The SIGNAL
Collins Collectors Association
Issue Number Two | Official Journal of The Collins Collectors Association | Second Quarter 1996

May 17-19

All Aboard for Dayton: Flea Market, Fellowship and our Annual Collins Dinner Meeting

Collins collectors from around the country are primed for the annual gathering at the massive Hamvention in Dayton, Ohio for three days of exciting activities including a banquet Friday night, May 17.

Hamvention Headquarters for the Collins Collectors Association will be the Radisson Inn-Dayton located at 2401 Needmore Road. All room reservations made through the organization are for Thursday, Friday and Saturday nights. The telephone number for the hotel is (513) 278-5711.

Room reservation confirmations and banquet tickets should now be in the hands of those who made advance reservations. The Radisson Inn reports it has no rooms left for the stragglers. If you sent your money to George DuBose and have not received confirmation, call him immediately at (954) 434-0722. Name tags for those who pre-registered will be available Friday evening prior to the cocktail hour at 1800. Please remember to bring your ticket confirmation slip with you to the dinner.

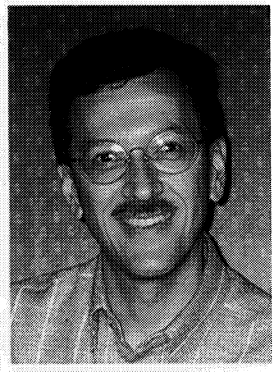
Our hospitality suite will be operational on Thursday and Saturday nights beginning around 2000 and on Friday following the conclusion of the banquet. A notice of the exact location in the hotel will be posted. Please bring 35mm slides, VHS video tapes, photographs and other items for "show and tell" as suitable projection/viewing equipment will be on hand. The hospitality room is a cash bar.

Friday night's annual banquet will feature Collins engineer Tom Vinson, NY0V, as the principal speaker. His topic is "End of the Line: S-Line, That Is." His illustrated talk will cover sales, rates of production, how the S-Line was built, how the assembly line was scheduled and staffed, problems seen on the line, what steps were involved in testing, some line trivia and the shut down.

Many of the Collins collectors attending the Dayton meet plan to arrive at the flea market area by noon on Thursday for set-up. You must have a flea market space and admission tickets to get in. The flea market itself opens to the general public at 0800 Friday morning (the inside exhibitions open at 1200). A list of members with flea market booths should be available at the hospitality suite on Thursday night. Please send your booth number to Butch Schartau, K0BS, to be included on the chart.

For those mobiling to Dayton with HF rigs, the MIDCARS will be monitoring 7.258 MHz. Two-meter talk-in frequencies are 146.94 and 146.91. UHF talk-in is 442.1.

Bus service is available between the hotel and the Hamvention area. The cost is $3; tickets may be purchased at the hotel.


Tom Vinson, NY0V

To all of you making this annual pilgrimage, please drive carefully— we want to see you there (and have you back) all in one piece! To those not coming to Dayton, the Sunday afternoon net will proceed as usual on 20 meters. A full report on the activites will follow in the next issue of the *Signal*, due out in July.

Mark Your Calendar: Cedar Rapids Meet August 9, 10, 11

Dayton Activities at a Glance

Thursday, May 16
0800 Flea Market Opens for Set-up
1900 CCA Board Meeting
Radisson Inn
2000 CCA Hospitality Suite
Radisson Inn
Friday, May 17
0800-1800 Flea Market Open
1800 CCA Cocktail Hour/Cash Bar
Radisson Inn-Regency Room
1900 CCA Annual Banquet
Radisson Inn-Regency Room
Saturday, May 18
0600-1700 Flea Market Open
2000 CCA Hospitality Suite
Radisson Inn
Sunday, May 19
0600-1600 Flea Market Open

At the Mike with Bill Wheeler

Chairman, Collins Collectors Association

On behalf of the Board of Directors I want to express my gratitude for the overwhelming support and encouragement we have received for this newsletter and the new Collins Collectors Association. It is a pleasure to report that we stand over 300 strong and are growing every day.

However numbers alone are not the secret to our future success. I have associated with many groups during my life, some professional and some in amateur radio, but never have I been involved with such a fine group of gentlemen that I find in our membership. As we analyze this statement I find only one answer, pride.

We take pride in owning, collecting, restoring and using radio equipment manufactured in the United States of America, we take pride when we trade or swap gear with other amateurs and we take a great amount of pride when we take a fledgling collector under our wing to breath new life into a 40-year old radio. People are what makes any organization and I am very proud to be part of this elite group.

During the Board of Directors meeting at Dayton, we will discuss some goals of this organization, make decisions on which ones are attainable and delegate the task of making them happen to capable and responsible people. I hope to report to you in the next issue what those plans are and the fine things you have to look forward to as a member of the CCA.

NET NEWS

Floyd Soo, KF8AT, Net Manager
Butch Schartau, K0BS, Net Control

Even though we are at the bottom of the sunspot cycle, the net participation has been excellent! All three nets are enjoying many check-ins and listings. During just about every net, I have been noticing new callsigns. Many even let us all know that it is their first time checking in. This is significant, because without new hams joining in the nets and our organization, we will stagnate. Everyone brings something different to the table. Sure, most people check in because they are looking for technical or swap information; but there are those unselfish people that are always there, answering questions and even providing parts and services. To these folks, we owe a debt of gratitude!

Now that Daylight Saving Time is here, many are beginning to get used to a new schedule. There has been some confusion as to the actual starting time for the Tuesday and Thursday evening gatherings on 75 meters. The reasons for this are several, first, 75 meters is busy. This means that many times 3.805 or 3.875 will be busy when net time comes around. Now, as you all know, the CCA is known for operating practices beyond reproach. We have had to wait for the frequency to clear several times in the past, and I am sure it will happen again. We have always conducted ourselves with the integrity and class that the Collins name is known for, and will continue to do so.

Second, I have had many requests and have heard many comments regarding the original plan to stay with the same local time for the 75 meter gathering. It seems that the majority of you would like to see the net stay with UTC time. This means that the 75 meter gatherings will start an hour later in the evening. Busier outside schedules during longer days seem to dictate this. So, we will continue to meet at 01:00 UTC on Tuesday and Thursday evenings until further notice.

Stay tuned to the nets and the Signal to find out if and when the change to 20 meters will occur. In the past, 75 meters has become very noisy during the summer, and we have found that the 20 meter frequency of 14.263 seems to work better during those times that 75 is so noisy. If and when that decision is made, the word will be put out through all channels!

I will be working at the HI-RES Communications booth (#472) inside of Hara Arena during the Dayton Hamvention and sure hope to see many of you there and at the Radisson Hotel. Bill Wheeler, K0DEW, will be at the booth along with me once in a while. Please stop by and visit during your wanderings!

The hospitality suites and the banquet will be a great time to get together and exchange QSL cards, eyeball cards and lies (I mean stories)! I am sure we will get our foreign friends joining us too. Many are surprised at the collectors and users of Collins gear that exist all over the world. We are so fortunate that we have Dayton right in our backyard, compared to the folks that come from other parts of the world!

Hope to see all of you in May!
73 de Floyd, KF8AT

Coinciding with the first issue of the *Signal*, there has been a significant increase in check-ins for the numbers. I am very pleased, as primary net control, to see this renewed interest in the Sunday CCA net.

Of interest to the buyers and sellers who utilize the net, the Board of Directors is working hard to come up with a uniform equipment grading system. This grading system will be published in the *Signal* as soon as it is finalized.

I continue to encourage anyone with technical questions to bring them forward on the net. In most cases, there will be someone out there who can help answer your questions.

I know there is a large number of Collins users out there that listen every Sunday, I would like to hear from you all, so blow the dust off the mic and say hi to us and tell us what you are using etc.

As we approach the Dayton Hamvention, I will compile a list of flea market spaces, maybe we can get Hap, WA4UPV, to print up a pocket card with call/space numbers again this year.

If anyone has an interest in being an alternate net controller or would like to help out when the net controller does not have conditions, please contact Floyd or myself.
73 de Butch, K0BS

Join Us on the Air!

14.263 MHz
Sundays
2000Z

3805 Khz
Tuesdays and
3875 Khz Thursdays
0100Z

Sunday for Technical and Swap.
Tuesday and Thursday for ragchewing.

Collins AM is Alive and Well
Interested in getting together on the air?
Listen in 3880-3885 after sunset or early mornings.

Do You...

Sell Collins parts, offer repair or restoration services or other Collins services on a regular basis? Support the CCA and advertise your work in this space. Contact the Editor for details. SASE please!

The **Signal** is published quarterly by the Collins Collectors Association for $15.00 a year (USA).

Bill Wheeler, K0DEW, President
Chuck Rippel, WA4HHG, Vice-President
George DuBose, AC4FQ, Secy-Treasurer
Board Members: Butch Schartau, K0BS; Warren Hall, K0ZQD; Foster Paulis, W4HCX; Floyd Soo, KF8AT; Rod Blocksome, K0DAS; Bill Carns, N7OTQ.
Jay Miller, KK5IM, Interim Editor
5402 ½ Morningside Avenue
Dallas, TX 75206
FAX (214) 828-2952 or jmiller@teleteam.com

The Association is not related in any way to the Collins Radio Divisions of Rockwell International.

The Collins Collectors Association
P. O. Box 840924
Pembroke Pines, FL 33084

An Insiders Look at the 30S-1 Amplifier

By Floyd Soo, KF8AT

Warren Bruene, W5OLY, was the brains behind the 30 S-1 linear amplifier and the 30K series transmitters, among others. He has numerous patents to his credit, one of them is the now popular "RF Feedback" circuit. Warren has written many articles that have appeared in many magazines, including *QST*. His field of expertise was and still is HF transmitters and amplifiers. When I was working on my 30S-1 Video project, one of the people I contacted was Warren. I certainly wanted his feedback and opinions when it came to the 30S-1. Warren has been very helpful and willing to help in any way. He has even made an appearance on the CCA's 75 meter gathering during the week!

I opened a can of worms several weeks ago when I asked many knowledgeable people out there about the 30S-1 and their opinions about performance enhancement. The purpose of this particular discussion is not to see who is wrong and who is right. What I am attempting to do here is to present some interesting facts and opinions, in the hopes of stimulating further thought and discussions.

In the early 1950s, Art Collins asked Warren to design a conservatively rated, legal limit linear amplifier to cover 10 - 80 meters that was to have the cleanest signal on the ham bands. In those days the legal limit was 1 kw dc INPUT. So Warren did exactly that. What he came up with was the now famous 30S-1. The design was so good that through it's production life, there were only three factory Service Bulletins ever issued on this amplifier. As more and more of the 30S-1s hit the airwaves, it became obvious that this was an exceptional amplifier. That reputation still holds true today! It's unlikely that you will find a linear with a cleaner signal, at any price! Now, keep in mind that this unit was designed to be used with the KWM-2 or S/Line; and when properly operated with these pieces of equipment, the distortion levels are nothing short of phenomenal! Here is how the distortion specification reads: "Harmonic and other Spurious Radiation: Second harmonic - 40 dB; all others at least 50 dB down. Third order distortion at 1000 watts PEP output 35 dB below signal." It will become evident why I am quoting these specs a little later.

The most talked about (and controversial) modification to the 30S-1 is a non-Collins one that is gaining in popularity. This is a mod to increase the screen voltage on the 4CX1000A tetrode. The reason this mod is so popular is because many 30S-1 owners want to raise the output to the current legal limit of 1500 watts PEP *output*. A stock 30S-1 will deliver somewhere around 1200 or 1300 watts PEP. Obviously, this just short of the present legal limit. Here are two schools of thought: The first one is this: the difference between 1200 and 1500 watts PEP is 300 watts, which would be virtually impossible to see or hear at the receiver end. There would have to be a two-fold increase in output level to realize a 3 dB increase. That means that from 1200 watts to 2400 watts PEP to get a half an S-unit. Look at it another way, going from 1200 watts to 1500 watts represents less than 1 dB! So why bother? Additionally, there is the risk of shortening the life of the power supply components.

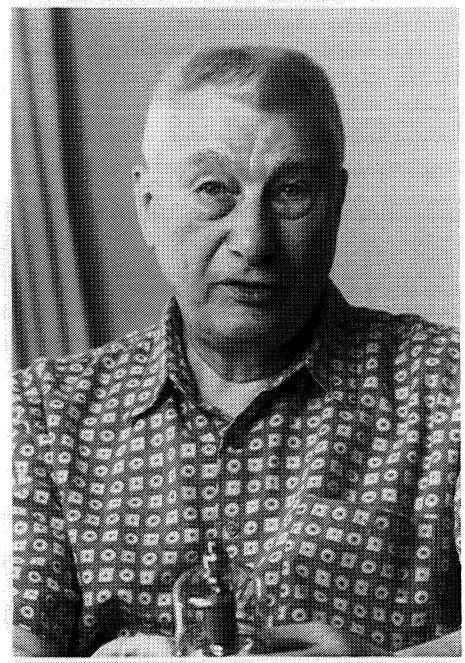
The second school of thought is that the amplifier is robust enough to increase it's output to the current legal limit to take full advantage of the HF privileges. Additionally, the increased screen voltage will go a long way in preventing grid current from being drawn as the amplifier is asked to deliver maximum power. It is a well documented fact that the grid on the 4CX1000A is extremely fragile and will not tolerate much in the way of current flow. (The 4CX1500B is a little better in this respect , but not much.) So, it should be safer for the tube to run more screen voltage and you get more output to boot! There has also been numerous discussions about how inefficient the 30S-1 is and how the increase in screen voltage actually comes close to doubling that efficiency!

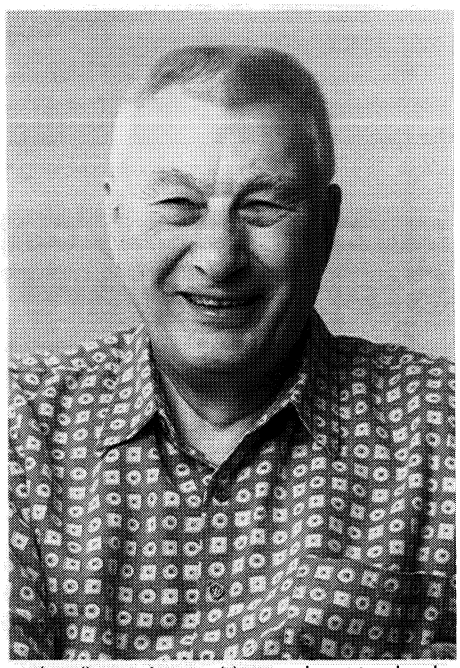
Here are some of Warren's comments:

"The 30S-1 design was highly optimized for what it was designed to do. It was to operate at the legal limit (1 kw as read on the plate current meter multiplied by the dc plate voltage). This included driver plate power in the 1 kw because most of the drive power is fed through. It had to meet 35 dB IM distortion and we wanted to keep blower noise to a minimum.

"The 4CX1000A was a new tube then and had so much gain that we could use RF feedback to improve distortion. Art Collins had established 35 dB as the signal to distortion ratio for all of our designs. Note that that is the same as what ham equipment manufacturers now would call 41 dB, because they refer the level of one IM product to PEP instead of to one test tone. The intermodulation distortion (IM)

See Inside, Page 4





Warren Bruene, W5OLY, discusses his design of the 30S-1 linear amplifier. Warren retired in 1980 after 45 years with Collins Radio. In addition to the 30S-1, he also designed the 30K series of transmitters which utilized the 4-125 final. Warren and his wife, Mildred, make their home in Dallas. –Jay Miller

Inside the 30S-1 Linear Amplifier *Continued from Page 3*

products of the driving transceiver and the linear add in voltage so, if they were equal, each would have to be down 6 dB more! The KWM-2 uses RF feedback which reduces the tube output (source) resistance to make it act approximately as a voltage source. (see Warren's article in Nov. '91 *QST*) A low source resistance at the 4CX1000A cathode helps linearity by reducing the effect of screen current loading across the input circuit. The electrical length of the circuit from the 6146 plates to the 4CX1000A cathode had to be approximately a multiple of 180 degrees. This was accomplished by using the special length of coax from the KWM-2 to the 30 S-1 (Now you know the reasoning behind that 20.5' connecting cable) and designing the correct phase delay into the cathode pi-networks (see Warren's article in the Oct. '93 *QST*).

"Reducing the screen voltage was another important factor in getting the IM down because, in general, for a given idling current, lower screen voltage gives lower distortion. Apparently many do not realize that the peak RF voltage on the cathode adds to the dc screen-to-cathode voltage. From the tube curves, I estimate that the grid bias for 200 ma idling current and 200 volts screen voltage will be -37 vdc. Based upon the feedback circuit capacitor values and the tube interelement capacitances, I estimate total RF voltage on the cathode then has to be 45 + 37 = 83 volts peak to get grid current for ALC. The instantaneous screen-to-cathode voltage at the peak of the plate current pulse is then 200 + 83 or 283 volts– not just 200 volts. This was enough for the then legal limit.

"We adjusted the amount of feedback in the 30S-1 to get the lowest distortion when driven with a KWM-2 (more feedback required more drive which made the KWM-2 distortion higher).

"The output (source) resistance of solid state transceivers is probably closer to 50 ohms so the special length of coax is probably of no value - and besides, we don't know how long it would have to be. The IM distortion of these transceivers is more on the order of -25 dB. This distortion is fed through, so even with a perfect GG linear, the output IM will still be only -25 dB. The IM of a 30S-1 with a 325 vdc screen supply is probably still better than a solid state transceiver which would account for not seeing much difference between the two screen voltages.

In regard to the efficiency claims, Warren says that the amount of idling plate dissipation has very little to do with the efficiency at PEP output. (Again, see the Oct. '93 *QST* article entitled "Inside the Grounded-Grid Linear Amplifier.") The idling current just flares the bottom of the plate current pulses. Plate efficiency at PEP is just a little less than:

$$\text{Eff} = \pi(e_P - e_K) / 4e_B$$

which is a little less than 65%. Where e_K is peak RF voltage on the cathode, e_P is peak RF plate voltage and e_B is dc plate voltage.. This removes fed-through power from the calculation of efficiency. The efficiency with 200 vdc on the screen is every bit as high as with 325 vdc.

"Boosting screen voltage will decrease the likelihood of grid current, but we get our ALC from small grid current pulses. With too much screen voltage you would have to get ALC from somewhere else, such as RF plate voltage.

"The cooling system was designed to be just enough for the original operating conditions. More plate dissipation probably will overheat the tube and shorten tube life. Install a larger (and noisier) cooling fan if you intend to run at higher power.

"You can increase power output to 1500 watts with a smaller increase in screen voltage -250 vdc total should be more than enough. I would be inclined to increase bias enough to keep the same idling plate current, although about 20% more current would improve distortion a little– if you don't use a high distortion transceiver.

"The ideal operating condition would be to get 1500 watts output with an RF Plate swing of (2500 + e_K) volts and just enough dc screen voltage to be on the verge of grid current. Once you find that point, note the screen current. Screen current is a sensitive indicator for whether you have too much plate swing or not enough.

"ALC should always be used to prevent overdriving the tube.

"I think that the original design limited the key down CW input to 1 kw as required by the FCC at that time. Therefore, there was an incentive to employ as high efficiency as practical to get more RF output. I do not remember what the operating conditions for CW was in the original design, but I think it was operated more like Class C since distortion was of no concern in CW.

"With the FCC limit on RF output. lower efficiency just causes more plate dissipation. If you don't mind the idling current, you can operate CW in the SSB mode. Then you won't have to figure out how to set it up differently for CW and reset the Tune/Load indicator set up.

"Operating at a higher power level probably will make the SWR on the interconnecting coax higher. If so, it could be fixed by changing the design of the pi-network cathode circuits. The 4CX1500B is not a 50% bigger tube than the 4CX1000A, it is practically the same. The filament power is the same and the screen dissipation ratings are the same. A major change is that the grid is rated at 1 watt dissipation versus zero watts for the 4CX1000A. I note that the maximum plate current rating is 1.0 A for the 4CX1000A, while it is 0.9 A for the 4CX1500B. It will take just a little more screen voltage to get the 'ideal' operating conditions listed above. An important reason for changing is that the grid is not so easily damaged by overdrive."

In a future installment, we will go into the details of an experiment that Warren conducted with a 30S-1 in seeking to raise the power to the present legal limit, while maintaining the 30S-1 level of distortion and durability.

Linn County History Center

Steps Toward More Perfect Communications

The Linn County (Iowa) Historical Society is presently designing and building an extensive display on Arthur A. Collins and the Collins Radio Company. The exhibit will focus on Collins' vision, achievements, and history of his company. It will be divided into the following exhibit/panel areas: "Arthur's Attic", "Arthur Collins", "Teenage Wizard", "Business from a hobby", "Byrd Expedition", "Goddard", "Autotune", "W.W.II", "Post-war Era" (Microwaves, Single-sideband, Amateur Radio, Broadcast Radio and Avionics), "Space" and "Legacy".

A fully functional Amateur Radio station will be included in the exhibit and which will include live on-the-air demonstrations of amateur radio at certain times. Current plans call for the equipment to include a complete S/Line station.

The exhibit is scheduled to open to the public on May 4, 1996 and will run through the end of the year. A smaller permanent exhibit will remain after 1996. Exhibit hours will be 9-4 Monday through Friday. The exhibit will be located at The History Center, 101 8th Ave.SE, Cedar Rapids, Iowa 52401.

The exhibit is being supported in part by the Collins divisions of Rockwell International. Additional material, artifacts, and information is being sought by the Historical Center from anyone wishing to donate or loan items. The Linn County Historical Society is a "Not for Profit" institution and will supply a deed of gift to anyone wishing to donate materials for the Collins exhibit.

If you are interested, please contact either Linda Langston or Susan Kuecker at the History Center address given above or by phone at. 319-362-1501.