THE SIGNAL

Collins Collectors Association

Issue Number Fifty Three

First Quarter 2009

OFFICIAL JOURNAL OF THE COLLINS COLLECTORS ASSOCIATION

Join Us on the Air!

- Sunday 14.263 mHz at 2000Z
- Tuesday 3805 kHz at 8pm CST
- Thursday 3805 kHz at 8pm CST
- Friday (West Coast) 3895 kHz at 10pm CST
- Sunday 10m AM 29.050 mHz at Noon CST
- 1st Wednesday AM 3880 kHz at 8pm CST

Sunday for Technical, Buy, Sell & Swap
Tues., Thurs., Fri., & Sunday for Ragchew

Inside This Issue

Visit the CCA Website @ www.collinsradio.org See our new features. You can also renew your membership on line via the website and new PayPal link.

In the News

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- 2009 CCA Cruise
- Collecting in Europe
- Renewal Reminder

75S-3/3B S-Meter Stability Improvements and Observations

by Don Jackson, W5QN

As have numerous other folks with 75S-X receivers, I've spent a fair amount of time fiddling with the S-Meter on my 75S-3B in an attempt to improve its stability. When I first acquired the receiver, the S-Meter was pretty much all over the place, moving up or down a couple of S-units or more over the course of a few days. I darn near got carpal tunnel from zeroing the meter!

I read a number of posts to the CCA reflector that discussed the problem. Improvements included resistor replacement, capacitor replacement, grounding, and cleaning/replacing the S-Meter zero pot. All these possibilities have validity and are recommended. In my experience, getting to the final solution involved peeling several "layers off the onion". Your results may be different from mine, but hopefully this article will offer some additional information or insight. In more-or-less chronological order, here are the layers of my "onion" and the results. Note that this discussion refers only to the DC stability of the meter circuit. Therefore, you should be sure no input signal or noise is present during any of these tests or measurements. Disconnecting the antenna and/or detuning the preselector should do the trick.

As I said, my S-Meter stability was pretty dismal when I first bought it. It

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From the Editor's Desk

by Bill Carns, N7OTQ and Co-Editor Joe Nyberg, WILJN

It is sure great to see the activity level of the CCA continue to come up. After a very successful Cedar Rapids Convention, we now have the Dayton Convention and Swap Meet coming up where Jim Stitzinger, thanks to backing by the ARRL, will again be showing his 60s vintage Ford Collins S-Line Van.

Then we have the CCA 2009 Caribbean Cruise coming up in the fall. I am certainly looking forward to all of these and I hope that you will consider attending these in spite of the current economy issues. When in Dayton, I hope that we will see you and yours at the banquet and please drop by the CCA booth as well as the nearby ARRL booth to see the van.

You can read more about all of these coming events here in this issue.

Speaking of this issue, we want to recognize the international nature of both Collins Radio and our membership. Starting this year,, the first quarter CCA ***Signal*** Magazine will be traditionally an issue featuring foreign content, literature and service. I hope that our members off shore will contribute to this effort and I solicit your inputs.

My experience recently seems to indicate that, finally, the propagation is improving and there has even been a sun spot or two, The 20 meter net is livening up and I hope that all of you will be checking in regularly. My project work on the shop/shack building is reaching the end and equipment is being set up as I write this so you will soon be hearing N7OTQ and K0CXX back in the mix. I put some pictures up on the CCA site via MyHamShack.com and I hope that all of you will take advantage of this capability so that we can see what our membership is up to. Please, when you do, include a picture of yourself in one of the scenes so that we can all get to know one another better.

I would like to take this opportunity to thank Larry Saletski for his continuing help in scanning documents and coordinating with Brian Sokol to get these put up on the CCA website. Larry has been doing this job for a number of years now and his continued support of the CCA is certainly appreciated.

Without the help of volunteers, the CCA would not be the success that it is today. While we mention them often one at a time, it is appropriate to add our thanks to all of them at this point and provide you with a list.

Membership - Pete Zilliox
Dayton - Tony Sokol
WebMaster - Brian Sokol
Archive Manager - Larry Saletski
Reflector—Paul Kluwe, etal.
Numerous Net Managers

This year, the staff of the ***Signal*** magazine wants to continue to provide you with educational, informative and even rare incites into the Collins of old, as well as the Collins Radio of today. I want to encourage all of you that can write, or are interested in writing, to provide your editors with article ideas and contributions. Remember that contributing a major article gets you a free year of CCA membership and that multiple minor articles or column contributions can do the same. We are particularly looking for technical articles on maintenance or restoration of Collins Amateur Radio equipment. As you do a project, keep this in mind and take good before, in progress and after pictures and share your experiences with the other members. If you have an older ('30s) piece of this Collins gear, I AM LOOKING FOR YOU.

This editor has had a major (actually two) computer problem during the last quarter. Fortunately all of the ***Signal*** material was backed up and not damaged. The first problem was caused by the "bot" that infected me through the Adobe 9 security breach that was announced last month. The patch is now out from Adobe (Adobe reader 9.1) and I hope that, if you are using Adobe 9, you are aware of this issue and have uploaded 9.1. Please note that the second problem that I had has caused me to lose ALL of my email records. I had some warning that this might occur and managed to save some of the in-process works, but not all. If you have been communicating with N7OTQ, and you have not heard from me in a timely fashion, send me a reminder email with some brief notes on what we were up to, and I will be back in touch with you. Please be patient. And know that I am not happy about this. One of the reasons that the ***Signal*** quality and content is up, is that I have tried religiously to acknowledge, and

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2009 7-Day CCA Caribbean Cruise Sails October 24th

by Butch Schartau, K0BS

As announced at the 2008 CCA Dayton Banquet, a radio friendly cruise to the Eastern Caribbean has been booked for October 24-31, 2009. All CCA members, family and friends are invited to join in. This cruise is a joint membership activity with the QCWA.

Please go to the CCA Web Site WWW.Collinsradio.org for more information on this cruise.

This is the 10th. anniversary of the CCA cruise back in November of 1999. Once again, thanks to the Collins Radio Amateur Radio Club in Cedar Rapids, we will have the privilege of using their club Call, W0CXX, while on board the ship. Collins equipment will be available along with other equipment being supplied by various current equipment manufactures. In addition to operating the W0CXX station on board, and in addition to the full range of cruise ship amenities and ports-of-call, CCA/QCWA related seminars and other CCA events are being planned.

October 2009 will be here before we know it, so now is the time to start making your plans to join your CCA friends on this exciting and relaxing venture.

By signing up early, you will be able to select the best accommodations tailored to your needs. Call White Travel Service Inc. @ 860-233-6177 to make your reservations or get additional information that is not on the CCA website. White Travel's website is WhiteTravel.com.

The cruise ship will be the luxurious EURODAM, a brand new ship in the Holland America fleet of cruise ships. It has 11 passenger decks, is 935 feet long and has a crew of 800 to serve us. Some of the new features of the EURODAM are an expanded Greenhouse Spa and Salon with thermal suites and hydro-pool, the largest gymnasium ever built for a Holland America ship and a youth facility that includes a teen-only loft.

A pass port will be required and, if you plan to operate, you will need a current Amateur Radio License. If I can be of any assistance, email me at K0BS@ARRL.net.

All of us on the CCA board hope to see you there.

de Butch Schartau, K0BS
CCA Board Member and Events Chairman

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The Dayton Hamvention is coming May 17, 2009 Don't Miss It

On the weekend of May 17th through 19th, the CCA will again meet in Dayton, Ohio to share experiences, hear some great talks, and attend the Dayton Hamvention - the biggest in the world.

The highlight of the event will be the Friday evening banquet, where Bill Wheeler (K0DEW), the founder of the CCA, will give the opening remarks and Rod Blocksome (K0DAS) of Collins Radio will present a very educational and, as usual for Rod, entertaining talk on the key technological contributions of Collins Radio. This is not to be missed.

Jim Stitzinger (WA3CEX), Board Member and one of the most prolific literature and Collins equipment collectors, will again bring his S-Line Collins Promotion Ford Econoline Van which will be located close to the CCA booth (# 459) in the ARRL booth. Our thanks go to Jim and the ARRL for providing this remarkable experience. If you have not operated from this original Collins restored van, you are missing a big opportunity to jump back in time to the Amateur Radio glory days at Collins.

With airline fares at a low level, and with the banquet bargain price of $38 per person, we hope that you will come and enjoy this event and the camaraderie with your fellow CCA members. As usual, there will be some great door prizes and our thanks go out to Hammond Manufacturing for their donations

Make your reservations early and take advantage of the group rate at the Holiday Inn Dayton – North. See the CCA website and click on "**Dayton 2009 information is now available here.**" link in the news announcement for Dayton 2009 at the top of the home page.

You can pay with a mailed check, PayPal or your debit or credit card (through the PayPal link).

Hope to see you there.

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Reducing Product Detector and BFO Noise In 75S-3 Receivers

by Dick Weber, K5IU

I operate CW only and very much enjoy using a 75S-3A / 32S-3A /30L-1 set up to work DX. Recently I became annoyed by two sources of noise from within the 75S-3A I was using. They were a problem while working weak signals when I would turn down the RF gain and turn up the audio. Just so happens these noises were also in a second 75S-3A I have. I suspect that these noises are not a problem or are barely noticeable when these receivers are used for SSB or casual CW especially if a loudspeaker, and not headphones, is used. But for me they became a problem. I was able to reduce the level of these noises in both my 75S-3As so they do not impair my ability to work weak CW signals - these receivers now sound so much better. Although, I still have the 60 Hz hum that most 75S-3 owners experience while using headphones when the audio is all the way down.

You can check your 75S-3 to see if you have these two noises - actually one is hum and the other is hash-like noise. To do the check, turn the RF gain all the way down fully CCW, BFO off, with the audio gain half to two thirds the way up while listening with headphones. You will hear a hum that will increase as the audio gain is turned up further. Now turn on the BFO. You will most likely hear the hum change to anywhere from slightly to significantly louder – this is one of the noises. You will most likely also hear broadband hash. On both my 75S-3As these two noise effects were very evident. The hash would appear and the hum would get worse when the BFO was turned on. When the BFO was turned off, the hum would reduce in volume and the hash would disappear. You can also try this on a 75S-3B, which I will address later.

Early 75S-3 receivers had a potential BFO problem and a hum problem that were addressed by two service bulletins: 75S-3 SB-1 and 75S-3 SB-2 respectively. The first addressed a BFO parasitic oscillation that could be present in some early receivers, which was resolved by the addition of a 47-Ohm resistor to the BFO circuit. Schematics for 75S-3B and later 75S-3 receivers show this resistor as R87. I had a 75S-3 built in 1961 that did not have this resistor and did not have the parasitic oscillation. Then one day the oscillation just showed up. Adding R87 per 75S-3 SB-1 fixed it. If you have an early 75S-3, check to be sure you have R87 on pin 6 of V11. If not, you should incorporate 75S-3 SB-1. Most 75S-3 and all 75S-3B receivers came from the factory with R87. The same is true for service bulletin 75S-3 SB-2, which addresses minimizing background hum. You can check if this service bulletin was incorporated in your 75S-3 by seeing if R25 at pin 9 of V8 is a 5,600-Ohm resistor. If R25 is 1200 Ohms, you should execute SB-2. In my case, my 75S-3A receivers did not need either of these service bulletins.

After a bit of trouble shooting it became clear that part of the problem was the close proximity of L16 and L12 to each other and that these chokes were not shielded. This was further supported by the fact that late models of the 75S-3B used shielded versions of L16 and L12. Before changing L16 and L12 to shielded versions, I noticed that L16, a 100 uH choke, is in parallel with C34, a 1000 pf ceramic disk capacitor. These can be seen in the partial schematic of the product detector and BFO, V8, in **Figure 1.** Using the nominal values for the choke and capacitor, the calculated resonant frequency of a parallel resonant circuit made with them is 503 kHz. With a series resistance 3.2 Ohms, the parallel LC circuit would have an impedance of about 1650 Ohms at 455 kHz.

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Service Line (Cont'd)

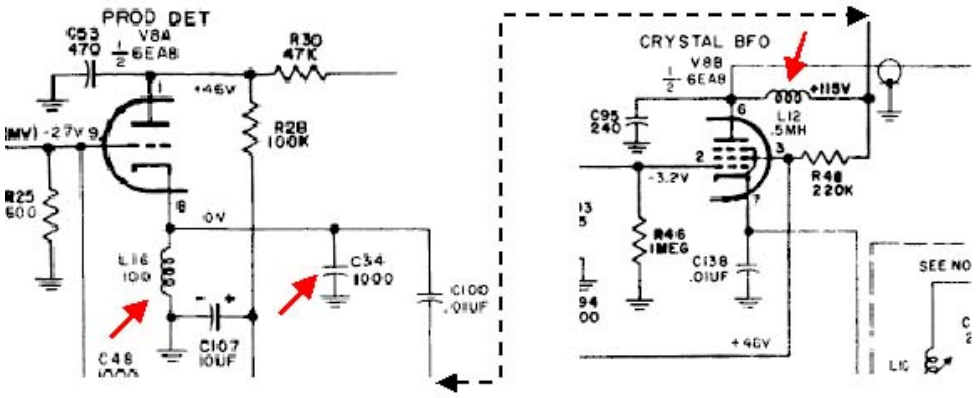


Figure 1—Partial 75S-3 Schematic Showing the Product Detector and BFO (V8A & V8B)

I removed C34 (X5U) from both my 75S-3As and measured their values to be 873 and 929 pf. Using the nominal choke value of 100 uH and the measured capacitor values, the calculated resonant frequencies are 538 kHz and 522 kHz, which would yield impedances of about 1000 and 1190 Ohms respectively at 455 kHz. This is illustrated by **Figure 2** along with the impedance of a 1000 uH choke discussed later. To further look at the impedance that may be seen at pin 8, I measured the resonant

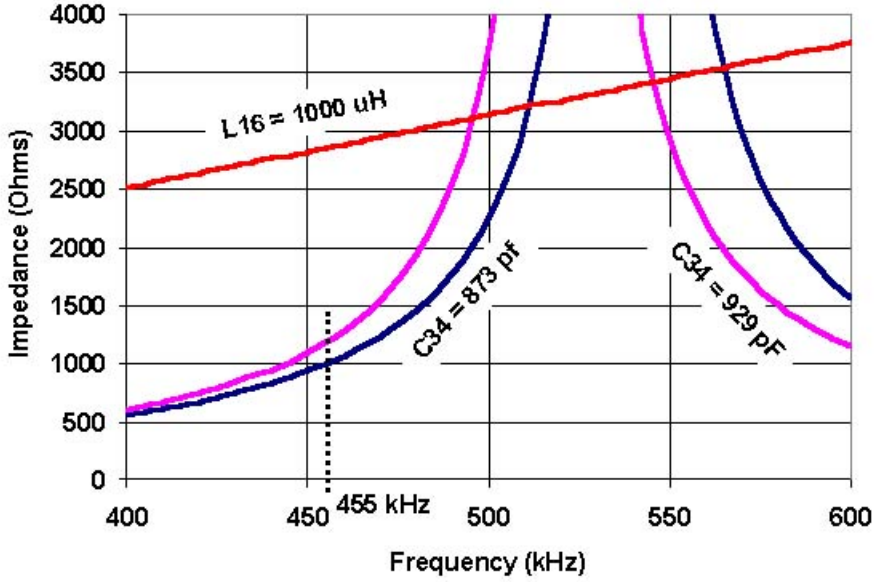


Figure 2—Impedance of L16/C34 Parallel Resonant Circuit with L16=100 uH & C34=873 or 929 pf vs. L16=100 uH w/o C34 (Red)

Service Line (Cont'd)

frequency of a parallel circuit made using a new, shielded 100 uh choke (API Delevan pn 1641R-104K) and a new 1000 pf (X7R) capacitor. It had a resonant frequency of 544 kHz, which would have an impedance of about 850 Ohms at 455 kHz.

Seeing that there could be a wide range of possible impedances at pin 8 of V8, I decided to replace L16 with a 1000 uH shielded choke (API Delevan pn 1641R-105K) and delete C34. Doing so would give an impedance in the range of 2570-3140 Ohms over the +/-10% tolerance range of the choke. The shielded 1000 uH choke used has a self-resonant frequency (SRF) of 3.8 MHz so using it at 455 kHz would not be a problem as it will develop the calculated reactance. I also used one to replace L12 even though the schematic calls out a 500 uH choke. When you replace L12 and L16 you will see that the old chokes are very large and that it would have been nearly impossible to use a larger value choke for L16, which necessitated using a parallel resonant circuit made from L16 and C34.

After modifications, both my 75S-3A receivers were significantly improved now that L12 and L16 were not radiating or picking up as much energy as they were when they were not shielded chokes. The hash was gone and the hum with the BFO either on or off was significantly reduced. The hum heard when the volume is all the way down was still there.

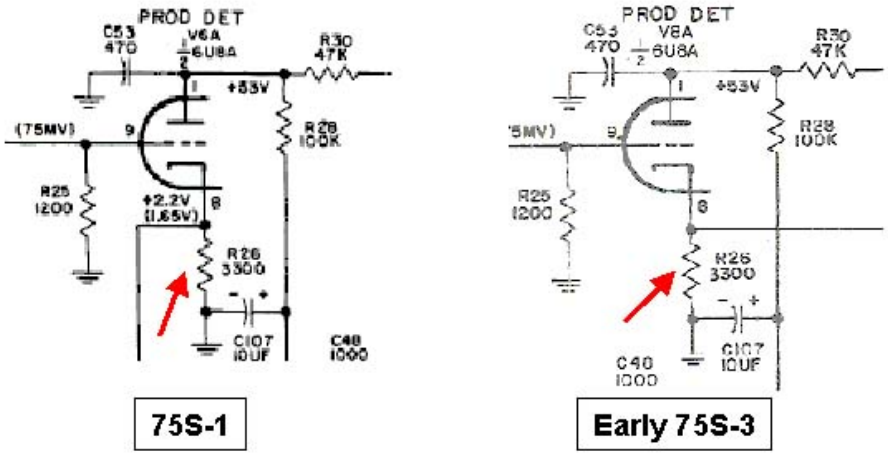


Figure 3—Schematic of 75S-1 and Early 75S-3 Product Detectors Showing the Use of the 3.3K Ohm Resistor

In the 75S-1 and early versions of the 75S-3 L16 and C34 on pin 8 of the product detector (V6 and V8 respectively) were not used, but rather a 3,300 Ohm resistor (R26 in both receivers) to ground was used as shown in **Figure 3**. After production of the 75S-3 had begun, L16 and C34 as shown in **Figure 1** were used in place of R26 - service bulletin 75S-3 SB-2 was published on May 10, 1962 to cover the units already in use. In view of this, I decided to see if taking out the new L16 (shielded 1000 uH choke) and replacing it with a resistor would further reduce the hum and hash – thinking that a resistor might be less likely to radiate or pick up energy than even a shielded choke. Risking going backwards a step or two, the L12, L16C34 combination was replaced with 1.6k ohm resistor. The result was a further reduction in noise of 2.7 dB BFO off and 3.9 dB BFO on. This was my stopping point.

de Dick Weber, K5IU See page 16 for Dick's Author Information limited by space. His conclusions about the 75S-3B/C will appear in a coming issue.

75S-3/3B S-Meter Stability (Cont'd)

drifted somewhat randomly over a range of perhaps +/-2 S-units, and sometimes jumped more than that. My 75S-3B was manufactured before 1966 and is therefore of "pre-SB1" vintage. The first thing I did was modify the circuitry of V6 to reflect SB1. This removed several components from the cathode circuit of V6 that were potential sources of meter drift. This modification helped quite a bit with the large random meter shifts, but I'm not sure which removed component was the problem. Most of you probably already have the more current circuitry in which the cathode of V6 is directly grounded.

The next thing I looked at were the resistors in the meter circuit, as well as other resistors that might affect the meter drift. For this analysis I used a Spice simulation created for theoretical experimentation. The receiver was assumed to be in AGC FAST position, RF GAIN at maximum and grid current for V6 and V7 was assumed to be zero. Each value of resistor was increased by 10%, and the resulting change (**Δ**) in meter current recorded. The resistor was then reset to its original value before moving to the next resistor. A "+" means the meter reading increased, while a "-" indicates a decrease. Only the resistors that had a significant impact on the meter reading are listed. I've also listed the power rating of each resistor as well as its power dissipation in the circuit.

One S-unit on the meter is roughly equivalent to 55uA meter current. (Note: The meter is 1000uA F.S., so S9 is at half scale, or 500uA; dividing 500uA by 9 S-units, you get 55uA/S-unit) From this list, you can see that the "big hitters" are R13 (zero pot), R21 and R16.

None of these resistors are operated beyond their rating. R51 has the highest "Dissipation to Rating" ratio, but it is a wire-wound design and is quite stable over time and temperature in comparison to the carbon resistors. I replaced R15, 16, 18, and 21 with new metal film units. (R18 isn't particularly sensitive, but I had that value in a metal film, so I replaced it also.) I was having trouble locating a pot at the time, so I just replaced those fixed resistors.

Resistor	Nom.Value	Δ (uA)	Rating Watts	Dissipation Watts
R15	15 k	+17.6	1.0	.407
R16	56 k	- 78.6	0.5	.072
R18	1 k	+3.4	0.5	.003
R21	39	- 73.0	0.5	.001
R33	270	+14.7	0.5	.002
R51	1 k	+14.4	5.0	3.33
R55	12 k	- 7.4	0.5	.102
R13 (zero pot)	500	+76.2	0.2	.001
R56 (RF pot)	10 k	- 6.3	0.25	.001

The result of the fixed resistor replacement was not dramatic in my case. (Your case certainly might be different.) I could see little improvement. It was not a waste of time, however, since I then felt reasonably assured that the fixed resistors were not the primary culprits. I was still observing a steady change in the meter reading each day of around an S-unit. It was always in the same direction and I would zero it every day. The behavior was pretty much the same each day, so a simple component value drift did not account for it.

I finally purchased a suitable pot for R13 and installed it. Initially, I tried to find a cermet pot, which has superior temperature stability to carbon, but could not locate a standard production unit with the correct bushing and shaft size. I settled on a carbon RV6 style pot from SSN. Installing the pot stopped the daily "one-way" drift problem. Apparently, the wiper contact resistance "reset" each time I turned the receiver off for the night. I can't say I fully understand what was happening, but replacing the pot certainly fixed that problem.

Since I have no other 75S receiver for comparison, I thought I might have reached the best performance that could be expected. Meter drift was satisfactory, moving only +/- ½ S-unit or so over the course of a couple of days. There was little reason for con-

75S-3/3B S-Meter Stability (Cont'd)

stant zeroing. However, curiosity got the best of me and I decided to investigate further into the remaining meter drift.

I was left with the possibility of leaky capacitors scattered around the circuit, or a variance in a tube parameter. Since I cringed somewhat at the thought of shotgun-replacing all the caps, I decided to investigate the tube possibility first. My tube stock included eight 6BA6s, so I started randomly substituting different units. Changing tubes in this manner had an affect on the meter drift, but I didn't achieve much overall improvement with this ploy. I suspected the drift had something to do with the grid current of V6 and V7, since the meter moved when I changed the AGC switch from FAST to OFF. The reason for this is that moving the switch to FAST to OFF removes R24 and R88 from the grid circuit. The presence of grid current is significant to S-meter stability because grid current changes the bias point of the tube when there is a series grid resistor involved. For example, if V7's grid current changes from zero to -65nA, the grid voltage moves in a positive direction by approximately 60mV. (Note that V6's grid voltage is also modified.) This grid voltage change is primarily due to the "Ig*R" voltage across AGC resistors R24 and R88 when the receiver is in AGC FAST or AGC SLOW mode. In this example, the result on the S-Meter reading is a downward deflection of about ½ S-unit.

After thinking a bit about this, I realized the AGC "OFF/FAST" behavior could be used to test each 6BA6 individually for grid current. Ideally, switching between AGC FAST and OFF should produce no meter movement if the tubes have zero grid current. With my 6BA6s, I saw considerable meter movement, so I suspected something was not as it should be. I used the following procedure to select 6BA6s for minimum grid current:

- Remove V2 from its socket, and set RF GAIN to maximum. (V2 is connected to the AGC line and normally draws a slight amount of positive grid current. You must remove this tube so that its grid current does not effect the measurement of the 6BA6.)
- Remove V6 and V7, set the receiver to AGC OFF, and allow the receiver to warm up.
- Install the 6BA6 to be tested into the V7 socket, and allow at least 10 minutes for it to warm up. My tubes generally started out with very little grid current, but after 10 minutes or so, the current became significant.
- Set the S-Meter zero adjust so the meter reads a convenient reference value. I used S9 to provide plenty of downward meter deflection room, but most any meter setting will work.
- Switch from AGC OFF to AGC FAST, and record the meter deflection from its reference value. A downward meter deflection indicates negative grid current. (current that flows out from the tube)
- Repeat this procedure for each 6BA6, resetting the S-Meter to the reference value each time a different tube is inserted in V7 for testing.

The tests on my tube stock revealed that the grid current was usually negative at the single bias point established with RF GAIN at maximum. (Bob Jefferis, KF6BC, suggests an excellent discussion of grid current phenomena may be found in "Electron Tube Design" [1]) What you want are tubes that show no meter movement between AGC OFF and FAST, indicating zero grid current. In my case, I found that 3 of my 8 6BA6s showed zero or near-zero meter movement. Four of the remaining tubes showed a downward deflection of the meter (from S9) in the range of 1.2 to 3.3 S-units. One tube had a .5 S-unit upward deflection.

Hopefully, you will have a couple of tubes that have no grid emission. Install these in the V6 and V7 spots. Zero the meter normally. Switching between AGC OFF and FAST should produce no meter deflection. Now install V2. With V2 installed you should see a deflection in the meter when switching from OFF to FAST. This time the meter should deflect upwards, indicating positive grid current. My stock of 6DC6s included 6 tubes, and they all exhibited an upward deflection from .3 to .7 S-units. This is normal, given the DC grid voltages in the 75S-

Cont'd Pg. 10

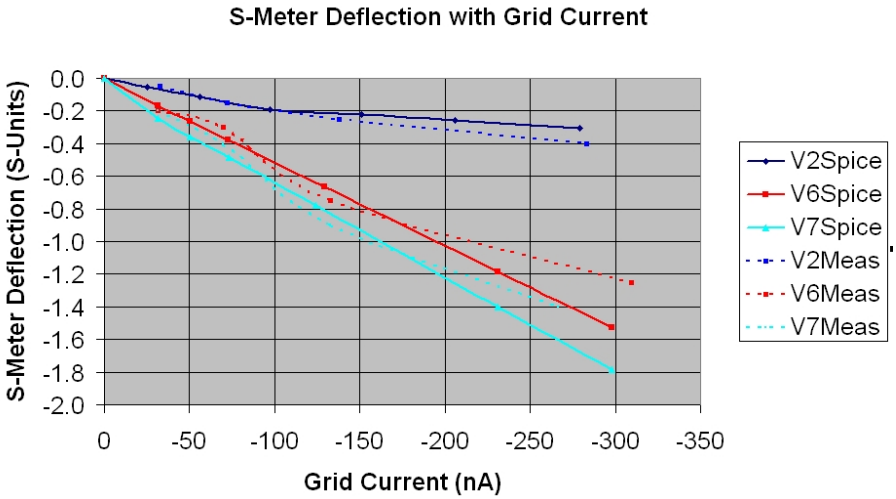
75S-3/3B S-Meter Stability (Cont'd)

3B manual schematic and voltage chart. Although V2 can still cause drift problems due to variance of its grid current, my experience has been that V2 is not as significant a problem as V6 and V7. For one thing, the mechanism that produces positive grid current is quite different from the manufacturing/aging defect mechanisms that produce negative grid current. It appears that the V2 positive grid current is more stable over time and temperature than the negative grid current of V6 and V7. This is an observation, not something on which I have done a rigorous analysis. Another good thing about the V2 circuit is that its unusually high series grid resistance (much higher than the grid resistance recommended on the 6DC6 datasheet) produces significant DC feedback that tends to reduce and stabilize the grid current as the tube ages. Additionally, unlike V6 and V7, changes in the plate and/or screen currents of V2 have no affect on the DC operation of the S-Meter. All these factors cause V2 to generally have less affect on S-meter drift than V6 and V7.

The S-meter deflection in the "single tube" 6BA6 test procedure was estimated using the Spice simulation. A 100nA grid current produces close to 1 S-unit. 500nA produces about 2 S-units, and 1uA produces about 3 S-units. I averaged the S-unit meter deflections of my seven 6BA6s (those that had negative or zero grid current) and found the average to be 1.3 S-units. This amount of deflection corresponds to an approximate grid current of -200nA. In an email from Bob, he said that a datasheet on the 5749/6BA6W premium tube listed a grid current spec. This was very informative since no standard 6BA6 datasheet I had read mentioned control grid current at all. The 5749 datasheet said the "Maximum" grid current was -1uA at -1V bias voltage, and the "Average Maximum" grid current for the tube was -200nA. This average number corresponded very well to my average measurement data. I was surprised, however, that this level of negative grid current would be typical for a "good" tube.

I was interested in the individual contribution of V2, V6, and V7 to S-Meter drift due to negative grid current. Using the Spice simulation, I produced curves of S-meter deflection vs. negative grid current for each of the three tubes. The simulations showed the affect of the DC feedback of the V2 circuit, which has a lower sensitivity to undesired grid current. In order to check the validity of the Spice model, I decided to collect some actual data. With my selected 6BA6 tubes in place, I opened up the 75S-3B and measured grid current and S-Meter deflection. The result of both the simulation and actual data is shown in Figure 1. In both cases I simulated the excess negative grid current by placing a resistor from the grid of the tube to ground. The simulations are the solid lines and the actual measurements are the dotted lines. Considering the complexity of the tube models, the difficulty of meas-

Figure 1



75S-3 S-Meter Stability (cont'd)

uring the actual grid voltages accurately (with an HP-410B) and visually reading the S-Meter, I was satisfied with the general agreement of the simulation and the actual data.

The end result of the tube selection process was better than I had expected. The meter is now pretty much rock solid. The only drift I see is perhaps a tenth of an S-unit or so. Additionally, the warm-up time required for the meter to settle to zero dropped from the neighborhood of 10 minutes or so to less than a minute. Very nice! Apparently, the long settling time was due to the slow increase of the grid current as the 6BA6s heated up. Another point to keep in mind is that line voltage fluctuation alone will cause meter drift. Measurements on my receiver showed that a decrease in the line voltage from 115VAC to 105VAC produced an upward meter deflection of approximately ½ S-unit. The Spice simulation indicates the same variation.

This tube selection process is easy and doesn't require any external test equipment or removal of the receiver from its cabinet. However, it does not test for leakage of passive components such as capacitors, tube sockets, wire, etc. connected to the AGC line or the grid circuits of V2, V6 and V7. If, during the tube selection process, you are able to find at least one 6BA6 that has zero or near-zero grid current, you can assume that you have negligible current leakage due to other passive components. However, if you cannot find a "good" tube, there is the possibility that another leakage is masking the test results. One approach is to borrow a "known good" tube and see if it checks out in your receiver. Another pretty easy test involves the use of a good DVM that is battery powered, enabling it to be "floated" off chassis ground. For this test, pull the receiver from its cabinet, and remove V2, V6 and V7. Set the DVM to DC Volts, and connect it across the R24/R88 AGC resistor combination. Set the receiver to AGC OFF and RF GAIN to maximum. You should read zero volts on the DVM since the R24/R88 combination is

Figure 3

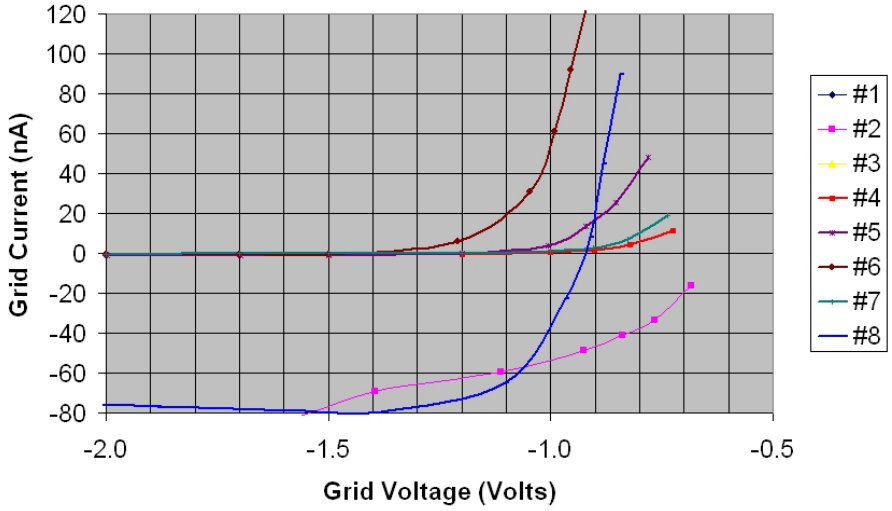
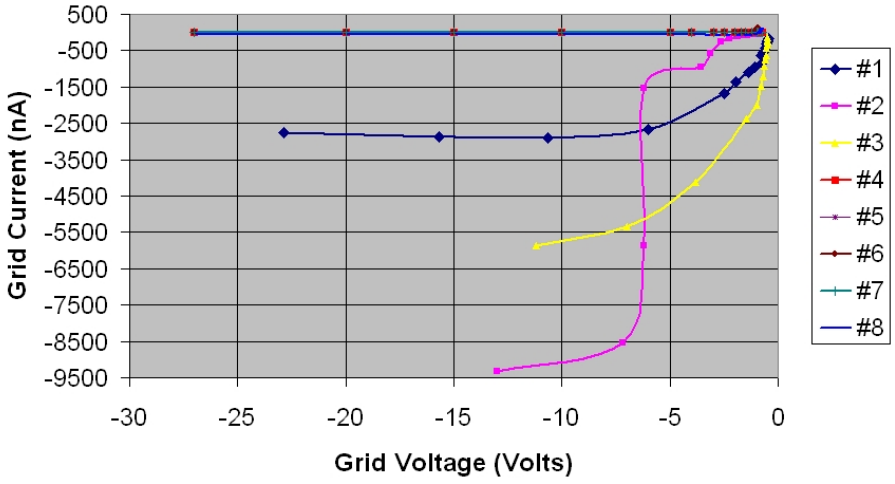


Figure 2



Cont'd Pg. 12

75S-3 S-Meter Stability (cont'd)

shorted out in the AGC OFF position. Switch to AGC FAST. Ideally, the DVM will continue to read zero. If it does not read zero, you have some current leakage due to something other than the tubes. For example, if the DVM reads 50mV in the AGC FAST position, and the input impedance of your DVM is 10Meg, then the leakage current is about 28nA. Since the voltage on the AGC line is approximately -.8VDC, the 28nA of current indicates an undesired resistance of about 28Meg to ground. You will want to find the offending leakage source and fix it.

Purely out of curiosity, I decided to attempt a determination of the mechanism that was causing the large negative grid current in some of my 6BA6s. I used a slight variation of the DVM method described above, and plotted grid current vs. grid voltage, using the RF GAIN pot to change grid voltage. (For this test, I used the V6 socket because its cathode is directly grounded.) Figure 2 and Figure 3 show the data on my eight 6BA6s. The data is the same in both figures, but the scales are different. Grid current curves published in "Electron Tube Design", figure 7 helped understand the issues.

Comparing these plots, I would have to conclude that the primary cause of the negative grid current is apparently not gas. The curves suggest that the grid current in my "bad" tubes is likely caused by primary grid emission, grid-cathode and/or grid-plate leakage, or a combination of the two.

In conclusion, I have found that once the better known and documented improvements to the meter drift problem have been implemented, perhaps the most significant remaining drift component are the grid currents of V6 and V7. Note that these grid currents would be unimportant to S-Meter stability if they remained constant over time and temperature. Unfortunately, they do not. All the 6BA6s I have in my possession meet the published grid current spec (-1uA at -1V bias) and are "good" as far as the manufacturer's datasheet is concerned. However, for the S-Meter circuit of the 75S-3B, the specified grid current of the 6BA6 (or the 5749) datasheet does not result in optimum S-Meter drift performance. Fortunately, we can select for very low grid current 6BA6s.

That's about it. I hope those of you out there who try this are pleased with the results. I would be interested to hear about your experiences with this procedure.

73s and good luck,

Don

W5QN

w5qn@verizon.net

1. "Electron Tube Design", RCA, First Printing, 1962

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Author Information
Don Jackson

Don Jackson, W5QN, of Garland, Texas is writing for us for the second time. After the thorough article about the 516F-2 PS choke, he again peeled the onion down to the core regarding the dreaded S Meter drift in the 75S-3(X) receivers.

Don is retired from a 40 plus year career as an electrical engineer, where he specialized in HF and Microwave Receiver design. He graduated in 1966 with a BSEE from the University of Florida and started his career with Texas Instruments.

He is fairly new to Collins collecting and has a 75S-3B, 32S-3, 30L-1, 312B-4 line-up which he uses as his main station. Don was first licensed in 1960 while in high school and started ham life with an Allied R-100 kit receiver and a Heathkit DX-40. When asked what his favorite piece of Collins gear was, he named off the 75A-4. I hope he has found one by this time. Thanks once again Don for your fine contribution..

In the "Shack" of Lino Esposito (Il-3152/Ge)

Normally this ***Signal*** "In the Shack of……." article highlights a licensed amateur's shack and background. This quarter will be a bit different. Lino Esposito has become a bright spot in my day. I look forward to his emails because they are always cheery and insightful. His passion for Collins Radio, Art Collins and the Collins equipment is obvious.

I think that sometimes we, here in the U.S., view Collins, and collecting Collins, as an American phenomenon. In fact Collins Radio manufactured and marketed equipment in a number of foreign countries, including Italy. Their reputation, and the impact of their equipment. was felt around the world.

Lino Esposito has a "shack" even though he is not a ham. In Italy, they have a SWL licensing system and Lino was first licensed in 1979 as I1-72003, then I1-3152/Ge. Shortly thereafter, he was exposed to Collins. (I will let you read the story on his website because I know you will enjoy it.)

What Lino has done is put together one of the warmest and most nicely displayed collections of Collins equipment, information and history that I have ever seen. Some of it is tangible - at his home location - and some of it is on his website at linoesposito.it.

Here are just a few select photos and I hope it will intrigue you enough to visit his website. Hope to see him at Dayton someday.

Collins Collecting Thrives in Europe

by Michael Lyman, W0JAM/DO1LMA

Although I have lived in Germany for almost 10 years, I have only scratched the surface of collecting, operating and knowing other Collins owners in Europe. What I DO know is that Collins is no stranger when it comes to European amateurs. There is a wealth of Collins equipment here but understandably it is not as easy to find as in the U. S. and it tends to be somewhat more expensive, especially for the harder to find pieces. Items like the 30S-1, 312B-5 and KWM-380, among other pieces are often difficult to find and will command high prices. A desired Collins piece can often be seen for sale in U.S publications such as eBay, or other forums with very accommodating prices however, after a successful purchase the new owner in Europe now must ship the radio….an often expensive affair with a good chance the piece will be damaged or destroyed in shipment. In addition to the cost of shipment there is also the issue of paying customs once the item reaches the foreign customs office. Here in Germany, everything purchased for more than $60 will cost about 20% in customs. In the end that $700 jewel that you just purchased from the U.S. may cost an additional $50-$100 in shipping and another $140 in customs. A customs official once (perhaps cleverly) advised me to try to send an item from the U.S. to Germany listing a value of $0.00 but insure it for the full amount. As it turned out, shipping companies insist the item value must match the insured value. For some of us who are severely infected with the Collins 'fever' this is just the cost of getting your hands on that piece you've been dreaming about. On a positive note, all equipment purchased within the European Union is free from customs costs and the shipping costs are fairly reasonable.

As an upside, the Euro has been quite strong throughout 2008 with typical exchange rates being around 1 Euro equaling $1.50. At one point during the summer of 2008 one Euro bought $1.60 but actually using this exchange rate was difficult since there was a certain amount of profit taking in this area as well (e.g. the exchange may have been 1 Euro=$1.58 but Paypal for example would only give $1.50. Overall however this favorable exchange rate made buying Collins gear from the U.S fairly attractive and buying that $1,200 Collins treasure for 600 Euro was an enticement difficult to resist.

As for Collins equipment resources, there are several ways to obtain a good Collins piece. The most obvious is to network with other private Collins owners and collectors. Another great resource is the yearly hamfest at Friedrichshafen (Germany). Very similar to Dayton, the yearly fest in June at Friedrichshafen draws hams from all over Europe as well as outside of Europe. Up to 5 complete buildings are filled with tables of equipment with usually no shortage of Collins pieces. This year saw a 30S-1, a very pristine KWM-1 as well as several other pieces up for sale. One of the great sidebenefits of this hamfest is that FCC license tests are offered by VECs living in this area. eBay.de (video-electronic/Collins), eBay.co.uk, as well as eBay from other countries, will usually turn up some piece of fine Collins history. In addition, I'm always seeing new European Collins owners (at least new to me) in the daily Collins reflector.

Once that Collins piece is in your possession, caring for it is easier in some places than others. I have had a hard time finding vacuum tubes or diodes and usually have had to order them from the U.S. Discreet components are available but one must locate an electronics store that carries such items.

Since the standard A.C. outlet here in Europe will supply 230 volts, most of my Collins equipment can be configured to plug directly into the wall outlet. The exception here is the 30S-1. Even though it is possible (even preferable) to use 230 volts for the 30S-1, it is necessary to use an isolation transformer that accommodates the difference between U.S and European phasing and grounding (the subject of some discussions on the reflector).

From here in Europe it would be nice to be able to link to the Collins nets that are held weekly but 20 meters propagation will just not allow it (yet)! As for the 80 meter net, working stateside stations is almost a common occurrence, but here again the propagation is not dependable. Worse yet, the band-limit (at least here in Germany) ends at 3800mhz, which makes access to the 80 meter net impossible.

Users of Collins equipment in Europe are no different than

Collecting Thrives in Europe (Cont'd)

anywhere else. We are dedicated to the memory and use of Collins equipment and may not actually have a more recent piece of equipment in our shack. To discuss more than a few owners would take more space than is available, so here are only a few:

When Lino Scannapieco (DJ0CL) isn't busy working at the embassy in Bonn he is usually collecting, working on or using his massive Collins collection on the air. The picture above is only a *sample* of his complete setup. Lino's most recent addition to his collection is a pristine 75S-3C (RE of course). Lino is a regular at the Friedrichshafen ham fest and is very active in buying/selling and trading equipment and can be heard on most bands during the weekend.

Any discussion of Collins radio in Europe wouldn't be complete without Henry Lewis (G3GIQ). Henry is the secretary of the U.K. chapter of the Collins Radio Association and its clear he has been an avid collector of Collins gear as can be seen by his shack (the pristine 30S-1 WE is out of view on the floor to the right of the desk). Henry is not content to simply collect his equipment but is also well known to restore those pieces that others may consider beyond help.

Please visit Henry's web page at www.qsl.net/g3giq/index.htm and you can read an interesting overview of his restoration of a 32S-3.

Finally, my shack (DO1LMA) is somewhat limited in space but I have no problem fitting the primary pieces into place.

The KWM-380 is the daily workhorse, but the S-line is also ready to go and provides an effective operating position. The 75S-3C is coupled to a KWM-2A but when I need a 'go-radio', the '2A comes with me along with a 312B-5 (not shown) and makes a good portable station that can be sometimes heard from Romania.

Only a few Collins shacks have been presented here and there are numerous other shacks that deserve to be here as well. Hopefully we can catch up with them in the next international edition.

In conclusion, while Collins equipment is not as prevalent throughout Europe as it is in the U.S., it may be surprising just how many European collectors have Collins equipment, including some rather rare pieces. As I mentioned, I'm just beginning to know what pieces are here in Europe and who to talk to for information and advice. I look forward to putting my hands on the next nice piece of Art's creations.

de Michael, DO1LMA/W0JAM
CCA Correspondent Europe

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Author Information
Michael Lyman (DO1LMA)

Michael (US call W0JAM) has recently joined the CCA Signal ranks as the European Correspondent. He is an American expat living in Munich, Germany where he has recently retired from Motorola to start his own consulting business. His brother, K0JAM was a long time employee of Collins and Michael grew up not far from Cedar Rapids. He was first licensed in 1965 and got his first piece of Collins (a home made 312B-5 from parts from the Collins store) in 1968. He is most often found using his KWM-380 and his 30S-1, which he says is his favorite piece of Collins equipment. When traveling, he often takes along a KWM -2/PM-2 combination in a suitcase for "mini-DXpeditions and often is heard from Romania.

THE SIGNAL

Collins Collectors Association

From the President

The Dayton Hamvention® 2009 is just around the corner, and many of your friends in the CCA will be there this year. Of course, don't miss the CCA Banquet on Friday evening: Bill Wheeler, K0DEW, and the original founder of the CCA, will welcome us. Tony Sokol, W9JXN, will emcee and the keynote speaker is Rod Blocksome from Collins Radio, K0DAS. Rod's presentation will be titled "Key Technological Advances from Collins". The CCA will also sponsor inside booth number 459 and provide a "dance card" for members in the outside flea market. There is additional information on Dayton 2009 elsewhere in this Signal and at www.collinsradio.org.

Congratulations are in order for our CCA ***Signal*** Editor, Bill Carns, as he can now officially add "CCA board member" to his list of association activities. Bill is very active in many facets of our organization, and we are most blessed to have his faithful management in producing the CCA Signal magazine. Thank you so much Bill!

Collins fancy is truly an international endeavor as noted elsewhere in this issue. Collins equipment has found admirers and homes all over the globe.

Sometimes, though, it is the sheer numbers of Collins users that can be surprising. I live in a small town in mid-Michigan, miles away from the "big city" and the area has very few amateurs on the HF bands. Imagine my surprise, while picking up the mail in the Edmore, Michigan post office, to hear the words "Are you Paul, W8ZO?"

It turns out that Don, N8DE and one of our members, heard me check into the CCA Collins net (14.263 MHz @ 2000 UTC) the previous day from his home, exactly one mile north of my QTH! The world does indeed seem small.

As always, thanks, 73s and hope to see you at Dayton.

de Paul W8ZO…
Email: paul@8Z0.com

Author Information
Dick Weber (K5IU)

Dick has had articles in the ***Signal*** but not for some time. He was first licensed in 1960 becoming an Extra class in 1974. He works CW only using his S Lines and occasionally his modern gear. At one time he was a die hard CW DX contester including holding a world title for five years. He has published numerous articles in QEX, CQ, Ham Radio, and Communications Quarterly on the design of antennas. Dick founded Rotating Tower Systems, Inc, which builds hardware to construct rotating towers using commonly available tower sections. He works for Raytheon as a Principal Engineering Fellow and has BSME and MSME degrees, 27 US patents and over a hundred foreign patents.

From the Editors' Desk
(Cont'd)

follow up on, all offers or suggestions regarding articles. I now may have lost track of some of these, although I have also tried to immediately import these suggestions into my ***Signal*** filing system which was not affected. Computers are a wonderful addition to our lives when they work right. When they don't, sometimes I wonder.

That is it for this quarter from this desk, and I hope to see all of you at Dayton or on the upcoming cruise. Enjoy your Collins equipment and see you on the nets here pretty quickly.

Visit MyHamShack.com to see my progress. Better yet, come visit.

de Bill, N7OTQ
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