The Signal

OFFICIAL MAGAZINE OF THE COLLINS COLLECTORS ASSOCIATION * Q3 2015 Issue *

COLLINS MOBILE

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Collins Collectors Association

From the President's Desk…

This tends to be the quiet part of the year for the CCA. The Orlando, Dayton and Dallas events are behind us and it is a little early to be working on next year's events. Further, many of our members take time to travel and enjoy the outdoors during the summer time and the AM static keeps many of us from spending our evenings rag chewing on 75 meters. I, for one, have been trying to sell my QTH and move farther out in the country where I have room to put up a proper tower. The house showings, and the uncertainty of the phone call telling me that the house will be shown in half an hour, has kept me from the CCA nets. This has been going on for 6 months now and I am ready to move on!

When I look at the activity on the reflector, I see increased interest in the restoration and repair of our beloved Collins Radios. Thanks to the hard work of Bill Carns, past president and *Signal* Editor, the RX section of our web site continues to grow as the premier resource for technical 'How to do it' articles. I know that many of the questions that I see on the reflector could be answered by a quick trip to http://collinsradio.org/RX. Try it the next time you are 'stumped' and see if you can get your questions answered without generating thousands of emails! And . . . If you have a question or problem you would like to see in the RX section, or have some solution you think would be of interest, drop Bill or me an email and we will get to work on it.

Board nominations have been submitted and we will see the return of Dennis Kidder, W6DQ, and the addition of Jim Stitzinger, WA3CEX, to the board. Jim had termed out 2 years ago and wanted to jump back in to help out as soon as he was eligible to return to the board. Jim, as many of you know, heads our Dayton committee and has also been at the forefront of the VOA transmitter rescue from the start. Both Dennis and Jim are passionate about all things Collins and bring a wealth of knowledge and enthusiasm to the leadership. Thanks to both of you for stepping up to serve.

All of us who have been involved with the CCA leadership are looking for members that want to join us in our efforts to further improve the CCA. We really have a need for enthusiastic help with articles for the *Signal*, help with events, behind the scene admin help, net controls and web support. I know all too well that life, family and career keeps us all extremely busy these days but I still think that those who get the most out of the CCA are the ones that give back with their time. Drop me an email to president@collinsradio.org if you want to get up out of the audience and help out. Hopefully, you will end up being a part of the future CCA leadership.

Lastly, start making your plans to come to Dayton next year. May 20th, 2016 will be here before you know it. I know several hams who made the trip for the first time last year and wondered why they had waited so long to make the pilgrimage. The Friday night banquet, and the CCA booth, have always been at the heart of the CCA operation – a time for an eyeball QSO with all those that you just have heard on Sunday afternoons. I look forward to seeing you next May!

73,
Scott Kerr – KE1RR
President

The Signal Magazine

OFFICIAL JOURNAL OF THE COLLINS COLLECTORS ASSOCIATION

Issue Number Seventy Nine - 3rd Quarter 2015

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

The ***Signal Magazine***

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Editor & Publisher - Bill Carns, N7OTQ
Assistant Editor - Gail Sheehan, K2RED
Technical Editor - Don Jackson, W5QN

The Collins Collectors Association
P.O. Box 1269
Wimberley, TX 78676-1269

Come Visit Our CCA Website

www.collinsradio.org

See our New Features & Members Area.

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WE NEED YOU!

A Quick Look in This Issue

Issue No. 79
Third Quarter 2015 Signal Magazine

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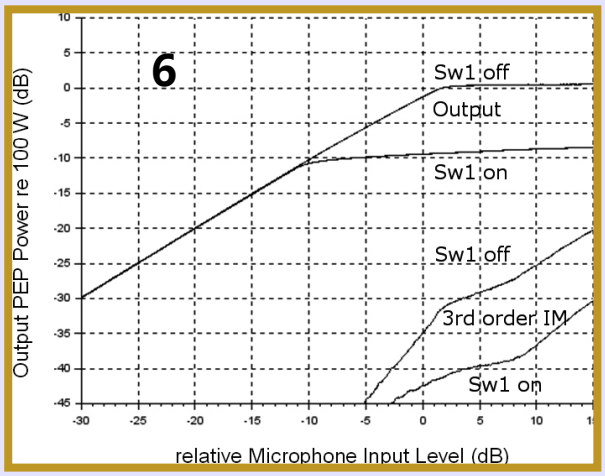
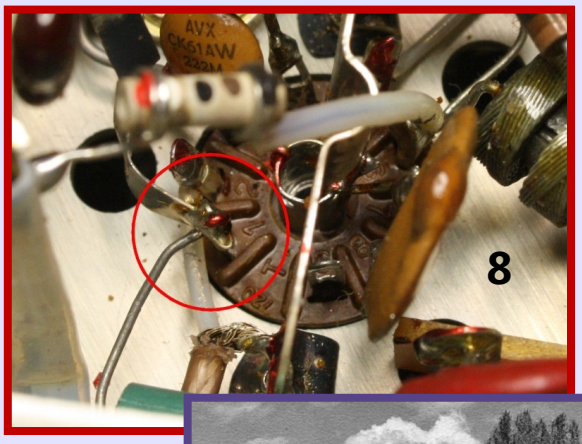
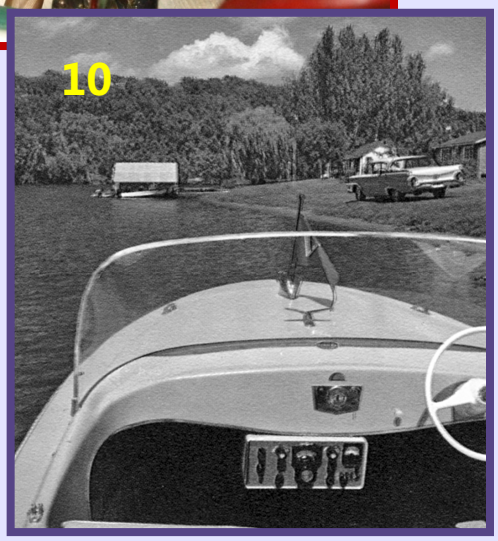






ON THE COVER - The Ubiquitous UNIMOG
Retired from NATO in 1966, this monster provides a mobile radio platform that suits Collins to a tee

FEATURES

REGULARS

FROM THE STAFF

by Bill Carns, N7OTQ & Don Jackson, W5QN

From the Desk of N7OTQ

Looking back over the last several issues, there is a nice pattern. It was unintentional, but it is there. Several of the *Signal Magazine* articles have originated based on threads (from the CCA provided Collins Reflector) that began with a challenging question from a member. These questions provide a starting point and then some interesting threads proceed to evolve. Recently, one of our reflector members asked about whether there could be a contest – run by the CCA or one of its supporters – that focused on using Collins gear. As the thread evolved there was, first of all, a lot of support for the idea, and also – as it evolved – several versions or nuances thrown over the wall. They got more and more complex. Read that more work.

We want you to know we are listening. I think that you can see that we are indeed listening from the historical pattern that was referenced above. As we proceed into 2016, we will be exploring getting this contest organized.

Along with this kind of input, our President, Scott Kerr, as well as the rest of the board, have some interesting thoughts about 2016. Change is good, and there is going to be some change. With this change will come the need for support. We like to build local teams that work on either hamfest related events, or special happenings like this contest idea, or a Northeastern Special Event 2016 that may be in the hopper.

Due to attrition, and one of the key member's moving out of state, the Florida/Orlando Team needs some reinforcement. The California team (West Coast really) could use some additional membership - and this specially applies to the LA/San Diego basin area. The Northeast area is just in the definition phase and could run across the entire northeastern states and just start at the brain storming phase. As I mentioned, Scott Kerr, listening to some inputs from members, has some strong ideas there that you will hear more about as the events calendar for 2016 evolves. There will be more about this subject in the Q4 issue.

NOW, let me get up on my little soap box. **There have been** many ideas recently about the contest concept that folks highly supported on the reflector. **There have been** many positive comments about the many events that the CCA held in 2015 across the country. * * * NOT ONE * * * of those comments included the phrase "I would like to volunteer to help organize this ……". e.g. - - - - Lots of support for the contest idea, but not one guy stepped up to organize it.

The Collins Collectors Association is a volunteer organization. Completely volunteer. Like any volunteer organization, it is about 1 % of the people that actually work. This is SAD.

Whether it is stepping up and earning the visibility and, dare I say it, privilege of serving as an officer, giving your talents for a project or responsibility, or just asking "How can I help", there are just very few new folks coming to the table with their hand up.

Guys, this has got to stop. I challenge you to realize that IT IS a completely volunteer group, and that, unless new blood steps up, it will eventually wither. The last 10 years has seen some pretty dedicated people providing ideas, follow through and a lot of work. The next 10 will be challenging.

You are the leaders of the future. You are out there somewhere, and the members, and we, need you. You know who you are. We need to know who you are. We need people with passion. People with passion for their Collins, the company and history and passion for the group and their hobby. We need people with people skills and imagination. Mostly we need people that will follow through and do a little work.

The contest will happen….when we find a volunteer. We will go hunting, but it would be ever so much better if one of you with the experience or the skills would step up and raise their hand. **How refreshing that would be**!

de Bill, N7OTQ email: wcarns@austin.rr.com

From the Desk of W5QN

Our hobby is changing. Surely you have noticed that there are less and less old timers doing quality repair work. However, more and more every day, the good news is that there are new people coming into the hobby. Our membership is growing even with attrition from age. The hobby of Collins collecting is healthy – but it is changing. You, the typical member, are younger and have less background in electronics. We will help you learn. Then you must help us, by documenting those repair and restoration projects. More of you will be doing your own work. Document it. Document your growth and document the repair and help others grow. It is essential to your happiness and it is essential to the organization. We will spread the word. **You need to write it. We need articles.**

Contact me if you have something you think might be worthy of an article for *The Signal*. It can be technical in nature, historical, or anything else you believe might be of interest to the CCA membership. As well, if you would like to submit information for our "In the Shack" feature, please contact me. **Don't be shy. Give me a shout! . . . . And if you have experience and can write with our help - PLEASE!**

73s - Don, W5QN email:w5qn@verizon.net

Collins KWM-2: An Adapter to limit Output Power

by Ernst Schroeder, DJ7HS

Did you ever feel the need to increase the output power of your KWM-2 transceiver? Sure you did, every time you got a report with less than 5 and 9 - But, did you ever see the need to reduce the output power? No? Well, there may be a good reason. In Australia the "Foundation" amateur radio license limits the transmitter output power to 10 watts. And if you are a Collins enthusiast down under, and want to put a KWM-2 up into the air, there is a problem to be solved. In addition this need may provide the QRP operator with some Collins "fun".

In spring 2014 the question came up on the CCA mail reflector, and one of the first ideas was to reduce the PA screen supply, probably fostered by the observation that in "Tune" mode and with reduced $\mathbf{V_{g2}}$ the KWM-2 delivers about 14 watts into the load. Immediately several possible solutions were being discussed on the reflector:

- Simply turn down the Microphone Gain and maintain an output of 10 Watts or less using a PEP output meter. That may work, but only with highly disciplined operators. Furthermore, this solution would probably not be acceptable for a licensing authority.
- Put a 10 dB 90 watt resistive divider between output and antenna tuner. Definitively works, but nice only when you want some additional heating in the shack.
- Reduce the screen grid supply for the 6146s. This is easy to apply: just open the jumper between J5 and J6 (PA disable) and replace it with an 18 K Ohm 2 W resistor. That way the screen supply is permanently reduced. But now the tubes are no longer working in class AB1, the grid bias is too high and the PA is more or less in class C. Not good for SSB and low IMD. Of course, the grid bias can be lowered to produce the idling current needed for a low distortion PA. Unfortunately it turned out that the standard bias adjustment range in a 516F-2 is not large enough. A modification inside the power supply would be needed.
- Pull one 6146. After all, 50 watts out from one tube is nearer to 10 watts than 100 watts out from two tubes. No, not a really serious proposal as this completely changes the tuning and loading capability of the output network by drastically changing the dynamic load line of the output stage.
- Convert the PA from 6146 to 2E26. Both tubes have identical sockets. This may indeed work but needs a lot of further work, including modifications inside the KWM-2 and 516F-2 for a lower HV and much lower grid supply.

So, except for the 10 dB power pad, it turned out that there was no solution in sight that would easily meet a few obvious requirements:

- Clear limitation to a fixed output power level that can be proven.
- No adaptations or changes to transceiver and/or power supply that cannot be removed easily. Better no modifications at all.
- Adjustable reduced power level and ideally there should be an on-off switch
- Full utilization of the built-in ALC-driven Collins RF speech compressor to have some "punch" in the 10 watt signal.

I skipped the idea for the time being, and put the search for a solution on the shelf. Then, one day when I was in a QSO, talking and watching the ALC meter go up and down, I suddenly realized that my 30L-1 was actually - via external ALC - controlling the power output of the KWM-2 to limit the drive to the four 811 tubes. There was the solution, already built into the 30L-1. And even better, it was clearly marked "designed by Collins". What more could I ask for?

In very short time I put together a small box with a few parts from the junk box, with the circuit I borrowed from the 30L-1. The circuit diagram is given in Figure 1. Figure 2 shows a photograph of my first implementation.

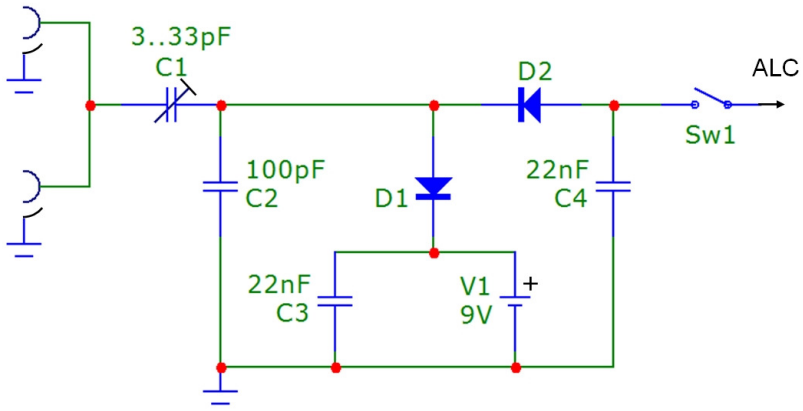


Figure 1 Circuit diagram of the power reduction adapter

D1, D2	1N4148
V1	9V Block Battery
C1	Ceramic Trimmer 3 - 33 pF
C2	100 pF Silver Mica or similar
C3, C4	22 nF 250 V Disc Ceramic

The adapter box (shown in Figure 2) is placed in series into the KWM-2 output antenna line. An adjustable capacitive divider (C1/C2) senses the output RF voltage. Diodes D1 and D2 generate a negative voltage that is shifted by V1, a 9 V block battery. The generated external ALC signal is fed into the KWM-2 ALC socket J4 via switch SW 1. Add two condensers for RF grounding, and that's all there is to it.

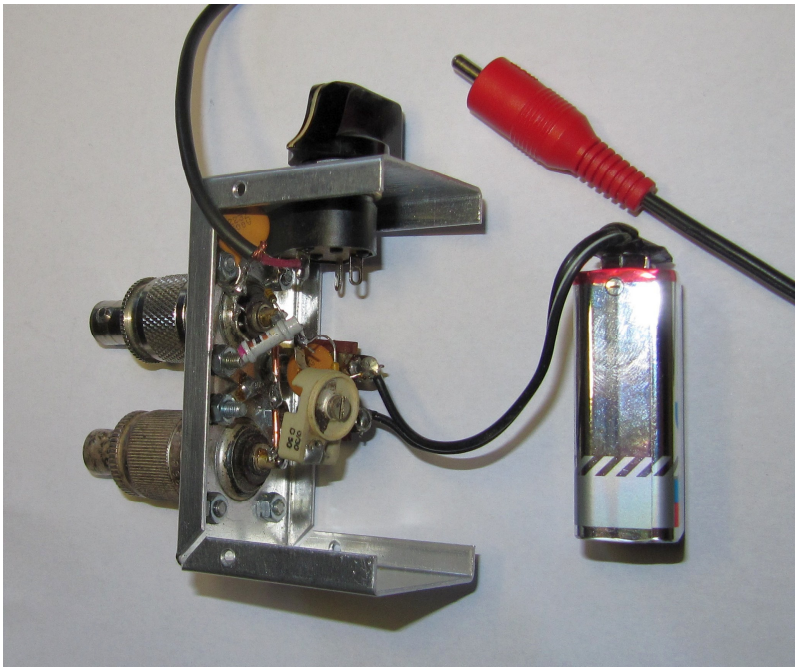


Figure 2 - Power reduction adapter, junk-box version

Adjustment and use of this little circuit are very simple. You should have a dummy load, a two-tone generator and a PEP reading output meter.

Put the adapter box into the antenna line and connect its output, first with SW 1 open, to J4 on the KWM-2. Tune up normally, then modulate with the two-tone signal and increase MIC GAIN until you see 100 watts PEP output. The meter in ALC position will just start to move upwards.

Now close SW 1. The PEP output will go down immediately and the ALC meter will jump to nearly full scale. Now you can adjust C1 for 10 watts PEP out.

Finally replace the two-tone generator with your microphone and start talking. Watch the PEP meter with SW 1 open and closed, and listen to your signal on a second receiver, just to ensure that there is nothing strange going on.

That's it, problem solved, and all requirements met.

Any problems left over? Well, yes, the adapter circuit senses output voltage and therefore assumes that the KWM-2 is working into load reasonably close to 50 Ohms. When this is not the case then the limited power output can be higher or lower than 10 watts, but this is easily checked with a PEP reading VSWR meter in the output line to the antenna.

While I had been measuring the input-output transfer characteristic and intermodulation distortion of the KWM-2 for a different project, I also measured the characteristics with the power reduction adapter in place. These results are shown in Fig. 3.

Figure 3 shows the input-output characteristic of a KWM-2 with a two-tone signal at the microphone input. The input signal level was slowly swept from -30 dB to +15 dB in about 10 seconds. 0 dB corresponded to a level of 10 mV with Mic Gain set to 12 o'clock. For lower levels you can see a 10 dB linear increase in output power for the same 10 dB increase in microphone input level. When the output comes nearer to 100 watts, a bit larger input is needed. This "droop" is due to power supply limitations.

The output level is very nicely held near 100 watts PEP due to the perfect ALC action with high loop gain, preventing grid current and keeping the 6146 tubes in AB1 mode all the time. Third order intermodulation distortion is always more than 30 dB down, up to a +4 dB input level, and clearly kept down by ALC action, even when the input signal rises to +10 dB or more.

With the power reduction adapter on, the output level is kept closely to -10 dB down from 100 watts PEP and that is your 10 watts PEP as intended. There is no droop. With only 10 watts out there is not that much demand on the power supply.

The output limiting characteristic is not as flat as the one for the KWM-2 without adapter, but is still acceptable. This is due to the limited loop gain in the new external ALC circuit. Third order intermodulation distortion is also way down, even for high peaks in the input level. de Ernst, DJ7HS - - - - - - - - CCA - - - - - - - -

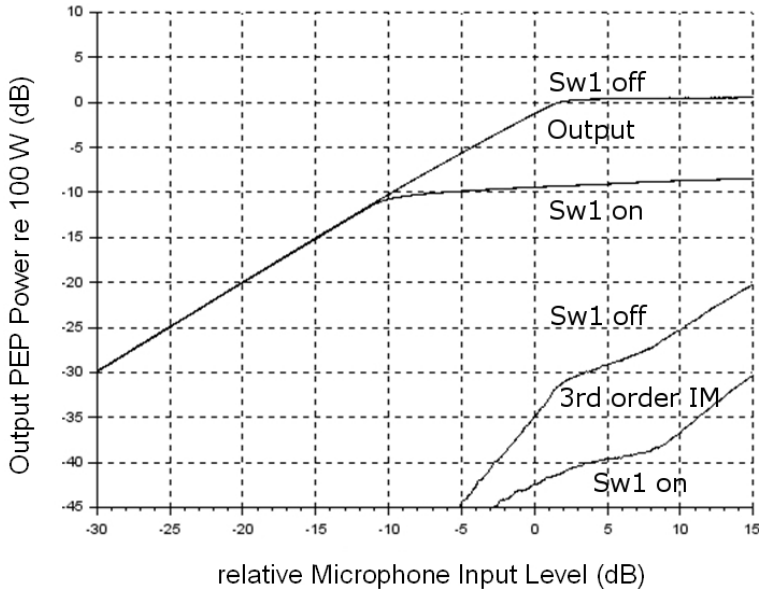


Figure 3 - Input-Output Characteristic & Intermodulation Distortion of a KWM-2 with power reduction adapter switched on and off

Collins KWM-2: Curing a Strange Problem

By Ernst Schroeder, DJ7HS

It all began, when I went to Denmark for summer holidays this year. On the way back I visited Bent, OZ5ZD in Augustenborg and he showed me his KWM-2, RE with S/N 38057 of about 1971. This M-2 had come from the estate of K0ZQD, had been serviced in the US and had been working properly. When it was sent over to Denmark it arrived in good order and worked fine, but unexpectedly it soon exhibited some strange behavior. So it was put aside until I got to see it.

This indeed was a strange rig, the calibration oscillator level was much too low and there was practically no peak from the exciter tuning. Even worse, the transceiver was very sensitive to mechanical shock. Even slight tapping would let the S-meter jump up and momentarily increase the speaker output level. I had a feeling that, after tapping on it, it would come to life for a short moment, then fall back into agony.

Some tubes had already been exchanged and also new relays K2 and K4 had been installed. These trials produced no change, so no quick remedy was in sight. I opted to take it home with me and another transport followed. This time first-class, in the back seat of my car.

When I put the KWM-2 on my workbench only a few days later, I had to learn that things had changed again: now the receiver was working properly, the calibrator signal had the right level and exciter tuning was OK. But the mechanical problem persisted, more or less slight tapping anywhere on the chassis would let the S-meter jump up and produce a popping noise in the speaker. While the transceiver was warming up I noticed that I had to tap harder and harder to produce the effect. Would this problem go away by itself without a chance to become identified?

I switched the M-2 off and started thinking all over. Whatever caused the problem, it was somehow influencing the AVC and this was to be seen throughout the receiver circuits. So as a first step I fed the AVC line with a constant voltage. When I switched the transceiver back on, the effect was still there and I still had to tap quite hard to produce it. But now the S-meter did not move any more, as expected. Now I started to isolate the stage in the receiver chain from where the problem was originating. I shorted J22 to ground: gone; grid pin 9 of first mixer V13B to ground: gone; grid pin 1 of RF amplifier V7 to ground: still there. So here was the first result: there was a problem in the circuits between RF amplifier V7 and first mixer V13B.

I hooked up an oscilloscope to V7 pin 5, the anode of the RF amplifier. While tapping the chassis I was able to see a short positive spike, immediately followed by a short negative spike. Countless stories of failing coupling and bypassing capacitors came to my mind, but how could the voltage at pin 5 become more positive at all? The 275 VDC line turned out to be rock-stable and nothing could be seen on V7 pin 6, the RF amplifier's screen grid. When I came that far I really had to tap hard now, so: switch off and again sit down and think.

The spikes at the anode of V7 were really short. C272 was ruled out as shorting of CR5 didn't change anything. Then there was only one further capacitor in the anode circuit: C44 with 1000pF. This is the coupling capacitor to the grid of driver V8. Was the problem originating from there? But we were on receive and the driver stage was biased off. Yes, biased off, the grid was at about -70 V. When this voltage would disappear by any means, there would be a positive-going spike across C44 and at the anode of V7. I hooked up the oscilloscope to V8 pin2, the driver's grid - and the problem was gone! How come?

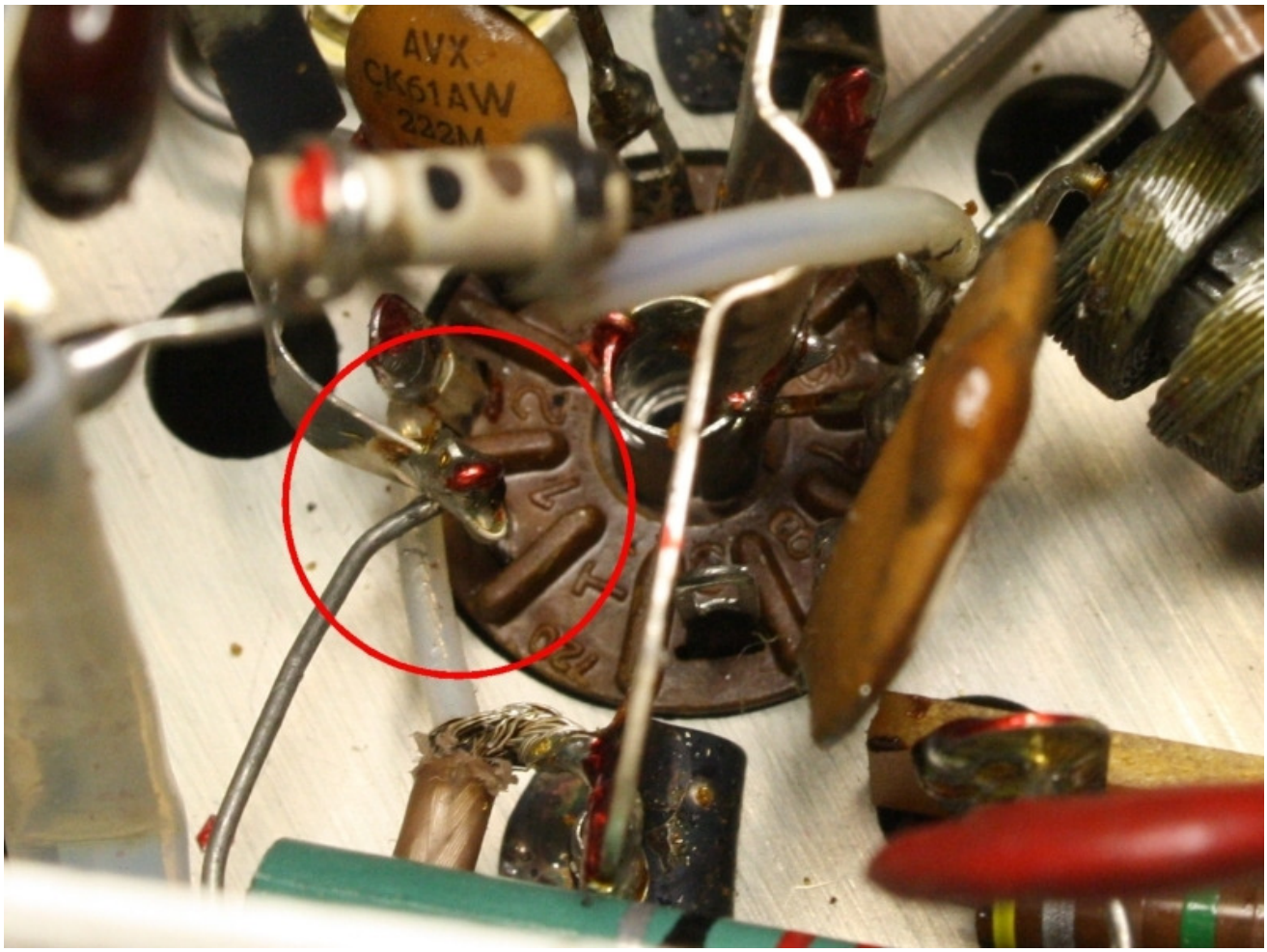
Well, the driver's grid is connected to the tuned circuit around band switch S5 via a short length of shielded wire. The braid is soldered to the center shield across the 9-pin socket and the center conductor goes past pin 1 to the lug for pin 2 (see picture below). A closer inspection of the driver tube socket showed that the center conductor was closely touching the soldering lug for pin 1. A little bending of lugs 1 and 2 separated both and the problem was solved permanently.

Now the mechanics of the problem were clear: any contact between pins 1 and 2 of V8 causes a severe de-tuning of the circuit in the anode of V7. That is why the calibrator's signal had been much too low and no peaking had been possible. The driver stage V8 would no longer be biased off, but that would not be harmful as screen grid voltage for V8 would only be applied in TX mode. The contact between pins 1 and 2 apparently was intermittent, so with mechanical tapping, the mechanical intermittent was introducing a large voltage spike into the anode of V7 and at the same time into the grid of first mixer V13B. This signal traveled down the IF chain, produced a large AVC signal and causing the S-meter to jump up.

Problem solved. And as I did not see any sense in dismantling the connection further for closer inspection (who volunteers to dig into the band switch compartments?), I can only speculate about the root cause. That center conductor must have been close to the lug at pin 1 right from production time, maybe there even had been a tiny cut in the insulation. Vibrations and low temperature on the air transport from US to Denmark may have caused an even closer contact until finally an unstable electrical contact was established. Tapping the chassis must have broken that contact, restoring proper operation momentarily. Repeated heating of the chassis may have relieved the strain and broken the contact again until only very hard mechanical shock was able to restore it momentarily. So, as I had feared, the problem might have disappeared altogether when the transceiver had been running in a cozy warm shack for some days. But who knows, it might have come back, haunting the operator.

Finally the KWM-2 was taken back to Denmark, this time in an appropriate CC-2 carrying case. And it still works!

Ernst F. Schroeder DJ7HS
dj7hs@qsl.net
www.qsl.net/dj7hs



Editor's Notes:

Ernst Schroeder writes for the *Signal Magazine* for the first time, and it is very good to hear from him. He has held the German call DJ7HS since he became a ham in 1961. Following his education in Electronics and Communication theory (leading to his PhD) Ernst went to work in his field working for Telefunken, Thompson CSF, RCA and Technicolor. His work took him into analog and digital audio technology, noise reduction, data reduction and psycho-acoustical models. This training and experience certainly shows in his work here. Although his first rig was a home brew mix on AM, he quickly graduated to his now favorite KWM-2 with a 30L-1 and 312B-5. He is married, and when time allows, he also enjoys hiking with his wife, Regina, playing the double Base in various bands - as well as singing. You can see more about Ernst at http://www.ernstschroeder.de.

There are many reasons that one needs a *less than full power* output signal from a KWM-2/2A or other 100 watt transmitter like the 32S-X series. Many times, operators just want to play with a QRP experience, drive a lower power amplifier, or even go on to use more available low power attenuators that can further reduce the output into the 500 mW range for use with the many Collins amplifiers (both ground and airborne) that require the standard (for Collins Radio) 500 mW drive for full output. The remarkable 204F-1 and H-1 fall in this category.

Recently there was a very good thread on the reflector exploring the best way to get 10 watts "full output" from an S-Line transmitter. There were some good ideas, and, as usual, there were some less than good ideas. Buyer Beware!

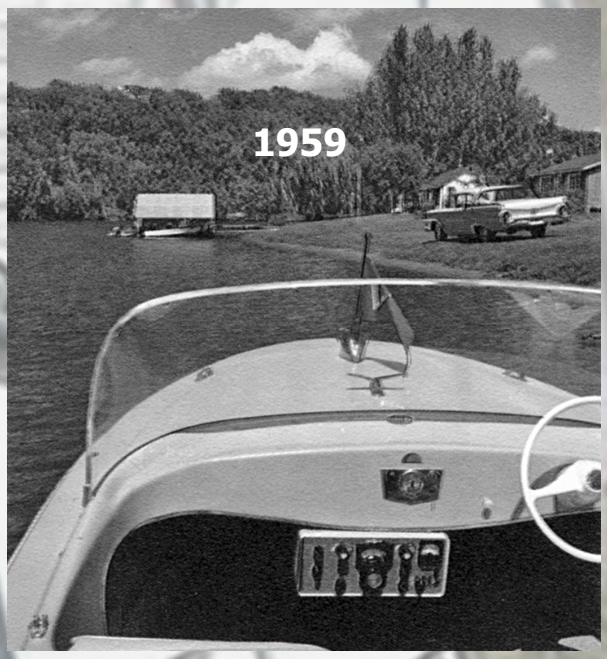
Ernst was fortunately motivated to provide us with a good technical solution.

1935
Collins field trial - Colombian portable HF

MOBILE AT COLLINS

1927
Collins, Engle and Salisbury (R to L)
with one of the first licensed
mobile stations - 9ZZA

955



1959

S OVER THE

1995

2012
Jim Stitzinger's restored TSC-60V HF-80 shelter at Dayton, Ohio
The Original Collins Proto-type no-less

Your CCA - 2015 - Third Quarter Report

Great Quarter Q3!

It is always fun to see 'Dreams come true" or just enjoy some nice progress and fellowship. Q3 saw the beginning of the culmination of what could have been just a wild dream, actually come to fruition. Below, in the AWA (Antique Wireless/ CCA Event) report, you will read about some exciting news related to the historical display of the huge Model 821A-1 250 KW shortwave transmitter that was rescued from the abandoned Delano, California Voice of America Transmitting Station in June of last year.

In addition, we have now completed the 2015 election nomination process and again have some great contributors stepping up to the plate to help serve you and manage the CCA for the coming years. *Read all about it* below.

Please note some procedural changes necessitated by the new CCA website database and its necessary "Activity to Activity" based membership period. Please read this carefully as this will answer a lot of questions, and help us get our jobs done here.

Membership Certificates – In the past, CCA membership ran from December to December 31st of the year that you joined. Membership Certificates were always mailed with the Q2 *Signal Magazine* at the end of Q2. Since the membership period distribution is now spreading out throughout the year, this is no longer the case. With the new website database and its related software package, membership now must run from the date that you renew, or join, to the following year on the same date. This has required that the Membership Certificate process change. Now that you can join mid-year, and your membership runs from that date, we will be mailing certificates in Q3 this year, and from now on they will be mailed in Q1 and Q3 (twice a year). This means that at most you will see a delay of about a quarter and a half.

Be aware that due to the added workload and the fact that you will now in all cases automatically receive four consecutive issue of the *Signal*, we will now no longer backfill missed issues if you forget to renew.

If they are available, missed of back issues can be purchased by contacting the *Signal* Staff or the Membership Chairman, but WE ENCOURGAE YOU to renew on time (prior to expiration works real well) so that you do not miss an issue. PLEASE NOTE that every *Signal* mailing envelope has your expiry date on it and there is just no reason to miss out.

Improved Renewal Procedure – While we are on the subject of renewal, please take a look at this update. Understand that our membership data is now stored and handled automatically by the website at www.collinsradio.org . Note that you MUST be logged in as a member to renew. How else can it know who you are? After logging in, you will be at the MEMBER LANDING ZONE and you can either just click the **RENEW** button, or click the link at the top of the zone which is titled **Click Here to Access My Account & Upgrade Options**.

PLEASE NOTE that we have worked hard to improve both the password reset (in case you have forgotten) and also to make renewal easier. Previously, if you had allowed your membership to expire, this made it difficult to log in and renew. There was a method but it was not very friendly and difficult to find. NOW - After expiration, expired members are automatically moved to a new membership category named "Expired Member" and allowed to log in and use the website for a grace period. After expiration, you will not receive the *Signal Magazine* or be eligible for discounts. After logging in, use the link above for upgrading and follow the prompts and you can "Upgrade" back to a Paid Member status.

Scan to see more about the CCA

Bottom line though is that it is always better and easier to renew before you expire. Note also that you can update any of your profile data including your address, email address or phone number by clicking on the **Click Here to Access My Profile and Password Change** link after you are logged in. You do not need to contact a staff member or the Membership Chairman.

Antique Wireless Association 2015 Annual Partner Event (AWA/CCA) - Again this year, the relationship between the AWA and the CCA (formally the Collins Radio Heritage Group) continues to produce fun and tangible results. On Thursday evening – during the week-long AWA 2015 convention, the now annual CCA theme dinner was held and very well attended. During the evening, a report was given on the progress of the project to recover the Collins Model 821A-1 250 KW Shortwave Autotune transmitter and its associated huge and charming VOA analog mixer and monitoring board.

Jim Stitzinger (WA3CEX) and Robert (Bob) Hobday (N2EVG), Deputy Director of the AWA, gave a presentation that covered the events from the extraction of this historical equipment up to the present time where it has now been sited at the AWA Museum in Bloomfield, New York. This presentation was in a round table format with both a formal slide show and also imbedded Q&A and was very informative and well received.

The Model 821A-1 transmitter and the VOA monitoring and mix board are now open for display. Opening ceremonies were held on that previous Tuesday. In spite of very severe winter conditions, this massive complex of equipment had been moved by truck and forklift from the storage building across the street, and into its present display site at the museum. This was a fantastic job on the part of the AWA crew. I might mention that Jim Stitzinger was there on several occasions at his expense to provide support and relocation guidance. **Thanks Jim**.

We all continue to enjoy – and benefit from – the synergistic relationship and the notable similarity of purpose and ethics that ties this AWA/CCA relationship together.

Continued on Page 15

West Coast CCA Event – 2015 – Due to a change of plans for the schedules of our West Coast Team, the scheduled CCA Dinner and related events in October had to be canceled. We regret that this happened and we will certainly make up for it next year.

CCA Election Process/Results – 2015 - As announced previously in the *CCA Signal* Q2 issue, we are in the process of electing new members to the CCA board as required by our State of Texas Not-for-Profit Charter.

During the past quarter, nominations were open for the two board position which have "termed out". One is being vacated by Paul Kluwe and the second one now held by Dennis Kidder (W6DQ). Before proceeding with the status report, take a moment and read and consider the following.

Any organization is only as strong as its leaders and their performance of their duties. In addition, renewal being a good and necessary thing, it is also nice to see new blood coming into the picture.

For several "election processes" in a row now, during nominations, there have only been one candidate nominated for each open slot. Also during this period, people that have previously served the CCA in some capacity (Dennis Kidder is the exception and it was sure good to see him come on board) were nominated to again serve. While this is, in many ways, a compliment about how things are being run, we do need - and want to see - new participants step up and aspire to serve on the board. If you are at all interested in this process, please contact any of the existing crew and we would be glad to discuss your potential contributions. Serving on the board – for many reasons – is always best preceded by service to the organization in some volunteer capacity. We are always looking for help on the nets, help with regional activities, and participation in other CCA activities - including this magazine.

With that being said, it is a pleasure to report that Dennis Kidder has again been nominated for election to his current position on the CCA Board of Directors. Since there has only been one nominee, Dennis is reelected to the board to serve his second term from November of 2015 through to the term end - November 2017. His bio and photo follow. Congratulations Dennis and welcome back. We appreciate your service and also your work as our sitting Secretary.

For the second open board slot, there was also only one nominee. Jim Stitzinger (WA3CEX) has previously served on the CCA board and was standing down for the minimum of one term required by our charter. He now has agreed to return to serve us again. In actuality, from a contribution standpoint, we hardly knew he was gone since he continued to supply significant contributions to the VOA/AWA Collins Radio Heritage Group efforts as well as bringing his van and shelter to so many of our events. We all owe him a big "Thank You"! It is sure good to have him back in a more official capacity. Jim will also serve until he is up for reelection in 2017.

According to our charter bylaws, these two new board members will be installed during November. Following this installation, the newly constituted board will elect internal officers and the results will be published in the Q4 *Signal Magazine*.

That's it for this quarter. Enjoy your Collins and your membership. - - - - - - - - - - - - - - - - - - CCA - - - - - - - - - - - - - - - - - -

New Board Members

Dennis Kidder - W6DQ


Dennis & KW-1

Dennis was bitten by the "Collins Radio bug" early. First licensed as WN6NIA in 1969, he went on the recommendations of his Elmers that "Collins was the way to go." So for Christmas in 1969, a 75S-3 found its way under the tree. That receiver is still a daily driver. He has been collecting Collins Radio ever since, with many pieces covering the 30's to the 80's. A favorite is his KW-1, obtained from Sam, W6HDU, a long time West Coast AM anchor.

Now retired from Hughes Aircraft and the Raytheon Company, his career as an electrical engineer spanned 40 years. Through that period, he found himself developing and implementing an eclectic array of systems. Included were: touring with large concert sound systems, flying satellites, publishing newspapers, air defense radar systems, building communications infrastructure for a large international airport and providing secure communications for our troops in harm's way. He now resides permanently in the small agricultural community of Inyokern, California. With cheap land, lots of open space, and low noise levels, Dennis finds this the ideal place to raise antennas and play ham radio. Mostly, he enjoys collecting, restoring and operating vintage radio equipment.

Dennis is a life member of the ARRL, and past president of both The Associated Radio Amateurs of Long Beach (W6RO) and the San Bernardino Microwave Society. He is also a member of the Sierra Amateur Radio Club.

Jim Stitzinger - WA3CEX


Jim & VOA Sterba Turnbuckle

Jim Stitzinger was born near Doylestown (Bucks County), PA in 1950 and became WA3CEX in 1966. He began with a NC -109 and a home brew transmitter. Next came an SX-115 and a Ranger I. From there it was only Collins Radio which has never stopped! Jim has significant collections of original quality Pre-War Collins, Saint James Gray, S-line, KWM 380, HF -80, Rockwell green radios, Collins Receivers, and large Collins Transmitters, along with the support parts for most. He managed to blend his vocation in Librarianship with his Collons hobby to collect over 6000 pieces of Collins and Rockwell literature - as well as memorabilia, pictures, signs, clocks, the Collins Van and several AN/TSC60(V) shelters filled with HF-80 Radios. He also collects large Rotating Log Periodic Antennas, hoping to erect a Rockwell 237B-4 soon.

Jim is thankful for the opportunity to enjoy the hobby of Collins Radio, and enjoys inspiring others to do the same. He maintains HF-80.com and has several "CA Hammin" U Tube Videos. He likes 20M phone best. Previously Jim has served as Secretary of the CCA Board and still serves as Dayton Events Chair. He looks forward to, again, serving on the CCA board and helping others enjoy Collins Radio!

Welcome Back Guys and Thank You for your service - - - - CCA - - - -

The Service Line

Mechanical Filter Test Fixture Simplified

by Don Jackson, W5QN & Paul Christensen, W9AC

The Q2 2015 *Signal* article describing a test fixture for the plug-in "FA" IF filters for the 75S-3B drew some attention, but the design perhaps was not particularly easy to implement, nor did many readers have an instrument similar in function to the Rigol DSA815TG to use for the actual filter measurements. This article is a discussion of a simpler test fixture, and use of more common test equipment.

First, you might ask why the original test fixture is so complicated in the first place. Part of the design complexity relates to measurement of filter ultimate rejection. This measurement requires excellent isolation between the test fixture input and output circuitry, which creates mechanical complexity. Further complexity was created by use of separate circuitry for impedance matching and resonating the 940uH filter inductance.

Since many folks may not have the equipment to measure ultimate rejection, or simply don't find that measurement necessary for basic filter evaluation, I dropped that measurement from my list of requirements.

Although the original article uses shunt capacitors, Bob Jefferis, KF6BC, brought it to my attention that Collins application notes suggest series capacitor networks can also be used in filter circuit designs. Figure 1 shows a test fixture circuit using series capacitors.

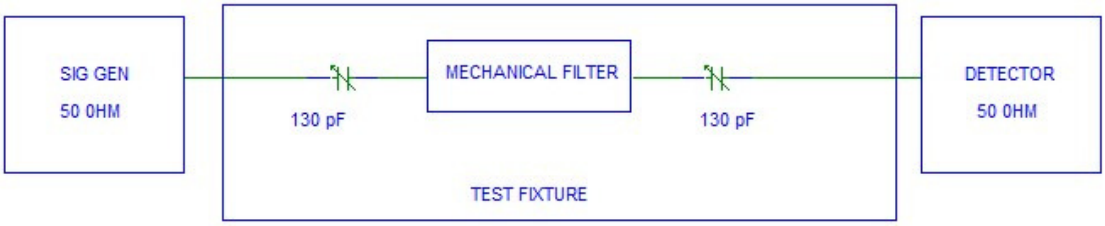


Figure 1 – Test Fixture w/Series Resonating Capacitors

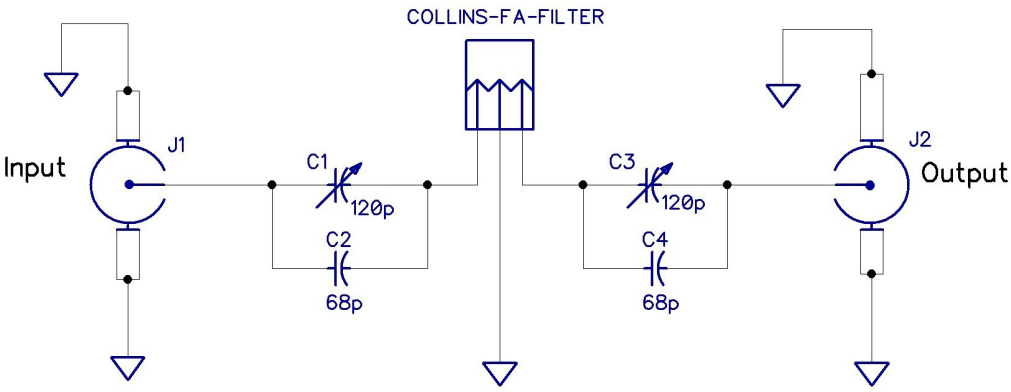
The circuit of Figure 1 uses a single series capacitor for both resonating the 940uH filter input inductance and transforming the 50Ω in/out impedances to a suitable filter terminating impedance. The 130pF series capacitor transforms 50Ω to 145kΩ. One way to think about this impedance conversion is that at 455kHz, 130pF in series with 50Ω is essentially equivalent to 130pF in parallel with 145kΩ. This 130pF is resonant with the filter inductance of 940uH. Thus, the series capacitor provides both the matching and resonating functions. The 145kΩ filter termination impedance is quite acceptable, and actually better represents the impedances in the 75S-3B receiver than the 50kΩ I used in my original test fixture design. A circuit can't get much simpler than this!

The 50Ω output load capability of the series circuit eliminates input/output cable (typically RG58) length issues. The matching networks have low loss, resulting in good measurement dynamic range. This means a filter ultimate rejection measurement is primarily limited by undesired input/output coupling rather than dynamic range of the measurement system.

A disadvantage of the series capacitor approach is that the test fixture input voltage is converted to a much higher voltage at the filter input. The maximum rated input at the filter is 2VRMS. With a filter installed in the fixture, that level is reached when the signal generator level is set to about 0dBm. **If your generator is capable of large output power, it is recommended that you use an attenuator at the test fixture input to avoid potential filter damage.**

Construction of the Test Fixture - Since we have assumed measurement of filter ultimate rejection is not a primary goal, we don't need to worry about attaining a high degree of input/output isolation in the test fixture. Therefore, a PCB design should be adequate. Figure 2 is a schematic diagram of the actual test fixture.

Figure 2 – Test Fixture Schematic Diagram



The test fixture consists of a CAD-designed, dual-sided PC board. Unlike the original test fixture design, the FA filter, surrounding components and traces are not shielded from leakage. However, a reasonable attempt was made in the design to ensure that leakage would be minimized. This was accomplished through minimum trace distances, component placement, and adequate distance between traces and the ground pour.

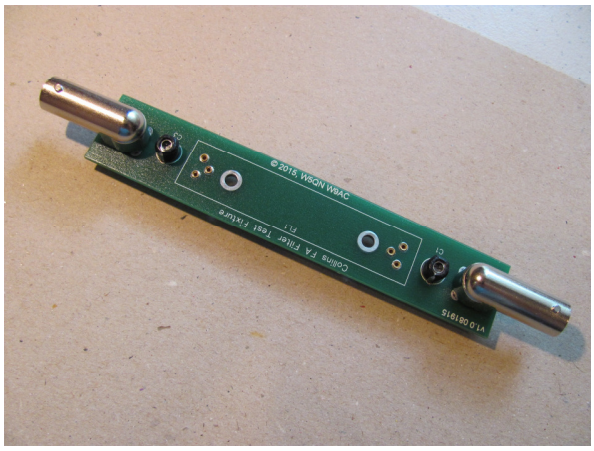


Figure 3 – Test Fixture Assembly (Top)

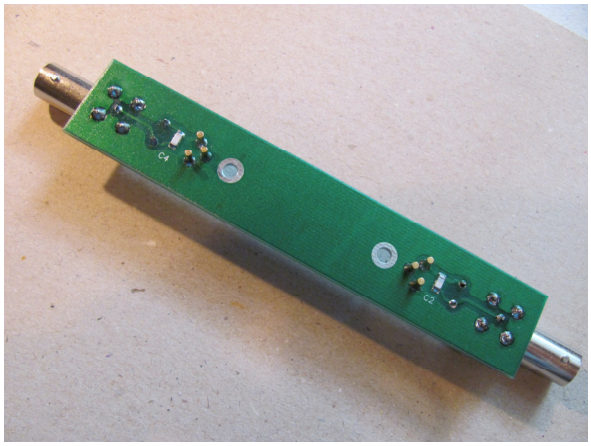


Figure 4 – Test Fixture Assembly (Bottom)

The CAD files were exported into a common .GBR (Gerber) file format and are available for download on the CCA website, along with the component B.O.M. file. The Gerber files are in a single "zip" file titled "FA Filter Gerber Files.zip". The files are free to use for non-commercial purposes. Note that 14 files are used with Gerber definitions and each represents a unique board layer (e.g., top silk, top copper, bottom copper, etc.)

Except for the trimmer caps, all component are available through Mouser – either individually or through the "Mouser Project Manager," a stream-lined ordering process that contains a pre-loaded B.O.M. Please refer to the CCA website for further instructions on accessing the Mouser Project Manager function. Trimmer capacitor information is available on the B.O.M.

Keystone gold-plated micro-sockets were chosen to securely seat the FA filter in place during testing. Optionally, one may secure the FA filter in place with #4 hardware. The micro-sockets offer excellent repeat connectivity and strength. Each hole is plated-through so it's only necessary to apply solder to the bottom portion of the micro-socket.

The BNC connectors, micro-sockets and trimmer caps are leaded components and may be assembled onto the test fixture with a soldering station. However, two components, C2 and C4 are 68 pF C0G 1206 SMD capacitors. For those readers who are not experienced with SMD soldering techniques, I suggest researching the subject online.

Note that Inrad filters are not balanced designs, as are the FA filters. Therefore, when testing an Inrad filter, you must plug it into the test fixture properly. In contrast, a Collins FA filter can be installed in either direction.

Figures 3 and 4 (above) show the completed test fixture assembly.

Test Setups

Using a Signal Generator

Let's assume we do not have a modern Network Analyzer, and must use more basic test equipment. Take a look at the test fixture of Figure 5 which provides a manual method of determining the insertion loss of the filter, its bandwidth and amplitude ripple. Test equipment required consists of a signal generator, oscilloscope and frequency counter. The frequency counter isn't necessary if the signal generator is of a modern synthesized design.

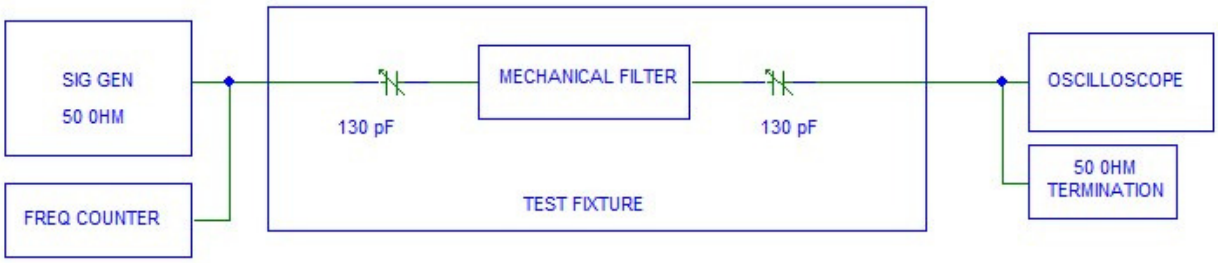


Figure 5 – Signal Generator and Oscilloscope

For a signal generator output of 0dBm, the output at the oscilloscope is typically 20mVRMS (28mV peak), so the scope must have sufficient sensitivity to display this level. With the 50Ω termination attached, the scope input impedance and cable length have no significant affect.

Recall that the maximum rated input voltage for the filter is 2VRMS, and this is typically reached with the signal generator set to 0dBm (224mVRMS). Although the filter isn't likely to suffer damage at somewhat higher levels, it is best to keep the input at 0dBm or lower.

The use of a frequency counter (or a synthesized generator), provides excellent frequency accuracy for determining precise bandwidth and center frequency measurements. The disadvantage of this approach is that the signal generator must be manually tuned while observing the oscilloscope level. Therefore, you do not have the ability to easily see amplitude ripple in "real time".

Using a Sweep Generator

The sweep generator was the instrument of choice in the old days prior to the development of network analyzers. They allowed creation of "real time" filter amplitude vs. frequency displays on an oscilloscope. To do this, the sweep generator RF output frequency is swept over the range of interest. In addition, the generator also outputs the linear voltage ramp that was used internally to generate the swept RF output signal. If the RF output signal from the device under test is applied to the "Y" (vertical) channel of the oscilloscope and the ramp signal to the "X" channel, the result is the amplitude vs. frequency display we want. A diagram of this arrangement is shown in Figure 6.

Sweep Speed Considerations

When sweeping a narrow filter, the rate at which the input signal is swept is important to the accuracy of the measurement. Using a sweep rate that is too high will distort the observed shape of the filter response and cause the amplitude readings to be inaccurate. This is normal, and occurs because every filter has a finite time delay characteristic from input to output. From a practical standpoint, simply start out with a very slow sweep speed, and increase the sweep speed until you begin to observe a change in the displayed frequency response. Then, back off until the distortion goes away.

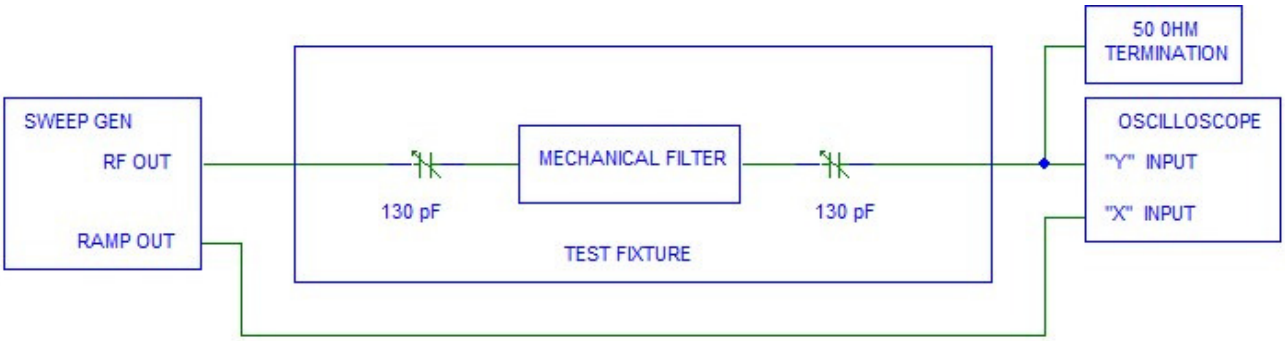


Figure 6 – Sweep Generator and Oscilloscope

Most sweep generator systems use a diode detector at the oscilloscope "Y" input to convert the RF output signal to a detected DC output, resulting in a nice single line trace on the oscilloscope. If you use a detector, be sure it has a good 50Ω input impedance. Also, experiment to be sure you are operating the detector in its typical "square law" range, meaning its output is proportional to power, not voltage. However, if the RF output from the test fixture is simply fed directly into the oscilloscope, the system is very linear, but you will see the entire envelope of the signal on the oscilloscope. It is convenient to adjust the oscilloscope DC offset so that you only see the upper half of the envelope. If you see the filter skirt amplitude drop to one half the measured at midband value, you can be sure that is the -6dB down point.

The disadvantages of most vintage analog sweep generators when used to measure narrowband filters are primarily associated with frequency accuracy. For example, FM on the signal can "smear" the resulting sweep, creating frequency measurement inaccuracies. Also, determining frequency points to an accuracy of 50Hz or so represents a real challenge for old sweep generators. Sweep generators often have frequency marker capability but, in my experience, these markers are at frequency spacings too far apart for narrowband applications. One option I've used in the past is to sum an accurate variable frequency CW signal generator signal with the sweep generator RF output. By adjusting this CW signal to a low level, it is possible to observe a small beat note on the oscilloscope display at the CW generator frequency. This technique provides a good variable frequency marker in the passband, but may not be that useful on the steep filter skirts.

Paul Christensen has a Wavetek 144 sweep generator that he attempted to use as a demonstration of this setup. Unfortunately, the results were very unsatisfactory, primarily for the frequency stability and narrow sweep issues mentioned above. In addition, the output ramp voltage did not remain constant as the frequency sweep width was varied, adding to the difficulties. The bottom line is that not all vintage sweep generators are capable of testing narrowband filters.

Figure 7 is a photo of what you might see on the oscilloscope with a good sweep generator. I don't have a good sweeper, so this is just something I rigged up using my Rigol DSA815TG. I apologize for the poor photo quality, but this was a very difficult photo to create without a storage oscilloscope.

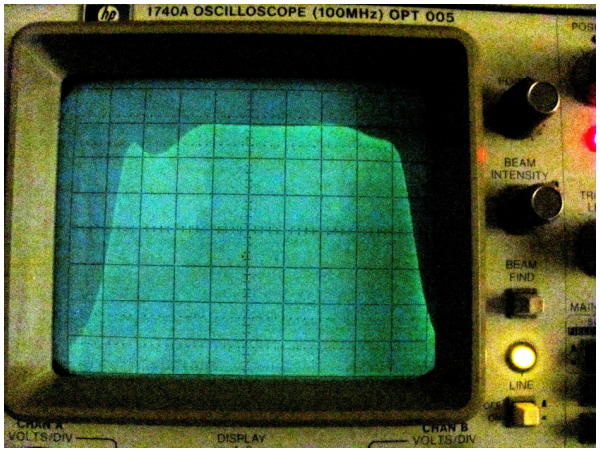


Figure 7 – Typical Display Using Sweep Generator and Oscilloscope

Test Results

Insertion Loss Measurement

Since the test fixture is intended to be used with 50Ω in/out devices, you can perform an insertion loss (I.L.) measurement. Simply remove the test fixture from the circuit and connect the cables together with a BNC female-female adapter. Note the level on the oscilloscope as your reference, Vref. Now insert the test fixture/filter assembly, and note the new voltage reading on the oscilloscope, Vtest. Calculate the insertion loss using the formula:

Insertion Loss (dB) = 20*Vref/Vtest

The I.L. is typically in the neighborhood of 20dB for most FA filters. This doesn't agree with the FA filter spec of 9.5dB maximum. The reason is that the Collins spec is the ratio, in dB, of the voltage at the input pin of the filter and the voltage at the output pin. This ratio is typically in the 5-8dB range, which agrees with the Collins spec. In contrast, the I.L. is a power loss measurement, which includes the loss of the various impedance mismatches in the test fixture, as well as the filter losses. The impedance mismatch losses are significant. Consider that the actual impedance at the input of the filter is typically around 12kΩ-16kΩ, and it is being driven by a "source" impedance of 145kΩ. Each of those mismatches (input and output) contributes a loss of about 4-6dB.

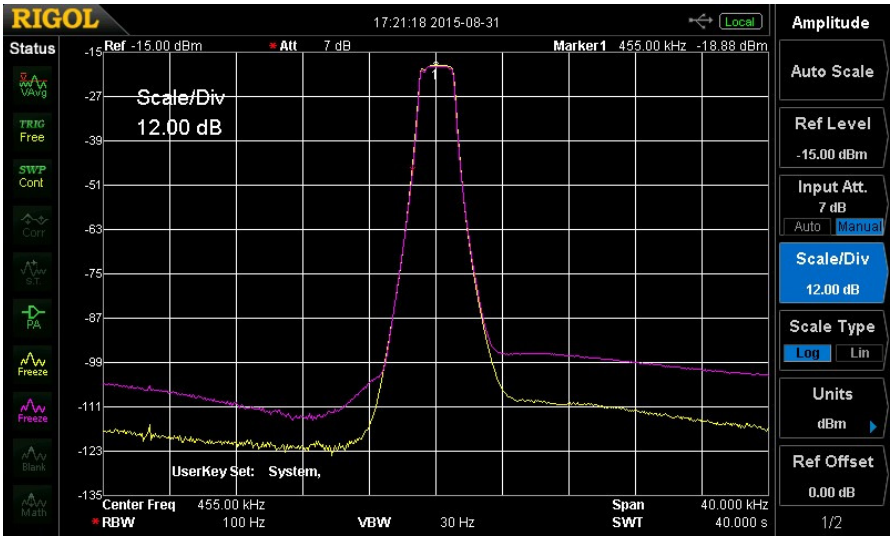


Figure 8 – PCB Fixture vs. Isolated In/Out Fixture

Ultimate Rejection

Although we have said that measurement of filter ultimate rejection isn't the primary goal of the PCB test fixture, it is interesting to compare its performance to the same circuit installed in an enclosure that provides high input/output isolation. Figure 8 shows this comparison using a Rigol DSA815-TG. The yellow trace is the circuit constructed with high isolation, and the purple trace is the PCB version. Clearly, high input/output isolation improves the measurement by about 8-14dB. Nonetheless, I was quite pleased to see how well the PCB version performs in this regard.

Conclusions

If you wish to evaluate Collins "FA" plug-in filters, and are not interested in measuring filter ultimate rejection, the PCB design presented here will do a good job. Basic functions such as bandwidth, center frequency, ripple and insertion loss can be measured using an oscilloscope as the output detector, provided a 50Ω termination is used. Of course, the text fixture will also work with 50Ω test equipment such as spectrum analyzers or network analyzers. However, note that use of an oscilloscope as a detector will limit the useful dynamic range to perhaps 20dB due to its linear (as opposed to logarithmic) Y-channel characteristic.

Although the circuit configuration used in the test fixture in my original article will certainly work, I recommend using the series version described in this article even if you decide to construct a test fixture with high input/output isolation. The series circuit has fewer components and, due to the higher filter termination impedance, produces passband characteristics closer to those seen in an actual S-Line receiver. The only disadvantage is that the series circuit results in a higher insertion loss (maybe 7dB or so) than the circuit in the original article. The higher loss is caused by a greater termination-to-filter impedance mismatch in the series circuit, but this is a relatively minor issue.

Remember, care must be taken to ensure the input power to the test fixture does not exceed approximately 0dBm, as greater input power may create a voltage at the filter input greater than the filter recommended maximum level of 2VRMS.

Cheers,
Don, W5QN
Paul, W9AC

- CCA -

Notes on parts and Gerber files for board construction: By the time that you get this article, our webmaster will have loaded files on the website that will provide an Excel spreadsheet of the parts list and also the Gerber files for the PC board involved.

Author Information

You are all well familiar with our *Signal Magazine* Technical Editor, Don Jackson, W5QN. If not please see one of his many bios done in the previous issues. Here, Don writes in concert with a newcomer to our list of authors - Paul Christensen.

Paul, W9AC, has been a ham since 1972 and was initially licensed as WN9JCG while in Joliet, IL. Paul's first rig was a Hallicrafters SX-100 and homebrew transmitter using a 6DQ6A final. His Collins collection began in 1990 with a KWM380, but his favorite is his Collins S-Line, which he operates regularly on the air. One of his prize Collins pieces is a restored very rare 1935 30FX. As well as hardware, Paul also collects Collins literature, particularly pre-WWII vintage.

Check out his QRZ.COM site and you will see a wide variety of professionally executed homebrew projects. Very nice! Also, check out the photos of his remote shack, which is the source of some huge signals, particularly on 40m.

Paul has worked in telecom engineering for 20 years and completed his career as a corporate director of engineering for AT&T Broadband. His areas of expertise also include telecom law and business immigration.

His formal education includes BSEET and BSCS degrees from Northern Illinois University, an MBA from the University of North Florida, and a JD from the Florida Coastal School of Law.

Paul enjoys tennis, and alpine snow skiing when he is not on the air, building projects or visiting with his daughter in Minnesota.

In the Collins Shack

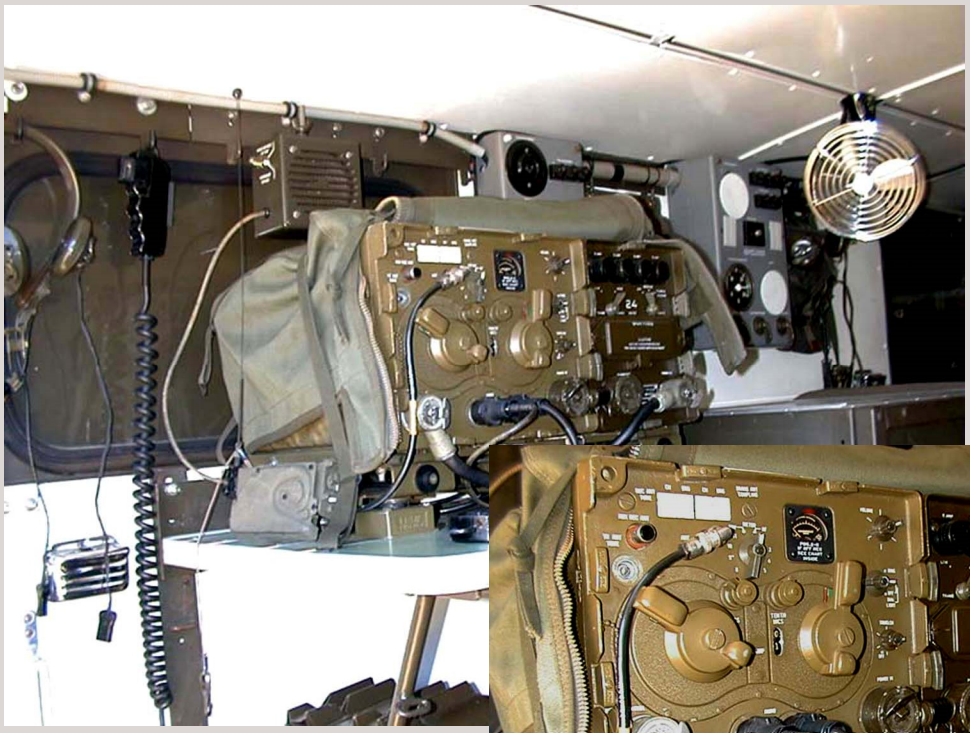
The Rather Robust UNIMOG Mobile

Randy Best, W7CPA, is by no means someone who does something halfhearted.

Whether it is in his career or his hobby, if he is in, he is "All In". Above, we can see Randy at his rather robust collection and operating position of Collins A-Line and S-Line equipment that he put together in the 80s and 90s.

Along the way, Randy decided that he wanted a Collins Radio mobile to use in his leisure moments. This UNIMOG (a Mercedes product), as set up by NATO in the 60s, and employing mostly Collins Radio mobile equipment, was his solution of choice. You do not get better quality than that—all-around. Mercedes plus Collins—Wow!

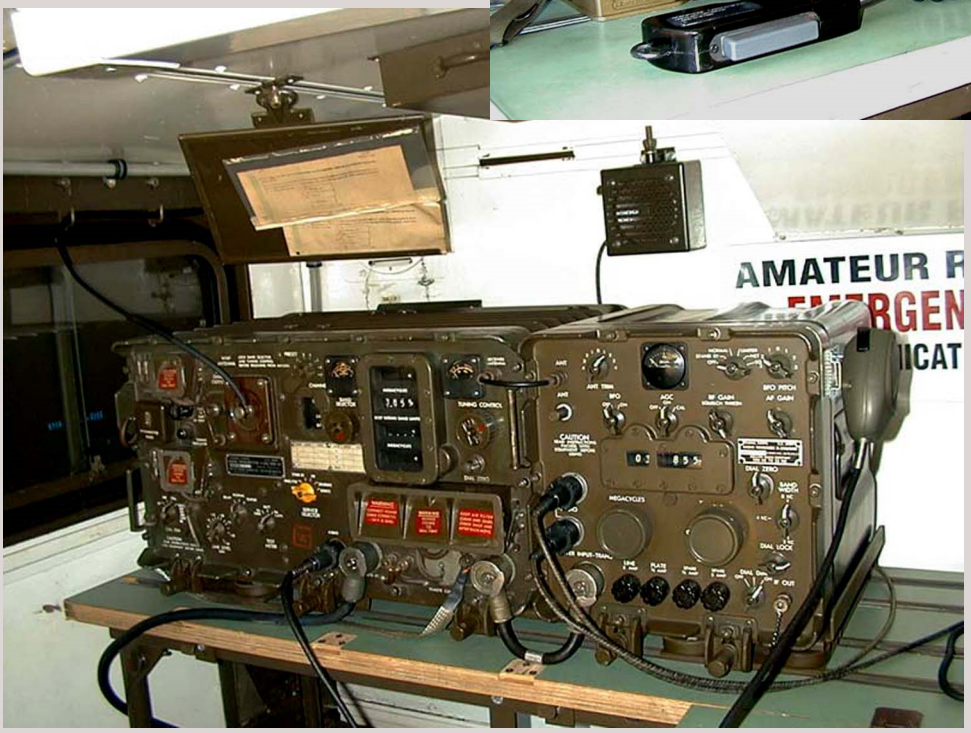
Like most of the things in Randy's life, nothing is stagnant, and his collection and his mobile has evolved and moved on, but he shares it with us here for this issue.



Below and to the left, a non-Collins tactical FM serving as the 38-54 MHz. vehicular comm.

Oh blasphemy! Not Collins . . .

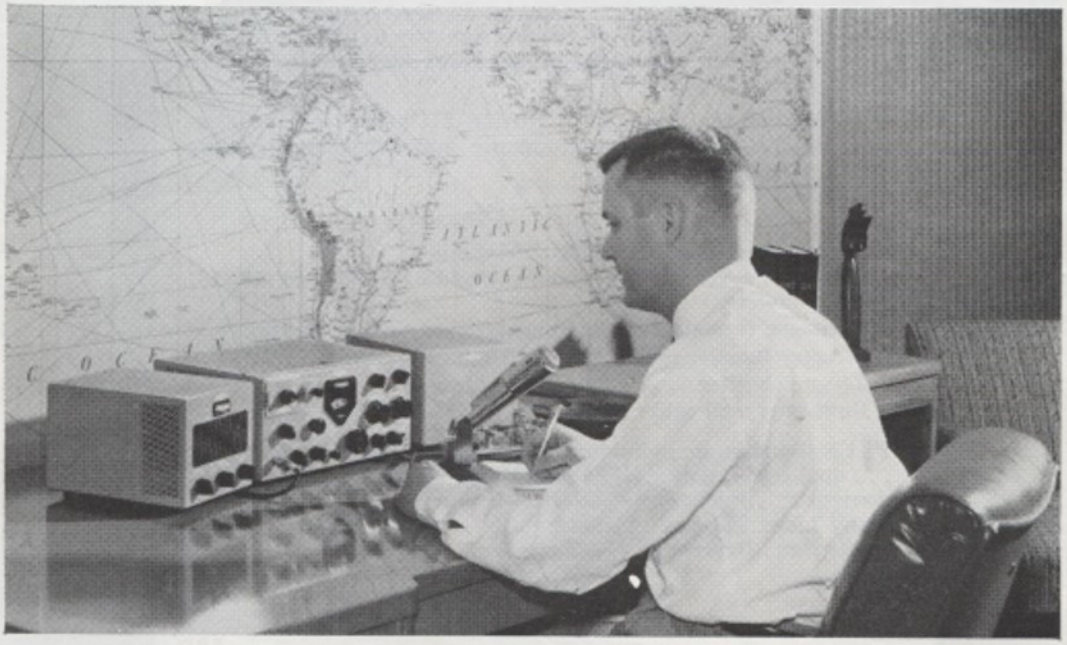
This AN/VRC-10 / RT-68 XMTR-RCVR was the stereo-typical tactical radio used in the 50s and 60s and put out about 15 watts.



The Collins GRC-19 Radio Set - Shown to the left mounted in the rear of the UNIMOG as it was used by NATO in the 60s, This radio set is comprised of the T-195 1.5 to 24.4 MHz transmitter and its companion R-392 Receiver which covers the more general 0.5 to 32 MHz range. Typical operation was AM, CW or external RTTY running into a short whip using the transmitter autotune.

A HAM'S AT HOME

IN CAR



OR 'CASTLE'
WITH A **KWM-1**

COLLINS

2

- QST - July 1958 - John Hunt, Product Line Manager, shows off the new KWM-1 in Arlo Meyer's Chevrolet Impala