 20.

V501, filament, pin 3; ground, pin 4.
V502, filament, pin 4; ground, pin 3.
V503, filament, pin 3; ground, pin 4.
V504, filament, pin 4; ground, pin 3.
V505, filament, pin 4; ground, pin 3.
V506, filament, pin 3; ground, pin 4.

V507, filament, pins 4 and 5; ground, pin 9.
V509, filament, pin 4; ground, pin 3.
V510, filament, pin 9; ground, pins 4 and 5.
V511, filament, pins 4 and 5; ground, pin 9.

Now insulate any bare connections, and use mini-tie wraps to secure the new wires to sturdy nearby points.

To enable final installation of the deck in your R-390A, you'll need to make two adapter cables. These cables shall consist of jumpers (RG-59 is OK, approximately eight inches in length) with BNC's on each end. You'll also need two adapters of the type found on the back of the frame of the R-390A at the IF OUT jack (AMPHENOL 47200). This will provide crossover from MB connection (R-390A standard)to BNC (R-390 standard). Connect P-218 of the R-390A to J-526 of the R-390 IF deck with one of the cables. Connect P-213 of the R-390A to J-525 of the R-390 IF deck with the other cable. It is a good idea to label these cables. See the photo for reference.

Install the deck in your R-390A. You will notice that the screw holes are the same as for the R-390A IF deck, however the screws of the R-390 deck are of larger diameter. I did not change these screw as they are captive into the deck. The BFO, BANDWIDTH, and power connector of the deck will hold it in place, however I would not install it in a Jeep this way. Changing these screws is optional.

When you turn on the power, make sure your dial lamps light up normally. If they don't, you have a filament supply problem so turn off the set immediately and troubleshoot.

For great sound, instead of using the built-in audio deck, I prefer to tap the audio from the diode load jumper at the back of the set. Through a 0.1 uF or larger capacitor, feed this signal into your line audio amp of choice, and enjoy the tuned circuit audio of the new R-725, errrr, R-390A with tuned circuit IF. You'll get the smooth sound of the R-390 and R-725, but have the parts availability and support common to the R-390A for the balance of the set. I've used my modified IF deck in two different R-390A frames, and it worked equally well in both. In my opinion, it makes the long term listening experience much more enjoyable. If you have any questions about the mod, please feel free to write.
73 DE N5OFF QRT

Thomas Marcotte is a registered professional engineer working in Lafayette, LA.

References:

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36-039-N-5-00093(E), September, 1965.

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FINDER SETS AN/TRD-15 AND AN TRD-15A, August, 1973.

TM 11-5820-358-35, FIELD AND DEPOT MAINTENANCE MANUAL, RADIO RECEIVER
R-390A/URR, May, 1980.

Special thanks to Wally Chambers and George Rancourt.

Date: Sat, 21 May 2011 14:28:59 +1000
From: "Pete Williams" <jupete@internode.on.net>
Subject: [R-390] R-390 IF Xfmrs

D'day all... In my list of IF xfmrs for sale for the R-390/URR I believe they may have come from a R-725 unless production mods were made

Reason being that in checking them, where was no connectivity from pin #7 to ground connexion via the internal coils as the schematic for the R-390 says it should be via a 470 k R across a capacitor.

Looking at my H/B on the R-725 today, I see that this resistor is omitted on all of the IF's. although the capacitor is still there . Maybe someone has a reason for this considering the use the rx was put to--- band width concerns or time constant perhaps .? The 'response' could be enlightening.

Date: Fri, 03 Jun 2011 16:25:50 -0500
From: Dan Osborne <wb5afy@wb5afy.net>
Subject: [R-390] R390 NON A IF deck mods

OK - here is another "MOD" I have discovered on a couple of my NON-A IF decks - V508 normally a 5749 (6BA6) has been replaced with a 6AU6 . Seems to reduce the IF deck gain BUT makes the S-meter zero pot MUCH easier to set !!

Anyone know if this is a "real" SB type mod or just a field tech hack ??
After resetting the IF deck pots I can't tell any difference in performance.

Date: Fri, 3 Jun 2011 17:59:41 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] R390 NON A IF deck mods

There are a lot of tubes that share base diagrams and that can be substituted into either the R390 or R390/A. A lot just depends on the actual tube. It's noise and cut off point will vary. Some times better some time worse. In some stages, (non AGC) the cut off characteristics of the tube do not matter. You can plug a lot of different tubes into these stages. Nice to see a 6AU6 will help get a zero on the meter. Someday you can do some signal to noise with a 6AU6 and a 6BA6 and see if the change is better or worse in that test.

Date: Fri, 3 Jun 2011 20:41:17 -0400
From: "Shoppa, Tim" <tshoppa@wmata.com>
Subject: Re: [R-390] R390 NON A IF deck mods

Almost any of the 7-pin pentodes will sub for any of the other 7-pin pentodes in a pinch.

I posted to this list several years ago where I just started swapping 6AU6, 6CL6, 6AH6, 6AG5, 6BC5 in at random and the radio kept "working". Also sticking these in the 6AK5 sockets (Which may not technically be the same pinout but is close enough in typical usage) and it kept on "working" too.

The AGC characteristics are not at all identical though especially if more than one tube is subbed out. That's what "remote" vs "semiremote" vs "sharp" cutoff is all about. This is in essence what you noticed as you noticed the zero pot sensitivity changing. The AGC curve of the radio was shifted. Change more than one tube out and AGC instead of "still mostly working" will start working more obviously wrong.

Date: Mon, 6 Jun 2011 09:28:04 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] Tube cutoff characteristics and AGC

If I may append a comment to Don's wonderfully clear description, a visible side effect of the 6AU6 is that the carrier meter will read low. This is because for all normal signals the AGC line will hover around the narrow range of -4V to -6V. Conversely, if you make your system _more_ remote-cutoff than before, say by replacing the 6DC6 with a 6BZ6, the meter will read abnormally high, because to reduce the gain to the appropriate value, more AGC voltage is needed.

Date: Mon, 6 Jun 2011 21:50:48 -0700 (PDT)
From: "Drew P." <drewrailleur807@yahoo.com>
Subject: Re: [R-390] Tube cutoff characteristics and AGC

Thank you for the description of remote vs sharp cutoff characteristics and the effect upon AGC operation. It is interesting to note that the Heathkit SB-100/101/102/ HW-101 series uses sharp cutoff pentodes as AGC controlled RF and IF amplifiers (6AU6 and 6HS6). I believe (but am not certain) that this was done to provide a bit of AGC delay, and a very aggressive AGC response once the AGC voltage reaches the threshold. Also, the 6AU6 seems to be run at about half the anode current of the 6BA6 - may have been selected by Heath for power supply considerations. Care to comment? Drew
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Date: Tue, 7 Jun 2011 09:29:33 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] Tube cutoff characteristics and AGC

Note that AGC characteristics are greatly influenced by the screen grid supply. The datasheet curves were taken with a constant screen voltage. If you add series

resistance (so the screen voltage increases with decreasing current and vice versa), the effective cutoff becomes more remote. Hammarlund fussed around with this in the SP600.

Date: Wed, 8 Jun 2011 17:20:59 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Tube cutoff characteristics and AGC

One nice article on the subject. Thanks Roger Ruszkowski AI4NI

Date: Thu, 9 Jun 2011 10:06:56 -0500
From: Ben Loper <brloper@gmail.com>
Subject: [R-390] Bugeye BFO removal

Does anyone know how to remove a Bugeye BFO. All I see are three screws around the edge and I started to remove those, but thought maybe I should ask before I break something. Thanks in advance.

Date: Fri, 10 Jun 2011 10:56:39 -0400
From: "Todd, KA1KAQ" <ka1kaq@gmail.com>
Subject: Re: [R-390] Bugeye BFO removal

> Does anyone know how to remove a Bugeye BFO……

Not exactly sure what you're referring to Ben, but if it's the microdial arrangement used for RATT/RTTY type installations, there are two small holes around the bottom of the aluminum skirt inside the black frame. Usually these are just open, threaded holes. Sometimes they have the Bristo 'plugs' in place. If so, remove them. These holes will give you access to the Bristo screws that hold the dial onto the shaft. Can't recall the actual size (really small), but once you loosen those inner screws, the whole mechanism should slide off the shaft.

Don't take out the 3 Phillips screws in the black frame: they simply hold the unit together.

Date: Sat, 11 Jun 2011 20:42:21 EDT
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Bugeye BFO removal

Ben, once you remove that bug eye you may send it to me here in South Carolina. My disposal site paper work is all in proper order.

Do remove the three screws.
The outer ring and counter part will then pull off.
Then you need to find a very small hex Allen to loosen two set screws in the aluminum big ring knob that serves as the BFO knob on the counter.

Loosen the set screws and pull the big ring knob off the shaft.

The big back black plate is held to the front panel with the BFO shaft

bushing and nut.

Find a couple 1/2 or 9/16 wrenches and remove the nut from the bushing. The big black plate can then be removed.

So now how you going to adjust your BFO?

You need to locate a stop tab washer and knob.

No stop tab washer (looks like the one behind the function switch) and the BFO shaft will do several rotations. This will expand and compress the bellows coupler between the BFO shaft in the IF deck (and front panel extension) and the BFO slug shaft that screws in and out. Keep this up and you will break something. Murphy says it will be the most un- obtainable part that breaks. What ever part you do not have a spare for.

So make a stop washer or acquire one and retain it to the front panel with the front panel bushing. The bushing used on the micro dial (bug eye thing) may be longer than the original. Put the bushing nut on the inside of the front panel. Install a Large BFO knob.

Why not just un-assemble every thing, give it a good bath, relube it all, and reassemble it with reasonable spacing so it works nice and smoothly. Tell every one you own a previous spook receiver and not just a stock signal corp receiver.

The extension shaft from the IF deck through the front panel is standard stock issue. It was not changed to install the micro dial and thus needs no changes to get back to a stock knob.

One conspiracy theory is that the micro dials were introduced to provide a source of spare replacement knobs. By installing a micro dial one knob was free from the BFO shaft to be applied else where on the front panel and thus no one needed to admit a part had been lost. This is just a theory as spare knobs were available. The stock number in the parts manual was good. Both R390 and R390/A knobs could be ordered.

Go ahead, ask me how you get the counter to zero with the BFO at exactly 455.

And then ask how you get the big knob to run smooth in the counter.

Those two questions are in order.

What keeps you from screwing up the bellows coupler with a micro dial? Nothing but common sense. How far a micro dial will dial up or down is dependent on the mechanical limits of the particular bellows in an IF deck and its current placement. After years a bellows may be stretched or compressed. This thus limits the range of the device under examination. Changing to a micro dial does not change how far you want to twist the BFO. That 180 - 270

degrees or rotation is the same for a stock knob or micro dial. The counter just makes a better position indicator than the stock knob against the stock front panel.

Roger AI4NI</HTML>

Date: Sat, 11 Jun 2011 22:20:28 -0500 (CDT)
From: nryan@mchsi.com
Subject: Re: [R-390] Bugeye BFO removal

Roger is right about the stop tab. You need to have it in place to prevent damage to the BFO slug or bellows. Here is how I center the BFO knob on 455 KC:

Warm up receiver.

Set FUNCTION control to MGC.

Tune receiver to 00.000. CARRIER LEVEL meter will read very high.

Set BANDWIDTH to .1 KC.

Limit the RF GAIN to approximately 3/4 full scale reading on CARRIER LEVEL meter as you peak the signal with the KILOCYCLE CHANGE.

Switch on BFO. Zero beat tone with BFO PITCH knob.

BFO PITCH knob should be at 0. If not, loosen knob setscrew, set at 0 and tighten setscrew. Check that BFO PITCH knob turns freely, but is limited by the stop tab to + or - 3 KC. 73 de Norman, KG4SWM

Date: Sun, 11 Sep 2011 15:57:50 +1200
From: Ken Harpur <igloo99nz@yahoo.co.nz>
Subject: [R-390] Rebuilding a R-390A IF Deck

I have started restoring one of my R-390As....so far I've rebuilt the Audio Deck and have now turned my attention to the IF Deck and I was wondering what the general thoughts are on the list as to resistor and capacitor replacement. I have Cornell-Dublier silvered Micas and SBE 716 series going in and have a full set of resistors arriving from Mouser. Obviously all the paper caps are going to be replaced and the Micas are sometimes problematic so my idea was to go ahead and replace all the caps with the long term view of never having to worry about them again.

My conundrum is with the resistors...I measured every one and about 40% of them are on, about, or just over 10% of their marked value so I figured I'd go ahead and replace those ones..apart from those that were at the edge of their tolerance when new my way of thinking is that they will just go even more out of spec over time. But what about the ones that are still well within their 10% tolerance? Is it reasonable to assume that if they haven't drifted out of spec by now they probably never will? Or do you guys think that in time they could be candidates for trouble/replacement if left alone?

Any advice, thoughts or tips would be greatly appreciated as I want to make sure I do it right the first time!

Date: Sat, 10 Sep 2011 23:28:47 -0500
From: Randy and Sherry Guttery <comcents@bellsouth.net>
Subject: Re: [R-390] Rebuilding a R-390A IF Deck

Which ever resistors you replace - make sure the replacements are not inductive - some of the new resistors are... Needless to say - that could be an issue in any RF circuit...

Date: Sun, 11 Sep 2011 18:53:43 +1200
From: Ken Harpur <igloo99nz@yahoo.co.nz>
Subject: Re: [R-390] Rebuilding a R-390A IF Deck

Yes doing damage is my concern too...particularly with military specs regarding the 180 to 270 degree wrap of component leads and wires around terminals and on tube sockets getting those parts out cleanly without co-lateral damage is something I'm weary of...I want to enhance my radio not ruin it! I am using 2 watt vishay-dale metal film resistors and the original 2 watters will be upgraded to 3 watt metal films if I decide to replace them...certainly the ones that are easy to get to will probably be replaced...it's all good experience for when I eventually go through the resistors in my Non-A IF deck. I haven't looked at the ceramic composition resistors...hmm...could be worth looking into perhaps?

Date: Sun, 11 Sep 2011 09:12:25 -0400
From: John Vendely <jvendely@cfl.rr.com>
Subject: Re: [R-390] Rebuilding a R-390A IF Deck

Since you've asked for opinions, I'll offer mine. In my opinion, folks are overly ambitious about component replacement in the R-390 series receivers. Component quality was quite high in this equipment, and although certain well-known troublesome components are well worth replacing, I would not routinely replace carbon comp resistors which are at or near their tolerance limits. It was common for resistor manufacturers to select from production lots those resistors which would be sold as 5%, 10%, and 20% tolerance. This skewed the statistical distribution of values in each of these selected groups. As a result, most 10% tolerance resistors ended up being 7 to 10% off the nominal value when new. Your findings probably reflect this practice, and not component aging. Equipment designers of that era were well aware of these practices, and very familiar with the characteristics and variability of the components worked with. Their designs took all this into account, and will work usually well with tolerances significantly beyond nominal.

Routine mass component replacement is extremely time consuming, is generally unproductive, and risks collateral damage to the equipment. Frankly, it borders on the obsessive, particularly in the case of resistors. In most cases, I would suggest replacing any 1/2 watt 10% resistor reading 20% or more off center--otherwise, leave well enough alone. There will be plenty of other problems to attend to. Of course, when making in-situ resistor measurements, you should be certain there are no

parallel conductive paths to influence the reading.

I should point out that I'm referring to the good quality Ohmite or Allen Bradley carbon composition resistors commonly found in the R-390 series receivers. Certain earlier style carbon resistors are much more prone to aging and outright failure. These can be identified by the dull, rough or "pebbly" surface texture of the resistor body, as opposed to the "shiny" appearance of the newer types. Those older style resistors were truly crummy, and are often found to be 50% or more above tolerance. Although they were still in use into the mid 1950s, I don't recall ever seeing these in the R-390/390A. In the unlikely event you do find any, they would be worth replacing. Best of luck in your restoration efforts.

Date: Sun, 11 Sep 2011 12:03:47 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] Rebuilding a R-390A IF Deck

I would highly recommend replacing the old paper capacitors.

The next step I'd do, would be to clean the switch contacts and tube sockets.

However, in lieu of running around replacing resistors, I'd give a crack at performing an alignment.

You may well find that the resistors, while not necessarily meeting specified values, will be adequate to allow the circuits on the IF Deck to function within range of alignment. I'd only go into replacing resistors after attempting the above. It has worked for me with an old R-390A IF deck from a Collins branded module. I have been able to leave almost all the resistors in place.

Date: Mon, 12 Sep 2011 21:26:01 +1200
From: Ken Harpur <igloo99nz@yahoo.co.nz>
Subject: Re: [R-390] Rebuilding a R-390A IF Deck

Thanks for your comments...I had thought long and hard about this and most of the feedback I've had pretty much echos what had already crossed my mind, I guess I needed to hear it from someone else! I'd got this idea of rebuilding my radio so it was as close to an 'as new' condition as possible therefore giving me years of trouble-free service...not unlike a person completely restoring an old hot-rod.

So, I am now going to leave them alone apart from the ones that are >20% out of spec, I'll do all the paper caps and any micas I can get out cleanly (these are the old 'domino' looking types that I have read somewhere in the archives can give trouble). I'll have a good look around for possible dry solder joints and redo any that may look bad also.

Interesting to note that some most of the resistors in this particular deck do indeed look like the poor quality ones that you describe although none are 50% off. I have seen the shiny ones that you refer to so I know the ones you mean...I have two more R-390As so I'll have a look at them and see if they are different.
One thing I have noticed about this particular deck (it is a Stewart Warner) is the

component dress seems to be messy when compared to the Motorola and EAC decks that I have here. The Motorola and EAC decks are very tidy looking...the Stewart Warner looks a little like a rats nest...

Date: Tue, 20 Sep 2011 10:10:12 -0600
From: Robert Moses <rhmoses@earthlink.net>
Subject: Re: [R-390] Rebuilding a R-390A IF Deck

'If it ain't broke don't 'fix' it.' If you do then you may get to learn about some truly challenging repair tasks! (wafer switches, binding posts, p.c. boards, etc.)

Date: Wed, 21 Sep 2011 12:37:44 -0500
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: Re: [R-390] Rebuilding IF Deck

I assume you are going to take care of the "killer cap" for the IF filters. The paper caps I can see replacing. I do not know about digging into the mica caps.

The resistors you are replacing with are all carbon comp or are they metal film? Sometimes the metal film resistors have an inductive behavior that will throw off a tuned circuit. Take a metal film and scrape off the coating and you will find many are like a glass rod with a spiral channel where the resistive component is filled in. It acts like a resistor and inductor in parallel.

For carbon comps the only two killers I know of are either moisture or heat. Unless they are off (if you need a cutoff value to decide what to replace or not I guess 10% is good enough) I would not go tearing out the original resistors.

The IF deck is tight enough to work in as it is. Just getting a fine tip soldering iron in there is a challenge so you do not burn off insulation, damage surrounding components or those unobtanium turrets.

Date: Wed, 21 Sep 2011 22:06:13 -0500
From: "robert" <rsisco@stx.rr.com>
Subject: [R-390] Ken Harpur, IF Deck

Ken Harpur, I am worried that your I.F. deck will look like a Heathkit receiver after you are through. I have Collins gear that is 60 years old, still works, never been rebuilt, just repaired.

Date: Wed, 7 Dec 2011 22:52:22 +1100
From: "Pete Williams" <jupete@internode.on.net>
Subject: [R-390] IF module ---

G'day list..... thanks to the respondents on the 1st Osc problem... fixed that with replacement of capacitor C327 across T 207.

Now....new problem... alining the IF module per book and no connection to the RF module , I find that with the cover off the filters and no tube covers on adjacent tubes , the IF module bursts into oscillation when adjusting the 4 kHz trimmer--- but

only the 4 kHz trimmer at top. All other filter adjustments / trimmers OK. , put the filter cover on and a couple of tube shields makes things normal--- but it shouldn't happen. Reducing the IF GAIN pot tends to minimize the problem and amplitude of the oscillation as shown on the diode load voltage Maybe there is a contributing factor in the fact that the AGC voltage is less with the 150uV input than what one might expect- hence excessive gain. Comments and advice on further directions appreciated. A proper dog this one!

Date: Wed, 07 Dec 2011 10:34:08 -0500
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] IF module ---

You have an "early" model IF Deck. That is essentially the rub - or fly in the ointment! Later models have the filter trimmers accessible by having holes in the IF Filter can. Suggest that you either obtain another cover, and punch the holes for access, OR simply punch the holes in the cover you have. Make adjustments with the cover in place through the holes. This was also done in depot and repair shops for these radios.

Date: Wed, 07 Dec 2011 15:16:43 -0500
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] IF module ---

Before someone makes comment regarding the "Earliest" IF Decks, I indeed do have one.

The First series of R-390As did NOT have trimmers. It is one of these that I'm working on restoring.

The cold weather and constant rain prevents me from getting a front panel done, to allow me to put things back together enough to begin testing and alignment.

I'm chewing whether to add the trimmers or not.

Date: Wed, 7 Dec 2011 17:51:28 -0500 (EST)
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] Sensitivity below 8 Mhz

Now that you have solved the problem and seam to have three good parts in hand, you need to suspect that the parts were not the problem. But some where you touched a part that did fix the problem. Back to those mechanical ground points and solder joints.

Yes, the problem was there. Yes, it got fixed. You are on the right track. Sometimes you just need to conduct these long boring processes to eradicate these type problems. In a 50 plus year old receiver it is not as much a shot gun approach as a comprehensive repair.

Date: Wed, 7 Dec 2011 18:11:42 -0500 (EST)

From: Flowertime01@wmconnect.com
Subject: Re: [R-390] IF module ---

Into the mechanical ground points you go. Some where one of the ones in the IF deck is not clean enough. My last go round was one that set the 16KHz filter into oscillation.

It was one of the ground lugs. AGAIN

The lug looked fine. The solder looked fine. The connection was unbolted and looked fine. The problem persisted. I ignored the problem and went about doing some recapping.

Shazam

As I was unsoldering one of the ground leads on a cap, the tin plate on the lug flaked off. I cleaned up the lug, got it re tinted so the solder would stick and went about replacing the cap.

The oscillating problem went away with that cap change. I was changing the cap because it looked ugly (leaky ugly). Was it the cap or the open in the plating or a cold solder joint. I do not know. I have no way to test the caps for leaking so I do not know what the real problem was. I just stumbled on this fix. Inspection (eye balling) and test (probing with a meter) was not leading to a solution.

Date: Wed, 7 Dec 2011 18:40:24 -0500 (EST)
From: Flowertime01@wmconnect.com
Subject: Re: [R-390] IF module ---

Aggravation exceeds return on investment.

Call Fair Radio and buy a bare module (less the filters) ask then to include the stand off and trimmer caps from where they pulled the filters out of the module.

Move your filters over to that module. There is about 32 little parts of difference between without and with trimmers. The layout of the module is different. The can over the trimmers is a different height. The no trimmer can will not let you put trimmers under it. Reworking the bottom end to add the trimmers is a lot of rearrangement beyond just the parts.

One version was top only trimmers. Then current flavor was with top and bottom trimmers. Pulling the square can off the filters to do the adjustment should not cause any of the filters to go into oscillation.

The goal of the adjustment was not to peak each filter for max. The idea was to match all four filters for about the same amplitude. Yea right, we peak each filter for max. So much for engineering theory.

Once you get the filters peaked with the trimmers you find they pretty much

stay peaked and readjust to the same point each time you align them. We did not find that decks without trimmers had lower output or poorer signal to noise than the decks with trimmers. Think that the caps are optimum for each filter. Set the IF gain and go on with the alignment. Bumping on one of the IF cans or swapping some tubes will get more out of the module than trimming the filter caps.

Because the trimmers will let you get real far off, we think the fixed caps were not well matched and optimized to start with so maybe a lot can be gained by adding trimmers. Not a true conclusion. The fixed caps were selected and close to peak. So if a cap has not gone bad then the circuit is close to peak.

Put a gimmick across a cap and see how short you need to get it to bring a filter above where you were before you added the wire, If you can get the gain above where you started. That should give you some idea if trimmers would help.

Date: Wed, 7 Dec 2011 20:15:21 -0600
From: Tom Frobase <tfrobase@gmail.com>
Subject: Re: [R-390] Sensitivity below 8 Mhz

I same issue some years ago it was the 10 pf mica. It checked fine, when it was replaced the radio worked again. I remembered finding a reference on the boat anchor list server…..

Date: Sat, 17 Dec 2011 20:45:38 -0500
From: Jim Sorenson <kjsorenson@gmail.com>
Subject: [R-390] T-503 Top - slug cracked

My Stewart Warner 390A plays reasonably well and I've run into no major problems using Chuck's suggested alignment procedures until ----

Peaking of T501 (top and bottom) ok at 467
Peaking of T502 (top and bottom) ok at 443
Peaking of T503 (top) peaks at 455 with T503 (bottom) cracked and stuck in the coil form.

I've assumed that the bottom (good one) is L512 and the top one (stuck) is L513)? I'm peaking off of diode load which comes right off of L513 (detector) through fixed L502. Obviously I'm going to have to replace T503 or break down the slug, fish it out and replace it, if possible. This IF unit is a Capehart - everything else is Stewart Warner.

Can anyone tell me how I might test if the present combination of L512 and L513 are ballpark having not been able to interactively walk both up to a joint peak on diode load at 455, or am I nitpicking? I've been through an entire alignment at least once and the unit sound fine to me?

Where might I find a replacement for T503? Could I replace with a generic 455 Kc transformer? I'm not planning to sell it or do a full restoration on it -- just use it on 160 CW and run the IF out to 455 Kc. SDR converter which works fine with the unit.

Since I don't really care about AM audio fidelity, might it be better to
align T501, T502 and T503 all at 455 Kc and not stagger them?

Any thoughts on this would be much appreciated.. I've looked through the
archives, but could not find anything pertinent - If there is something in
the archives that might help, I'd be grateful if you could point me to it.

Date: Thu, 19 Apr 2012 11:47:25 +1000
From: "Eric Gauja" <ericgauja@optusnet.com.au>
Subject: [R-390] Greetings from Sydney, Australia.

<snip> I do have 2 initial questions that I would like to put to the group.

1) AGC performance. It seems that my R390A needs a relatively high value of input signal before its AGC activates, and the Carrier Meter moves. I note that in the AGC circuit description in the technical manual it states that the AGC circuit operates only for signals in excess of 5 microvolts ? this to me seems to be quite a high signal level for a communications receiver, and in general listening to non local stations, the R390A does not use its AGC circuit. I have zeroed the Carrier Meter , and the IF gain pot is set to midway, so it is not a case of my 390A having excessive IF gain. Is this normal , or do I have an AGC fault?

Date: Sat, 21 Apr 2012 13:46:27 -0400 (EDT)
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: [R-390] AGC performance

Your R390/A is about typical and normal.

Remember the R390 and R390/A were built for the signal corp to do RTTY communication links around the world for the US military. They were not expecting to do any weak signal work. The idea was nice transmitters and excellent antennas with good receivers at fixed sites operating on fixed frequencies. It was just simpler to make the receivers full frequency coverage from .5 to 32 megahertz than just the military allocated frequencies. AM broadcast was not a real consideration. CW was just to accommodate a fall back position if the RTTY modulation could not get through. SSB was yet to be invented.

Only in later years were the receivers diverted to perverse applications in weak signal work. There has been a lot written on the R390 and R390/A AGC circuits. Most is dislike for the time constants. Some stages have been omitted from the AGC circuit. The RF gain has been split between the IF and RF stages with separate gain controls. The resistors have been changed in the AGC circuit to rearrange the gain. All personal preferences and what you want to hear from your receiver.

One mod is to pull the 2MFD AGC cap in the IF deck. Insert an 8 pin octal socket in the chassis and mount an 8 pin octal 2 crystal oven can in the socket. The oven can, can then be populated with AGC caps of your choice. The MED and SLOW AGC caps can be both placed in the can. You can also squeeze in a resistor or two. This then lets you do changes to the AGC by just unplugging the oven can and changing

parts in it until you reach a set of values you like.

There is an AGC jumper on the back panel. You may think external DC amp that boost the AGC derived voltage to a higher voltage. The Audio (line or local) has also been rectified using a bridge and caps on the back panel and then feed as AGC into the AGC pin on the back terminal board. This higher voltage level and possible voltage doubler with selected AGC time constance allows lots of flexibility for AGC in the receiver. The line output can be utilized with variable line again to drive the AGC. The limiting resistors on a terminal board behind the front panel above the dial counter can be by passed on the terminal board (R111 - R115) to provide a higher power audio signal to convert to AGC if you need it.

Date: Mon, 23 Apr 2012 11:36:15 -0400 (EDT)
From: Gordon Hayward <ghayward@uoguelph.ca>
Subject: Re: [R-390] AGC performance

I see the same thing. Its known as 'delayed AGC' - I used to think that had something to do with the time constant, but it really means the AGC only comes on with stronger signals. Since the AGC reduces the receiver gain, I think running it wide open as designed is an advantage for weak signal work. My external S meter derived from the AGC doesn't come alive until about S7 so I took the diode load out into a logarithmic amplifier / meter driver so I can now read to less than S1. This works below S7 and when the AGC is off as when the AGC kicks in, the volume (final IF level) becomes constant - the signal strength is then read from the AGC effort to keep it constant. I went to the extreme of calibrating it in both modes against an attenuated signal generator. I did look for attenuator leakage.

Date: Fri, 11 May 2012 12:42:23 -0400
From: "Jim" <jbrannig@verizon.net>
Subject: [R-390] 4KC Filter

I'm in the process of aligning my 67 EAC R-390A. All is working well except for the 4KC filter, the signal level is about half (3db.) the level of all the other filters. The trimmers peak normally. Bad Filter? I hope not, any other ideas?

Date: Fri, 11 May 2012 13:00:29 -0500
From: "chacuff" <chacuff@cableone.net>
Subject: Re: [R-390] 4KC Filter

You should note two distinct peaks on each trimmer. If not then you may have to change the padder cap value to get back in resonance. I've had to do that on several occasions where the trimmer only had one peak in 360 degrees. Should peak twice 180 degrees out. If they all do...then you probably have a bad filter.

Date: Fri, 11 May 2012 18:52:04 -0400 (EDT)
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: [R-390] 4KC Filter

If you need a replacement filter, Fair Radio in Ohio had a bunch of 4KC pulls. 2KC are plum gone. We fellows discovered some time back that the foam padding inside

turns to a black tar like gunk. A bit of ugly stuff will drift around and glum onto the wafer core stack that makes up the filter. It is literally a mechanical device inside the can. this will pad the filter stack and cause a loss. Half power is about expected. The filter band width is also not likely 4KC any more. The filter can, can be de soldered, opened, cleaned, repaired, coils rewound if needed, new foam instaled and then the can re soldered. Another used item is not likely to look any better inside. Also consider a cold solder joint in the circuit before you just pull the filter.

Date: Fri, 11 May 2012 19:37:31 -0600
From: Anthony Casorso <canthony15@msn.com>
Subject: Re: [R-390] 4KC Filter

My 67 EAC is the same way. Down about half on 4KHz. I have measured the bandwidth and it is still fairly close to 4KHz. I just let the AGC make it up but I have been considering a new filter.

Date: Fri, 11 May 2012 21:37:48 -0500 (CDT)
From: nryan@mchsi.com
Subject: Re: [R-390] 4KC Filter

I would first ask myself if the receiver is seriously impaired with an under-performing 4 KC filter. I have one such and compensate for it by turning up the volume a bit. These filters are increasingly hard to come by and best reserved for instances of open or shorted filters.

Date: Sat, 12 May 2012 08:12:04 -0400
From: "Jim" <jbrannig@verizon.net>
Subject: Re: [R-390] 4KC Filter

Thank you all for the responses.
I've had a lot of Collins gear and this is my first Filter failure.
The receiver still performs at 4kc. and I will leave it alone.

Rebuilding the filter per the Y2K manual is an option I will leave for another day.
Well, one more tweak on the alignment and I'll fire up the forklift and put the radio back in the rack.

Date: Sat, 12 May 2012 14:25:52 -0500
From: Jim Green <jagreen3@sbcglobal.net>
Subject: Re: [R-390] I had a working R-390A before I started (sort of)

Thank for all the assistance and the cookbook recipe for locating the problem. It was a problem in the IF deck. After failing the tests from your instructions I went back and started a DC analysis. The voltages were pretty wonky so I discontinued the DC analysis and went back to carefully look over my work of replacing the caps in the IF deck.

I found the bottom connection of R536 was shorted to ground. I also made sure all the caps I replace were connected to the proper points by the schematic. I found no other problem, but moved a few wires around to be sure they were not shorting.The

result is I have a working receiver again! I plan to pull the IF deck again this afternoon. The filter switch feels kind of mushy and I want to see if I can give it some snap. Thanks Again!

Date: Mon, 25 Jun 2012 22:38:35 -0400
From: N4be_Jim <n4be_jim@yahoo.com>
Subject: [R-390] Re. AGC and Stability

Both of my 390as do the same thing. I have tried to isolate the cause but all I can suspect so far is that with varying AGC the current drawn by the AGC controlled tubes varies, causing the load on the B+ to vary. The B+ varying could pull one of the oscillators slightly. I know there is a regulator tube in there but it seems like one of the crystal oscillators is not driven with regulated voltage (going from memory here). Another theory I have is that the AGC applied to one of the mixers, which is also fed from a local osc, could change the operating conditions of the tube, again changing the oscillator slightly as it sees a varying load. If you are running PSK your best bet is a modern PLL controlled receiver.

Date: Tue, 26 Jun 2012 20:23:44 -0400 (EDT)
From: chuck.rippel@cox.net
Subject: [R-390] Re. AGC and Stability

Tune through WWV after 1 hour warm up and with the BFO on. You should get a linear note when tuning. If not, the PTO may be failing. To confirm its the PTO, create a beat note on WWV with the BFO and tap the PTO gently with the handle of a screw driver. If it changes frequency, that is the problem. The last 2 radios I finished both had "noisy" and unstable PTO's. If its a B+ problem, rot'sa ruck.

Date: Wed, 27 Jun 2012 20:59:08 -0700 (PDT)
From: "Drew P." <drewrailleur807@yahoo.com>
Subject: Re: [R-390] AGC and Stability

Some time ago, Dave Wise quantified this effect and isolated it to, in his case, varying loading on the oscillators presented by the AGC-controlled mixers. The archived postings will be found in Wei-i Li's "Pearls of Wisdom" at r-390a.net. If you will read the "Engineering Report" also found at the aforementioned site, you will learn that AGC was applied to the mixers of the R-390a to make its AGC control range more like that of the predecessor R-390, which did not have AGC on the mixers, but instead had a larger number of IF stages, all of them AGC-controlled.

I've wondered if that much AGC authority is really necessary in the R-390a, and if we couldn't just remove AGC from the mixers, live with a slightly less effective AGC, and eliminate the problem of the AGC-induced frequency shift. It would seem that the audio-derived AGC which you have applied would make up the difference if you were to remove AGC from the mixers, and thereby control just the RF and IF amplifiers.

Date: Sun, 3 Feb 2013 15:05:45 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: Re: [R-390] Filters

Yes, thanks for the replies. A few things.

I've had these 2 R-390A's for quite a while. One of them is in fair shape, Dittmore, the front panel is a bit beat up and screwed with, but it worked pretty good when I got it, maybe 15 years ago. I did some mainly cosmetic work on it and went through the book aligning it. It's not a bad RX. Sens is generally sub uV, with the IF module set up at 100uV input for -7V diode load. I kind of disagree with Chuck(?) on the setup of the IF module. I haven't been into the best input for it, but the book suggests 100-200uV for -7V diode load. 150 may be a good compromise but I need to check the intercept point for different inputs.

The second 390A had problems from the get go, EAC. Bad PS chokes, bad filters (maybe) but the RF, PTO and PS decks are fine. They both were converted to SS rectifiers, but I had a pair of 26Z5s I picked up a long time ago and one of the PS modules still had the sockets in place so I re-installed the tubes in that one. I still installed a CL-90 in the AC input and have some 10W 220? resistors coming from Mouser which I think I will install in both because the voltages with the tubes is still a bit high.

Years ago I went through both RXs to clean out the mechanical dial mechanism and both of them are working very smoothly, and the PTOs are pretty close, stable and all xtals in the both RF decks are working. Meters work in the EAC, Dittamore is missing the both meters, but I have some old stuff I'm going to try to get working.

Actually I had another 390A that I loaned out in 91, it was the best of the group, and the guy disappeared with it. I never loan out radios any more. Same thing happened to an old HQ-145 I had. The first good RX I had.

The IF modules, both EAC. I've been through both of them and the units appear to be undisturbed, no hacking in them, original solder joints. One of them is reasonable (#5025), but I haven't checked out the AGC voltages and AGC response thoroughly. All the filters seem to work and there is no great deviation of gain with any of them. I have all the .1, .01, .033 caps on order to replace. The filter blocking caps seem to have survived but I've already replaced them (only) with Orange Drops. This module has gain problems however that appear to be not tube related by tube replacements.

The other IF (#123), seems to have a lot of problems. .1, 1, 2KHz works but gain is much lower than the 8 and 16 KHz. The 4 KHz seems dead, but I'm not convinced of that. 8 and 16KHz seem reasonable. Resistance measurements on the filters are the same in the good module and the bad one, that's switching through the diff bandwidths. The AGC is not working on the bad module either. Unfortunately I got ahead of myself and replaced all the caps in the bad module with Orange Drops, so it's pretty crowded in there right now. I ordered newer caps (Panasonic ECW radial style) because they are so much smaller plus they're 800V to put in the other module.

The 'good' module has a drifting gain issue that I'm working on. The 'bad' module seems to have much better gain at least through the 8 and 16 KHz filters. I'm thinking about pulling the 'bad' 4 and 2 KHz filters to go through the switching, it seems impossible to trouble shoot the switching with the filters in place unless someone can point me in another direction. It seems to screw with the AGC too. I really don't want to send these things out, I enjoy working on them and have a fair shop and equipment to work on them. Fluke 189, Analog Simpson 313-3, Motorola Service monitor R2005D/HS with LPRO-101 if needed, lots of other stuff.

So far the RF sections seem to be about equivalent, but I still have the better one (Dittmore) in the rack with most of the modules out of it to check out in the EAC. I did have to pull apart T202 in the EAC RX to find a short in the transformer. Never did really find it, but by moving around wires, it started working, so there must have been a short to ground that I got rid of. It's really nice you can take these things apart and fix them down to the component level.

Bottom line, if anyone can steer me into not taking out the filters from the 'bad' module, plus I really do not understand the AGC line going through R507 into the filters, but it somehow must end up on the grid of V502, but I don't understand the switching. My thinking is the AGC is screwed up in that module because of the 'bad filter'.

Yes, these radios are incredible for the era they were build in, they seem to be right up there with anything build now, just not the bells and whistles and computer control.

My plan is if the filters are actually bad, I'll just use it in the 16KHz position with 'Dream' or similar IF decoder mixed down to sound card capability if I can get the AGC to work.

I've read through a lot of the R290A FAQ pages, so it's not like I haven't been doing my homework, it just gets a bit long to read these old threads that seem to repeat themselves and pull out the gems. Sorry to be so long winded.

Date: Sun, 3 Feb 2013 23:23:41 -0800 (PST)
From: "Drew P." <drewrailleur807@yahoo.com>
Subject: Re: [R-390] R-390 Digest, Vol 106, Issue 2

>…..Is there any way to search the archives?"……..

Go to http://r-390a.net/Pearls/index.htm and there you will find nicely distilled and categorized information.

Date: Mon, 4 Feb 2013 09:24:28 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: Re: [R-390] Filters

Well, I'm pretty sure the AGC problem in the one IF strip is confined to the IF since the other IF unit seems to work pretty good AGC wise, but I do still need to check the AGC action even on the 'good' IF strip. I see there's a test for AGC action in the book, I just need to go through it. But even the good AGC one has the 'gain drift' problem, so I'm not home free on that one yet either. I suppose I should fix the drift problem first and then go on to the one with the bad filters and no AGC.

I'll check the AGC action tomorrow and see if I can get a feeling for where the gain drift is coming from. It will start off with 150uV 455KHz into the IF module giving -7V on the diode load, then it 'snaps' and then 25-30uV will give -7V, then it starts drifting around on the diode load meter finally resting back at about 150uV in a half an hour or so. Since it takes so long to do this, it's hard to check. The 2uF C551 checks out OK on the Fluke, if a bit high, but who knows what it's doing during warm up. I need to start checking voltages as it warms up. This may take a while. I do have some tube extenders. Other problem is one of the pins on P112 is broken, keeps falling off and now I've lost it, I need a new P112 for that one unless I can swap the line to the unused pin, but then the IF modules are not compatable.

Yes, that AGC stuff is pretty iffy to check since so many things are hooked to it.

I hope I'm responding to this group correctly, I notice I can't just 'reply'.

BTW Tisha, thanks for the link to this group. I see you are on Lookout Mt, but I was thinking of the one at Chatanooga, I've been there for work (repeater up there), but

it's a different Mt in a different state.

Date: Mon, 4 Feb 2013 07:55:53 -0800
From: "Craig Heaton" <hamfish@efn.org>
Subject: Re: [R-390] Filters

Something more than the Fluke will be needed to test C551, more to the point it has to be tested at rated voltage. In this case 500V. Both of the R-390/A's in my shack have had C551 replaced, their insulation resistance was zip, nada, zero. The Sprague TO-6A analyzer showed the value (2MF) was close but failed on IR. A new cap can be placed under the chassis; NTE makes a mylar cap which will fit inside old can.

Date: Mon, 04 Feb 2013 11:16:27 -0500
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] Filters

I simply used a disk ceramic rated for 1KV. Just put it in after removing original. Used teflon spaghetti.

Date: Mon, 4 Feb 2013 13:47:28 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: Re: [R-390] Filters

OK, I have 2 - 2uF 650V MLR205K630 on order. I also found the RF gain had a glitch at the high end. It goes from some small resistance to 0 and produces a click. Taking apart the pot, it looks like it's just made like that. I found a replacement I had and it a bit better, but not perfect. I guess I'll have to wait until I get the new caps including all the Mouser ones installed to see if it makes any difference. It's acting pretty much the same all the time. Starting at 100uV the gain goes up to maybe 30uV then back to 100 and sometimes even more, but after a while it settles down to 100uV. The other module seems more sensitive, so I'm sort of assuming the variable gain one is loosing gain for some reason.

Date: Mon, 04 Feb 2013 13:58:56 -0500
From: "Charles P. Steinmetz" <charles_steinmetz@lavabit.com>
Subject: Re: [R-390] Varying gain [WAS: Filters]

>Starting at 100uV the gain goes up to maybe 30uV then back to 100
>and sometimes even more, but after a while it settles down to 100uV.

Does the background noise you hear at the audio output track these changes, or does it stay constant?

Date: Mon, 4 Feb 2013 17:31:21 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: Re: [R-390] Varying gain [WAS: Filters]

Yes, the audio tracks the gain changes, as does the diode load voltage. My thinking is when it's at it's most sensitive, it's about equivalent in module gain as the module

with the bad(?) filters. But it always settles down to some lower gain value. I'm doing this all in MGC, so the AGC shouldn't be affecting it. I've got all replacement caps coming for C551 as well as all the bypass and coupling caps. The Orange Drops I put in the other module were so large, I opted to buy smaller radial Panasonic ones for this module. The ODs make it nearly impossible to work on.

I'm going to pull the 2 bad (?) filters out of the 2nd module and see if that makes the AGC work on that one, which it is not at all now. Maybe I'll find a bad cap or something in the filters. Otherwise the gain on the 2nd one seems good, however it will go into oscillation if I crank up R519 too much. I don't know if that's 'typical'? I've found Z503 on the module with bad AGC is open. I've tried tracing the fine wires back to where it goes in the glue, but nada. That will kill the AGC for sure. Fair Radio has a used one for $16. Anyone else have any?

Date: Mon, 04 Feb 2013 20:30:25 -0500
From: "Charles P. Steinmetz" <charles_steinmetz@lavabit.com>
Subject: Re: [R-390] Varying gain [WAS: Filters]

>I've got all replacement caps coming for C551 as well as all the
>bypass and coupling caps. The Orange Drops I put in the other
>module were so large, I opted to buy smaller radial Panasonic ones
>for this module. The ODs make it nearly impossible to work on.

As has been pointed out before, the film capacitors in tube equipment should really be "film-and-foil" types rather than the smaller metallized film caps. Most especially, C551. (For the reasons, consult the archive -- the search terms "self-healing" or "self-heal" may be helpful, as well as "film-and-foil".)

>I've found Z503 on the module with bad AGC is open. I've tried tracing the >fine wires back to where it goes in the glue, but nada. That will kill the AGC for >sure. Fair Radio has a used one for $16. Anyone else have any?

Look in the archive for a thread from a couple of years ago regarding replacements for Z503. Search "Z503". There are many ways to improvise a suitable replacement. One suggestion: the inductor should be reasonably well shielded so it doesn't radiate 455 kHz into the IF grid circuits.

Date: Mon, 4 Feb 2013 22:57:22 -0500 (EST)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Varying gain [WAS: Filters]

Others may have a clearer explanation of the "whys" for not using metalized foil, but as I remember the discussions, these caps "heal" themselves when a defective area in the dielectric is destroyed by a very temporary short between the adjacent films. It is this process that can be detrimental to other components - in this case, the filter(s).

Date: Tue, 5 Feb 2013 05:48:42 -0600
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: Re: [R-390] Varying gain [WAS: Filters] (self healing caps)

Self healing caps will rely upon supplying some amount of current across the cap to "pop" a shorted area open. (like a pimple). I suspect the thinking is that you definitely do not want any sort of current flowing through the filter bobbins. They are wound with such fine wire they are extraordinarily sensitive to cooking a winding open.

Then again we do not need to be putting a Sprague 715P, 600 volt cap in there when a '225 would work (different grade of Sprague Orange Drop capacitor). Just about anything we put in there is going to be better than some BBOD (black beauty of death). We attach too much significance to "premium" capacitors in every application in the receiver. Putting 600 volt '715P's in some B+ bypass application where it will never see more than 220-250 VDC is overkill. There may be 4-5 spots in the receiver where a higher end cap would make a difference (that "IF filter Killer Cap" and a few spots in the audio chain). It has gone from practical to mystical and the "mor is betta" approach seems to take hold. <snip>

Date: Tue, 5 Feb 2013 09:49:19 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: Re: [R-390] Varying gain [WAS: Filters] and archives

Thanks for all the replies. I was beginning to figure out most of what has been said. I thought maybe I was missing some search feature I couldn't find. Seems for some reason some of the pdf files I get aren't searchable, but maybe if I save them it will work. I'll look into the Z503 before I go buy one. I suppose I could clean out the junk from my old one and re-wind it if I can find any litz wire. I'm about to break into one of the chokes that is bad (L603) and see if I can re-wind that. I'm sure it's just wound with enameled magnet wire which is readily available and I have some. I've been through most of the Y2K stuff, but it gets pretty interminable reading through all the stuff and yes I've seen the 'Pearls'. I have most of the items that interest me on the hard drive. As far as the IF caps, I do have the OD in the filter in and out coupling caps. I was going to use the metalized for the rest of the bypass and coupling, and since they are 800V, I'm hoping they won't have any 'pimples'. I did use Xicon Poly Met 400V axial ones in the AF module, mostly because of their small size. The ODs just won't fit on the AF board TB601. Another filter question. I have pulled the input circuits off the 2 and 4K Collins filters and at least the input seems to measure pretty good on the Fluke, around 50 ohms across the terminals, and about 34Meg to ground. I haven't checked from in to out yet, but should get to that today. Seems like the filters measure good with the ohmmeter, but don't act right, and the rest of the circuit components seem fine. Need to check the switching though. I'm not adverse to pulling the filters apart to see if I can work on them, but don't want to if not necessary.

Date: Mon, 25 Feb 2013 13:51:08 +0000
From: William A Kulze <wak9@cornell.edu>
Subject: Re: [R-390] Decoding with DReaM

You have to mute your line input in windows.

Bill W2NVD

-----Original Message-----
Sent: Saturday, February 23, 2013 9:27 AM
To: R-390@mailman.qth.net
Subject: [R-390] Decoding with DReaM

Can someone help me with DReaM? When I feed the mixed IF (455 mixed down to 12KHz) into my SoundBlaster Audigy I hear the input monitor (line in) as well as the DReaM output (line out). How do I turn off the input monitor? Or is that a function of the soundcard? It seems like I've done this before, but I can't remember, something about disabling the input monitor, but how? If I turn down the recording line in, the output goes away too, of course.

Also, has anyone in the US had any luck decoding the DRM stations with Dream?

Date: Mon, 25 Feb 2013 10:11:30 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: [R-390] Dream

When I mute the line input, the output goes away too.

Date: Mon, 25 Feb 2013 16:22:38 +0000
From: William A Kulze <wak9@cornell.edu>
Subject: Re: [R-390] Dream

I'll have to look at my setup when I get home. I have an older winradio that supplies the IQ signal to the soundcard and I have to mute it so I don't hear the high-pitched squeal from the line input. The speaker output from the app to the soundcard is all you want to hear. I'll check it tonight if I remember and I'll let you know.

Date: Mon, 25 Feb 2013 11:31:44 -0500
From: Robert Newberry <N1XBM@amsat.org>
Subject: Re: [R-390] Dream

There is a yahoo group devoted to DRM in North America. I'm waiting for approval. I need help building the library for the dll. I don't have hardware issues, mine are all software issues. Maybe I can get someone to help me there.

Date: Fri, 26 Apr 2013 09:23:09 -0700
From: Gordon <gordon@n6wk.com>
Subject: [R-390] BFO Bellows

I just noticed that the little copper Bellows under the IF Chassis for the BFO control is cracked about half way around one of the grooves. Does anyone have one they would sell me?

Date: Fri, 26 Apr 2013 12:30:17 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] BFO Bellows

If all else fails, Fair Radio has them.

Date: Fri, 26 Apr 2013 10:02:04 -0700
From: Gordon <gordon@n6wk.com>
Subject: Re: [R-390] BFO Bellows

I searched for them on Fair Radio but can't seem to find it.
Can you send a link?

Date: Fri, 26 Apr 2013 13:25:06 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] BFO Bellows

I don't see them there anymore.
They only have the BFO - NO bellows.
Give them a call! They may have some out back.

Date: Fri, 26 Apr 2013 10:37:08 -0700
From: Gordon <gordon@n6wk.com>
Subject: Re: [R-390] BFO Bellows

Thanks Bob, I just shot them an Email to see.

Date: Fri, 26 Apr 2013 14:37:04 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] BFO Bellows

Precisely! That's why I suggested that he call, (or write). They have more parts than they can keep up with! I've picked up parts that way before. Sometimes they even have listings on the watery place. That was how I picked up a NIB Z-503.

Date: Fri, 26 Apr 2013 14:42:16 -0500
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: Re: [R-390] BFO Bellows

Usually a cracked bellows does not bode well for the BFO in general. They do not like being over rotated and if someone was cranking away on it they likely damaged it internally.

You could put a frequency counter on the BFO output and see if it is anywhere near 455 KHz. I bet it is not.

Generally they show up on auction sites and probably most people on the list have a few extras. I would think that you could get a replacement in that $20 US range (not that I have one to sell).

The front panel knob has a keyway that should prevent you from just spinning away at the BFO. If the knob was not put on to be nearly flush with the front panel or the keyway is missing you can end up with a BFO

adjustment that just turns and turns. (bad thing).

When pulling the IF deck this is one of those things that you should set to the zero position and use a dab of paint or fingernail polish on the IF deck so you know where to put things back together at.

Date: Sat, 27 Apr 2013 23:24:55 -0400 (EDT)
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: [R-390] BFO Bellows

<snip> bellows under the IF chassis for the BFO control is cracked<snip>

Another opportunity to demonstrate some solder skills.

There is nothing sacred or special about the bellows.
As the BFO PTO is adjusted, the shaft screws in and out.
The shaft through the deck and the front panel are fixed.
Thus the bellows needs to expand and contract.

Like about 1/16 inch as you adjust +/- 3KHZ.
Less than 1 turn on the front panel knob.

Time to get out the good non radio flux.

Take the bellows out of the deck.
Buy some good solder prep like to repair an auto radiator back when they were real metal.

Copper pipe flux may work well.

Just run a bead of solder across the crack.

The loss of one bellow section will not impair the operation of the device.

I hope Fair Radio still has some bellows on hand.
You do need to ask Fair Radio for what you want.

Demand by part number volume is low compared to cost to get it printed in the catalog or maintained on a web site.

Please do ask here first for parts.
Several fellows do have stock for sale.
But again the cost / time to advertise exceed return on investment.
These fellows do not have everything.
So then do ask Fair Radio.

Bellows are also available as stock drive parts from other sources. These items will not be the part that leaves an R390 non repairable.

D

’sVC

<snip>

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Date: Mon, 15 Jul 2013 07:43:27 -0700 (PDT)
From: Johnsay Johnsay <groundwave@yahoo.com>
Subject: [R-390] AGC

I am currently working through resto-mods on my Mototrola R-390A.?? As it stands the radio is working very well and I'm considering the various mods... I've installed the BFO and audio mods and I've felt those were worthwhile. I've been looking at the Lankford AGC mods and I'm wodering if that is the best way to go.

Date: Sat, 28 Dec 2013 20:19:07 -0500
From: <w4thq@cox.net>
Subject: [R-390] Collins s/n marking

A Collins AF unit has the following stamping:

FINAL AUDIO UNIT
  540 7553 005
COL SER. NO. 323

A Collins IF unit has the following stamping:

FINAL I. F. UMIT
 540 7577 006
COL SER. NO. 221

I am curious about the word "Final"

Date: Sun, 29 Dec 2013 02:28:18 +0000 (GMT)
From: chuck.rippel@cox.net
Subject: Re: [R-390] Final IF

The IF module is electrically, the last IF unit in the signal path. You have 2 variable, tracking IF's which are located on the RF deck that are "in front of" the "final" IF unit.

Sent: Tuesday, December 31, 2013 1:16 PM
Subject: [R-390] R390A AGC troubleshooting procedure

I posted this on another thread yesterday -- I'm reposting with some additions and so it has the correct "Subject:" header.

R390A -- AGC troubleshooting procedure:

Throughout this entire procedure, the "FUNCTION" switch should be set to "AGC."

First, make sure there is a jumper installed between TB102, Terminals 3 and 4. If not, install one and see how the radio works now.

Set the AGC to "MED" and tune the radio to a good, strong, local signal (like a strong AM broadcast station). Measure the DC voltage at TB102, Terminals 3 and 4 with a high impedance meter (VTVM, DVM, or scope, with an input resistance of >= 1M ohm; not a VOM). It should be significantly negative, -10v or more. If it is, you have no gross AGC problem and the fault lies elsewhere. But if the voltage is only weakly negative, or zero, you have an AGC problem. If so:

Turn off the radio, and pull the plug. Set the AGC time constant to "MED." Remove the jumper between TB102, Terminals 3 and 4. Measure the resistance to ground from each of these Terminals. Terminal 3 looks back into the AGC detector, and should read in the neighborhood of 500k ohm due to R545, R546, and R547. Terminal 4 is the AGC line feeding the RF and IF circuits and should read essentially infinite (>> 1M ohm). If you have gotten to this point, one or the other of these Terminals will probably show a much lower resistance to ground than this. Trace the circuit to find the leaky component(s).

If Terminal 3 reads less than ~500k ohm, the usual suspects are C551, C548, C547, C545, and C544.

If Terminal 4 reads less than 1M ohm, the usual suspects are any of the several dozen bypass caps on the AGC line in the IF and RF sections, or possibly leakage to ground in one or more of the mechanical filters. It is also possible that the sector of the "FUNCTION" switch that shorts Terminal 4 to ground when the switch is set to "MGC" or "STAND BY" is mis-timed, broken, or dirty, but this
is very unlikely.

If, on the other hand, the resistance readings are OK, suspect V508, V509A, and associated circuitry (Z503 and C546, especially).

The R390 is very similar, although the part numbers are different.

Best regards, Charles

Date: Mon, 6 Jan 2014 11:19:57 -0800
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] R390A AGC troubleshooting procedure

I like your writing; it's clear and easy to follow.

> Terminal 4 is the AGC line feeding the RF and IF circuits and should read essentially infinite (>> 1M ohm).

No, there's a voltage divider in the RF deck. R201 and R234, on Figure 5-18, page 39 in Y2K-R3. Resistance to ground will be 1.8M . When you unplug P108 off the RF deck, terminal 4 should go open.

Date: Mon, 6 Jan 2014 14:51:16 -0500
From: John Wendler <wendlerjrv@gmail.com>
Subject: [R-390] Debugging rules

Here is a link that some members of the list might enjoy.
http://www.debuggingrules.com/Poster_download.html
The book is pretty good too.

Date: Mon, 06 Jan 2014 15:21:27 -0500
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] R390A AGC troubleshooting procedure

>[TB102] Terminal 4 is the AGC line feeding the RF and IF circuits
>and should read essentially infinite (>> 1M ohm).

Dave wrote:

>No, there's a voltage divider in the RF deck. R201 and R234, on Figure 5-18,
>page 39 in Y2K-R3. Resistance to ground will be 1.8M . When you unplug P108
>off the RF deck, terminal 4 should go open.

Right you are, Dave -- thanks! Here's a further corrected version of the procedure:

R390A -- AGC troubleshooting procedure:

Throughout this entire procedure, the "FUNCTION" switch should be set to "AGC."

First, make sure there is a jumper installed between TB102, Terminals 3 and 4. If not, install one and see how the radio works now. Set the AGC to "MED" and tune the radio to a good, strong, local signal (like a strong AM broadcast station). Measure the DC voltage at TB102, Terminals 3 and 4 with a high impedance meter (VTVM, DVM, or scope, with an input resistance of >= 1M ohm; not a VOM). It should be significantly negative, -10v or more. If it is, you have no gross AGC problem and the fault lies elsewhere. But if the voltage is only weakly negative, or zero, you have an

AGC problem. If so: Turn off the radio, and pull the plug. Set the AGC time constant to "MED." Remove the jumper between TB102, Terminals 3 and 4. Measure the resistance to ground from each of these Terminals. Terminal 3 looks back into the AGC detector, and should read in the neighborhood of 500k ohm due to R545, R546, and R547. Terminal 4 is the AGC line feeding the RF and IF circuits and should read approximately 1.8M ohm due to R201 and R234. If you unplug P108 from the RF deck, Terminal 4 should then read essentially infinite (>10M ohm). If you have gotten to this point, one or the other of these Terminals will probably show a much lower resistance to ground than this. Trace the circuit to find the leaky component(s).

If Terminal 3 reads less than ~500k ohm, the usual suspects are C551, C548, C547, C545, and C544.

If Terminal 4 reads significantly less than ~1.8M ohm, the usual suspects are any of the several dozen bypass caps on the AGC line in the IF and RF sections, or leakage to ground in one or more of the mechanical filters. It is also possible that the sector of the "FUNCTION" switch that shorts Terminal 4 to ground when the switch is set to "MGC" or "STAND BY" is mis-timed, broken, or dirty, but this is unlikely. If, on the other hand, the resistance readings are OK, suspect V508, V509A, and associated circuitry (Z503 and C546, especially).

The R390 is very similar, although the part numbers are different. If, on the other hand, the resistance readings are OK, suspect V508, V509A, and associated circuitry (Z503 and C546, especially).

The R390 is very similar, although the part numbers are different.

Date: Tue, 28 Jan 2014 17:44:37 -0500
From: Roy Morgan <k1lky68@gmail.com>
Subject: Re: [R-390] [Glowbugs] R-390 IF output jack freq.?

> does anyone on the list remember off hand the IF output (jack) frequency on the R390?

Yes, both the R-390/URR and the R-390A have an IF of 455 kc.

A second matter is the level. If you are feeding an SSB adapter, you need to both not overdrive the adapter, or provide too little signal. The R-390 IF output level may be on the order of a volt or two or more. The CV-591 SSB adapters are meant to accept this level as I understand it.

Any SSB adapter meant to get its signal through a 10 pF cap from the last IF stage may be ?expecting? way less voltage. If this is what you have, a simple two-resistor attenuator, or even a low-value volume control or pot will work fine. You may be able to measure the IF output voltage with your DMM or VTVM.

Date: Wed, 12 Feb 2014 21:58:28 -0500
From: "AE4CW" <ae4cw@att.net>
Subject: [R-390] BFO Question on Newly Acquired R-390A

This is my first post after acquiring a R-390A last weekend. The radio plays well on AM, and all the basic functions seem to be in the ball park except one. The BFO is offset by about 9 KC from the carrier. At the "0" position the BFO tone is very high pitched. Turning the BFO to the far right reduces the frequency but still is very high pitched. I concluded it's 9 KC from the carrier by peaking the carrier of a BC station in the 0.1 KC BW position, then listening for the BFO and zero beating in the 16 KC BW position. Zero beat is very nearly 9 KC above the BC carrier.

I don't see any way to adjust the BFO frequency other than maybe L509 inside the Z502 BFO can which I presume is factory set and not accessible. Before I head down a rabbit trail, can someone please suggest the most likely problem(s) and best approach to diagnose and fix? Perhaps the whole 455 IF strip is off frequency, but that seem unlikely to me. No measurements taken yet, but I do have the Y2K documentation.

Thanks in advance for your advice.

Date: Wed, 12 Feb 2014 19:28:11 -0800
From: "Craig Heaton" <hamfish@efn.org>
Subject: Re: [R-390] BFO Question on Newly Acquired R-390A

I don't think the following is in the Y2K, but.....found it on Chuck's webpage years ago. Make sure the mechanical adjustments are up to snuff, they have to be correct before the electrical is done. Proceed to the IF alignment in section 6. Get it all done.....but before disconnecting all the test stuff, put the jumper back on the diode load terminals. With the sig-gen at 455KC, turn on the BFO. Zero beat should be at "0". If not, undo either the knob fastener or clamp, and set at "0" at zero beat.

Date: Thu, 13 Feb 2014 17:05:19 +0000 (GMT)
From: chuck.rippel@cox.net
Subject: [R-390] The Cobblers Childern

You know the old saying, "The Cobblers Childern never have any shoes....." Thats a trueisim here. I have 2 R390A's, one of which has, over the past 30 years I've owned it, broken in ways I seldom see in one of your radios that comes through my shop. Crazy stuff.....

Ok, this week it’s no or AGC. Turned it on last weekend to listen to the Saturday evening parade of pirate radio stations that are on 6925.0 and that general area. No AGC..... Rats ! I'll be taking it apart this weekend and seeing what the offending part is. Will share the outcome here as I recall that subject has been discussed recently.

Date: Thu, 13 Feb 2014 12:16:41 -0500 (EST)
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] BFO Question on Newly Acquired R-390A

Will one you of you please remind Chuck and I of the size number for the spline wrench.

Chuck, I see into your future and you are about to acquire a spline wrench.
All the clamps and knobs on the R390 and R390A when assembled with the proper bolts and set screws have a Bristol wrench AKA spline wrench "drive bit recess" You will need one of these bit to loosen the BFO extension shaft clamp so you can adjust the BFO.

Look in side the top behind the BFO and band width switches on the front panel. You will see the BFO and band width switch shafts are extended out of the IF deck through the front panel with an extension shaft. The shafts have a clamps.

You loosen the clamp.
Turn off the BFO
Center your signal into the 0.1 band pass as you did.
Turn on the BFO
Grab the BFO shaft at the IF deck with pliers and rotate the shaft until the BFO zeros.
Set the BFO knob to zero
Tighten the clamp.

The BFO is reset. Job complete.

There should be a lock plate under the front panel bushing nut that limits the BFO shaft rotation to about + and - 3 on the front panel.

The knob should set out from the panel so it does not rub.
But the dog in the knob catches on the lock plate tab to limit rotation.

The IF deck BFO shaft should have groves and lock rings at the bushing in the IF deck. these lock rings keep the BFO shaft from pulling out or pushing in.

Some day when you get the IF deck out, you will want to check the BFO bellow coupler expansion stress.

With the BFO at zero and the shaft bushing washers in place, you loosen the set screws in one end of the bellows and let the bellow freely be what ever length it wants to be.

Then retighten the set screws.

As the BFO preamble slug is screw in or out by the rotation of the BFO shaft, the shaft length changes.

The bellows will compress or expand as the extension shafts (chassis shaft and bushing, front panel shaft and bushing) do not change length.

Common practice is to pick up a set of spline Bristol wrenches on line as a set of Allen wrenches. Find the size that fits. Grind the hook end off and square it up on the grinder. Insert the length of bit into a long handle and make your self a spline wrench tool for your R390. Splines are also available in nice long handle screw driver like hand tools. You can buy just the one you need. You will not find Bristol or spline bits at the Home Depot. Lowes or Ace stores.

A good tool shop may have a set.

A very small torx bit may get you into BFO clamp. These bits go in the hex 1/4 drive bit and may get this job done for you.

This tool arrangement will have to large of a diameter to get you into tighter locations.

Visit the R390.net page and down load the R2K manual and begin reading. I like the R2K because it comes in sections. If you only have dial up and slow speed getting the manual in parts is a real plus.

The Y2K re write is so much easier to read and understand.

Date: Thu, 13 Feb 2014 12:41:05 -0500
From: "AE4CW" <ae4cw@att.net>
Subject: [R-390] FW: BFO Question on Newly Acquired R-390A

WOW, what a group, thank you! I searched the Y2K doc but didn't find any reference to adjusting the BFO frequency other than the standard +/- 3 KC.

Max-Gain Systems, just a couple of miles down the road has Bristol wrench sets, so I'm off to see Alan Bond the owner to get a set. I too would like to know the specific Bristol size to make sure I get the right one.

Date: Fri, 14 Feb 2014 20:52:07 -0500 (EST)
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] BFO Question

The BFO PTO just is. It has a range more than ample so you just crank the shaft on the can to 455Khz. Back in 54 prior to the invention of counters, you just zeroed it against the incoming 455 being passed through the 455Khz crystal in the 0.1 bandwidth. You watched the line meter drop to zero and stop ticking.

On a good day you had a signal generator (AN/URM 25) to work against.
Not so good days you used Arm Forces Radio as a strong signal.

You can put a frequency counter on the BFO and set it to 455,000 if you have a counter in house. Put a tube extender under the BFO tube. Use a blocking cap between the Tube plate and the counter and you can set the BFO to exact.

In 74 75 in Okinawa we took to setting the BFO with a counter and then zeroed every thing else including the AN/URM 25 against the BFO at Zero 455Khz. We also hung the counter on the AN/URM 25 to get 455 for the IF deck alignment.

As tools and test equipment come along and improved we used them.
If the knob does not twist + - 3 from stop to stop smoothly you may want to pull the IF deck and check the bellows coupler or the shaft bushings on the front panel or IF deck front. If the bellows coupler is not set right you can over stretch it or compress it as you get to the end of the shaft rotation travel. This is your clue that some adjustment could be in order.

Stretch and compress are not equal so a nice operating center that gives smooth shaft rotation may not be with the bellows coupler at neutral length (set screws loose on one end) and the BFO at exactly 455Khz. Its a touchy feel thing a point of pride to have a smooth BFO shaft.

Your micro dial should run as smooth as a plain knob from - + 3. But your micro dial has no stop and you can run the BFO until you hit the bellows coupler starch or compression limit. The shaft rotation range of the BFO PTO is larger than the bellows range. So most times the bellows keeps you from cranking the BFO PTO can into the trash.

But be mindful do not force the BFO PTO. A smooth operation lets you know when you have bumped up to the limit and there is not need to force the mechanics of the BFO.

Date: Fri, 14 Feb 2014 23:44:06 -0500
From: "AE4CW" <ae4cw@att.net>
Subject: [R-390] BFO Question

Good information. I took a fairly simple approach to setting the BFO by using a strong local BC station, peaking the carrier in the 0.1 filter position and then zero beating the BFO against the BC carrier. I do have a counter so will see how close I came with the BC station approach.

There is slight amount of drag and noise on the - side of the BFO travel. I'm going to pull the IF, so will see if I can find that sweet spot where it's smooth across the full travel. BTW, I do not have the micro dial...just the knob.

Date: Sun, 16 Feb 2014 02:17:10 +0000 (GMT)
From: chuck.rippel@cox.net
Subject: [R-390] Cobblers Childern Now Have Shoes and a Saturday SWBC Target

Checked the radio and found that I only had 3.65V at the rear panel RF jumper on a strong AM station so knew something was up. The resistance from TB3 and TB4 to ground were in spec so on a whim, pulled the IF deck and installed the known good one I use in the shop. The problem was not present using the swapped IF deck. Glad it wasn't in the RF deck.

Plate voltage on the AGC amp was good, the tuneable coil had not opened up so changed C519 and the other .05 AGC line bypass cap near the input of the IF deck. Bingo, the proper AGC voltage was back. Problem solved. Checked a few of the alignments and after at least 8-10 years since I touched this radio last, they were all perfect. I had C-519 written in my notes as a previous problem child found in a couple other radios.

Tonight, there will be pirate radio stations on the 43 meter band. Right now, I'm listening to "Radio Free, Whatever" on 6925.0 Keep a watch there along with 6930 and 6940. Europirates have been heard around 6290 - 6330. Whats interesting, these guys run only 10-20 watts and the probramming can be.... "diverse."

Date: Sun, 16 Feb 2014 14:41:17 +0000 (GMT)
From: chuck.rippel@cox.net
Subject: [R-390] R390A Birthday and otherness

I believe I sourced the 02/24/54 date from Ed Fong's originial R390A article that appeared in The Signal. He compared modern receiver designs to what he considered THE performance baseline, the R390A.

The full list of components I changed to correct the AGC failure in my own R390A is:

C502
C519
V508 (Just because)

Didn't have any .05 uf 1KV ceramic disc caps so used a .022 in its place.

Date: Mon, 17 Feb 2014 19:04:45 -0500
From: Bill Cotter <n4lg@qx.net>
Subject: [R-390] Odd problem - Raspy BFO

I have a BFO problem with my EAC R-390A (completely recapped & restored) that has eluded me after doing all the usual easy stuff (test/swap tubes, measure voltages, etc). While listening to an AM station, strong or weak, or turning on the calibrator, and I flip on the BFO, the note is raspy and harsh. Otherwise the receiver works great. I have checked for fil/cath shorts in the tubes, dirty DC, AVC, etc and have not found the culprit.

It's time to bring out the Tek-475 and snoop around. My first suspicion is a leaky 12pf C535 or 100pf C530.

Any thoughts/suggestions/experiences? It's time for me to step up to "level-2" troubleshooting.

Date: Mon, 17 Feb 2014 21:28:30 -0500
From: Bill Cotter <n4lg@qx.net>
Subject: [R-390] Problem solved - Raspy BFO

Well, my wild guesses of C535 and C530 were just that - wild guesses.

I had a thought about the 12BA6/12BA6 series combo in the BFO and PTO, thinking the string may have an issue. I had tested/swapped the BFO tube to no avail, but not the PTO tube. Sure enough the 12BA6 in the PTO had a F/K/G short, according to the Hickok-6000A. I swapped out the shorted RCA and dropped in a Dumont 12BA6, and the raspyness went away.

Lessons learned:

1) I had jumped to the wrong conclusion about the BFO because I could not hear the

120Hz modulation on the PTO in AM mode. I suppose the PTO modulation was below the audio output response range. When beating the incoming signal against the BFO, the raspy tone was apparent.

2) For a problem that just suddenly crops up, check tubes. If you don't find a bad one, check more tubes until you checked them all!

Date: Tue, 18 Feb 2014 21:00:19 -0500
From: "AE4CW" <ae4cw@att.net>
Subject: [R-390] AGC Problem - Diagnosis Help Appreciated

Here's the progress so far on my recently aquired R-390A.

The BFO tuning is resolved, and I'm now tackling the AGC. Here are the symptoms:

1. AGC works on strong BC AM in Fast and Medium with only slight change in carrier level ~ 80 db. On Slow the carrier meter goes to 100+ and AGC is lost. Moving from Slow to Medium results in about 1-2 seconds of silence. RF gain for all the preceeding at maximum.

2. AGC does not work (marginal at best) on CW and SSB in any position. Seems equivalent to MGC. Perhaps linked to BFO?

3. MGC is very touchy on CW and SSB. Goes from no signal to overload in about one dial unit on the RF gain.

Here's what I've done do far:
1. Exchanged V504, V505, V506, V508 and V509 with new tubes...no change in symptoms.

2. Deoxit on all IF deck connectors.

3. Checked leakage of mechanical filters...greater than 50 megohms from pin 6 of IF deck connector to ground.

4. C551 shows nearly 50 megohms.

Next step planned:
1. Check IF deck resistances.
2. Check AGC caps.

I would appreciate any guidance on likely causes and other diagnostic steps.

Date: Tue, 18 Feb 2014 21:47:47 -0500
From: "quartz55" <quartz55@hughes.net>
Subject: Re: [R-390] AGC Problem - Diagnosis Help Appreciated

I have just rebuilt all the filters on one of my IF modules and it measures 190+ megs from pin 6 to ground. The one I haven't messed with and seems to work just as good measures about 170+ megs with a Fluke 189. The one I rebuilt had AGC problems

not unlike you describe, but I really didn't document the details, since some of the filters were dead anyhow. They were all leaky when I finally pulled them out of the circuit. It's not for the faint hearted. If you think you may want to go there, let me know. There are other things in that AGC circuit than the filters, you can separate the filters out with some judicious pulling of resistors, like R507.

Date: Tue, 18 Feb 2014 19:49:57 -0800
From: "Craig Heaton" <hamfish@efn.org>
Subject: Re: [R-390] AGC Problem - Diagnosis Help Appreciated

With my limited listening to SSB with a R-390/A, MGC adjusted to somewhere around 6 or 7 and Local gain around 4 or so seems best. AGC and SSB never seems to cut the mustard, but I don't use it for SSB. YMMV

On Slow the carrier meter goes to 100+ and AGC is lost. C55I would be my target, did you check insulation resistance at rated voltage? Need a cap checker/analyzer. Both of my receivers had faulty C551's. Value checked good on the cap analyzer, insulation resistance was terrible. I've used a NTE MLR205K630 with good results.

Date: Wed, 19 Feb 2014 09:37:53 -0800
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] AGC Problem - Diagnosis Help Appreciated

Just replace it. It's bad. It's always bad. If I saw a good original C551, I'd faint.

To expand on what Craig said, if you simply measured resistance with an ohmmeter, the figure you got is wildly optimistic, because leakage increases faster than proportionally as applied voltage increases. 50Meg is incontrovertible evidence of failure. Once it charges, a good cap will read open.

The only difference between SLOW and MEDIUM is the voltage applied to C551. (Polarity too, but that shouldn't matter here.) If it sort of works on MEDIUM but fails on SLOW, C551 is THE suspect.

Date: Wed, 19 Feb 2014 10:05:48 -0800
From: "Craig Heaton" <hamfish@efn.org>
Subject: Re: [R-390] AGC Problem - Diagnosis Help Appreciated

Tongue in Cheek: It rains a few days here in Orygun and an old man needs something to do besides counting raindrops. With that said, there are two main options. Disconnect the old C551, leave it in place and mount the new one under the chassis.

Or.....for devilment; the old oil filled cap has other uses. Take a Dremel tool with a thin cutoff wheel and go around the inner edge of the bottom side of the cap (next to the solder joint). The oil had other medicinal uses and can be used to grow greener grass in the neighbor's lawn that owns a plasma TV. Moving on.....with the inners exposed, take a wood screw and twist it into the foil & paper wrapping. Grab the screw with a pair of pliers and yank! Remove the cardboard insulation along the inside walls and clean the case with your favorite solvent.

Install new cap with heat shrink on the leads. Tack the bottom back on at the corners with solder. Beats counting rain drops.

Date: Thu, 20 Feb 2014 11:15:20 -0800 (PST)
From: Perry Sandeen <sandeenpa@yahoo.com>
Subject: [R-390] AGC Problems

David Wise is being far too modest. Dave contributed a tutorial named AGC “Ending The Moment Of Silence” where he re-engineered the AGC circuit to eliminate this problem. It’s found in Chapter 11 of the Y2KR3 manual.

If one hasn't done so already, it is to one’s great advantage to D/L at least Chapters 9 and up. There is a wealth of information, much of which is the from the kindness of Roger Ruszkowski, that will greatly aid in both trouble shooting and alignment.

Another resource that is available is the schematics I've made entitled The Almost Ultimate R390A Upgrade Schematic. Besides upgrades, the schematics have listed a number of known re-occurring problem areas and parts.

The schematic is in two parts. Since I did them as an 8 bit TIFF image, one can take them to a Kinkos or similar place with a large format printer and get them enlarged to whatever size is useful too you as they won’t smear when enlarged. My 18 inch by 3 foot wide schematics cost me about $7 each. The Y2KR3 manual can be found at: WWW.r-390a.net. I’ll be glad to email my schematics to anyone. Please contact off-line.

Date: Tue, 29 Jul 2014 20:37:48 -0700
From: Perry Sandeen via R-390 <r-390@mailman.qth.net>
Subject: [R-390] Why use a Roofing Filter?

Roy Morgan wrote: I suspect that there are some of us who - are not all that sure what a roofing filter is - wonder why the R-390A needs to be “improved” by adding one - think that maybe the conditions under which we use our radios at our places, does or does not warrant the improvement. So, a short description of what the thing is, where it goes in the radio, and why it might be an improvement would be welcome.

Great questions, Roy. Here is the information Dallas Lankford gave about his mod: There are two reasons to put a roofing filter in a R-390A:

(1) to improve the close spaced 3rd order intercepts, and

(2) to provide a more appropriate wide AM bandwidth. The close spaced 3rd order intercepts for 2, 4, 8, and 16 kHz BW’s without a roofing filter is about -20 dBm, which can definitely cause 3rd order intermod in high RF environments.

With a 6 kHz BW roofing filter placed at the input of the IF deck, the close spaced 3rd order intercepts are improved to better than 0 dBm. The 8 and 16 kHz BW?s are too wide for general AM listening in most cases, so a 6 kHz roofing filter kills two birds

with one stone.

You could put a roofing filter in the RF deck, immediately after the 3rd mixer, and the performance would be the same. But removing and reinstalling an RF deck is an order of magnitude more difficult than removing and reinstalling an IF deck.

Since the signal path from the RF deck to the IF deck is via two mini-coax cables and two quick release mini BNC connectors, you could implement the roofing filter external to the IF deck, provided you had appropriate connectors. But it seems simpler to put it in the IF deck. The general idea behind the mod is quite simple. Below are “Before” and “After”
schematics for the mod that I do. [Snip]

One can find the rest of the article’s details, with pictures and schematics, in the Y2KR3 manual Chapter 11 page 135.

Hopefully that will answer all questions.

Date: Wed, 30 Jul 2014 14:42:29 -0400
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] Why use a Roofing Filter?

Basically, it is an IF filter that sets the maximum bandwidth of the system. To be effective, it needs to go as far "upstream" as possible in the radio, to keep out-of-band energy out of as many stages as possible.

These days, it is very common to make general coverage radios by upconverting received signals to a VHF first IF frequency (70 MHz or thereabouts is common). This gives good image rejection, but exposes the radio to out-of-band energy at VHF frequencies. Most radios do not have sharp RF filtering (because it is hard to get the RF filters to track), so this is a problem. Enter the roofing filter -- installed at the output of the first mixer, it limits the frequencies that can enter the VHF first IF. Typical BW is 20 kHz -- wider than the widest filter bandwidth in the final IF. (These radios often have no RF amplification, and have "brute strength" first mixers and post-mixer amplifiers with 3rd order intercepts in the +40 dBm range to handle the strong out-of-band energy they will receive.)

Contesters (people who spend their radio lives trying to pick weak signals out of pile-ups) frequently install much narrower roofing filters, to improve the closer-in overload performance of their radios. It is not uncommon for these folks to install roofing filters that are only a few kHz wide. Again, this filter needs to go as far upstream as you can get it -- at the output of the first mixer. (Note, however, that trying to design VHF filters that narrow is a losing proposition. If that sort of performance is what one wants, better to start with a single-band, downconverting rx architecture instead of a general-coverage upconverting rx. That also allows you to make the RF filters much narrower, too, which further improves close-in IMD performance.)

The retrofitted "roofing filters" for boatanchors (and, in particular, for the 390/390A) are typically installed much farther downstream for convenience, thereby pretty much nullifying most of the benefit by leaving all of the preceding IF circuitry unprotected.

In the case of the 390/390A, because the VFO feeds the last mixer, the preceding IFs must be wide to accommodate a whole band -- so any roofing filter placed where it really needs to be to do its job would need to be a tracking filter. In practice, people put them after the 3rd mixer, generally ahead of the existing 455 kHz IF filters (the mechanical filters, in the case of the 390A). Placed there, the "roofing filters" can clean up the stop band of the narrower mechanical filters, but that's it. And since the real IMD limitations in a 390A are the RF Amp (V201) and the First Mixer (V202), the retrofitted "roofing filter" can't do anything to improve the weakest links of these radios.

In sum, the overall architecture of a 390A does not accommodate a real roofing filter. People add what they think are roofing filters anyway, because they've heard that it is a good idea.

A 6 kHz filter added to a 390A DOES reduce the close in IMD -- but ONLY compared to the existing 8 or 16 kHz filters. The existing 4 kHz filter is better than the added 6 kHz filter. So the improvement is not a matter of "roofing," it is simply a reflection of the fact that narrower IF bandwidths have better close in IMD performance that wider IF bandwidths -- it is inherent in the nature of close in IMD measurements. Replacing the existing 8 kHz filter with a 6 kHz filter (or using the 4 kHz filter) would do the same thing.

I concur that in today's band conditions, the existing 8 and 16 kHz filters have no practical use, and that a 5 to 6 KHz filter is optimal. If I were choosing a filter array from scratch today, I'd probably choose 1.5 kHz, 2.1 kHz, 3 kHz, and 6 kHz.

Date: Wed, 30 Jul 2014 21:56:12 -0400 (EDT)
From: Bob Miller via R-390 <r-390@mailman.qth.net>
Subject: Re: [R-390] Why use a Roofing Filter?

FWIW the term Roofing Filter is a carryover from the old days of FDM multiplex systems and video base bands used in FM microwave transmitters and Satellite uplink FM transmitters. It was basically a LPF filter and not a band pass filter like the units used in various ham radio schemes. It's main purpose was to prevent harmonic and IMD content from the FDM or Video basebands from generating sideband spurs into adjacent M/W channel assignments. I don't know when the term Roofing Filter took on the personae of a BPF

Date: Thu, 31 Jul 2014 22:31:47 -0700
From: Dennis Wade <sacramento.cyclist@gmail.com>
Subject: Re: [R-390] Why use a Roofing Filter?

Charles, I noticed in Dallas' article that he puts his filter just before the first IF...a stage before the mechanical filters. Would a filter there offer more improvement? Your note suggested that the roofing mod that Dallas describes simply sticks a 6 kc filter where the rest of the mech filters are now. I've been toying with ways to output the IF of my 390A for further processing by SDR software. It seems to me that something without any of the mechanical filter influence would be good...let as much of the filtering be done in software as possible, and with as wide as practicable slice of spectrum as possible. So, maybe a nice wide ceramic (?) filter ahead of the 1st if, or

even in place of the 16kc mech filter (which in my receiver is dead).

Date: Fri, 01 Aug 2014 03:15:07 -0400
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] Why use a Roofing Filter?

Whether it goes on the grid side or the plate side of V501 doesn't really matter. (By "just before the existing filters," the grid side was what I meant -- it is the first practical point before the existing filters.) The 390A's IMD characteristic is basically all generated way before the 3rd mixer, so nothing you do at 455 kHz is going to help much (except with the close-in IMD that is simply a reflection of the IF bandwidth). So there is no practical difference between putting another filter on the grid side of V501 or just using it to replace one of the mechanical filters.

>I've been toying with ways to output the IF…….

The 390A already has a perfectly serviceable IF output, and you should let the radio provide at least a roofing filter for the SDR (BW wider than you are going to use on the SDR). So just select whatever BW you want with the 390A BW switch and feed the existing IF output to the SDR. That's the one thing a 390A 16 kHz filter is good for. You aren't going to get a wider slice of spectrum (than you get with a 16 kHz filter) out of the 390A in any case, because the BW of the IF cans is just barely wider than the 16 kHz filter. (A 16 kHz filter is still be better than a jumper wire, however, because it suppresses the stop band more than the IF cans do.) So, fix your 16 kHz filter, find one that works, or just use the 8 kHz filter when
you feed the SDR.

Date: Fri, 1 Aug 2014 08:36:58 -0400
From: Bob Camp <kb8tq@n1k.org>
Subject: Re: [R-390] Why use a Roofing Filter?

Ignoring the “why” of R-390 + SDR there are some right and wrong ways to do it.

1) You need a way to drive the AGC on the radio, or you need to pick off ahead of the IF.
2) You need a bandpass shaped dither source if you are going to pick off after filtering.
3) You need pretty good shielding on your SDR to keep it?s clocks out of the R-390

There are other nice to do things:

4) Compensating for the filter passband is nice if you pick off after a filter
5) Driving the S meter makes tuning a bit easier.
6) Using the audio volume control on the radio makes operation a bit more natural.
7) Using the bandwidth control switch on the radio.
8) Using the AM switch on the radio
9) Using the AGC switch

If you go the whole way down the list, that’s a lot of playing with the radio. If you go part way, you have something that’s a bit more of a hassle to operate than it could

be. The net result of the list would be mating up a SDR IF up with the RF deck of an R-390. The resulting radio would look cool. It would have the overload and drift issues of the original RF deck combined with the normal issues of an SDR. It *might* get some benefit from the RF filtering.

Yes I've given this a lot of thought on and off over the years.

Date: Fri, 1 Aug 2014 15:19:46 +0000
From: Bill Kulze <wak9@cornell.edu>
Subject: Re: [R-390] Why use a Roofing Filter?

Hi, All. Mating up the R-390a with an sdr is something I've done. Nothing real elaborate, IF out to SDR RF in, in this case a WinRadio G303i tuned to 455kHz. The biggest issue I ran into was attenuating the IF out signal to something more agreeable with an antenna input. One of the obvious advantages of the SDR is the panadapter. A visual reference is handy. With it I can find the optimal IF gain adjustment before you introduce noise. Same with the RF gain control. On My unit that is about 3 o'clock. You can see it all go to crap when either of those is too high. I usually ran it in MGC. Since the 'roofing filter' of the SDR is only 20kHz in this case, I just leave the radio at 16 kHz bandwidth, unless there is something very strong near something weaker I'm trying to copy, then the radio's filters can help.

The sdr comes in handy during alignment, also. It's sort of a poor man's spectrum analyzer. Leave the agc off in the sdr so you can see changes in amplitude better. You can sweep back and forth and see the shape of the IF bandpass.

In operation you have any mode of demodulation that the software is capable of available for use. I've also used the SDR by itself as a kind of station monitor, especially when using an analog rig, I can tell when I'm on frequency, and if I'm driving it too hard and putting out spurious signals.

Am I saying this is superior to the standalone R-390a? No, but it's something else to play around with.

Date: Mon, 4 Aug 2014 15:17:16 -0400 (EDT)
From: Glenn Scott via R-390 <r-390@mailman.qth.net>
Subject: [R-390] BFO Dial

I am looking for a source for the vernier dials that are occasionally seen on R390A's, Looking for a quantity of 10 to 20 or more but will buy whatever you have if it's in decent shape. A few scratches is no problem just as long as they work well and can be made to look decent without surgery. Does anyone know if there was a particular contract that called for these dials or were they added on by Hams later? Any history about these would be interesting.

Date: Mon, 4 Aug 2014 14:25:39 -0500
From: Raymond Cote <universal_comm@reagan.com>
Subject: Re: [R-390] BFO Dial

I have 2 R390A's with vernier dials on the BFO shaft. My understanding when I got

these at military surplus in Pearl Harbor is that it was used by spooks as the front panel was scratched with small lines to facilitate returning to set spots for listening

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Date: Mon, 4 Aug 2014 17:45:55 -0400 (EDT)
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] BFO Dial

Funny you should ask, I will explain these funny dials to you and then you will have to self destruct in 60 seconds. The micro dials as they were called were Military stock additions. The BFO micro dials were used for RTTY work. The dial made it easier to set the BFO pitch to center the audio into the RTTY demodulator and thus copy RTTY. The signal corps used them in their RTTY installations. So much miss information OH look the receiver has a micro dial it must have been a spook receiver. No it was a signal corps HF link receiver. The spooks did use them but not exclusively. What are you going to use 10 to 20 for? Try Fair Radio in Ohio to round out your needs. There are other dial counters available if you can not find the micro dials as used items.

Date: Mon, 4 Aug 2014 17:13:18 -0500
From: Raymond Cote <bluegrassdakine@hotmail.com>
Subject: Re: [R-390] BFO Dial

Why call it mis-information Roger? You were not I in Honolulu at Pearl Harbor with me when I talked with the military. They used occasionally RTTY 5 group code to send messages. I used 5 diget grouped codes at sea via RTTY to receive data for ONR in the late 80's when in the Bearing sea. It the had to be decoded manually. I did not have an R 390A then but a Scientific Radio (now Harris). So why not all of the above? There are most likely other reasons and examples. Just my 2cents

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Date: Mon, 04 Aug 2014 18:14:15 -0400
From: rbethman <rbethman@comcast.net>
Subject: Re: [R-390] BFO Dial

These were made by Litton Industries, Potentiometer Division, Part # 1309-00. These sold for the princely sum of $18, according to this box with inside of it is one, factory wrapped, NOS of these. Now I spent a sum of $60 plus shipping, (I may be wrong on the shipping!), and I'd let it go for the said $60 plus packing and shipping. Not sure how many of these you will find. Other than this one in my hand, I have never seen another, but also don't run around looking for them either. Andy Moorer, or Matt Parkinson may be a source for some of them. To the best of my knowledge their procurement and installation was entirely by Uncle Sam. The numbers of which I haven't a clue. I only hope I haven't started an email bidding war on the one I'm holding! That is the VERY last thing I want to do! If that nonsense starts - *I will throw it out*!!!

From: Pete Williams <jupete@internode.on.net>
Subject: [R-390] R-390A BFO --service .

If you are servicing a IF module with non functioning BFO, and suspect someone has been there before you, Take note..... Checking plate and screen might show

incorrect voltages leading to checking caps and R's.
It's not necessarily so and the problem. remains ..... Previous attempts by the ungodly if they have taken out /replaced the oscillator assy. may have transposed the two wires going to terminals #2 and #3. Check with schematic and conform their connection to the tube socket.. Faith and performance restored after a reversal. ..... and whilst on the unusual. , ensure a replacement or even a current installed power xfmr has no obvious corrosion around the ceramic studs. I didn't with result AC input to terminal
#2 blew its stack,, exploded out of the case and took the line filter with it.. ..nasty !

Date: Thu, 28 Aug 2014 16:02:56 -0700
From: Perry Sandeen via R-390 <r-390@mailman.qth.net>
Subject: [R-390] R390A Roofing Filter Kit Update

I have been able to flesh out some more details of the Roofing Filter kit for the R390A. The kit will consist of a Collins 5.7 KHz mechanical filter (P/N 526-8695-010), PC mounting board, two ferrite cores, wire and a copy of the Dallas Lankford article covering the coil winding and installation instructions. For further details of what this project entails, please see the Y2KR3 manual. The target price for each kit is $95 ea. Later on, IF there are enough kits ordered I will make an assembled and tested filter assy available for $175. Delivery time is subject to stock on hand plus the Collins factory
lead time of 6 to 8 weeks ARO so we are looking at a delivery date of late October.

Date: Thu, 28 Aug 2014 20:33:53 -0700
From: Norman Ryan via R-390 <r-390@mailman.qth.net>
Subject: Re: [R-390] R390A Roofing Filter Kit Update

ARO = After Receipt of Order?

Date: Fri, 29 Aug 2014 01:15:58 -0400
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] R390A Roofing Filter Kit Update

As I noted in a previous post (7/30/14), any IF filter added to a 390 or 390A will not be a real roofing filter and will not provide the advantages that a roofing filter can provide to receivers designed with other architectures.

The problem of out-of-band IMD was addressed by Collins and, for better or worse, the design the engineers settled on was the multistage tracking RF that we all know and love. By its nature, this architecture prevents the use of a roofing filter. The Collins engineers COULD (in principle) have added a tracking IF roofing filter, but they didn't -- and you can thank them every time you
align your 390/390A for not doing so.

There is always an improvement in close-in IMD if you use a narrower IF filter -- that is inherent in the nature of close-in IMD measurements. The existing 4kHz and narrower filters already have lower close-in IMD than an added 5.7kHz or 6kHz filter, and they will not be helped by the addition. The only help an added filter can

provide is by narrowing the IF compared to the existing 16kHz and 8kHz filters.

So, if one is going to install a filter narrower than 8kHz, there is no benefit (and there are potential detriments) to putting it in-line with the existing mechanical filters. It would be better to replace either the existing 16kHz or 8kHz filter with the new filter, thus avoiding the insertion loss of the new filter on top of the existing 4kHz and narrower filters when they are selected as well as any unfortunate interactions that might occur between the responses of the 4kHz and narrower filters and the response of the new filter.

Or, much simpler, just use the existing 4kHz filter if you find that you need better close-in IMD performance than the 8kHz and 16kHz filters provide. As noted above, the existing 4kHz and narrower filters already have lower close-in IMD than an added 5.7kHz or 6kHz filter.

From my previous post, lightly edited:

>A roofing filter is an IF filter that sets the maximum bandwidth of
>the system. To be effective, it needs to go as far "upstream" as
>possible in the radio, to keep out-of-band energy out of as many
>stages as possible.
>
>The retrofitted "roofing filters" for boatanchors (and, in
>particular, for the 390/390A) are typically installed much farther
>downstream for convenience, thereby pretty much nullifying most of
>the benefit by leaving all of the preceding IF circuitry
>unprotected. In the case of the 390/390A, because the VFO feeds the
>last mixer instead of the first mixer, the IFs preceding the last
>mixer must be wide enough to accommodate a whole band -- so any
>roofing filter placed where it really needs to be to do its job
>would need to be a tracking filter. In practice, people put what
>they call "roofing filters" after the 3rd mixer, generally ahead of
>IF amp V501 and the existing 455 kHz mechanical IF filters. Placed
>there, the "roofing filter" can clean up the stop band of the
>narrower mechanical filters, but that's it. And since the real IMD
>limitations in a 390A are the RF Amp (V201) and the First Mixer
>(V202), the retrofitted "roofing filter" can't do anything to
>improve the weakest links of these radios.
>
>In sum, the overall architecture of a 390A does not accommodate a
>real roofing filter. People add what they think are roofing filters
>anyway, because they've heard that it is a good idea. It's really not.
>
>In today's band conditions, the existing 8 and 16 kHz filters have
>no practical use, and a 5 to 6 KHz filter is optimal for pretty much
>all AM listening. If I were choosing a filter array from scratch
>today, I'd probably choose 1.5 kHz, 2.1 kHz, 3 kHz, and 6 kHz.

Date: Fri, 29 Aug 2014 08:14:10 -0400

From: rbethman <rbethman@comcast.net>
Subject: [R-390] Roofing Filter

Charles is very knowledgeable in the technical arena, and is due great respect. Dr. Lankford is not without the same knowledgeable technical aspects, and is also due the same respect. I would suggest actually performing an experiment with both possibilities. I believe it would be beneficial to conduct such, and then provide the results. Nothing would be damaged nor hurt to try this comparison. Bear with me, as the more we attempt to improve these wonderful receivers, the greater the collective knowledge is aided.

Date: Sat, 30 Aug 2014 01:45:13 -0700
From: Perry Sandeen via R-390 <r-390@mailman.qth.net>
Subject: [R-390] Lankford Filter Mod

>……any IF filter added to a 390 or 390A will not be a real roofing……..

That may be true but that's not at all what my post was about. I believe the issue is what the filter does or doesn't do for improvement of one's own receiver performance for the money paid. The *roofing filter* mod was real and worked well as an improvement for its intended purpose regardless of its *Purity of Definition*. Whether the receiver improvement was/is worth the time and effort is a personal judgment decision. As this mod requires getting into a small shielded compartment. That is why I recommended anyone considering it to look at the Y2KRE manual article to see if it was something they wanted/could do.

>…..The Collins engineers COULD (in principle) have added…….

I think the key word here is COULD. I'm not technically qualified to comment on receiver design. To me, the word COULD or COULD HAVE means a theoretical speculation of a concept or situation of something that didn't happen. We all do that from time to time on various subjects You have the benefit of your present knowledge and 20-20 hindsight of 50 or so years. OK. However it was a far different world then. Collins worked with what components were available, specifications required: physical, electrical, operational and financial.

I would like to see that with your skill set you would design a plug in DBM first mixer replacement using the LM 1496 for the *A*. I think that it would be a quantum leap improvement. And we have what we have or What it is, what it was, what it shall be?. We can take it, leave it or change it. For me, being 73 yrs old. I think negative second guessing of past designs is a complete waste of the few years I have left before I take the big dirt nap. So here are the facts as I understand them: We have to work within the physical and some electrical limits of the receiver we have unless we want to make a whole new receiver. Some have gone that route. But then it's not a R390A anymore. OK, go for it if that's what you want. Pink paint with a purple boa, neon lites and sparkles? No problem!

Please remember, the roofing filter mod was never stated as a cure for other R390A problems. It maybe that to achieve its best performance enhancement other mods need to be implemented. There are over 10 authors that I'm aware of

whom over the last 20 years who have made design improvements. Some major, some minor. That's why I added 4 additional chapters of data to the Y2KR3 manual. When I can get some more round-to-its or some free help (whichever comes first) I have about a hundred pages of more of proven Heretical Goodness upgrades to issue as a supplement. I have already released a two part schematic that incorporates most of those upgrades for those who want to join the dark side of excellent performance.

Date: Sat, 30 Aug 2014 18:45:44 -0400
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] Lankford Filter Mod

>I would like to see that with your skill set you would design a plug
>in DBM first mixer replacement using the LM 1496 for the *A*. I
>think that it would be a quantum leap improvement.

I'm not sure a "plug-in" replacement is practical. The first challenge with adding any SS circuitry to a 390/390A is getting a "ground" reference into it and providing low-voltage DC power for it. We have seen any number of designs that create LVDC supplies from the resources already available inside the radio, but none of these is a solution I'd adopt for various reasons (hum, excessive loading of power transformer, etc.).

I would specify an additional power transformer to run the DBM, making it not strictly a "plug-in" replacement. There is also the question whether it could be packaged (complete with any necessary heatsink) in the space available over and around the mixer tube socket. The power and ground could go to a connector at the top of the unit, so if it would physically fit the available space it could be "plug-in plus."

There would still be things that could be done better if some further mods to the radio were allowed. Note that high dynamic range active mixers and post-mixer amplifiers draw quite a bit of current and can be sensitive to noise on the power supply, so the power supply needs to be beefy, well regulated, and low-noise.

I would certainly not use an LM1496 as the mixer -- the best you could do with that at the levels required would be at least 20dB noisier than any good design. A passive diode DBM looks attractive, but it would need a post-mixer amplifier, so we're back to the "not really plug-in" issue. Adding a diode DBM and using the existing mixer tube just for post-mixer gain is a possibility, but it's not a "plug-in" solution.

>Please remember, the roofing filter mod was never ……..

My concern is that it doesn't cure ANY problem that simply using the 4kHz filter doesn't cure (or replacing the 8 or 16kHz filter with a narrower filter).

>There are over 10 authors that I'm aware of ……...

Well, changes, yes. Not all "improvements," by any means (judging by

the random selection I've seen, not very many are net improvements). Anyone contemplating making such changes should do their own careful design evaluation to see if the mod being considered is likely to solve any real problem(s) without creating any worse problems. But not everyone who plays with 390s has the engineering skills to do this, so when I see a mod that, based on my design evaluation, (i) would likely solve no real problem, (ii) would likely cause worse problems than any real issue it may help, or (iii) is not the best way to attack the problem, I think it is appropriate to speak up.

>I have already released a two part schematic ……..

Again, anyone contemplating making changes should do their own careful design evaluation to see if the mod being considered is likely to solve any real problem(s) without creating any worse problems. If they have questions about the wisdom of any mod that they cannot determine for themselves, they should feel free to ask on the list. Making a change and observing how it works "on the air" is a useful process, but it takes thorough and systematic testing to see what other aspects of performance may have been compromised or degraded by the change -- things one could easily miss just by using the radio on the air in average conditions.

Date: Sat, 30 Aug 2014 20:33:18 -0400
From: Bob Camp <kb8tq@n1k.org>
Subject: Re: [R-390] Lankford Filter Mod

Not to pick to many nits here, but……. the power transformer as designed should have been capable of running the heaters on the crystals and VFO in the radio. That's not an insignificant amount of power. Anybody running one of these radios with those heaters turned on should turn them off. The have no benefit for a radio running at rational temperatures. Once you have turned them off there should be a few watts to spare off of the filament winding. I suspect that relatively few people are running 26Z5W's rather than solid state diodes. That gives you a couple more watts. Yes indeed you need to be careful about how you turn the AC into DC.

There are indeed good reasons not to mess with a 390A. Not having a couple of watts to spare on the 25V winding for this or that would not be one that I would worry much about.

Date: Sat, 30 Aug 2014 21:04:02 -0500
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: Re: [R-390] Lankford Filter Mod

Thanks for pointing out the power reduction from the heaters being turned off and the diodes replacing the rectifier tubes. I was just about to point out the same thing.

Any sort of solid-stated-ness additions for specific enhancements could easily draw power off of that circuit. You could either down-regulate the 24 VDC supply that drives the antenna relay or even stick in a tiny power transformer to isolate the AC side and create a tiny little DC supply to run whatever project you have in there. I

cannot see any sort of digital addition drawing more than a half-amp from the DC supply, more than enough headroom is available after you pull the rectifiers and PTO/ crystal oscillator heaters.

The most I could see would be if you did something like a solid state audio mod or maybe some sort of amplifier to compensate for insertion loss on the filter (milliamps for that one at the most).

I do have a Collins helical filter as a roofing filter mod in place on my prime receiver. Perry had asked me to provide the winding details on the ferrite transformers but it was so long ago that I lost the files I had that described what I had come up with. Originally I tried to be all professional-engineer about it but ran into problems that you could not make any assumptions about the actual impedance of the RF or IF deck.. much less that stupid mini-bayonet/ coax setup. I had already modified my radio to use RG-174 coax and SMA connections so anything I had done was useless for y'all to copy, unless you did all of the cumulative mods I had in place.

I found it best to wind ferrites and measure insertion loss, then pull one winding off of the ferrite transformer, measure again and plot it, pull another winding off, measure and plot it... until I found the sweet spot. I do not remember what I ended up with. Without my little spreadsheet that I plugged all of that data on to I cannot reliably give you numbers to work from and as I said, they will be different with the other things I have already done to the radio. It turned out that empirical data from experimenting gave me better results and was actually more fun.

Perry and I spoke a few months ago about the roofing filter mod and what sort of improvement I saw. It is not an earth shattering type of improvement. I can detect it with a sweep generator and a spectrum analyzer on the IF output. This is also complicated by the fact that my best IF deck had Clevite ceramic filters instead of the coil, disk and vibrating needle mechanical filters. My spare IF decks use the old sort of filters but they do bench duty on my second radio or are working spares on the shelf.

I have even dinked around with the stagger tuning on the IF deck and increased shielding between stages on the IF deck. Added PI filters between stages on certain lines, fingerstock on the chassis. Added the squelch facility, made audio mods. It is all rather complicated and only someone crazy would do what I have done with that radio.

You want to know the rub? I have not made such a big difference in the radio that I would wholeheartedly endorse someone else going through all of the bother. Is it better than it was? Yes. Enough to justify the cost and time? No. I can always go power up an RF-590 or a Cubic, Racal or Watkins Johnson if I want to go listen to electrons getting intimate out by Jupiter. The improvements are all subtle little things that are apparent on a bench full of test equipment and are as easily nullified by one tube getting a bit soft.

Date: Sun, 31 Aug 2014 03:25:17 -0400
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] Lankford Filter Mod

>…… turned [the heaters] off there should be a few watts…….

It's not just a matter of the load on the transformer. To be truly "plug-in," a replacement would have to run on the 0 and 6.3vac supplied on Pins 3 and 4 of the V202 socket. This means it would of necessity be a half-wave supply (ugh -- exactly the wrong way to go for high current and low ripple, and a design compromise I will almost never accept). It also forces you to use the chassis ground at the tube socket, when some other ground point for the mixer
circuitry may be better for low noise. **

If you allow use of the 26vac winding, you either re-wire the tube socket (leaving a booby trap for anyone who later replaces the new mixer with an original 6C4) or provide another connector for power. And if you accept adding another connector, why use the internal 26vac with one end grounded when you can just add a small transformer and have exactly the AC supply you want?

>I suspect that relatively few people are running 26Z5W's rather than
>solid state diodes.

I've been under the hood of several hundred 390As, and about 70% of
them still have 26Z5s.

Date: Sun, 14 Sep 2014 18:02:12 +0300
From: Grayson Evans <wa4gvm@gmail.com>
Subject: [R-390] The BFO pitch counter dial?

I picked up another R390A at the junk yard. Not too bad a shape, insides look very good. It is a Motorola unit with what looks like a brand new Cosmos PTO.
This unit has a multi-turn counter dial on the BFO pitch. I thought it was a mod the last owner installed, but it seems to me, I read something about this mod somewhere, but can?t remember where or what it was. It was built for some government agency? I can’t think why anyone would want this mod to tune the pitch. Anyone have a clue on this?

Date: Sun, 14 Sep 2014 10:16:31 -0500
From: Cecil <chacuff@cableone.net>
Subject: Re: [R-390] The BFO pitch counter dial?

BFO fine tuning for RTTY..

Date: Sun, 14 Sep 2014 11:46:21 -0700
From: Ryan Scott <n7qj.rs@gmail.com>
Subject: [R-390] AGC voltage issue

Having been a lurker for the last 7 years I am finally getting around to working on the 12 or so R-390a's I have. I have one R-390a that I use as a test bed for testing the rebuilt AF and IF modules I have worked on.

The original IF module in my test bed works fine, (EAC '64 which I did replace all

brown beauty caps). I recently completed working on an Amelco IF module which I replaced all the capacitors (brown beauty) but also found many of the resistors had increased in value well beyond the 10% tolerance so I replaced those. So after all that work, I place the module in the test bed and it seems to work fine for about 10 min. Then the audio drops out. Still have reception, gain and RF gain make some difference in audio, and BFO works.

Subbing several tubes have not solved the problem.

Here's what odd. From a cold start, the IF deck works good. If you move the function switch to standby and back to AGC, the audio drops out (again still have reception) and the AGC voltage drops to ~200mV. When the radio is cold, the AGC voltage is 2V..So why does moving the function switch kill the audio?? Could it be the big 2uF cap on the IF deck? Slow/med/fast AGC do not change anything, same with MGC.

I'm certain it's the IF module since swapping the test bed IF module back into the radio the problem goes away.

I have triple checked the parts I installed and R5's tube sockets and tightened some of the grounding points. The IF deck is using a 12BH7 in place of RT-150 but since that is for the BFO and PTO I don't see how that can be an issue.

I'm going to start looking in the archives and the Y2K R3 manual (Thanks to all who wrote that!) for clues, but in the meantime has anyone seen this when moving function switch from AGC to STBY and back to AGC?

Date: Sun, 14 Sep 2014 14:23:10 -0700
From: "Craig Heaton" <hamfish@efn.org>
Subject: Re: [R-390] AGC voltage issue

Could it be the big 2uF cap on the IF deck? YES is my answer. If you have a capacitor analyzer, test that cap at rated voltage! My wager says the insulation resistance is about zip, nada, zero. I haven't found a good one yet. One replacement is a NTE mylar cap 2uF MLR205K630.

Question: Does the IF gain change (-7VDC @ 150 microvolts;455KC) with this drop in audio?

Date: Sun, 14 Sep 2014 16:42:22 -0700
From: Ryan Scott <n7qj.rs@gmail.com>
Subject: Re: [R-390] AGC voltage issue

After reminding myself I do this for fun a few times I managed to have the IF deck hooked up where I could poke at it from underneath. I found C553 (someone else before me replaced, but I removed to replace a few parts then put it back) was really sensitive to tapping, even lightly. The audio (and subsequently the AGC voltage) would come up to about 0.5V then would drop if tapped again. Really sensitive on the lead to the inductor. (I think my removing one lead to move it out of the way and then putting it back may have had something to do with it). So I replaced the cap. The issue where

putting the function switch in standby and then moving back to AGC killing everything went away and it's no longer sensitive to tapping and prodding, but compared to 2 other IF modules, the gain is really low. (low audio) AM BCST is acceptable, but WWV @15MHz on this IF Deck is weak. (ACG voltage on strong AM BCST is ~ 0.5V while WWV is 0.2V) . It's possible to that someone was messing with the transformers as well so it probably needs an alignment which I will read up on.

I removed the wire from R507 to verify the filters are not pulling down the AGC voltage (I read this in Y2K R3 manual) and the results were the same with the resistor connected and if it was not connected.

I checked the 2UF cap of course not at the rated voltage but it seems OK. The schematic shows if I have the AGC set to Fast, the cap is not connected to anything. Moving the AGC switch and even MGC seems to make no change.

I agree at this point I'll need to scrutinize everything I did which was to replace almost every resistor (I think 10 or so checked OK) and all the brown beauty caps... I'll put it aside for another day when I feel like circuit tracing it to try and find the reason for the low gain. I have found that I can put a piece of cardboard and rest the IF deck on it's side near the back of the radio and get to the underside. I'm not yet ready to sacrifice another radio to make an extender cable yet. (I have one connector, but not the mating connector)

Oddly, on every IF deck I've looked at (3 so far), I've found the gain control fully cranked. is this common?

On Sun, Sep 14, 2014 at 3:36 PM, Larry H <dinlarh@att.net> wrote:

> Hi Ryan, Since you have both audio loss and agc loss, it's probably in
> the 1st to 3rd IF. Any problem in the agc only circuitry that reduces the
> agc voltage only, would normally cause the audio to increase.
>
> BTW, did you put in a good cap for C553, the filter killer.
>
> Regards, Larry
>
>
> On Sunday, September 14, 2014 2:32 PM, Larry H <dinlarh@att.net> wrote:
>
>
> Hi Ryan, It sounds like you've got a bad solder connection or an
> unintended short somewhere. I'd closely inspect all of the connections you
> did, which sounds like quite a few. If that yields nothing, then try
> measuring some voltages or signal levels in appropriate places. If the agc
> line is getting loaded to ground, you'd probably see louder and distorted
> audio, so its probably loss of IF signal before the agc amp.
>
> Do you have the 'test' cables so you can operate it outside the chassis?
> If not, you can use 'tube extenders' to get at most of the points you need

> to check.
>
> Regards, Larry

Date: Sun, 14 Sep 2014 17:31:59 -0700
From: "Craig Heaton" <hamfish@efn.org>
Subject: Re: [R-390] AGC voltage issue

The 2uF might test at a value of 2uF, but that is just part of the issue. Poor insulation resistance at rated voltage will equal a short. No matter the position of the AGC switch or if the Function switch is at AGC or MGC; one end of C551 is connected to the grid of V506A. A bad C551 will cause problems.

The IF decks played with here in Springtucky, OR; the IF gain pot R519 is somewhere/just about/near 80% counter clockwise when life is good. (-7VDC @ 150microvolts/455KC)

The "Too Loud Amelco" in the shack has been a problem child! The quality control of assemble & component quality are lacking, nuf said. Go thru that IF deck with a fine tooth comb. Break out the soldering iron and melt every connection possible. Take the covers off of the transformers and look for wires that might be touching the cover or the wrong component under said cover. Find a set of tube extenders for the joy of working on boat anchors.

Date: Sun, 14 Sep 2014 18:45:21 -0700
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] AGC voltage issue

Hi Ryan, Sounds like you solved 1 of your problems. Great.

As for the overall gain, the pot R519 should not need to be at max - something wrong if so. Check gain in the 1kc position (no filter). If its better, look at the filters, check 2, 4, 8, and 16. If all bandwidth positions are about the same, then the filters are probably OK.

In ref to C553, there are some .01's you should not use. See the discussion in this list in August by Charles Steinmetz. Allied and Mouser carry a good one 715P10356KD3 for a few $. Or I could send you one.

Also, the test cable connectors are available at Fair Radio and other places - no need to cannibalize anything good.

Date: Sun, 14 Sep 2014 19:55:03 -0700
From: Ryan Scott <n7qj.rs@gmail.com>
Subject: Re: [R-390] AGC voltage issue

Many Thanks for the advice. Sounds like you played this game before! I am surprised as the 2 other EAC IF decks the resistors are in tolerance (although close to 10%) but that AMELCO every resistor was way off. Guess they used another component vendor.

For C553 I'm using a Vishay Poly Film 0.01 @ 630V. (yellow jacket type) (Newark MKT1813310635G) I'll check out your recommendation and get some on my next parts order.

I found that I replaced C548 with a 0.01 instead of a 0.1... That's in the AGC circuit! but, no joy on that. Still the same, really low audio. I did compare voltage readings with the good IF vs. the bad IF and my trouble seems to start at V504, pin 2. (3.8V on bad IF, -2.1V on good IF) Of course the detector voltages are different as well, likely due to low gain. But if the gain is low, and the detector voltage is low, then one would expect to have AGC off a bit.. I'm going to study up and tackle it again soon.

Time to wind down and get ready for another full week of work and everything else.

Date: Sun, 14 Sep 2014 23:09:45 -0400
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] AGC voltage issue

Cold solder joint in an IF transformer bumped around by all the other work.
You can pull the can tops and re solder the coil wires on the assembly corner post strut wires.

Put a good IF deck back in the test receiver.
Use an isolation cap between the signal generator and the If deck.
Pull a tube.
Insert 455 to the plate pin of the tube socket.
Determine how much signal is needed to drive the diode load to -7 volts DC.
Write the tube number and signal level down for reference.
Do every tube in the signal chain of the IF deck.

Now put the problem deck back in.
Wait for it to fail.
From the back to the front:
Pull a tube
Insert a signal
Decide if the stage being driven is good or bad.
Remember you are going into the plate output of the prior stage.
So you get the coupling cap into the next stage and the next tube stage.
Isolate the problem to one tube stage and analyze.

It could be a bad new cap or resistor or solder joint.
But you need to work it down to a stage so you only have a few parts to fret about.

Date: Sun, 14 Sep 2014 21:17:19 -0700
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] AGC voltage issue

Hi Ryan, Yes, you're right on the pos voltage there. If the IF sig is very low, then the agc delay bias R544 can make it a little pos (about .2v), but not what you're seeing. However, since the agc and audio are still low I think I'd focus on the gain of IF 1, 2

and 3. Good luck.

Date: Mon, 15 Sep 2014 00:54:52 -0400
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: [R-390] AGC troubleshooting

Here is a guide to AGC troubleshooting (I've posted this before, each time with some minor revisions):Best regards,Charles

R390A -- AGC troubleshooting procedure:

Throughout this entire procedure, the "FUNCTION" switch should be set to "AGC."

First, make sure there is a jumper installed between TB102, Terminals 3 and 4. If not, install one and see how the radio works now.

Set the AGC to "MED" and tune the radio to a good, strong, local signal (like a strong AM broadcast station). Measure the DC voltage at TB102, Terminals 3 and 4 with a high impedance meter (VTVM, DVM, or scope, with an input resistance of >= 1M ohm; *not* a VOM). It should be significantly negative, -10v or more. If it is, you have no gross AGC problem and the fault lies elsewhere. But if the voltage is only weakly negative, or zero, you have an AGC problem. If so:

Turn off the radio, and pull the power plug. Set the AGC time constant to "MED." Remove the jumper between TB102, Terminals 3 and 4. Measure the resistance to ground from each of these terminals. Terminal 3 looks back into the AGC detector, and should read in the neighborhood of 500k ohms due to R545, R546, and R547. Terminal 4 is the AGC line feeding the RF and IF circuits and should read approximately 1.8M ohms due to R201 and R234. If you unplug P108 from the RF deck, Terminal 4 should then read essentially
infinite (>10M ohm).

If you have gotten to this point, one or the other of these Terminals will probably show a much lower resistance to ground than this. Trace the circuit to find the leaky component(s).

If Terminal 3 reads less than ~500k ohms, the usual suspects are C551, C548, C547, C545, and C544.

If Terminal 4 reads significantly less than ~1.8M ohms, the usual suspects are any of the several dozen bypass caps on the AGC line in the IF and RF sections, or leakage to ground in one or more of the mechanical filters, or (much less likely) leakage to ground due to contamination of the fiber insulating washer on the shaft of the antenna trimmer capacitor. It is also possible that the sector of the "FUNCTION" switch that shorts Terminal 4 to ground when the switch is set to "MGC" or "STAND BY" is mis-timed, broken, or
contaminated/dirty, but this is even more unlikely.

If, on the other hand, the resistance readings are OK, suspect V508, V509A, and associated circuitry (Z503 and C546, especially).

The R390 is very similar, although the part numbers are different.

Date: Mon, 15 Sep 2014 20:02:40 -0700
From: Ryan Scott <n7qj.rs@gmail.com>
Subject: Re: [R-390] AGC voltage issue

Thanks so much for your help so far. I took note of the AGC troubleshooting post by Charles. With the Good IF Deck, I get about -7V AGC with a strong AM BCST station. The resistance readings appeared funny - I read -2.7M ohms. Hmmm. Had some residual voltage on the AGC line that was messing up my reading (I'm using a Fluke 87 DVM).. Once I removed C551 from the circuit the readings were in the ball park. This module is good but will get a C551 replacement - Craig stated this could be bad, see below.

The Bad (Amelco) IF Deck has -0.182V AGC that does not move at all for anything. The resistance readings are in the ball park as well. I'm suspecting low gain in the circuits of V501-4 and will use Roger's advice to troubleshoot that. C551 in this IF deck seemed more normal, it only had 0.05V across it.

So this C551 on my good EAC IF Deck: When I removed it from the circuit it has 0.6V across it. When you short it, the voltage goes away. When you remove the short, the voltage is back. Reading is about 10M ohm (one way, less the other) So I'm thinking this cap is BAD. Does anyone think it's good? I mean this residual voltage that won't go away.... I have a Sencore LC502 that should be able to test it at it's rated voltage but I have only done the test with a DMM thus far.

I remember seeing on the messages sometime before about replacements for C551.. But I have to ask, is a 500V cap necessary? I have (2) 1.0uF @400V in my junk box. The B+ is only ~210V and the AGC voltage is much less.

Date: Mon, 15 Sep 2014 21:00:32 -0700
From: "Craig Heaton" <hamfish@efn.org>
Subject: Re: [R-390] AGC voltage issue

Good to see some progress. I'll just chime in on C551. The Collins engineers did a pretty good job and I'll not second guess them, use a proper replacement. The NTE cap I suggested has been working in several of my R-390/A's for years. From memory, it has a 630 volt rating and in that circuit a mylar cap is good. It will fit either under the chassis or inside of an old C551.

There might be other caps that will work, but since there is a electronic parts store in Eugene, OR., which handles NTE parts; I spent $$ to support local mom & pop stores.

Date: Tue, 16 Sep 2014 02:41:57 -0700
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] AGC voltage issue

Hi Ryan, Good progress. Yes C551 is a problem cap and it looks like you have

some bad ones. It's definitely bad if its changing any voltage readings (that's unacceptable leakage). It must have more than 10,000 Meg ohms at 300V or its definitely bad (that's .03 micro amps of leakage). And the same from each contact to ground. And even if it does have that, it's on its way to being bad. There should be no measurable leakage.

The 500V criteria is just a longevity consideration - higher voltage caps usually last longer. A good 400 V cap should be just fine. All of the caps in the agc line must be very good in order for it to work properly.

A quick cap leakage test that I use is hook one end (correct polarity) to a high voltage supply at working voltage and the other end to a 10k res to a microamp meter and see what gives.

Date: Tue, 16 Sep 2014 08:54:50 -0400
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] AGC voltage issue

>….. When you short it, the voltage goes away…….

It's bad, replace it. You may have caught it just before it expired with finality, so it may not make much if any operational difference. But if you don't replace it, you'll be back inside again very soon.

>I remember seeing on the messages sometime before about replacements for C551.. But I have to ask, is a 500V cap necessary?

If you switch the radio on from cold straight to Slow AGC, depending on how fast the power supply comes up and how long it takes V506A to warm up, C551 could see the full power supply voltage across it for a short time. Because the radio uses a choke-input power supply (search the archives for "choke input" for discussions of the implications of this), it is possible for the B+ to be >400v for a short while at startup. This is worse in radios in which the tube rectifier has been replaced with solid state diodes (and it is not helped by putting a resistor in series with the SS diodes). So, I'd stick with a 500 or 600v cap. As ever, I caution against using a metallized film capacitor -- use only a film-and-foil cap like a Series 225P Orange Drop or equivalent (for much more on this, search the archives for "film-and-foil" and "self-healing").

Date: Tue, 16 Sep 2014 08:19:48 -0500
From: Tisha Hayes <tisha.hayes@gmail.com>
Subject: Re: [R-390] AGC voltage issue, erratic readings

Well, your DVM is also interacting with the capacitor and the resistor and cap are working together to create an RC circuit. You will not get a true reading of the resistor because your meter is using a DC potential to make current flow through the resistor and then measuring the current through the DUT (device under test). The meter than takes this precision voltage, along with the measured current (or voltage drop across a precision resistor in the meter working as a shunt) to do ohms law and figure out

the resistance.

I bet if you watch it you will see the resistance starts as one thing and then starts to climb or fall. That is the resistor charging up. Depending upon if it is a series or parallel or complex circuit you can see all sorts of weird things happening. The only accurate way to get a reading is to test the resistor by itself, away from the influence of other components that can take a charge or transform the energy. (meaning, magnetics with inductors).

That is one of the reasons on why I really liked some of the old tube based models of HP voltmeters. They used AC voltage to do the measurement and did not exhibit this charging effect as readily

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Date: Tue, 16 Sep 2014 09:35:39 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] AGC voltage issue

>…….. and "self-healing"…….

Self-heal events (characteristic of metallized film) are harmless in C551, the AGC Time Constant cap. It's C553 (mechanical filter coupling) that needs to avoid them. By the way, if you're replacing C551, look up my mod that removes the "Moment of Silence" behavior. It's in the Y2KR3 Manual, chapter 11. It abandons the original cap, which saves you the aggravation of restuffing it.

I too have seen caps playing "battery". In my case it was an electrolytic. I guess that impurities attacked the electrodes. I would never have noticed except it was upsetting a low-level DC circuit. (Galvanometer section of a Fluke 540B AC Transfer Standard.) In your case, it's innocuous, but the leakage that is certainly also present is a deal breaker. Terminate with prejudice.

Date: Tue, 16 Sep 2014 17:59:46 -0400
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] AGC voltage issue

>……But I have to ask, is a 500V cap necessary?……..

400V should be OK

Date: Tue, 16 Sep 2014 20:11:12 -0400
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] AGC voltage issue

>Self-heal events (characteristic of metallized film) are harmless in
>C551, the AGC Time Constant cap.

While the radio is operating normally, that may be so (although C551 can end up with >200v across it with strong signals, as you noted in your AGC article, and my tests indicate that a metallized film cap of any voltage rating has self-healing events above 200v). But during the startup condition I described in my message, C551 may

have >400v across it for some seconds every time you turn on the radio, positively ensuring that there will be self-heal events.

If your point is that self-heal events at this location would not matter even if they occurred, I disagree. Any self-healing current would flow through the grid of V506A. Cumulative occurrences would damage V506's cathode.

Date: Tue, 16 Sep 2014 19:12:43 -0700
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] AGC voltage issue

Hi Ryan, The reason I though a 400v rating would be ok for C551 is that the caps in the power supply and most in the audio deck are rated at 300v. I think the reason they are not rated higher is that the power supply is a 'choke input' and the voltage regulator is active immediately (putting enough load on the rectifier to minimize the initial 'power on' high voltage condition you see in many other power supplies). Granted my 2 R390a's here have 26Z5's, so I don't see instantaneous B+, but my B+ comes on quite fast. It goes to 260v very quickly and then holds at 250. I used my 11 megohm VTVM to measure the voltage at F103 so as not to load the voltage down. Even if you have the SS recs, I don't see this changing much because of the design mentioned above.

Date: Tue, 16 Sep 2014 20:18:20 -0700
From: Ryan Scott <n7qj.rs@gmail.com>
Subject: Re: [R-390] AGC voltage issue -- SUCCESS!

Having spent another few hours circuit tracing this AMELCO module, I discovered the gain from V501 (measured on the switch side of C553) was in the dirt. All the other stages had decent gain when compared to my good EAC module.

Further tracing and comparisons to the good EAC module revealed ***L505 shorted***! on the good EAC module, the DC resistance of this coil was around 74 ohms, on the AMELCO it was a short (about 0.5 ohms)... I tacked in a 10mH inductor from the junk box and I now have loud audio and about -8V AGC with a strong AM BCST station.

It all makes sense now as to why the signal was barely there on the output of V501 on the other side of C553. But what caused the inductor to short? Previously, I mentioned the original C553 was sensitive to tapping. It's connected to the inductor. Once I replaced the cap, the intermittent audio issue went away and I was left with low audio. I'm suspecting the unsoldering and re-soldering multiple times caused it to short, and my final soldering caused it to fail?

At any rate, I will clean this module up and replace C551 with a voltage equivalent cap and move on to the next module or radio. (I have 11 R-390a's, one is fully restored and working great [ebay purchase], the others are well, work in progress as they say).

Thanks again to all on the list for the help. This, along with all the resources on the net is what drew me to these radios -- and to be able to actually work on something without surface mount devices. (I work as a RF analog semiconductor test engineer at MAXIM Integrated).

All these resources and interest from the group will keep these radios playing for another 50 years.

Date: Tue, 16 Sep 2014 23:30:09 -0400
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] AGC voltage issue

The regulator circuit does not draw anywhere near enough current to hold the initial voltage surge down (see previous posts in the archives about choke-input filters). If your B+ does not exceed 260v, it is because the 26Z5 cathodes warm up more slowly than the other tubes in the radio (the current drawn by all of the other tubes, even when they are only partially warmed up, is enough to provide a sufficient load to hold the B+ down with the choke-input filter). And that is how it is supposed to work. However, some 26Z5s warm up much quicker, and if they have been replaced with SS diodes the rectifiers are active immediately, so the voltage rises until all of the tubes have warmed up and are conducting. (Also note that if you switch the radio to Standby, the B+ rises because the load is removed.)

Depending on how you measure the B+, it is also possible that the indication you see may lag and integrate the actual voltage (i.e., your measurements could be under-reporting the actual peak). The time constant of a VTVM can miss this transient (due to both the R-C noise filtering and the electromechanical ballistics of the d'Arsonval movement).

Best regards, Charles

ps. I don't understand why so many people seem to want to get by with substandard parts, and why there is so much resistance to doing things right (e.g., using a capacitor that is rated for less voltage than it may see in operation, or using metallized film rather than film-and-foil caps where the voltage could exceed 200v). Jeez, people, just buy the right part and use it. IMLTTO, anyone who whines about the cost of the right capacitor, or that they can't fit it into the old can, doesn't deserve to own one of these fine radios. They should sell it to someone who will treat it right and take up stamp collecting.

Date: Wed, 17 Sep 2014 06:57:24 -0700
From: "Craig Heaton" <hamfish@efn.org>
Subject: Re: [R-390] AGC voltage issue

Amen,..... PS: from Craig: it is their radio, time, & money

Date: Wed, 17 Sep 2014 10:27:42 -0400
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] AGC voltage issue

Put another way, there is simply no excuse to design for best-case conditions. Competent design always focuses on worst-case conditions. Replacing C551 with a capacitor rated at <450v, or with a metallized-film capacitor of any voltage rating, is designing for best-case conditions.

Date: Wed, 17 Sep 2014 11:03:51 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] AGC voltage issue

You have forgotten something.
Max current is less than 5mA due to R549.
["Best-case design" rant snipped]
I won't hunt you down for using film/foil! <g>
I can appreciate the satisfaction of using the best materials money can buy.
But only at a distance.

In this particular case, my personal cost-benefit meter is firmly pegged at the Cheap end of the scale. My C551 is, and will remain, metallized. There's another satisfaction in being Just Good Enough.

Date: Wed, 17 Sep 2014 11:07:41 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] AGC voltage issue -- SUCCESS!

Congratulations on a successful debug run.
You didn't know. Now you do. And you figured it out yourself.
Doesn't it feel great?

Date: Wed, 17 Sep 2014 11:15:40 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] AGC voltage issue

Talk about synchronicity. An auto-email from Design World just plopped into my inbox. Lead article: The Era of Designing Defensively

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Date: Wed, 17 Sep 2014 12:21:06 -0700
From: Norman Ryan via R-390 <r-390@mailman.qth.net>
Subject: Re: [R-390] AGC voltage issue

Is this the link you refer to?
http://www.designworldonline.com/era-designing-defensively/

Not directly germane to R-390 design, but an interesting read on defensive design in the computer era.

Date: Wed, 17 Sep 2014 14:29:54 -0700
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] AGC voltage issue -- SUCCESS!

Good work Ryan!

I knew you'd find it in IF 1, 2, or 3 as I suggested.

Date: Thu, 2 Oct 2014 17:00:44 -0700
From: Alan Victor <amvictor@ncsu.edu>
Subject: [R-390] R390A AGC Troubleshooting technique.

Currently in the process of troubleshooting the AGC in the R390A. The sensitivity on all bands is about 5 uV some bands better than 1 uV. The unit needs alignment. However, the AGC is clearly absent. The largest negative AGC voltage seen is about -5 V at 3-4 terminal. I will be looking at all the known documented causes from mechanical filters to leaky caps, open xmfr's,
bad tubes and so on. However, my question is about a troubleshooting technique documented in the Army TM. There they suggest opening the
AGC loop and provide a negative supply to the AGC line, terminal 4, from -10 to 0 V. If all the AGC lines to the first RF AMP and all 3 mixers track this forced AGC line, then those stages are probably ok.Further, they suggest without details, that should assist in tracking down the issue of the AGC circuits on the IF subchassis. I believe I would monitor termnal 3 as this would be the feedback AGC voltage. Is this correct? I see in the Y2K book, their was a request for evaluation of a good AGC line current. That would be helpful. Was that ever documented? Thank you reflector in advance!

Date: Thu, 2 Oct 2014 20:32:06 -0400
From: djed1--- via R-390 <r-390@mailman.qth.net>
Subject: Re: [R-390] R390A AGC Troubleshooting technique.

I would think the source impedance of the AGC voltage would make a big difference. A fairly low level of leakage in an AGC capacitor would pull down the normal AGC line, but would have no effect on a regular power supply. Maybe if you fed the PS voltage through a 1 meg resistor you'd get a better idea of any problems. (I believe the RF stage AGC line is grounded through a 1 meg resistor, so you would expect some voltage drop with the setup I've suggested.
I haven't tried this, but I slept in a Holiday Inn Express last night.

Date: Fri, 3 Oct 2014 08:06:58 -0400
From: "Bill Riches" <bill.riches@verizon.net>
Subject: Re: [R-390] R390A AGC Troubleshooting technique.

Check R546 - 180k off pin 1 of V509 and R 506 - 220k of pin 2 of V506. I have had them change value higher and kill agc operation

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Date: Fri, 03 Oct 2014 10:46:43 -0400
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] R390A AGC Troubleshooting technique.

>my question is about a troubleshooting technique…….

I'm not sure what you mean by "a good AGC line current." The AGC line resistance to ground is determined by several resistors. Terminal 3 looks back into the AGC detector, and should read in the neighborhood of 500k ohms due to R545, R546, and R547. Terminal 4 is the AGC line feeding the RF and IF circuits and should read

approximately 1.8M ohms due to R201 and R234.

So, if there is -10v on the AGC line feeding the RF and IF circuits (i.e., at Terminal 4 with Terminals 3 and 4 disconnected), the current will be 10v/1.8M, or 5.6 uA. Any other current is the result of leakage to ground from any of a large number of possible paths, or grid current from the controlled tubes. But you don't need to measure currents (or even know what they are) -- just measure the resistance of Terminal 4 with the radio turned off. If it is less than 1.8M ohm, use the ohmmeter to find the leakage, and fix it. If it is ~1.8M, then you probably do not have any problem with the AGC line feeding the RF and IF circuits.

Note that if you are getting -5v on the AGC line, the leakage is relatively minor -- you don't have a 10k ohm or less leakage path (if you have an AGC leakage problem at all).

What is the measured resistance from Terminal 4 to ground (with Terminal 3 disconnected)? What is the measured resistance from Terminal 3 to ground (with Terminal 4 disconnected)?

Date: Sat, 4 Oct 2014 02:35:22 -0500
From: Raymond Cote <universal_comm@reagan.com>
Subject: Re: [R-390] R390A AGC Troubleshooting technique.

Charles and all, in R390A school all that was specified was to check out the caps on the AGC line. Many are really hard to find. Oh, and then they said, "by the way ring out the resistors. "

Date: Sun, 5 Oct 2014 18:43:38 -0700
From: Alan Victor <amvictor@ncsu.edu>
Subject: [R-390] Fwd: tuning tool for Z503

For further documentaion of this thread, forward to qth address.
---------- Forwarded message ----------
From: Alan Victor <amvictor@ncsu.edu>
Date: Sun, Oct 5, 2014 at 6:59 AM
Subject: Re: [R-390] tuning tool for Z503

Thanks Craig and others for the heads up and good info. Yes, I have the Y2K manual and Chucks video series as well as the Army TM. The Y2K Ch6 is clear and a quality job. I was able to fashion a tool for Z503, the tune peak is broad and not much improvement in AGC negative V at large signal input. Another measurement on the Z of TP3 point of the AGC shows 380k-400k ohm and the charge up shows AGC caps present but certainly not 500 k plus ohms. So either a R is out of spec somewhere or the AGC caps, bypass caps or both are leaky. One more measurement with the AGC feedback open and controlled with an external supply should shed perhaps some light. I did monitor the E208-E211 grid voltages while looking at the AGC V and they tracked quite close. So I do not suspect an RF deck issue yet. The radio is functional on all bands now, AM sounds great, and there is some AGC action for sure. Just not quite enough to prevent overload particularly on CW signals. In any case, after the IF deck is inspected and I am reasonably happy

with the electrical, I will then tear the whole radio down and begin the clean process.

On Sat, Oct 4, 2014 at 5:44 PM, Craig Heaton <hamfish@efn.org> wrote:
> These beast have been around for a while, maybe abused? With the IF deck
> out of the receiver, take all the covers off from the IF transformers. With
> a magnifying glass if necessary, look for wires touching things they should
> not. Z503 just has a single slug, and uses litz wire as a winding. I?ve
> found strands touching the cover on Z503. The other IF transformers will
> have resistors & caps inside. Make sure all is kosher.
>
> Just a suggestion: Follow the Y2K manual, chapter #6, almost to the
> paragraph as to what is next to adjust. There are a few items that can be
> looked at later, but not many. After getting the IF & RF in alignment, then
> go back and fix those pesky bugs. With the IF & RF peaked and adjusted per
> the manual, the other bugs are easier to find.
>
> *From:* Alan Victor [mailto:amvictor@ncsu.edu]
> *Subject:* Re: [R-390] tuning tool for Z503
>
> Yes that makes sense. The transformer I am after right now is actually
> just a tunable L, namely Z503. Trying to double check an AGC issue and to
> be sure that I am not seeing a miss tuned plate load Z on the AGC IF amp.
> However, further measurements are pointing more towards a leaky cap or a
> grid bias way out of line due to major shift in grid resistor value(s).
> T503, 501,502 etc... I can see where I need to be able to tune primary and
> secondary independently.
>
> On Sat, Oct 4, 2014 at 4:24 PM, Craig Heaton <hamfish@efn.org> wrote:
>
> Went out to the shack for a look at my tool. Got it from Radio Shack years
> ago. I doubt they handle them today. As close as I can measure with a mike
> and converting to a fraction, (0.095) 3/32 of an inch is about it. Do a
> search on Google and you might still have to place a phone call. It is
> important the shaft is smaller in diameter than the hex portion, so both
> slugs can be adjusted independently of each other.

Date: Tue, 7 Oct 2014 18:54:11 -0700
From: Alan Victor <amvictor@ncsu.edu>
Subject: [R-390] Further AGC measurements

I completed some more AGC measurements and have some clues. However, bottom line, ready for a module pull and mainframe breakdown. For the record though, I found the following:

Monitor the AGC TP3-4 points with VTVM. That AGC voltage tracks AGC feed to the RF amp, and the three mixer grid control AGC voltages within 0.2 V. Still the AGC value always low even on large RF input of 150 uV/30%modulation.

First a careful Z measurement again on TP 3 shows ~ 380K. Clearly less than the desired 500 K. Possible issue here.

Next, look at all the series grid R values from RF amp and all mixers. The values are all on target, except for the RF amp, its 50 K to large! Measured over 500 K. Possible issue here.

Finally, the most interesting measurement, with the AGC loop open. Function switch is set for the AGC ON, MEDIUM time constant. The AGC control line is fed via an external power supply with series 10K R to pin4. The RF input level is 150 uV/30% AM mod, now I can easily control the AGC line so that -7 V (AGAIN AGC OPEN LOOP) is generated at TP3 and the carrier meter comes alive.
Larger input RF level can readily drive the AGC line pin3 to over -12 V.

So the AGC circuit (OPEN LOOP) is functioning. Clearly, with the AGC loop closed it is not. Either the AGC source Z is not nearly low enough to source the required current (includes leakage) or the leakage which is present is larger than desired for proper AGC action.

I think it would be helpful to measure the actual power supply current when this experiment is run. That would confirm that the current required by the AGC loop closed is just to high to support a functioning AGC.

Date: Tue, 7 Oct 2014 19:49:25 -0700
From: "Craig Heaton" <hamfish@efn.org>
Subject: Re: [R-390] Further AGC measurements

A couple of questions, sort or wondering if the cart is in front of the horse? Going back thru this thread on the R390 e-mail reflector & AM Forum, have you replaced the BBOD's & electrolytic caps yet in the entire receiver? Have all the switches been cleaned? There are so many of those little got-ya's which should be addressed first. Have all the variable IF & RF transformers been removed/cleaned so there is good pin contact?

I'm rather new playing with these R-390/A's, it takes me about two weeks of cleaning, replacing old caps, etc., before any mechanical or electrical alignment. After which comes all the bugs to track down. (poor grounds, bad pots, leaky caps, more out of speck resistors)

Should the module pull & mainframe breakdown come first?

Date: Tue, 7 Oct 2014 23:34:41 -0700
From: Alan Victor <amvictor@ncsu.edu>
Subject: Re: [R-390] Further AGC measurements

Excellent question and you are probably right! My approach was driven by...
Is this radio electrically sound or is there something so bad that a mechanical tear down is an absolute necessity? And lets start ripping out stuff. I looked at CAM alignment, no binding, no slug hangup, decent sensitivity above 8 MHz. Checked for bad mechanical filters, AH yes, replaced the . 01 uF Vitamin Q (which I subsequently measured and it was spot on and not leaky), pulled the power supply filter caps, a-ok, and the 8uF acid leaky cap in the audio

section, was pristine! That all said, decided to look at troubelshooting what was to me obviously not right electrically. That process found several of the 2nd LO xtals way off in spec. Fixed. The PTO over range and end points are nearly spot on. And so I continued along the electrical route with this final bit with the AGC. At this point I think I am finally convinced I must pull units to begin a probe for out of spec items. The tube extender and playing modules out of the main frame is attractive to me for troubleshooting but has mixed reviews. I do have evidence now that the MC bandswitch needs attention, as the sensitivity below 8 MHz degraded last night only to return after
changing to say 21 MHz and then returning back to 7 MHz. So, yeah, now I am seeing some mechanical ugly issues. Finally, the AGC fault is not going to get resolved without pulling the subchassis. Hence, now its time to do what you suggested. P.S. the power supply is not converted, not solid state, supply caps look and play like new, and operation for now is on variac.

Date: Wed, 8 Oct 2014 12:45:53 -0400
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] Further AGC measurements more

In your past post you indicated that you thought the AGC of the RF deck was OK, in that you could open the AGC loop and control the RF deck AGC gain
with an external voltage.

So now you are looking at the IF deck for the problem.

Past practice has been to set the receiver up on end on the bench and operate the IF deck just swung out of the receiver laying on the bench. You can also operate the audio deck this way.

You can thus get some scope and meter probes into the circuits this way and get readings with all the tubes in place.

Back in the days 68 - 75 we were not having AGC problems and so we never got to understand the problems in the AGC circuit as we did not have them
back then. Now the parts are getting old and problems are popping up. We are learning to resolve the AGC problems.

By way of understanding the AGC circuit you are out on the leading edge of measuring and reporting what the circuit has to offer up as operating values for both good and bad points.

Thank you for putting the time into sharing your results here on the reflector and of course it all goes into he archives where your findings can be found again.
I trust the reflector Fellows are giving you lots of input and feed back to encourage you to continue working your problem to a successful solution in your receiver.
Thank you for sharing it all with us.

Date: Wed, 8 Oct 2014 14:28:31 -0400
From: Alan Victor <amvictor@ncsu.edu>
Subject: Re: [R-390] Further AGC measurements more

Hello Roger and thank you for the feedback (no pun intended).

I certainly appreciate all comments and the recent correspondence from Craig makes sense. However, my approach in this "fix-it" process has always been to look for a measurement or an experiment that would hopefully find a clue as to what is wrong. With respect to the AGC, opening the loop and conducting measurements, certainly was an eye opener. Before doing a tear down, perhaps this evening, I'll record the numbers for a given RF input level. Specifically the 150uV/30% AM metric point. The power supply controlling the AGC line is fed to TP4 via a series 10 k R. I need to record the voltage right at the AGC terminal, I suspect it would read the power supply V IF THE LEAKAGE IS SMALL. As reported prior, say -3V to 0V in the power supply V was sufficient to drive the open loop AGC V as measured at TP3 from nearly zero V to over -12 V. At the same time, the -3V on TP4 was sufficient to just about shut the audio down, while at 0 V, your ears hurt! Sorry, did not record S/N ratio. Carrier
meter tracking quite nicely. However, upon closing the loop the range of AGC V is severely constrained. It almost appears as though the reference V for the AGC, obtained by the resistor bias divider (see the circuit description in the TM) consisting of R544, 546, 545, and 547 is off base. Or, the open loop gain of the AGC loop is way to LOW. That is to say, it takes a 3 volt shift in AGC line V at TP4 to swing 12 V at TP3. In a "proper" working unit, that voltage change may be substantially less! Weak V506A, V509A; perhaps? A leaky cap... perhaps. The Z as stated before is not 500k. And of course a part value (resistor) way out of spec. So the real AHA moment will be when the problem is found correlating back to the original problem and those symptoms.

Date: Wed, 8 Oct 2014 12:17:33 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] Further AGC measurements

First, let's assume it hasn't been butchered. If it has, then all bets are off; anything could be miswired to anything.

From a systems point of view, there are three possible causes for subnormal AGC voltage.

1. Signal chain gain is subnormal. Less signal means less AGC. This is pretty likely. Standard troubleshooting techniques apply.

2. AGC chain is bad. No matter how much signal you have, AGC will be low. Symptom is excessively loud (maybe distorted) output, since the signal chain will be running with excessive gain.

3. Something is loading down or pulling up the AGC line. Standard suspects are listed below. You probably have more than one.

a). Leaky C551. Look for a change when switching between FAST, MED, and SLOW. If this cap has not been replaced, I guarantee it's bad.

b). Leaky mechanical filter(s). The foam rubber goes bad. With power off, look for a change in resistance when changing bandwidth.

c). Leaky antenna trimmer. This variable cap is tied to AGC. It's insulated from the chassis, but the insulation is exposed to contamination and can easily get leaky.

d). One or more tubes have grid emission.

e). One or more coils, switches, etc are leaking to the AGC line.

We've taken care of item a. Items b, c, d, and e can be diagnosed in a number of ways, but here's what I do. First, we will partition the AGC system into "the controlled" and "the controlling". We will analyze the former first.

Disconnect the AGC NOR jumper between TB102 terminals 3 and 4. Except for R201 and R234 in the RF deck, and a number of tube grids which will conduct if driven positive, the controlled side of the AGC net should be a perfect open circuit.

Measure the voltage at TB102-4 with the radio running. It should be around 0V or slightly negative. (The negative comes from the Contact Potential effect.) If it's more than about 0.5V positive, you have B+ intrusion, grid emission, or both. Pull the following tubes, one by one, until you see the voltage fall: V201, V202, V203, V204, V501, V502, V503. If the voltage stayed positive even with all these tubes out, you definitely have B+ leakage. (You might also have grid emission; you will have to check again after you have eliminated the leakage.)

I had much more but I got tired. Post your results and I will direct you further.

Date: Wed, 8 Oct 2014 15:41:52 -0400
From: Alan Victor <amvictor@ncsu.edu>
Subject: Re: [R-390] Further AGC measurements

Thank you David. I will take a look at these items in addition to others. I appreciate your time taken and I will let you know what I find. The assumption, the radio is not corrupted with mods etc... Is valid. It is quite original but not a pedigree.

Date: Wed, 8 Oct 2014 14:35:09 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] Further AGC measurements

You're welcome, Alan. I hope it helps. I forgot to say that the "excessively loud" symptom is not unique to a bad AGC chain. If the signal chain is working, then anything that spuriously moves the AGC voltage in a positive direction will cause the signal output to be too loud.

When debugging an instrument that's been in bad environmental conditions, or simply one that's very old, one must guard against expecting the schematic to 100% describe the instrument. Degraded insulation, leakage paths... there may be things "connected together" that's you'd never guess from the diagram. Forgetting this may cut you off from a successful diagnosis. "It's not what you don't know that'll get you, it's

what you 'know' that ain't so."

Date: Thu, 9 Oct 2014 18:58:15 -0700
From: Alan Victor <amvictor@ncsu.edu>
Subject: [R-390] AGC investigation, one very bad part

After looking at the open AGC loop behaviour and the schematic, it became clear something is wrong in the bias string setting up the AGC reference voltages. That coupled with some resistance measurements leads to *R544*. Its value nominal is *2.7 Meg*, measured *327 K*.

This really upsets this string bias current, the voltage divider and the subsequent AGC voltage points when the loop is closed. I'm sure there are more culprits, but for now its electrical is reasonable. There are now more mechanical issues then electrical, so a clean up is in the works.

Date: Thu, 9 Oct 2014 19:30:32 -0700
From: "Craig Heaton" <hamfish@efn.org>
Subject: Re: [R-390] AGC investigation, one very bad part

Sounds like your off to the races! There were a few resistors in the IF deck where I had to unsolder one end to get a correct reading. At my age, lucky to remember "had to unsolder one end", which resistor(s), who knows. If the receiver has been sitting in the barn for a few years, yes there will be mechanical issues. Elbow grease will fix those.

Date: Fri, 10 Oct 2014 09:25:54 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] AGC investigation, one very bad part

Ha! Nailed it. Good job, Alan!

Date: Fri, 10 Oct 2014 16:21:56 -0400
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] AGC investigation, one very bad part

Thank you for taking the time to share all of this discovery with us.
This is how we all learn things.

Date: Sat, 20 Dec 2014 19:00:21 +0000 (UTC)
From: Perry Sandeen via R-390 <r-390@mailman.qth.net>
Subject: [R-390] Synchronous Detector Circuit

I have Lazerused the 1993 ARRL SDC and added some updates. Since is uses a 455 KHz It will work on the R3XX series as well as our beloved SP-600's. Anyone wanting a copy PLEASE send me an original email off list.

Date: Sat, 20 Dec 2014 19:57:05 +0000 (UTC)
From: Perry Sandeen via R-390 <r-390@mailman.qth.net>
Subject: [R-390] Synchronous Detector II

Several people have kindly offed to send me money for my SDC article. It does take a tremendous amount of time to do what I do, that said, like all the others who maintain the list this is a labor of love. I do hope that some will build and enjoy the articles I reproduce. The lynch pin though is the financial support for the list. I know that the *new* charity pitch by many is to *give just $19 a month* (by automatic bank deduction) and then show some truly heart-wrenching pictures or video. A concern of mine if with the frequency of theses ad's, how much is left for the charitable cause. When you donate to QSL list, 100% goes to the cost of running this list and many, many hours of volunteer labors is given. If one wants to have these resources continue, one must donate. Period.

Date: Sat, 20 Dec 2014 15:54:42 -0500
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] Synchronous Detector Circuit

This article, as well as many more articles on synchronous detectors and other information useful to those interested in designing and/or building synchronous detectors, is available in a ZIP file here (~50MB total):

<http://www.ko4bb.com/manuals/download.php?file=06_App_Notes_-_Proceedings/Synchronous_AM_detector_document_collection.zip>

Since I posted that (several years ago), I have accumulated another ~50MB of synchronous detector-related material, which I will post as an addendum. Real Soon Now. It will be at the same place <http://www.ko4bb.com/manuals/>. Search for "collection" or "synchronous". [I do not expect that I will get around to it before some time next year.]

Date: Mon, 22 Dec 2014 17:58:01 -0500
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] Synchronous Detector Circuit

>The new setup is making it more difficult……..

If anybody is having problems downloading the synchronous detector files, go to: http://www.ko4bb.com/manuals/ and search with the "Enter Search Term" box. Meanwhile, I have uploaded the Addendum that I mentioned in my first message. The file names are:

Synchronous AM detector document collection.zip
Synchronous AM detector document collection Addendum 1.zip

If you search for "synchronous" (don't type the quotation marks), you will find them both. They are ~50MB and ~30MB, respectively.

Date: Sat, 3 Jan 2015 03:59:26 +0000 (UTC)
From: Perry Sandeen via R-390 <r-390@mailman.qth.net>
Subject: [R-390] Synchronous Detector Circuit-update

> This article, as well as many more articles……..

Well, not really. While there is a wealth of additional information in whatCharles has posted, my article is completely different. The document in his collection is a photo copy of the original ARRL document. This document was scanned from the original and then reformatted and a new page layout was done in MS word.
Besides making a new document, I solved the *unobtainium* tuning coil part problem, edited the original schematic into an 8-bit tiff image and enlarged it to fit a whole 8.5 x 11 sheet of paper. Then I added additional schematics that should improve performance. After that was finished I converted it to a PDF for universal readability.

A list member alerted me that I had screwed up by not paper printing and proof reading the finished document. (All the technical stuff wasOK.) I went back and found a whole bunch of little punctuation things and removed some repeated sentences and did a general cleanup. So I have renamed the corrected document AM Sync Detector Rev A. Just ask for *revised sync* if you wish a cleaned up copy. But thanks to Charles' comments, I will also add it to the www.ko4bb.comsite
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Date: Tue, 13 Jan 2015 18:27:34 -0500 (EST)
From: larrys@teamlarry.com (Larry Snyder)
Subject: [R-390] Yet another undocumented mod?

The more I look at the stranger it gets. My IF deck has an unlabelled mini-BNC connected through a 270 pF to the BFO plate. Anyone know why this may have been added?

Date: Tue, 13 Jan 2015 17:15:10 -0800
From: Dennis Wade <sacramento.cyclist@gmail.com>
Subject: Re: [R-390] Yet another undocumented mod?

Possibly to inject a crystal controlled BFO for USB/LSB? Just a thought...

Date: Tue, 13 Jan 2015 21:09:05 -0500
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] Yet another undocumented mod?

Once upon a time there was a series of R390A's that were modified to be what we would consider as scanners. It took six racks of stuff to make this so. This six rack critter launched a small company in Maynard Mass called the Digital Equipment Corporation. The output was that every oscillator in the receiver was coupled out to a frequency counter.

This IF deck may be from one of these receivers.

Every thing was summed up or subtracted as need so the nixie tube readout gave a number that represented the frequency to which the receiver was tuned thus implying the signal of interest was also at that frequency. The BFO in the IF was easy. A longer cable was used from the IF deck connector to another BNC connector next to the 455 KHz back panel connector. The original 455KHz output was coupled into an different FM and AM detector. These dual detectors were used to find the zero center of the incoming RF signal. The audio outputs were the stock R390A audio and

were patched to an operator with split head sets. The VFO, first, and second mixers were more complex operations.

Someone would read the nixie numbers out loud across the bay. The designated operator would spin his receiver over to the frequency and use the
audio patched to his position to find the signal. As soon as the signal was being tracked by an operator the scanner was set free to find the next signal.
The guys use to set the scanner to watch a frequency range where a net was expected to come up soon. As soon as some one started to transmit in the range and the scanner caught it a half dozen ops would spring over to do intercept. There were methods to the intercept operators behavior.

Date: Tue, 13 Jan 2015 21:23:35 -0500 (EST)
From: Barry <n4buq@knology.net>
Subject: Re: [R-390] Yet another undocumented mod?

Someone should make an app for that. :)

Date: Tue, 13 Jan 2015 21:35:23 -0500 (EST)
From: larrys@teamlarry.com (Larry Snyder)
Subject: Re: [R-390] Yet another undocumented mod?

Pictures of that would be very cool and probably non-existent.

Date: Tue, 13 Jan 2015 20:39:05 -0600
From: Don Reaves <donreaves@gmail.com>
Subject: Re: [R-390] Yet another undocumented mod?

I thought I had heard all the anecdotes about R-390 early uses but this one spawning a company like DEC is new to me. Fascinating. Do you have any citations that I can read up on that?

Date: Wed, 14 Jan 2015 09:28:03 -0800
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] Yet another undocumented mod?

It sounds like this is not the same as the R-1240. Do you remember if it got a real model number, or was it just a mod?

Date: Wed, 14 Jan 2015 21:47:31 -0500
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] Yet another undocumented mod?

Pictures of the one I lived with are very non-existent.

Date: Sat, 21 Feb 2015 17:16:49 -0500 (EST)
From: larrys@teamlarry.com (Larry Snyder)
Subject: [R-390] 10-turn S-meter zero pot

Every one of these I've seen has been a bit too big to wiggle into the bracket on top

of the IF chassis. Is there something I'm missing?

Date: Sun, 22 Feb 2015 04:46:27 +0000 (UTC)
From: Norman Ryan via R-390 <r-390@mailman.qth.net>
Subject: Re: [R-390] 10-turn S-meter zero pot

I recall similar difficulty some time ago. I think somehow you have to detach the bracket sufficiently to swap out the zero gain pot, using your ingenuity. Fasteners are tricky to reach. While you're contemplating this, consider using a ten-turn Bourne pot. Then zero-ing the carrier level meter accurately becomes a breeze. You won't require a locking ten-turn knob, but it gives a cool look to the IF deck.

Date: Sun, 22 Feb 2015 10:12:15 -0800
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] 10-turn S-meter zero pot

Fix the problem, not the symptom. A simple wiring change makes the original pot work like a dream. It's archived in the Pearls Of Wisdom.

Date: Wed, 25 Feb 2015 10:09:01 -0800
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] R390 carrier level pot fix

I misspoke, partly. It's mentioned in the Pearls (Jun 2002, search for "R523"), but the actual 2007 article is in Y2K-R3 Chapter 11. (Search for "Carrier Zero".)
Just today, as I reviewed it, an improvement occurred to me. Better late than never.
Supplement to "R-390/R-390A Carrier Meter Zero Adjust Mod":

If you need a low value of R537 to get 100dB, and this makes it impossible to zero, you can increase the current in R537, which will shift the zero-adjust range upward.
A neat way to do this is to lift R541 (270 ohms, V508 pin 7,
cathode resistor) off ground and run it to R537.

Date: Mon, 4 May 2015 12:12:51 +0200
From: Pierfrancesco Mengacci <pf.mengacci@outlook.it>
Subject: [R-390] Strange variation of sensitivity AGC resistance towards the chassis

In my former mail I complained a variation of the R390/A-URR sensitivity. I experience a slow variation, up and down, in all bands, unpredictable but in some way related to chassis temperature (even 5 times from min to max performance). I must thank Larry, Roger, Jim and Cecil for suggestions on the matter. I’ve been invited to control the efficiency of the AGC circuit, but, apparently, it seems OK.

Just for scruple, does someone know which is the “normal” value of the AGC circuit resistance toward ground , measured at the rear contacts of TB 102 (? 3 or 4), when the receiver is set on AGC function and disconnected from power supply- (AGC delay setting: medium)

In my case, I read 380 Kohm (when the negative terminal of the ohmmeter is connected to the chassis, it has a minor influence...). This reading takes even 5 minutes to stabilize.

Date: Mon, 4 May 2015 08:07:35 -0400
From: Roy Morgan <k1lky68@gmail.com>
Subject: Re: [R-390] Strange variation of sensitivity AGC resistance toward the chassis

No, but I can get to a receiver today and measure it. I'm pretty sure this has been reported on the list, and is likely to be found in the Pearls of Wisdom.

http://www.r-390a.net/Pearls/index.htm

The IF deck section is: http://www.r-390a.net/Pearls/IF_deck.pdf

Note that this is some 500 pages long.

> In my case, I read 380 Kohm……

I think you have bad capacitor(s) in the AGC line, or leaky wires. All your reported symptoms point to this.

Date: Mon, 4 May 2015 14:45:51 +0200
From: Pierfrancesco Mengacci <pf.mengacci@outlook.it>
Subject: [R-390] R: Strange variation of sensitivity AGC resistance toward the chassis

Thanks for help. In theory, the value I measure (rear AGC plug, toward ground), does correspond to the figure which comes out from the receiver diagram: It is series and parallel of the following resistances: "Res1" = [R546 (180K) in series with R545 (100 K)] = 280 K ; "Res2" = [R544 (2.7 M) in series with about 20 K(resistance of B+ line)]; the parallel of these two resistances is "Res3" = 1/(1/280 + 1/2720) = 254 Kohm. Referring to the control grid of V506-A (pin 2 of AGC time constant tube), its resistance toward ground , which I call "Res4", is the sum of "Res3" + R547(220K) = 254 + 220 = 474 Kohm

But, in addition, at the control grid of V506-A is connected also the resistance of the AGC circuit inside the RF deck, which I call "Res5", = R234 (1.5 M) + R201 (270K) = 1770 Kohm. (coil resistances are minimal and they have been omitted).

In conclusion: The resistance toward ground of pin 2 (control grid of V506 - A) comes out from the parallel of "Res4" and "Res5" = 1/(1/474 + 1/1770) = 374 Kohm. This, seems to me, ought to be ALSO the theoretical value of the AGC circuit resistance, when measured at contacts 3-4 of TB102 on rear panel (if there are NO Extra Losses or bad capacitors or bad insulation...). By the way, I measure 380 Kohm, which is rather close to thae above "theoretical" value (if I'm not mistaken) Anyway, I wait for your effective measurement!!

Date: Tue, 5 May 2015 10:31:55 +0200

From: Pierfrancesco Mengacci <pf.mengacci@outlook.it>
Subject: [R-390] I: R: Strange variation of sensitivity AGC resistance toward the chassis

Your patience and completeness are commendable; the information is perfect!!!

A) Measurable resistance toward ground (chassis), when on AGC and receiver disconnected from power net:
Your datum, V201 pin 1 = 940 K; my datum = 980 K
Your datum, E208 = 490 K; my datum = 505 K
Your datum, E209 = 1.45 M; my datum = 1.45 M
Your datum, E211 = 900 K; my datum = 835 K
Your datum, TB102 (3-4) = 390 K; my datum = 380 K

B) I tried with a 9.0 V battery connected to AGC rear test point(minus to ground; function on AGC, receiver unpowered) At all control grids I read a voltage variable from -7,5 V of V 201 to near -9 V on IF tubes); this corresponds with good approximation to the diagram, when I take into consideration the various resistive partitions associated with the multimeter internal impedance (10 Mohm)

CONCLUSION
The AGC circuit of my R390/A-URR is behaving almost correctly, the anomaly is to be found in some other zone..

ERROR on the TM11-856A Manual. I have controlled the diagram page 183 , figure 104: IT DOES NOT CORRESPOND TO THE GENERAL CIRCUIT of the following pages (V201 RF section). In particular, E208 is not connected to the control grid of V201 but to the union of E213 and R233 (470Kohm). In addition, R201 is not 22K but 270 K. This gives reason of "theoretical" discrepancies

SOUL
I think the "anomaly" o "trouble" or "vice" of my radio (i.e.the unpredictable and slow sensitivity reduction/variation via antenna only) HAS A SOUL: when it has understood that I was tracking it with the help of the friends of the R390 forum, it has disappeared or concealed itself, may be it has committed suicide!!! The fact is that in the last few days I do not have experienced the problem (i.e. I get at least 40 Db on calibrator position, on all bands, and a sensitivity in the range (approximate) of 1-2 microvolts on all bands).

What I did in the meanwhile was to remove an reinstall for the 10th time the first RF coil of band 16-32. I suspect there was a random contact between some pin of the coil (those on chassis side) and conductors nearby

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Date: Wed, 6 May 2015 00:46:46 +0000 (UTC)
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] I: R: Strange variation of sensitivity AGC resistance toward the chassis

Hi Franco, Glad to hear that your mystery sensitivity variation is gone.

There are 2 more checks you can make to ensure that your agc is working correctly - 1. Disconnect the power connector on the RF deck and measure from E8 to ground. It should be 1.5 meg. 2. Disconnect and remove IF chassis and disconnect 1 end of R546 and R544. You should read 50 meg to ground on C547 in the 'fast' position and at least 30 meg in 'medium'.

Date: Wed, 6 May 2015 11:16:22 +0200
From: Pierfrancesco Mengacci <pf.mengacci@outlook.it>
Subject: [R-390] R: I: R: Strange variation of sensitivity AGC
resistance toward the chassis

I have disconnected J208 (the multiple connector on RF deck). I read almost exactly 1,5 Mohm when I measure resistance of E208 toward ground (while on AGC and medium delay).

The second check you suggest is more relevant and interesting: I will do it when I come back from a ten days vacation, which I badly need after a ten months breathless consulting work.. <snip>

Date: Wed, 6 May 2015 20:16:25 +0000 (UTC)
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] R: I: R: Strange variation of sensitivity AGC
resistance toward the chassis

Hi Franco, I forgot that with the IF deck out of unit, the AGC switch won't work of course. So the 30 meg would be across the problematic C551 (these go bad fairly regularly). Of course, ideally you would read infinity across these caps, and the suggested readings may or may not mean that they are on their way to being bad. If you read above 100 meg, you should be safe.

Date: Thu, 7 May 2015 12:29:04 +0200
From: Pierfrancesco Mengacci <pf.mengacci@outlook.it>
Subject: [R-390] R: R: I: R: Strange variation of sensitivity AGC
resistance toward the chassis

Yes, you're right. If an AGC component is to go bad, that is the 2µF paper capacitor C551. Indeed, I still have some residual doubt about AGC: the overall resistance of rear AGC test point toward ground varies from 380 K when the rig is "cold" to about 360°K when is warmed up for a couple of hours. Considering that the RF deck has only ceramic capacitors (and only 5kpf in value), there may be some minor loss in the IF deck, which AGC resistance is in parallel with the one of RF grid circuits.

What I think to do, also, is to apply (carefully) an external -50 DC Voltage at TB102 (3-4), with function switch in AGC and receiver unpowered (and test at various delay settings). I will try to measure the leakage current (may be warming with an hair dryer the suspect components). To measure the leakage current I will add, in series to the external voltage source, a 1 K resistor, and I will measure the voltage drop upon it with a 10 M-ohm electronic multimeter; if leakage currents are irrelevant, I should read only 0.13 Volt on this additional resistor (50/380000 x 1000). If this value varies with forced warming of components, it will mean the decay of some capacitor or , in

second instance, of the related resistors

Date: Thu, 7 May 2015 23:12:12 +0000 (UTC)
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] R: R: I: R: Strange variation of sensitivity AGC resistance toward the chassis

That should give you some results, but I think you will see something much easier if you use a 10k res instead of a 1k res. Since you're looking for a 5% change, that will be hard to detect using a 1k res representing 25% of the AGC resistance. You will probably have better luck applying your procedure to the IF and RF decks separately. You can isolate them a little by unplugging and/or removing the 3-4 link. Good luck. Regards, Larry

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Date: Fri, 8 May 2015 21:54:29 +0000 (UTC)
From: JAMES GREEN <jagreen3@sbcglobal.net>
Subject: [R-390] IF deck resistance tables in Y2K

I thought I had finished the cleaning and restoration of all the modules for Caphart R-390A. I didn't want to put the face-plate back on until I had the thing re-painted. Whilst awaiting my next pay-check to fund the purchase of paint and such I decided to go through the resistance checks of the pins on the connectors. I found tables for this in the Y2K manual.

I started with the IF deck and found one discrepancy that was related to a mod I made to the AGC circuit. No problem there. However, when I check the resistance of pin 6 of J512 on the IF deck I get about 50 Ohms to ground. The table says it's supposed to be infinite.

I traced Pin 6 to R-507 a 22K resistor. From there it goes to the common legs on the top ends of the 4 mechanical filters. from there it goes to the rear of S503. I see nowhere where this circuit ever reaches ground. Therefore it should be infinite. I de-soldered the top ends of all the filters and went so far as to remove one of them. When I measure across the end lugs of my filters they all measure about 50 ohms. Is this correct?

Pin 6 of J512 also goes through R-516 (22k) to T501 then to pin 1 of V503 the 3rd IF amp. Should I suspect a problem in T501? Either way I should be going through a 22k resistor. I will keep scratching my head and poking about, but any ideas would be helpful. Is it possible the table in the Y2K manual is wrong?

Date: Sat, 9 May 2015 00:32:54 +0000 (UTC)
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] IF deck resistance tables in Y2K

Hi Jim, Yah, the pin 6 should read infinity. Since you're reading very low res, you probably have a short to ground before hitting a 22k res. Sometimes the wires in the connectors get a little to close. At least you have it isolated to the primary agc line in the IF deck. Good luck.

Date: Fri, 8 May 2015 20:39:32 -0400
From: N4BE_Jim--- via R-390 <r-390@mailman.qth.net>
Subject: Re: [R-390] R: Strange variation of sensitivity AGC
resistance toward the chassis

For what it's worth, in restoring my SW radio, I found it more expedient to just "shotgun" replace every capacitor touching the AGC, especially in the RF deck. The .005 mfd bypass caps throughout the RF deck were completely replaced with modern caps. Didn't bother wasting time trying to isolate specific caps. With the age of these radios you can safely assume they all leak.

Also check all resistor values. They typically drift with age.

And I can't emphasize enough the problems induced by spraying switch wafers with any kind of cleaner. It's best to individually clean each contact wiper with a Deoxit pen. If you spray the phenolic wafers, they will absorb the chemical and will no longer be high impedance. And for the same reason, never lubricate the antenna trimmer phenolic shaft. The trimmer cap is connected to the AGC line.

Date: Sat, 9 May 2015 01:40:00 +0000 (UTC)
From: Norman Ryan via R-390 <r-390@mailman.qth.net>
Subject: Re: [R-390] IF deck resistance tables in Y2K

Yes, 50 ohms (+/- 10%) across either end of a mechanical filter is correct.

Date: Sat, 9 May 2015 16:41:49 -0400
From: N4BE_Jim--- via R-390 <r-390@mailman.qth.net>
Subject: [R-390] Fwd: R: Strange variation of sensitivity AGC
resistance toward the chassis

> I have used Big Bath Cleaner/Degreaser to remove oil and such from phenolic wafers and the antenna tune shaft.
http://www.gcelectronics.com/order/Catalog_PDF/2007%20Catalog%20120407%2042.pdf
>
> Be sure it says degreaser. Available from many electronic suppliers. Works on old phenolic tube sockets too. Just be sure it doesn't contain lubricant. I was restoring a Collins KWM-2A once and made the mistake of spraying the tube sockets with tuner cleaner/lubricant. The sockets absorbed the lubricant and dropped impedance. Same happened with switch wafers. I think the older fibrous materials are porous and soak up liquids and lubricants. The degreaser dissipates water and lubricants. Hope this helps. Jim N4BE

>> Good advice on all points. Do you have a suggestion for what solvent would remove lubricant from the antenna trim phenolic shaft? I used Mobil 1 on mine. Fortunately, I have conscientiously kept Deoxit away from the switch wafers, but if you have a suggestion for removing Deoxit for folks who may have inadvertently sprayed the wafers, please feel free to share it with the R-390 list. (I've responded here offlist.)

Date: Wed, 17 Jun 2015 20:17:48 +0300
From: Grayson Evans <wa4gvm@gmail.com>
Subject: [R-390] What's with the 5.3V filament

Can anyone tell me why the R390A IF deck 5314 limiter tube is run with a 5.3V filament? while all the other tubes on the module run at 6.3? Was there some reason to drastically lower the gain of this tube? This is an odd way to do it.
I read through the manual on the limiter section, but it makes no mention of the odd filament voltage.

Date: Wed, 17 Jun 2015 12:22:13 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] What's with the 5.3V filament

It's to reduce noise and hum. That tube is not called on to conduct more than about a hundred microamps, so it is feasible to run the cathode below normal temperature.

Date: Tue, 12 Apr 2016 19:17:58 -0700
From: "Craig" <hamfish@comcast.net>
Subject: [R-390] Y501 Rattles

The Motorola R-390/A has a rare disease, rattle of the Y501. This is not good if the receiver is to be placed in a vibrating location. The 455KC crystal inside Z501 is broke, plain and simple. I see where Fair Radio has Z501 with crystal/less cover, but have to wonder about the condition of the crystal. Last week I spoke with ICM (International Crystal Manufacture) and thought they had the real thing; upon arrival of their crystal the pins were too small in diameter and way too long. Anyone been down this road?

Date: Wed, 13 Apr 2016 13:29:57 -0400
From: Roger Ruszkowski <flowertime01@wmconnect.com>
Subject: Re: [R-390] Y501 Rattles

The crystal cans can be unsoldered and opened. You can stuff a 455 KHz crystal inside the can and resolder. I stuffed a couple cans with some no name surplus crystals and they run close enough for my counter and signal generator to zero with. As a CW filter and for dial calibration they are good enough.

Date: Wed, 13 Apr 2016 13:58:37 -0700
From: "Craig" <hamfish@comcast.net>
Subject: Re: [R-390] Y501 Rattles

Thanks for the reply. So far it is no dice for ICM & JAN. The crystal from ICM has 0.030 inch diameter leads about 3/4 inches long. Thinking I might be able to push those leads thru the crystal holder in Z501. Then bend and solder with fingers crossed.

The old 455KC crystal has met the mico butane torch for a look see inside. The Crystal was a small 1/4 inch wafer, seems to be gold plated and was somehow attached to the two leads.

A note for those who might ship crystals to others: ICM ships in the small USPS priority cardboard box. Two layers of bubble wrap are used for a cushion. So considering the age of original R-390/A crystals, shipping in just a thin paper bubble wrap envelope is a roll of the dice. I still have one 200KC crystal that was shipped using the envelope and it arrived with a rattle.

No matter the solution for the crystal, R502 & R503 were selected to optimum bandpass. Just another challenge. First, gotta get something oscillating at 455KHz.

Date: Wed, 20 Apr 2016 17:09:49 -0700
From: "Craig" <hamfish@comcast.net>
Subject: [R-390] Y501 Update

Here we are back at the abode. The domestic chores are done & the lawn is mowed. Time to play radio again.

Today?s victim was the crystal from ICM. It is catalog #4122426, cost to my door was $53.00 US dollarettes, and the holder type is HC51U, frequency 455KHz. Short version it works.

Fair Radio in Lima Ohio has used Z501 assemblies with crystal, less cover. Price them if you must; your time, money, & radio. I decided to try a new crystal and see if it works.

Plan A fell apart rapidly. Sticking the inch leads thru the crystal holder was a no go. The holes in the holder are blind, they do not go all the way thru to the underside of the IF deck. What to do, what to do? Plan B was quickly devised. The leads on a CR-45/U holder are about inch in length and 0.050 inches in diameter. The pins on the HC51U holder are about inches long and 0.030 inches in diameter. Back to the garage and retrieved my metric caliper (it was handy). First cut the leads on the ICM crystal to 10mm in length. Next bend half (5mm) back over on itself. Don?t leave an open loop at the bend. Use a needle nose vise grip to gently crush the bend. The goal is to end up with leads about 5mm (1/4 inch) in length and 0.060 inches in diameter.

The crystal holder accepted the non-Collins part. Oh Lord, is Charles Steinmetz reading this or Art? (need to insert e-motion here, smile) The proof is eating the pudding……time to plug the Motorola into an outlet and watch for magic smoke. Chapter Six in the Y2K R3 was used: 6.2.17 Crystal Filter Neutralizing. The short version. I was able to get the .1KC & 1KC positions to peak at 454.97KHz using a HP 8640B (no sticker traceable to NIST).

That is all for today! Chapter Three, paragraph 3.2.9.2 goes on to describe the bandwidth for the 0.1KC & 1KC positions and resistors R502 & R503 for adjustment. Gotta chew on this awhile.

Date: Mon, 9 May 2016 01:15:38 +0000 (UTC)
From: Larry H <dinlarh@att.net>
Subject: [R-390] AGC Slow - Moment of silence

It looks like the problem with the circuit is the charge time of C551 when switching the AGC into the slow position. This causes the agc line to be pulled + for a second while C551 charges. Even if it had zero leakage, one end is switched from ground to B+ potential, causing the problem. I came up with a fairy simple solution to this problem. Add a 10 meg to 20 meg resistor to the AGC switch contact 8 to ground. Remove the wire that goes to that same contact and add a 20 mfd cap (call it C590) in series with that wire to contact 8. This will maintain a charge on C590 all the time and will have very minimal affect on the operation of the AGC circuit. I know that this will reduce the effectiveness of the slow position a little, but I don't think you will notice it. Use the largest res that will overcome the leakage in C590 (should be very low), but I don't think it should be less than 10 meg. See this schematic.

http://s32.postimg.org/6310y6av9/IMG_7198s.jpg

I've been using this for a while and have not noticed any issue with it.

Date: Mon, 9 May 2016 11:35:13 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] AGC Slow - Moment of silence

I would not notice a 20% reduction in the SLOW time constant. The symptom appears when you switch to MEDium, but the situation got set up during SLOW. Your solution eliminates the voltage jump at the positive end of C551.

On paper, none of the commonly available 22uF/450V aluminum electrolytic caps has acceptable leakage, but I expect that actual parts beat spec by a wide margin. You can also use a film cap (a motor-run type can be less than $10) but it can't go behind the front panel. While the low end of C590 averages 0V, you'll get a bump if you go to SLOW during an excursion or during the first minute or so after power-on.

I attacked the problem differently, running the Miller integrator on MED as well as SLOW. See "Ending The Moment Of Silence" at www.r-390a.net .

Larry's mod is easier and still pretty good, and I encourage the rest of you to try it first.

Date: Mon, 09 May 2016 15:04:29 -0400
From: Charles Steinmetz <csteinmetz@yandex.com>
Subject: Re: [R-390] AGC Slow - Moment of silence

>It looks like the problem with the circuit is the charge time of……

A more comprehensively engineered version of the same basic solution was posted back in December 2009, in a thread about SSB reception (this version removes V506A from the circuit entirely -- it's not quite as simple, but makes it easy to create whatever release times you want very easily):

The "nether" end of C551 gets switched between ground and the plate of V506A, which sits at about 30 volts. Every time you switch from Slow to Medium AGC, you put a -30 volt step onto the AGC line, which turns all the gain-controlled stages hard off. You don't get your audio back until C551 discharges through the AGC release resistance. When you switch from Medium to Slow, you get a blast of distortion (but it

doesn't last as long as the silence, because the cap discharges relatively quickly through the grid of V506A).

Mod (2): Install a new 20 uF film capacitor with one end to the junction of C548 and C551 (i.e., the grid of V506A). Disconnect the plate of V506A from J512 pin 15, and connect the free end of the new 20 uF capacitor to J512 pin 15 instead. Switch the wires from S107, terminals 9 (ground) and 7 (C551) -- ground to terminal 7, C551 to terminal 9. Install two, 2.2 Mohm resistors at S107 -- one each from terminal 9 (C551) to terminal 7 (ground) and from terminal 8 (new
capacitor) to terminal 7 (ground). The AGC switch will then add C551 in parallel with C548 for Medium AGC and the new 20 uF film capacitor in parallel with C548 for Slow. The new 2.2 Mohm resistors bleed any residual charge from C551 and the new capacitor to reduce any pops when switching between AGC time constants. You can adjust the AGC release times by changing the values of C547 and 548 (Fast), C551 (Medium), and the new capacitor (Slow). I often use as much as 50 uF for the Slow AGC capacitor.

Mod (2) fixes the "audio disappearing" problem when switching to and from Slow AGC. (Note that this is a design "feature" [i.e., problem] -- If your 390A does NOT have this problem, it's because C551 is not a capacitor anymore.) If you can live with the "audio disappearing" problem when switching from Slow to Medium AGC, you can omit Mod (2).

Date: Tue, 10 May 2016 18:01:08 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] AGC Slow - Moment of silence

I thought of a mod that's halfway between Larry's simple mod and my "Ending The Moment Of Silence" article. Like Larry's (and ETMOS), it's front-panel only.

THE PROBLEM

The problem with Larry's mod is the extremely long time it takes to charge C590 (20uF) through R590 (10Meg). The time constant is 200 seconds. It takes about five TC's to get near full charge. That's 17 minutes!

If you are listening to a weak signal, all will be well.
If you switch from SLOW to MED or FAST, all will be well.
If you switch from SLOW to MED or FAST then right back to SLOW,
    all will be well.
If you receive a strong signal for a while on FAST or MED, then switch to SLOW,
    all will be well.

BUT: If you receive strong for a while, *and then the signal fades out*, and then you switch to SLOW, you will get the same old Moment Of Silence you were trying to fix. (It's because V506A's plate dropped when the signal faded.) It will happen once in a while, seemingly out of the blue, depending on your habits. The intensity decreases the longer you stay no-signal before switching, finally petering out around the 15 minute mark.

The following mod makes it 10x better. Plus, you don't need a 20uF cap.
It can fit on the same five-position terminal strip that's pictured in ETMOS.

THE MOD

Refer to the IF Module schematic, Figure 5-22, e.g. Y2KR3 Chapter 5 page 43.

1. Disconnect the wire at S107-8
2. Connect the wire (V506A plate) to two new caps,
   2uF and 0.15uF, C590 and C591
3. Connect the other end of C590 to S107-8
4. Disconnect the wire (ground) at S107-9
5. Connect a 10Meg resistor, R590, between S107-8 and ground
6. Connect the other end of C591 to S107-9
7. Connect a 10Meg resistor, R591, between S107-9 and ground
8. Connect S107-7 to S102-5

Now the TC is only 20 seconds instead of 200. You can still get a MOS - but the vulnerable window is 10x smaller. To close it entirely, you have to do ETMOS, or Charles' all-passive mod.

I think I will call this mod "Almost Ending The Moment Of Silence", AETMOS. :)

PRINCIPLES OF OPERATION

C551 is abandoned in place.
V506A's grid goes directly to S107-7.
V506A's plate goes to two caps, which in turn go to S107-8 (SLOW)
and S107-9 (MED).
SLOW: Unchanged (V506A with Miller feedback),
except the cap is on the front panel.
MED: Instead of using C551 passively, we operate like SLOW,
only with a smaller cap. 0.15uF gives about 2uF of effective capacitance.
FAST: Unchanged.

In MED and FAST, R590 charges C590. Since it pulls C590 to ground, not to AGC, if you switch to SLOW on a strong signal, you will get a brief MOL (Moment Of Loudness).

In SLOW and FAST, R591 charges C591. Since it pulls C591 to ground, not to AGC, if you switch to MED on a strong signal, you will get a very brief MOL (Moment Of Loudness).

In SLOW and MED, R590 or R591 loads the AGC line. Since the line is 390K, this perturbs it by less than 4%. The radio will play a tiny bit louder; you won't notice, especially since it's probably coming off a MOL.

Date: Wed, 11 May 2016 03:14:21 +0000 (UTC)
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] AGC Slow - Moment of silence

David, I like this one that you made a lot. Although I haven't seen the problems you correctly point out with my simple one, I think this new one is a keeper. I through a quicky schematic together for what I believe you are suggesting - is this right?
http://s32.postimg.org/aziojxup1/IMG_7216s.jpg

Yours is not that much more work than mine and is much better - I'm going to try it.

Date: Wed, 11 May 2016 10:11:26 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] AGC Slow - Moment of silence

Thank you, Larry. Your sketch is correct, but I think it's important to show all of the wire to S102-5, so it's clear that the destination is V506A/G, and we are rerouting S107-7 around C551. It's a neater markup if you use Y2KR3's Figure 5-22 instead of TM 11-856A.

One can also disconnect and tape off the original S107-7 wire, which leaves C551 open instead of shorted. The result is the same, and the next guy will have easier understanding in case the documentation is lost. I'm editing it into the copied post below.

The problem I saw with your mod is a corner case which only manifests if you have certain habits. It happens to be something I'm likely to do.

I think this is the best we can do with the original S107. ETMOS substitutes a 2-pole switch, which makes a separate path to charge the off-duty cap quickly, closing the window almost entirely.

You can see drawings and pictures showing how I mounted the parts in the ETMOS article. (AETMOS can use the same hardware.) And if you figure out a better way, let me know!

Date: Fri, 13 May 2016 13:12:08 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] AGC Slow - Moment of silence

If you have refurbished your C551, here is an AETMOS variant that takes advantage of it. Call it "AETMOS-51".

1. Refurbish C551
2. Disconnect and tape off the wire (ground) at S107-9
3. Connect C591, a 0.15uF 400V cap, from S107-8 to S107-9
4. Connect R590, 10M, from S107-7 to S107-8

SLOW: Unchanged (V506A with Miller feedback).

MED: Instead of using C551 passively, we operate like SLOW, only with a smaller cap. C590 (0.15uF) in series with C551 gives about 1.9uF of effective capacitance. R590 (10M) keeps the high end of C551 near V506A's plate voltage, and keeps

C591 discharged.

FAST: Unchanged. R590 (10M) keeps the high end of C551 near V506A's plate voltage.

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And here is an improved AETMOS write-up, which replaces yesterday's write-up. I thought of a mod that's halfway between Larry's simple mod (20uF in series with S107-8 plus 10Meg to ground) and my "Ending The Moment Of Silence" article. Like Larry's mod, and ETMOS, it affects only the front panel.

THE PROBLEM

The problem with Larry's mod is the extremely long time to charge C590 (20uF) through R590 (10Meg). The time constant is 200 seconds. It takes about five TC's to get near full charge. That's 17 minutes!

If you are listening to a weak signal, all is well.
If you switch from SLOW to MED, all is well.
If you switch from MED to SLOW on a stable signal, all is well.
If you switch from MED to SLOW on a signal that recently got stronger, you will get a Moment Of Loudness.
If you switch from MED to SLOW on a signal that recently got weaker, you will get a Moment Of Quiet.

You will get a MOQ, not a full MOS, because the jump is divided by V506A's gain. The cause behind MOQ and MOL is that V506A's plate voltage changed, taking the low end of C590 with it, and R590 hasn't had time to pull it back to ground. It will happen once in a while, seemingly out of the blue, depending on your habits. During the 17-minute window after a fade, you will get a MOQ/MOL every time you go SLOW/MED. The depth and length decrease with time and number of switches. The following mod shortens the window from 17 minutes to 1.7 minutes. Plus, you don't need a 20uF cap. It can fit on the same five-position terminal strip that's pictured in ETMOS.

THE MOD

Refer to the IF Module schematic, Figure 5-22, e.g. Y2KR3 Chapter 5 page 43.

1. Disconnect the wire at S107-8 (V506A plate)
2. Connect the wire (V506A plate) to two new caps, 2uF and 0.15uF, C590 and C591
3. Connect the other end of C590 to S107-8 (SLOW contact)
4. Disconnect the wire (ground) at S107-9 (MED contact)
5. Connect a 10Meg resistor, R590, between S107-8 and ground
6. Connect the other end of C591 to S107-9
7. Connect a 10Meg resistor, R591, between S107-9 and ground
8. Disconnect and tape off the wire at S107-7 (wiper)
9. Connect S107-7 to S102-5 (MGC contact, and AGC output to TB102-3)

Now the TC is only 20 seconds instead of 200. You only get one MOQ, instead of over and over when you switch back and forth. The MOQ is the same depth and length, but the window of opportunity is shortened. To close it entirely, you have to do

ETMOS, or Charles' all-passive mod. I think I will call this mod "Almost Ending The Moment Of Silence", AETMOS. :)

PRINCIPLES OF OPERATION

C551 is abandoned in place.
V506A's grid goes directly to S107-7.
V506A's plate goes to two caps, which in turn go to S107-8 (SLOW) and S107-9 (MED).
Each cap is also returned to ground through a resistor.

SLOW: Unchanged (V506A with Miller feedback), except the cap is on the front panel.

MED: Instead of using C551 passively, we operate like SLOW, only with a smaller cap.
0.15uF gives about 2uF of effective capacitance.

FAST: Unchanged.

In MED and FAST, R590 pulls the low end of C590 to ground. If it isn't at the AGC voltage when you go SLOW, AGC will jump then taper off. The effect is proportional to how far behind C590 is, i.e., the change in signal strength just before SLOW.

The effect is also biased toward MOL. With constant signal strength, you will get a 10% MOL that you may not notice. (This asymmetry is not present in Larry's mod, because we connect to AGC a capacitor terminal that was previously returned to ground. ETMOS has the same asymmetry and I never notice it.) In SLOW and FAST, R591 pulls the low end of C591 to ground. If it isn't at the AGC voltage when you go MED, AGC will jump then taper off, but it's too brief to notice.

In SLOW and MED, R590 or R591 loads the AGC line. Since the line is 390K, this perturbs it by less than 4%. The radio will play a tiny bit louder; you won't notice, especially since it's probably coming off a MOL.

Date: Fri, 13 May 2016 17:23:41 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] AGC Slow - Moment of silence

Aw heck, typo, corrected below.

-----Original Message-----
From: David Wise
Sent: Friday, May 13, 2016 4:28 PM
To: R-390 Forum
Subject: RE: [R-390] AGC Slow - Moment of silence

I realized that AETMOS-51 can use C551 or an external 2uF cap.

THE MOD
Take 3

C590 on the grid side, C591 in series

If C551 is okay, omit steps 1 and 2.

1. Disconnect and tape off the wire (C551) at S107-7 (wiper)
2. Connect C590, 2uF, between S102-5 (MGC contact; V506A grid) and S107-7
3. Disconnect and tape off the wire (ground) at S107-9
4. Connect C591, 0.15uF, between S107-8 and S107-9
5. Connect R590, 10M, between S107-7 and S107-8

PRINCIPLES OF OPERATION

SLOW: Unchanged (V506A with 2uF of Miller feedback).

MED: V506A with 0.14uF of Miller feedback).

Instead of using C551 passively, we operate like SLOW, only with a smaller cap.
C591 (0.15uF) in series with C551 gives about 0.14uF of feedback capacitance, which V506A multiplies to about 1.9uF of effective capacitance.
R590 (10M) keeps the high end of C551 near V506A's plate voltage, and keeps C591 discharged.

FAST: Unchanged. R590 (10M) keeps the high end of C551 near V506A's plate voltage. Regards,Dave Wise

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Date: Sat, 14 May 2016 01:06:43 +0000 (UTC)
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] AGC Slow - Moment of silence

Hi Dave, This new one looks great. I sketched it out on a schematic and don't see a thing wrong with it (of course). This is much easier to do. This one does not require dropping the front panel, where as the last one would to get at S102-5. I like it.

Date: Sat, 14 May 2016 16:53:46 +0000
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] AGC Slow - Moment of silence

DO NOT USE! IT'S NO GOOD. What a pity.

At MED speed, the resistor shunted across C591 adds a long "tail" to the response, just like the model for Dielectric Absorption.

Go back to my post of 2016/05/10. That one's okay, there's no resistance inside the feedback loop.

Sorry!

Date: Sat, 14 May 2016 17:09:36 +0000
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] AGC Slow - Moment of silence

Actually, use my edited post of 2016/05/11.
This new Outlook Web App is infuriating.

Date: Fri, 13 May 2016 16:28:28 -0700
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] AGC Slow - Moment of silence

I realized that AETMOS-51 can use C551 or an external 2uF cap.

THE MOD
Take 3
C590 on the grid side, C591 in series

If C551 is okay, omit steps 1 and 2.

1. Disconnect and tape off the wire (C551) at S107-7 (wiper)
2. Connect C590, 2uF, between S102-5 (MGC contact; V506A grid) and S107-7
3. Disconnect and tape off the wire (ground) at S107-9
4. Connect C591, 0.15uF, between S107-8 and S107-9
5. Connect R590, 10M, between S107-7 and S107-8

PRINCIPLES OF OPERATION

SLOW: Unchanged (V506A with 2uF of Miller feedback).

MED: V506A with 0.14uF of Miller feedback). Instead of using C551 passively, we operate like SLOW, only with a smaller cap. C590 (0.15uF) in series with C551 gives about 0.14uF of feedback capacitance, which V506A multiplies to about 1.9uF of effective capacitance. R590 (10M) keeps the high end of C551 near V506A's plate voltage, and keeps C591 discharged.

FAST: Unchanged. R590 (10M) keeps the high end of C551 near V506A's plate voltage.

Date: Sun, 15 May 2016 02:48:29 +0000
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] AGC Slow - Moment of silence

I did not send this, I wasn't even home when it went out. It was some kind of glitch.
I've already warned, DO NOT USE THIS VERSION OF THE MOD.

Date: Tue, 2 Aug 2016 14:30:14 -0400
From: Guido Santacana <gsantacanav@gmail.com>
Subject: [R-390] EAC AGC

It has been a while since my last post on this list. Recently I acquired an EAC R390A and brought it back to life. Every works ok but some overloading is evident when the AGC time constant is in the slow position. Z503 is ok too. Any recommendations are welcome.

Date: Tue, 2 Aug 2016 21:04:05 +0000 (UTC)
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] EAC AGC

Hi Guido, C551 is probably leaky - only a couple micro amps allowed here under high voltage.

Date: Tue, 2 Aug 2016 18:41:49 -0400
From: Guido Santacana <gsantacanav@gmail.com>
Subject: Re: [R-390] EAC AGC

Thanks for the information. I replaced all the bumble bees in the IF deck and also C553 and 549. Will do the same with C551. My last R390A here was gone back in 2000. This one appeared in a hamshack and was stored for about 35 years. It required major cleaning, recapping, tube pins cleaning, a lot of Deoxit, main chassis cleaning after removal of all decks and reassembly. Luckily it came out strong.

I want to build prepare a bucking transformer to run this radio at a line voltage that is more in agreement with the times when it was built (110-115VAC). The line coltage here is almost 125VAC. The set requires 140 watts without the crystal ovens so I think that a 3 amp bucking transformer can do the job.

Date: Tue, 2 Aug 2016 23:17:18 -0400
From: Guido Santacana <gsantacanav@gmail.com>
Subject: Re: [R-390] EAC AGC

I already have it at 113VAC with a Variac that I connected today but will do the bucking transformer project because I use the Variac on other smaller radios and for this one I want a dedicated power source. The caps that I used, and have used before, are polypropylene types that seem to work quite well. Voltage rating is at 630VDC. I sent for a couple of 2uF caps to replace C551. There were none in my parts box. I can install it underneath the IF deck and keep the original for the looks.

Today I performed the old Chuck Rippel procedure for IF gain adjust and to my surprise I was able to peak the noise with the antenna trimmer at 15.2MHz with no antenna connected, so I was able to lower the noise floor. The original multisection 30 and 45uF caps are holding well. I tested them at max voltage days before and apparently they are still ok. They also tested well in my cap meter and ESR meter. Nonetheless I am keeping them under surveillance for any leakage or heat. After I get the 2uF C551 in and also replace C609 then everything will be prepared for alignment. The vedeer root counter is a bit off but I think that it can be corrected with the zero adjust. The fact is that I bathed the whole gear section with WD40 to clean out the crud and forgot to take out the WD40 from the zero adjust area. It is slipping. My bad! as millennials say now. The set has been on today for 3 hours with excellent sound and good sensitivity. Now I wish that one R390nonA would suddenly appear around here as this one did. Then my setup would be complete because I already have the R392. The next

challenge is looking for space in this crowded shack for this set. I may get rid of some of my sand state stuff.

Date: Wed, 3 Aug 2016 17:33:45 +1000
From: Pete Williams <jupete@internode.on.net>
Subject: [R-390] Why is it so ?

IF Module R-390A prob.
Preliminary observations herewith.
A supposedly reconditioned Module .
Very distorted audio;
1.. Diode load measures -60 (sixty) V on local BC station
2..Tune off- no signal diode load shows -16 V.
3..AGC terminal measures -3 V on signal as above .
4.. AGC terminal measures -0.4V no signal.

Selecting all AGC switch. slow/med/fast positions no change.
RF gain at maximum and in AGC mode.
Limiter switch on- minor variation in any of above conditions.
No in depth forensic examination as yet, but someone may have been this route before and have heads up diagnosis for me ! Radio operates OK on a different module. It all seems rather odd.

Date: Wed, 3 Aug 2016 10:28:12 +0000 (UTC)
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] Why is it so ?

Hi Pete, Sure looks like you have an agc problem. As you might guess, there are numerous problems that can cause these symptoms, but 2 would be more common:
1. Tubes: v508, v509, and v506.2. C551 can get resistance to gnd, c547 and c548 can become leaky.
I suggest replacing these 3 tubes, first. If that's no help, measure resistance to gnd on v506 pin 2 with large connector disconnected or agc link on term 3 and 4 removed and power off. It should be 500k. If less, 1 of those 3 caps in 2 above may be bad. If =, they may be ok. Put it back together. If you have a tube socket test adapter, plug it into v509 and power on and look for -15 v on pin 1 or 2 on a strong station. If you have it or close, 1 of the 3 caps or ? is loading the agc down. If you have low - v on pin 1 or 2, you will need to find the loss of signal after the 3rd IF.

Date: Wed, 3 Aug 2016 08:44:44 -0400
From: Charles Steinmetz <csteinmetz@yandex.com>
To: r-390@mailman.qth.net
Subject: Re: [R-390] AGC troubleshooting procedure [WAS: Why is it so ?]

> Sure looks like you have an agc problem.

R390A -- AGC troubleshooting procedure:

Throughout this entire procedure, the "FUNCTION" switch should be set to

"AGC."

First, make sure there is a jumper installed between TB102, Terminals 3 and 4. If not, install one and see how the radio works now.

Set the AGC to "MED" and tune the radio to a good, strong, local signal (like a strong AM broadcast station). Measure the DC voltage at TB102, Terminals 3 and 4 with a high impedance meter (VTVM, DVM, or scope, with an input resistance of >= 1M ohm; *not* a VOM). It should be significantly negative, -10v or more. If it is, you have no gross AGC problem and the fault lies elsewhere. But if the voltage is only weakly negative, or zero, you have an AGC problem. If so:

Turn off the radio, and pull the power plug. Set the AGC time constant to "MED." Remove the jumper between TB102, Terminals 3 and 4. Measure the resistance to ground from each of these terminals. Terminal 3 looks back into the AGC detector, and should read in the neighborhood of 500k ohms due to R545, R546, and R547. Terminal 4 is the AGC line feeding the RF and IF circuits and should read approximately 1.8M ohms due to R201 and R234. If you unplug P108 from the RF deck, Terminal 4 should then read essentially infinite (>10M ohm).

If you have gotten to this point, one or the other of these Terminals will probably show a much lower resistance to ground than this. Trace the circuit to find the leaky component(s).

If Terminal 3 reads less than ~500k ohms, the usual suspects are C551, C548, C547, C545, and C544.

If Terminal 4 reads significantly less than ~1.8M ohms, the usual suspects are any of the several dozen bypass caps on the AGC line in the IF and RF sections, or leakage to ground in one or more of the mechanical filters, or (much less likely) leakage to ground due to contamination of the fiber insulating washer on the shaft of the antenna trimmer capacitor. It is also possible that the sector of the "FUNCTION" switch that shorts Terminal 4 to ground when the switch is set to "MGC" or "STAND BY" is mis-timed, broken, or contaminated/dirty, but this is even more unlikely.

If, on the other hand, the resistance readings are OK, suspect V508, V509A, and associated circuitry (Z503 and C546, especially).

Date: Sun, 7 Aug 2016 11:13:16 +1000
From: Pete Williams <jupete@internode.on.net>
Subject: [R-390] Why is it so? AGC SOLUTION

Hi all..... My thanks to Larry and Charles for their excellent advice on solving my AGC problem per recent email..The solution was relatively simple once you know all the facts and I apologise for not initially reporting that this IF module had been modified to mate with a non-standard carrier meter (100 ohm) using the

David Wise mod with the addition of the 1N914 diode from R546/R547 to chassis .It might have made the diagnosis easier in retrospect. However, following the checks suggested, I changed all the AGC capacitors figuring that in this case a 'shotgun' approach would
eliminate any doubtful and leaky caps seeing as how they were aged about 60+ years. A new 2 mFd replacing C551 nicely installed under the chassis finished that bit. Surprisingly, reinstallation of the module produced absolutely no improvement ! -what the ? ! No AGC and the high -45 V on pin 2 of V509 not getting to V506-----if it was getting somewhere why was it being siphoned off and to where?

An inspired(?) moment of reflection and look at the meter mod schematic seemed than it might be possible that the 1N914 might be questionable.
A check showed the diode had a problem--- 1.5 K in both directions.!
The future beckoned and a replacement did all that was expected of the module and faith restored with situation and voltages normal. Again , my thanks to Larry and Charles who steered me in the right direction.

Date: Mon, 8 Aug 2016 23:02:28 +0000
From: David Wise <David_Wise@Phoenix.com>
Subject: Re: [R-390] Why is it so ? AGC SOLUTION

Sorry not to get involved until it was over. I was busy with other things.

Anytime the symptom is low AGC voltage combined with high signal output, I consider C551 the prime suspect.

On my '58 Motorola, C547 and C548 are Sprague "Vitamin Q". They are based on oil-soaked paper, which is notorious for deteriorating over time, but this model is hermetically-sealed and uses exceptionally good materials. Mine are in good shape even 60 years later.

But my C551 was leaky. Replacing it effected a complete cure. I gutted and stuffed the original can, an operation I did not enjoy. Later I wrote up a mod to fix an ergonomic problem (see "Ending The Moment Of Silence"), which included replacing C551 again, this time with a cap remotely located on the front panel. The original refurbished C551 was abandoned in place. If I had to replace a C551 today and for some reason did not want the Moment Of Silence mod, I would put the new cap on the front panel anyway.

PS: How is the Carrier meter mod working for you? (Gary Gitzen came up with the idea; I just made it ready for prime time.)

Date: Fri, 9 Sep 2016 17:45:35 +1000
From: Pete Williams <jupete@internode.on.net>
Subject: [R-390] A hard one
Why do I get the hard ones? this is a new arrival.

IF MODULE....It goes into oscillation..
1.. all AGC caps changed

2... tubes changed
3.. little or no - AGC. Can also see + V on AGC (about + 3 V) depending on setting of RF gain and local audio.. AGC terminals correct R to chassis.
4.. Varying local gain and RF changes character of oscillation as heard on speaker.
Testing done in chassis and external on extension cable
5.. The IF of 455 kHz introduced to J513 from sig, gen and output level varied Carrier meter works but has gone backwards when AGC goes positive .
6... tube potentials to be checked but a day of audio racket, a wonder to behold .

Do I have a problem ?

Date: Fri, 9 Sep 2016 10:24:07 +0000 (UTC)
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] A hard one

Hi Pete, Sometimes this is a tough one. Here's some things you can try:
1. disconnect both IF deck input cables. If it stops, 455kc is getting into the RF deck. Good metal tube shields on RF and mixers.

2. turn IF gain all the way CW (low)3. Metal tube shields on all tubes carrying 455kc4. check L502 (detector filter) for short5. Weak bypass cap on cathode, screen, or plate circuits on V501 - V504 and V508.6. Wiring and component dressing on these tubes. 7. Look for mods that could cause this.

Date: Fri, 09 Sep 2016 08:17:05 -0700
From: Renée K6FSB <k6fsb.1@gmail.com>
Subject: Re: [R-390] A hard one

Sounds like the AGC itself is osc, possible mis-wire or so far out of adj (had one with both), remove the tube in agc circuit, see if still persists Renée

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Date: Wed, 14 Sep 2016 16:21:44 +1000
From: Pete Williams <jupete@internode.on.net>
Subject: [R-390] IF Module --- dog

I'm still wrestling with this mutt! Can any one tell me --- before the wife calls the men with the white coats ---- why there is interaction between LOCAL GAIN and RF GAIN controls . With IF input 150uV,modulated , function switch AGC and about -7V showing on DIODE LOAD, there is precious little showing on AGC rear panel #3 and 4 until I turn up LOCAL GAIN and AGC voltage dramatically increases.

Is there a major wiring error to rear panel... pots seem to have correct wiring, but previous owner may have had a go at something. I'm now about to gather strength and up end the beast for a look. What have I missed

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Date: Tue, 27 Sep 2016 18:25:41 -0400
From: <wb3fau55@neo.rr.com>
Subject: [R-390] 6HA5 vs 6AK5/5654

Well, I need some input here as to improved performance using a 6HA5. I put one in the xtal osc section, it works, but not sure if it is better. thanks to all.
Now working on a '56 contract Motorola, all working except no receive on 28mc.
73s Russ

Date: Wed, 28 Sep 2016 03:36:41 +0000 (UTC)
From: Larry H <dinlarh@att.net>
Subject: Re: [R-390] 6HA5 vs 6AK5/5654

Hi Russ, It is important for the osc to produce a certain level of output and the less distorted the output is the better. The 6AK5 was chosen to produce a very clean osc output. That minimizes IMDs and noise in the mixer. If you can't measure a specific improvement, I think you should put the 6AK5 back into service.

Date: Wed, 28 Sep 2016 07:11:34 -0400
From: Bob Camp <kb8tq@n1k.org>
Subject: Re: [R-390] 6HA5 vs 6AK5/5654

The really tricky part of the oscillator output is its phase noise. That impacts the adjacent channel / overload performance of the radio. This is the section that likely was in the missing engineering report on the radio.
