The Signal

OFFICIAL MAGAZINE OF THE
COLLINS COLLECTORS ASSOCIATION
Q2 2019 Issue #94

Dayton Hamvention 2019

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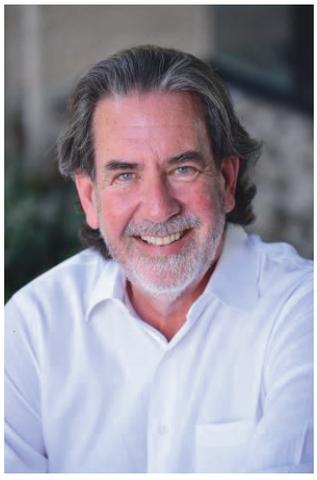
Collins Collectors Association

From the President's Desk...



This is the quarter that is the most fun for the CCA crew. Dayton rolls around each year and you look forward to working with the same guys and swapping stories (see the Dayton report elsewhere in this issue). I can say that I really missed having Jim Stitzinger around as he and I have done so many Daytons together we seem to have it down pat. The only advantage was that he is the ultimate flea market shopper so it should have left some good buys out there for the rest of the Collins hunters! I am sure he will be back next year though.

The big news is that our Vice President, Francesco K5URG, is heading a committee to investigate the formation of some kind of museum to host the tons of material that might be lost if we cannot figure out a way to capture it all as our members downsize. Some of the printed materials are one of a kind and priceless. At the very least, we need an online museum to host this type of material. See Francesco's announcement later in this issue.

I have applied for, as Trustee, and received a CCA Vanity Club call sign for the CCA. It is K5CCA. We will be using it for net controls and other official CCA events. If you hear K5CCA on the air know that the operator is a CCA guy.

I was interviewed by George, KJ6VU and Jeremy, KF7IJZ of Ham Radio Workbench last Friday night - the subject being the restoration and operation of Collins equipment and the resources that the CCA brings to the table. It was a fun time and they have a really unique and cool web site. Take a look at http://hamradioworkbench.com – lots of diverse info! The podcast is available at https://www.hamradioworkbench.com/podcast/july-02nd-2019. The board is always trying to spread the word about the CCA and Collins in general. Help us spread the word with your ham friends and at your local Club.

Well, Dayton is over and this is the first time I came home without buying one piece of equipment. It was lots of fun though and I brought home great memories. Come join us next year!

On the cover: Four of my favorite people - Hap Perry, W3UPV and Wayne Spring, W6IRD are pictured at their flea market booth at Dayton. Sheila Perry and Sharon Spring, K6IRD are seated behind.

- Scott, KE1RR
President, CCA
president@collinsradio.org

The Signal Magazine

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The Signal Magazine

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You can renew your membership or join the CCA on our website using the "JOIN US" link.

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From the Editor

Dear Friends,

This issue is dedicated to the Dayton 2019 Hamfest; unfortunately, family issues kept me at home.

For years, we have been dreaming of having a museum/library to preserve Collins technical and historical documents and Collins equipment of special significance. Of course, this library/museum would be accessible to CCA members and others to consult and view the available documentation and equipment. Speaking from myself, I have a few Collins items that I find very special that I would like to see preserved in a museum rather than sold to recover my financial investment.

To explore the possibility of creating a Collins Collector Association museum, an exploratory team has been put in place; this team has to:

a. Determine and propose the function and scope of the library/museum

b. Determine the range of interests of the library/museum (A.E. Amateur Radio, Avionics, Space, etc.)

c. Understand the financial requirements to create and maintain a library/museum

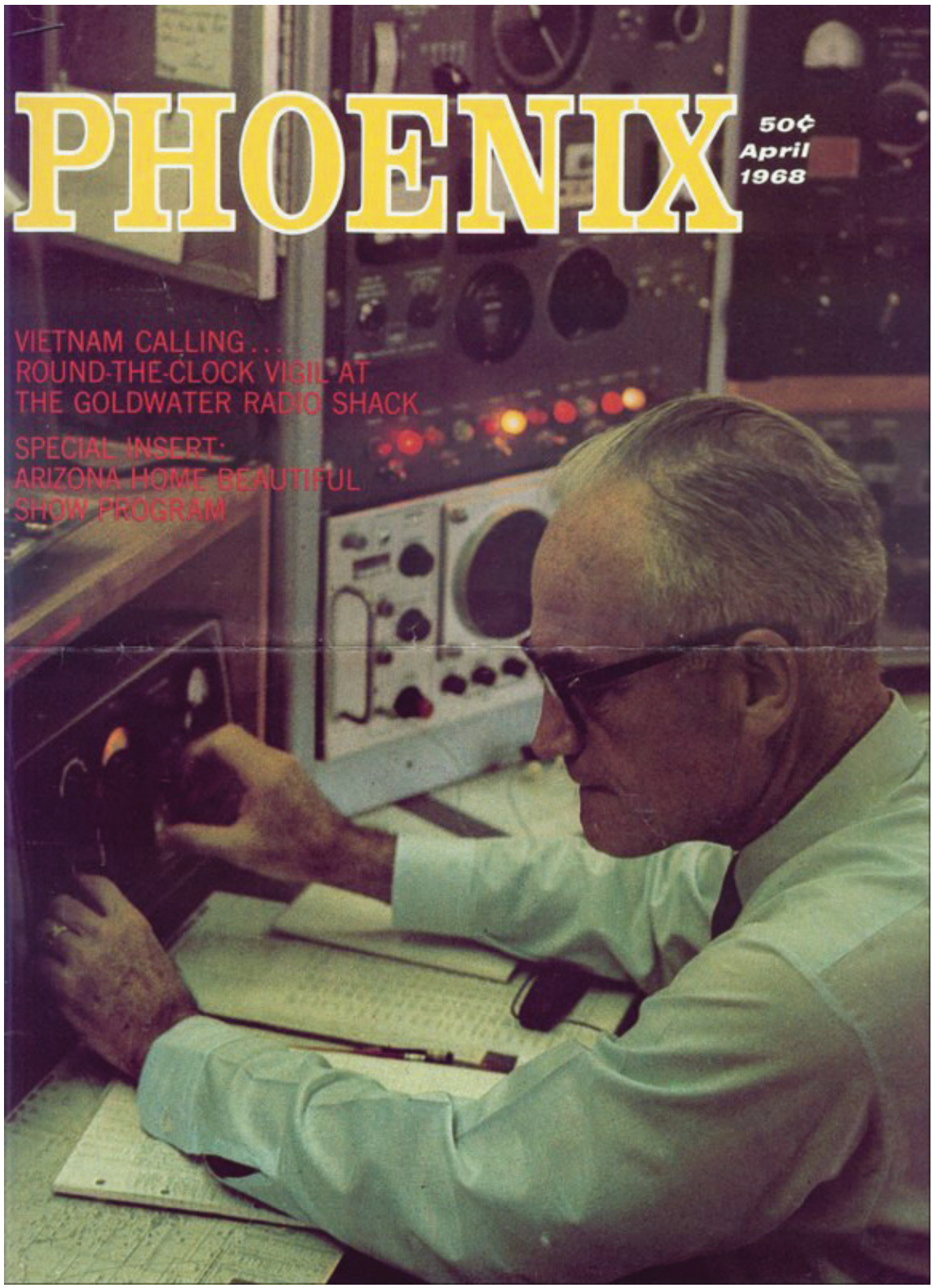
d. Determine and propose the appropriate corporate structure, bylaws to manage a library/museum and accept donations.

If you think you have something to contribute to this discussion, please, contact me with your ideas and suggestions by email. This is going to be our museum, and we need to hear from you.

Best Regards,
Francesco Ledda, K5URG
Editor & Vice President, CCA
k5urg@yahoo.com

Barry Goldwater AFA7UGA MARS Phone Patch Operation

By Don Jackson, W5QN



A while back, Darell Brehm, WA3OPY, sent me a number of photos of ex-Senator Barry Goldwater's ham shack and his extensive Viet Nam war phone patch operation. These photos belong to Frank Fahrlander, N7FF, who was part of this MARS operation. Wanting to learn more, I called Frank and he was gracious enough to give me an hour of his time to describe some of his experiences with Barry in Phoenix, Arizona.

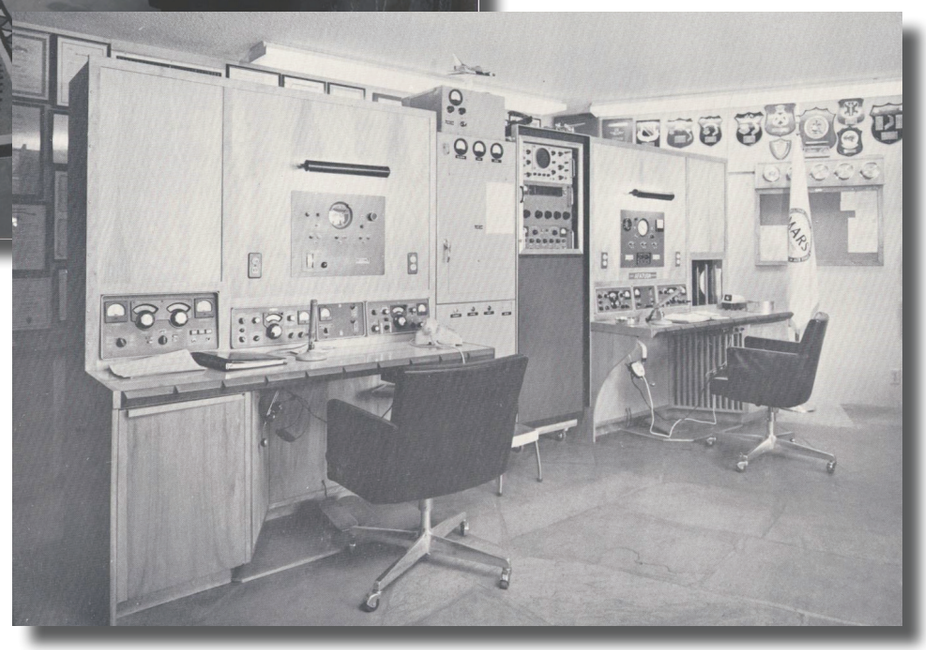
The photos show the interior of Barry's shack, which was a cabana adjacent to his personal house in Phoenix. Some of the photos show the MARS operators and other folks. The shack operating equipment evolved over the years, but during the Viet Nam war, there were two Collins S-Line stations, purchased by Barry himself, and a TMC 5kW amplifier between them. This amplifier was most likely a government issued piece of equipment. Although the Viet Nam phone patch operation began using a stack of yagi antennas and a Hy-Gain log periodic, eventually the primary antenna was the Collins 237B-3 shown on the cover of the Q3 2018 Signal magazine. Frank thinks that this particular antenna was originally installed at the Pentagon, but he's not sure.

Frank has a wealth of interesting anecdotes and stories about Barry, K7UGA. Frank mentioned that Barry was held in high regard by the Hopi Indians, and he had a large collection of Hopi katsina figures (also known as kachina dolls) that can be seen on the wall of the shack. Barry also had a tattoo on his hand that was related to the Smoki People. A little research determined that the Smoki was a social group dedicated to the support of Native American tribes, and they devised specific tattoos for their members. Other personal tidbits included Barry's enjoyment of swimming "au naturel" in his pool, and that he played a bit of trombone (emphasis on "a bit" – hi!) The trombone thing was the result of a bet between Barry and his brother Bob, based on whether Barry could learn to play a Christmas song by December 25th! Barry won the bet, and Bob had to donate to one of Barry's charities. Frank also said that Barry initially paid for all necessary long-distance phone patch charges, but eventually had to change that since some of the calls wound up being very expensive overseas calls. The longest phone call Frank remembered was one to Greece!

If you wish to learn more about the AFA7UGA operation and gain additional insight into Barry's amateur radio history, Frank has created a PowerPoint slide presentation that he has shown at ham clubs. This is an extensive 53 page slide show with all sorts of detail covering the 1967-1977 time span. If you wish to receive an electronic copy of this presentation, contact Frank or myself. It is a large (21MB) file, so be sure your email system can handle large attachments.

Frank:
frank.fahrlander@sbcglobal.com
Don: w5qn@verizon.net

Cheers,
Don, W5QN



Dayton 2019

Seems like Dayton rolls around faster each year. This was the consensus of all of us sitting around the booth. The normal crew of Floyd Soo, Charlie Talbot, Tony and Brian Sokol and our Membership Chairman, Jerry Kessler showed up on Thursday to set up the booth. We have done this so many times that few instructions have to be conveyed and the booth takes shape on its own! Then off for a good dinner and early to bed as the crowds start early on Friday morning. Traffic was brisk at our new normal location in Building One at the Xenia Fairgrounds with lots of membership renewals and stories of what has been acquired or restored over the last year.

This was the first Dayton that I can remember where it did not rain, and the temperature never dropped to the point you needed a jacket. That made the flea market vendors happy to not have to deal with any mud this year. Speaking of the flea market, it is back – and in a BIG WAY! I had heard that there were more vendors out there and there was a huge amount of S Line gear, but it was Saturday afternoon before I was able to make the rounds and I was shocked. There was more Collins gear out there than in the last ten years – and a lot of it was really nice looking and priced to sell. If you have been holding off going back to Dayton because of the move to Xenia, you need to start making plans to go. A lot of Collins gear traded hands this year. Many of the major vendors said it was the best show that they have seen, and sales of new ham gear were brisk.

Friday night was our annual banquet with Rod Blocksome as our featured speaker. Rod did a great job, and showed the AACLA's newest movie – Moon Talk. The is the second AACLA video on the history of Collins Radio and it was impressive. Go to https://arthurcollins.org/store.php if you would like a copy - I highly recommend it.

All too fast, Saturday afternoon was upon us and time to pack up the he booth. As always, we all gathered for Pizza on Saturday night and then the long drive home.

If you have not been to Dayton or have been holding off due to the move to Xenia - put it on your bucket list. It is a wonderful weekend celebrating our love for Collins Radio with great friends.

de Scott KE1RR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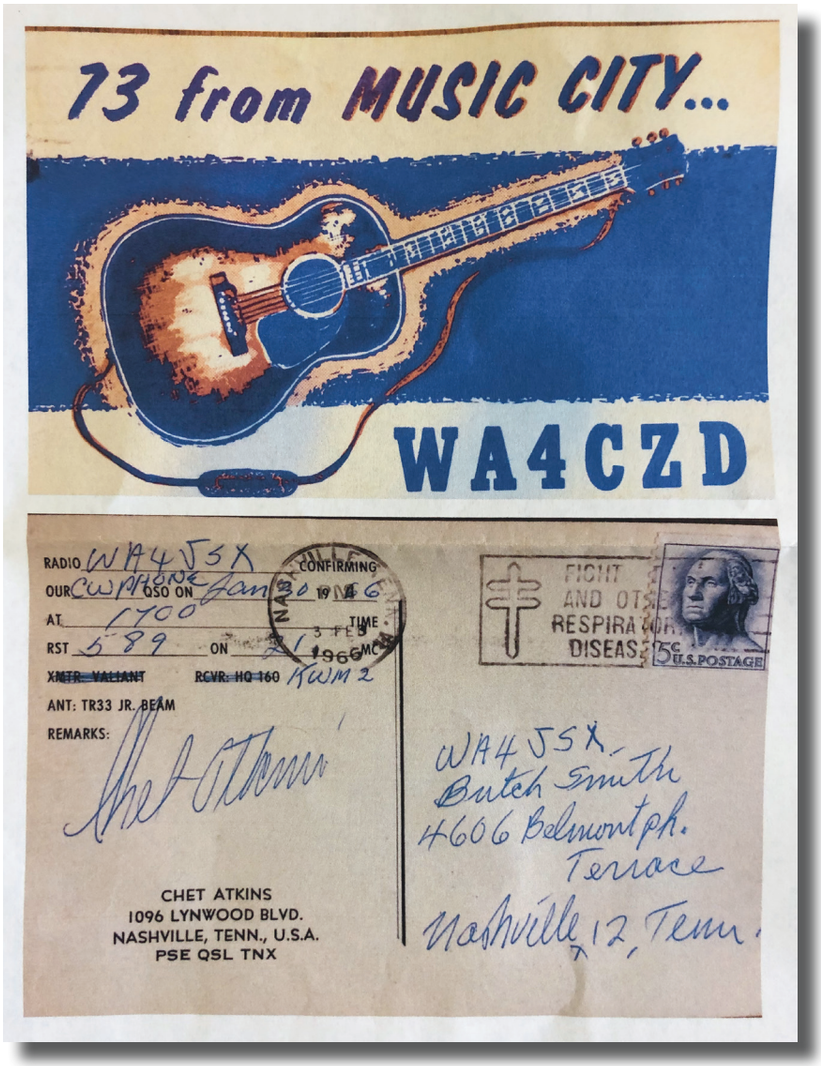
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Collins 75S-3B Band Switch Cleaning/Adjustment: the Good, the Bad and the Ugly

By Jack Harper, WØYJ

I am bringing a very clean and gorgeous Collins 75S-3B Receiver back to life – and have learned a few things about the Band Switch after some trials and tribulations.

The Band Switch was intermittent on a number of bands – rock the switch back and forth very slightly and the Receiver would cut out – and it was completely dead on two other bands.

I read everything that I could find about the Band Switch, which was not very much and having no choice tackled the disassembly. Why would I do that? Because, clearly, the Band Switch contacts were dirty and scratchy (Really? After only 52 years since manufacture…).

I asked lots of questions on the Collins List seeking advice and got great comments back from Steve/VK4VN, Tom/KØEOA and Mike/K9LSH including a lot of badly needed encouragement.

The prospect of that disassembly was a bit scary as it looked like a clear path to perdition – remove the three shield cans to uncover and display the three switch wafers; disconnect the Bristoled mechanical coupling from the front panel Band Switch Control Knob; Pull the phenolic/fiber control rod through the three wafers; Clean and then Put it all back.

What could go wrong?? Well, everything including perhaps broken 50-year+ old switch wafers and/or contact lugs, mechanical misalignment and, of course, the unknown unknowns.

However, my experience has been that there is nothing to fear – well, not too much – about cleaning the Band Switch. I believe that I went down just about every possible blind alley and perhaps what I encountered might be of use to some other intrepid soul.

Figure 1 - The Collins 75S-3B Receiver that is the subject of this article has serial number 17019 and by component date codes was manufactured in late summer 1967. It is beautiful, but had many problems when received that I have been working to resolve: Several bad and even incorrect tubes, tuned circuits grossly misaligned, missing crystals (including the crystal for 20-meters – ironic as I usually hang out at 14.005/CW), several strange parts soldered in for no apparent reason, terrible Birdies everywhere, dirty pots/connections, very poor or nonexistent response to signals, wrong fuse, a couple of old electrolytics, distorted audio, mangled AVC, horribly rewired power section with filter parts floating in the air, missing 100-ohm dummy load – all now corrected – and, now, most recently, intermittent and/or dead bands with the Band Switch – now also corrected.

I enjoyed the process, mostly, and it was quite interesting.

This article is about the Good, the Bad and the Ugly associated with tackling the Band Switch. The Good is that repair of the switch is very doable even for a mechanical klutz like me; The Bad is that you do run the risk of damaging something difficult to replace during the procedure, though that risk is quite small if you are careful; and The Ugly is that careful adjustment of the switch during reassembly is absolutely required and that adjustment is quite tedious and very time consuming.

Here is the process to clean the Band Switch that I eventually evolved by a lot of staring at things and some trial and error:

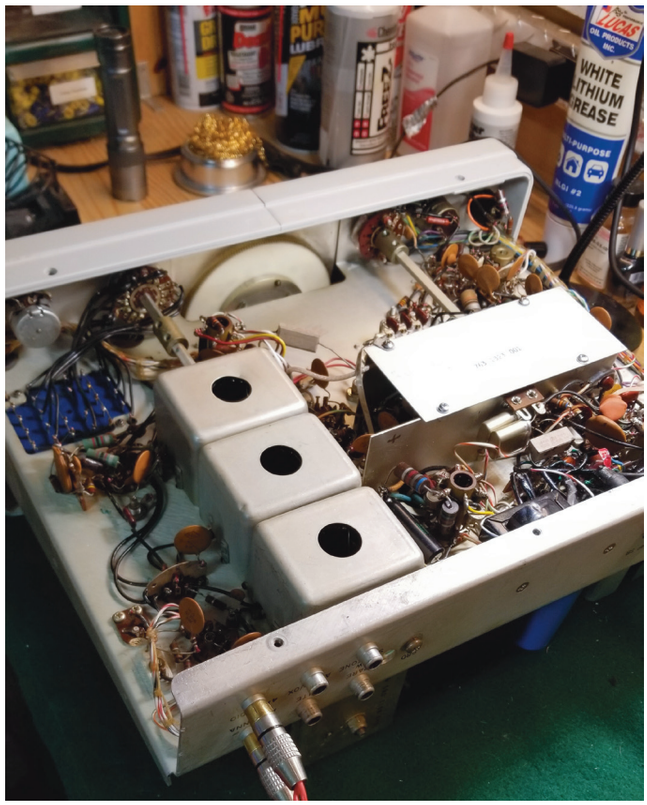

Figure 2 - The three-shielded Band Switch wafers are under the three large rectangular shield cans in the photo above – one shield can per wafer. The fourth wafer that switches the crystals for the Crystal Oscillator V3B is not shielded and is closest to the front panel. The phenolic control rod and its Bristoled coupling can be seen above between the crystal switching wafer and the first shield can near the top of the photo.

(a) Turn the chassis upside-down with the RF front end (V1/V2/V3 & Friends) closest to you.

The Band Switch has four wafers jointly rotated by a rectangular shaped phenolic/fiber (I think it is) rod that goes through and more or less mates with the central wafer holes but with quite a bit of loose rotational slop, which creates some headaches during reassembly.

The front-most wafer nearest the front panel is not shielded and switches in for each band the correct crystal for the Crystal Oscillator V3B that feeds the First Mixer V3A to produce the first variable (2.955 – 3.155 MHz) IF.

The three other wafers are each shielded with three individual cans and those wafers are not visible until the shield cans are all removed.

(b) First step is to remove the three shield cans so you can see the three wafers.

But first, remove the six nuts and copper washers on the chassis top that fasten down the shield cans.

Next, remove the phenolic control rod, which goes through each of the shield cans. The cans cannot be removed until the control rod has been removed.

This sounds daunting, but it should actually be very easy. Make a very small mark – as small as possible – with, say, a dob of red fingernail polish on both the Bristoled coupling and the control rod itself so you know during reassembly the rough alignment position of the rod relative to the coupling. This step is very important. Let the fingernail polish dry thoroughly so you do not smear red polish all over the wafer holes as you withdraw the control rod.

The Good News, at least in my case, is that the control rod was quite loose and it easily slipped out through the center holes in the wafers. Hopefully, the control rod is not warped etc – I have seen reports of warpage, but have not seen that myself.

You must use a Bristol wrench to loosen the setscrew on the coupling – those wrenches are easily found online. Once the Bristol setscrew is loose, just push the control rod, carefully and gently, back toward the rear of the chassis as far as you can go with your fingers. Then grab the back end of the control rod with needle nose pliers through the small hole in the back of the chassis and pull the control rod, carefully and gently, through the three wafers and out the back.

Now, lift the three shield cans to fully expose the three switch wafers. You can now admire the view of the beautiful Collins engineering – what a work of art – see photo right.

Very important: Do not touch or rotate any of the switch wafers as it will be difficult to get the relative positions back correct. Without the control rod, the wafers will freely rotate.

Now that the shield cans are off, reinsert the control rod through the back chassis hole and carefully and gently through the three wafers all the way into the Bristol coupling. Tighten the Bristol setscrew. Now you can rotate the control rod and clean the wafers with, say, DeOxit™.

(c) You are now done – well, not quite. This is the tedious part – reassembly.

It is a bit difficult to explain verbally, but each of the five bands (80 - 10M) has three sets of five tuned circuit elements (see schematic). The three sets switched by the Band Switch are for the front-end tuned circuit with T1 on the antenna input that feeds the RF Amplifier V2; RF Amplifier V2 L2 output and the Crystal Oscillator V3B. Therefore, there are five sets of circuit elements for each wafer that are switched in/out for each of the 14 Band Switch positions.

On Crystal Oscillator V3B, the first wafer up close to the chassis front and not shielded by a shield can switches in the correct crystal - e.g., a 8.5775 MHz XTAL for the 14.0 MHz band. The second wafer (shielded) switches in for the 14.0 MHz setting C74 68pF and a parallel C73 8-50pF trimmer, which with slug tuned T2 (PRESELECTOR) forms, I think, a tank circuit for the Crystal Oscillator. That same C74/C73 combination is used for all three 20M positions (14.0MHz, 14.2MHz, 14.8MHz).

Point of all that is that the five sets of capacitors for the first shielded wafer are split amongst the 14 Band Switch band settings meaning that Set #1 of capacitors C70/C69 is used for the three 80M positions; Set #2 is used for the two 40M positions; Set #3 for the three 20M positions; Set #4 for the three 15M positions; and Set #5 for the three 10M positions.

Therefore, the switch contacts on the Band Switch are not evenly spaced around the wafers and Collins implemented this by having, for example for the three 14 MHz positions, the wafer slider tab touching one contact, touching the other contact and then sort of straddling between the first and second contact - and that is the design weakness. It would have been far better to have all 14 switch contacts rather than just nine, but wafer switches were/are quite expensive.

Figure 3 - Above shows the three wafers after the control rod and shields have been removed. On the top-left is the control rod Bristoled coupler and diagonally down toward the right are the three aluminum wafer support brackets. The control rod goes through each wafer and each support.

This means that the exact rotation angle of the drive rod relative to the ganged wafers is very sensitive. If off by even a tiny amount, the wiper tab will not quite touch the correct contact and you will end up with, say, no C74/C73 capacitor for the 14.0 MHz tank circuit for the Crystal Oscillator V3B or for the 14.8 MHz band. The middle band section – e.g., 14.2 MHz – always functions correctly unless a wafer is grossly off.

It is good to know that the three switch wafers are identical and the mechanical configuration of the five switched elements shared between the 14 possible band switch settings are also identical. Therefore, once you understand the circuits for one wafer, the other two are identical, which makes testing considerably easier.

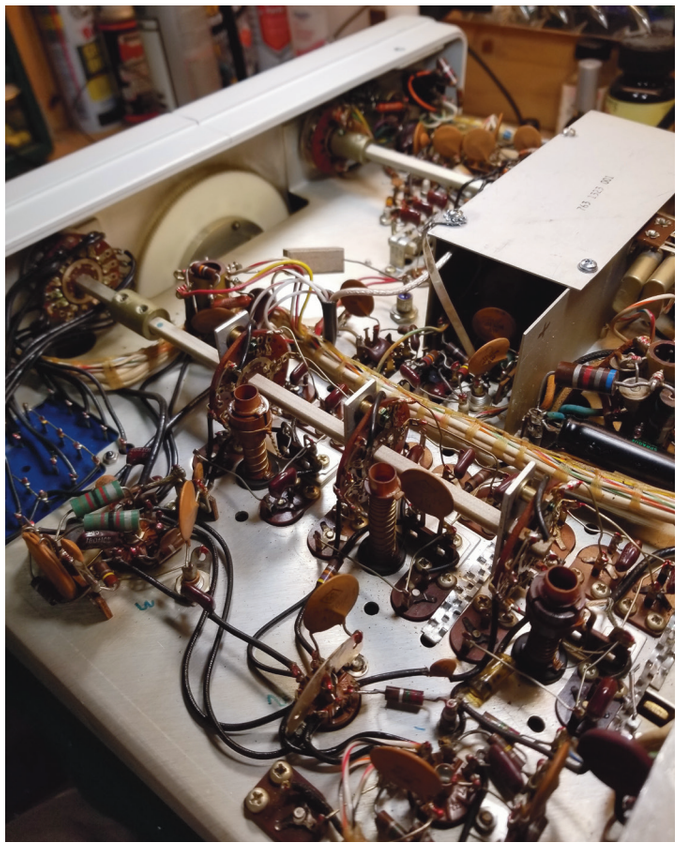

Figure 4 - Control rod back in to enable switch wafer rotation with the shield cans removed.

Figure 5 - The Band Switch has 14 settings, but each band has three sets of five capacitor/capacitor circuits switched in and out meaning that the 14 settings each share five circuit elements. Thus, e.g., the 14.0, 14.2 and 14.8Mhz settings have three contact lugs that contact the single wafer wiper tab. The center position (14.2) usually contacts with no problem but either the 14.0 or the 14.8 lug will just slightly miss contact if the control rod is not precisely rotationally placed. Same problem with 80M, 15M and 10M. 40M has only two positions and usually works fine.

The way to deal with this, I found, is to use an ohmmeter and the schematic to identify the correct position of the tab for each of the 14 band selections - fiddle with the rod angle until all 14 positions touch the correct C/C combination - it is quite tedious to get this correct - and the ohmmeter is the only way I found to make this work.

You can tell which set of capacitors is which by reading the values of the Micas and comparing to the schematic (however, C120 on my Receiver has a wrong value as per the schematic - schematic says 15pF but is actually 120pF).

The real hat-trick is that to reassemble, you must get everything correctly positioned; pull the rod out; replace the shield cans; put the rod back in; and then tighten the Bristols - but, with the shields on you cannot see or test the wafers for correct operation! It either works after being reassembled or it doesn't.

If needed, insert a very small shim (VK4VN suggested using a small piece of classic two-edged razor blade, which works well – scissors will cut the blade to shape) along the edge of the rod in the Bristoled coupling so that when you tighten the coupling the Bristols are at 90-degree angles with the shimmed rod - otherwise, the rod will shift over time.

The mistake that I made originally was that I assumed that the Bristoled coupling is machined to exactly fit the non-round shape of the rod so that alignment of the wafers would be forced - it is not! The coupling has simply a nice round hole in which the more or less rectangular rod happily freely rotates. The rod is sort of rectangular in shape so as to loosely mate and drive the wafers.

(d) There is considerable rotational slop between the control rod and the wafer center hole edges – and that slop is the fundamental problem. The slop enables the control rod to be not quite correctly positioned and so one of the three wafer wiper lugs might very slightly miss contact with one of the contact lugs and that will kill that band. This only happens with the three-sectioned bands: 80M, 20M, 15M and 10M and not with 40M.

If able, the acid test is to remove the control rod after thorough testing with an ohmmeter; reattach the three shield cans and then reinsert the control rod and position that – correctly! – in the Bristoled coupling; tighten the Bristol setscrew and then inject a 100µv signal of the correct frequency (3.4, 3.6, 3.8, 7.0, …MHz) for each band setting into the antenna input and monitor the output audio. Of course, when tightening the Bristol setscrew, you are blind and cannot see the exact position of the wafers. The red mark helps, but is not exact.

It required eleven tries before I got the rotational angle of the control rod correct. One of those failures happened when everything was fine with a warm Receiver, but failed when cold. Watch for that. However, the last four attempts failed on 7.2 MHz and I thought that the control rod was at fault. I finally realized that the 7.2 MHz band crystal pins were making intermittent contact and the fault was not with the control rod. A bit of DeOxit™ in a second cleaning cured that. Once everything works reliably, attach and tighten the nuts and copper washers back to the shield can threaded lugs on top of the chassis. Be careful not to over-tighten the nuts as it is very easy to deform the shield cans. I tighten not much more than finger tight with a nut driver. A bit of DeOxit™ on each of the threaded lugs followed by several tightnings/loosenings/tightenings might help to kill any Birdies etc.

What are the symptoms that show a need to disassemble and clean the Band Switch?

What prompted all of the above in my case - to "simply clean the Band Switch" - was that the output of the Crystal Oscillator V3B to the input of the First Mixer V3A was intermittent. Some bands were totally dead - I could slightly wiggle the Band Switch and a band might come alive. I could tap the Band Control knob and a band might drop out.

In addition, some of the bands that were alive showed only about 0.2V RF from the Crystal Oscillator V3B and not the 2.0V in the manual - and so I descended into this morass. The wrong 0.2V came from, I think, the fact that the Crystal Oscillator V3B in those almost alive bands had no C/C combination switched in and, therefore, no tank circuit. On the Spectrum Analyzer, I typically saw 0.2V (on the 'scope) as White Noise running up to 100MHz+. After cleaning the Band Switch contacts and aligning the wafers mechanically so the correct C/Cs were reliably switched in, I now see the correct 2V RF from the Crystal Oscillator in all positions.

The 14.0 MHz band position gave me special trouble. There, at first, I would usually see a very low frequency signal that after a second or two would change to something that looked reasonable but with considerable jitter; or I would see some sort of White Noise gibberish; or I would see nothing - all that randomly.

I could visually see that the wiper tab was very slightly flexing the contact and the ohmmeter showed that it was switching in the correct C/C - C74/C73 in the 14.0MHz case - but, weird stuff was coming out of the Crystal Oscillator. I thought, of course, a dirty switch contact - I re-cleaned - no. How could this be - the three contacts 14.0, 14.2, 14.8 are all wired together - I then tried jumpering around the 14.0 contact and got exactly the same thing - how is that possible? Then, I remembered that there was another variable - the different crystals being switched in by the front wafer. Bad crystal perhaps - I checked and to my amazement, the 14.0 MHz crystal 8.5775 MHz was simply not there - just two holes – and I had not noticed that before! I did not know that a crystal controlled oscillator with the crystal removed will, in fact, oscillate - I suppose at or roughly at the frequency of the tank circuit - or generate White Noise - or nothing at all randomly - an interesting phenomenon. I learned a lot going through all this - and that counts - a lot of fun - a couple of Rum & Cokes® here and there also helped :)

Figure 6 - Testing continuity of a wafer wiper lug for each band position. The red clip is on the common wafer wiper.

Best to the List - Jack, WØYJ [Evergreen, Colorado USA at 8,000-feet elevation in the shadow of Mt. Evans.]

ps – Disclaimer. You are clearly insane to play with primordial radios filled with lethal voltages and you will probably get killed. In addition, performing the above procedure will probably destroy your radio. I assume no liability for any death or destruction.

Updating and Tailoring S-Line Frequency Cards

By Dick Weber, K5IU

An option offered by Collins for S-Line receivers, transmitters, and KWM-2s was a version of each with a second crystal deck and the hardware to switch between the original deck and the additional one. This included a frequency card mounted within a cover co located with the band switch assemble as shown in Figure 1. When the selector switch was turned, the alternate deck was connected and the frequency card moved left or right to reveal the band coverage for that band switch position.

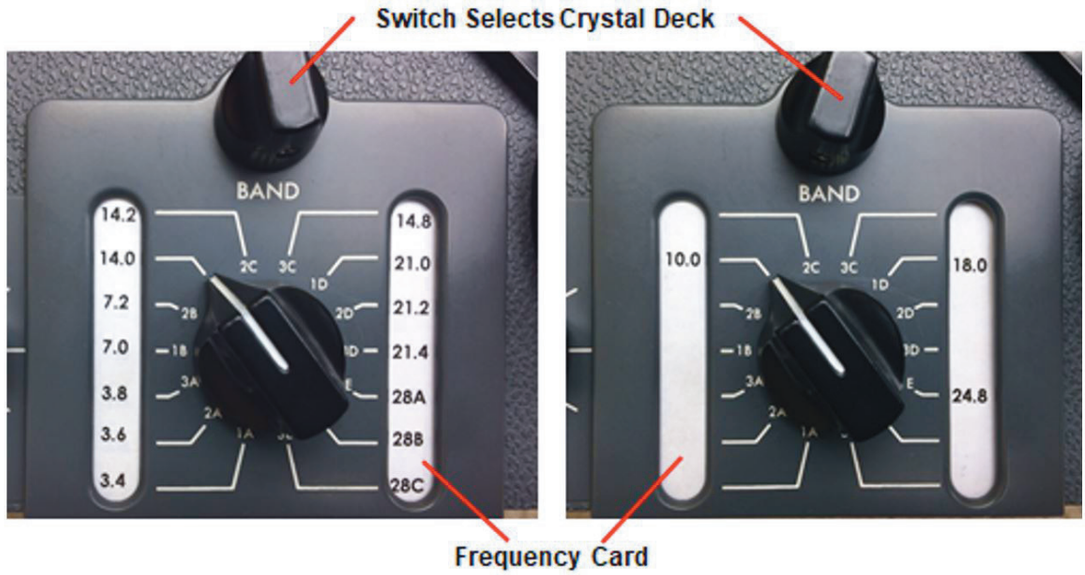

Figure 1 - Figure 1 – Frequency Card Shows Bands Available with Both Crystal Decks

The frequency card shown in Figure 1 is not the version that comes from the factory. The factory version only has the lettering shown in the left picture. The right picture shows lettering I added for the WARC bands, whose crystals are mounted using the second crystal deck. In addition to lettering for the WARC bands, some people have added lettering for crystals they used for shortwave listening. I have even seen lettering, along with corresponding crystals in S-Line receivers and transmitters, for CB use. I am confident none of the people who did this were CCA members. Further, you will see lettering added using a pencil or using rub-on transfer letters, which is how I used to do it.

I now use a simple way to update and tailor frequency cards. With this method, you can create a frequency card that looks like it came from the factory. You can also create one that looks like it came from the factory and incorporates fixes for several issues with the original artwork. You can see these in the left picture in Figure 2. First, the vertical columns of numbers are not well positioned relative to their corresponding band-position leader lines. In addition, 3.4 and 28C are partially cut-off. Second, the right column shows 28A, 28B, and 28C are not aligned with the numbers above them. Of the thirteen frequency cards I have checked, all but one has these issues. That particular one does, though, have the 28A, 28B, and 28C out of alignment. I do not know where I got this card or whether it is a very late factory version using improved artwork. It may be an aftermarket item as it has a different font.

The middle picture in Figure 2 shows a frequency card with an improved layout. The numbers are positioned better including 3.4 and 28C, which are not cut-off. The right picture shows 28A, 28B, and 28C were replaced with the actual bands this rig is set up for. With my method, you can have a new looking frequency card using improved and tailored artwork or one have one that looks new using the original layout – factory warts and all.

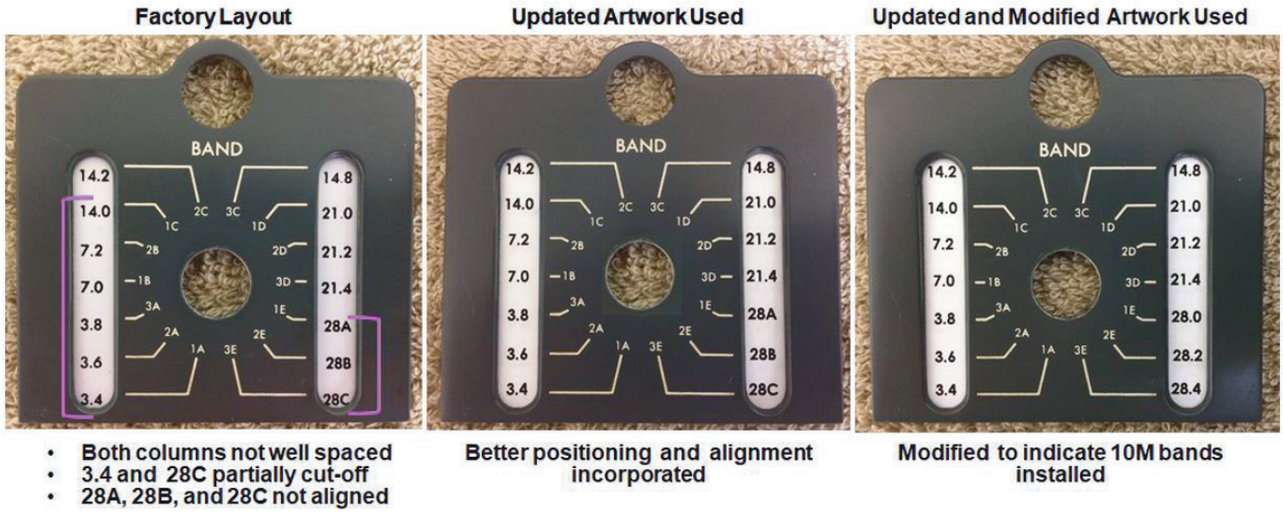

Figure 2 – Factory and Alternate Frequency Card Layouts

With age and use, frequency cards will yellow, fade, or become grimy. Some will have blemishes or have pencil marks that cannot be removed. Most often they have a couple of these problems and sometimes to the extreme – see Figure 3. The card to the left is a good example. It is in really bad shape. The right picture in Figure 3 is the same card after being updated. (You may notice what looks like a piece of paper with new lettering glued to the frequency card.) Even the worst looking frequency card can potentially be made to look like new.

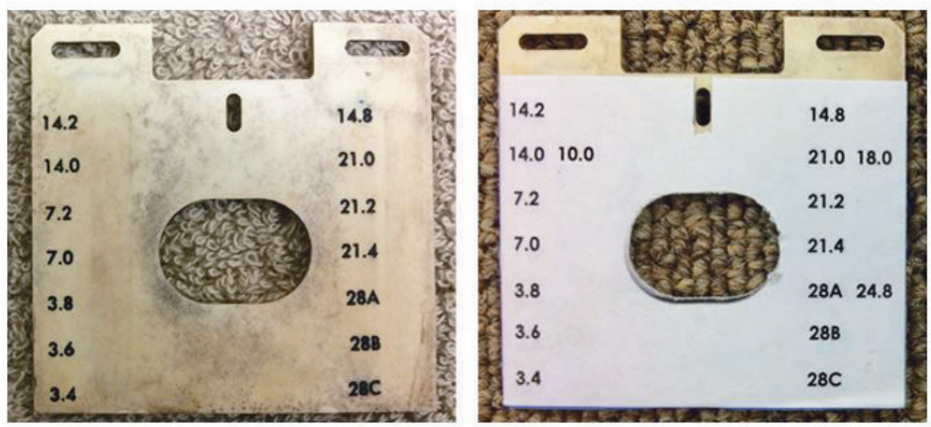

Figure 3 – Updated Frequency Card Before-and-After

I used PowerPoint to generate new artwork that included red lines as shown by the left picture in Figure 4. It was printed on 28 weight paper. Using the red lines as guides, I cut-out the artwork from the printed sheet using an Exacto knife, a steel straight edge, and a soft piece of wood as a cutting board. The middle picture in Figure 4 shows the cut-out artwork.

The next effort was to glue the cut-out artwork to the frequency card. The first step was to mask-off a portion of the frequency card as shown in Figure 4. Then I coated the card's surface with spray adhesive. Immediately after spraying, I removed the masking tape and positioned the new artwork on the card using the two side edges and bottom edge of the card as guides as shown in the right picture in Figure 3. (If you do not wait too long after spraying the adhesive, you will have time to shift the piece of artwork a bit to help align it with the edges.) After the adhesive dried, I cut-out the paper covering the frequency card's oblong hole with an Exacto knife using the card's hole as a guide. The right picture in Figure 3 shows the frequency card after the oblong hole was cut-out of the artwork.

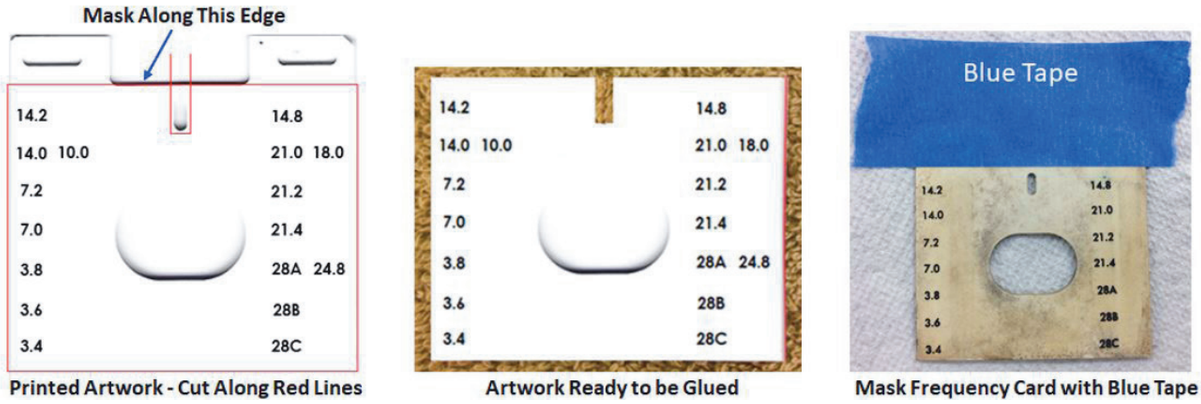

Figure 4 – Artwork and Frequency Card Preparation

The procedure is quite simple, but I suggest you do a couple of practice runs without the spray adhesive. If you do this procedure where the adhesive dries before you have the artwork aligned, you can use a solvent to soak the paper to remove it. Then you can use another piece of artwork.

To generated the artwork, I started with a scan of a frequency card that I inserted into a PowerPoint file. The first thing I did was to determine the font Collins used was most likely Century Gothic. Since you are making your own artwork, you can use any font or color for the print you like. You can use the factory layout to make an updated frequency selector card that looks original or one that looks original with better positioning of the lettering. As shown by the right picture in Figure 2, 28A, 28B, and/or 28C could be replaced using the band segments you have crystals installed for. You could highlight a particular band by making its lettering a different color. You could even change your mind later and use different artwork after using solvent to take off the prior version.

How hard is it is to make the artwork? It may take you several hours with a lot of trial and error. Or, you can use my artwork. My PowerPoint file has several pieces of artwork that are ready to go or you can modify any of it. Using my process, I have updated the frequency cards in seven pieces of S-Line equipment. Each card looks like new, has improved positioning of the lettering, includes the WARC bands, and shows actual frequencies for 28A, 28B, and 28C. As a side benefit, I do not have to remember how each of my rigs is set up for 10M.

There is one last thing you may need to do. The back side of a frequency card is supposed to have two felt bumpers as shown in Figure 5. If your frequency card does not have two, you need to add one or two as needed. Without these, the frequency card will flop-around behind its cover. If you need to add these, the pad cannot be over 1/32-inch-thick or it will impede the card's sliding motion. I used to be able to buy thin ones at the major big box hardware stores. For some reason, I cannot find them anymore. Instead, I buy 1/16-inch-thick ones and slice them to 1/32 inch using a razor blade after they are stuck to the card's backside.

Figure 5 – Felt Bumpers on Rear of Frequency Card

I think you will find this process relatively easy to do and you may be able to make the ugliest frequency card look like new. See Figure 3.

Article by: Dick Weber, K5IU
P.O. Box 44
Prosper, TX 75078
DWEBTX@yahoo.com

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