The Signal

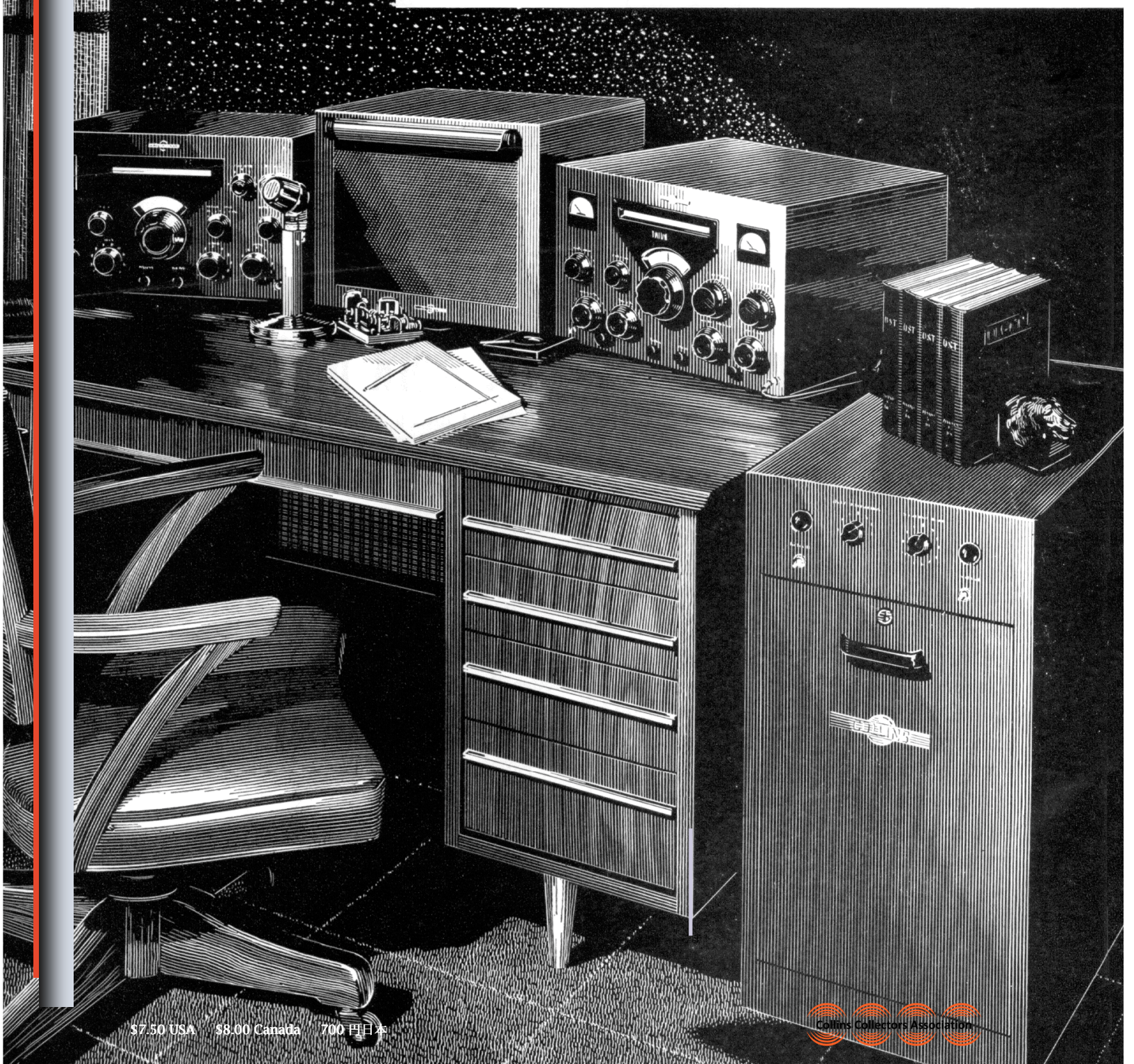
OFFICIAL MAGAZINE OF THE COLLINS COLLECTORS ASSOCIATION * Q3 2014 Issue *

Why this rig is a sound Investment

KWS-1

Feature Issue

Collins CREATIVE LEADER IN COMMUNICATION



$7.50 USA $8.00 Canada 700 円日本

Collins Collectors Association

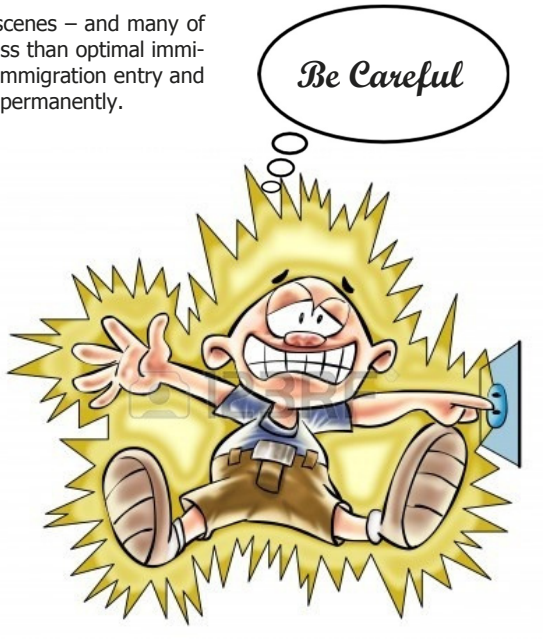
FROM THE STAFF

by Bill Carns, N7OTQ & Don Jackson, W5QN

From the Desk of N7OTQ

Some of you will certainly see through what is going on here, so I am just going to be honest and "fess" right up here and now.

This past six months around the CCA "headquarters" has been a bit busy. Behind the scenes – and many of you have been fortunate to meet her – we have been coping with what I would call a less than optimal immigration process in order to get may new wife, Zhang Rui Lin Carns, processed through immigration entry and obtain the necessary approvals so she can again travel, and more importantly stay here permanently.



At the same time, I am pleased to say there have been some significant involvement with the CCA. This involved participation in the preparation and handling of four national events, the supporting and eventual winning of approval (and then the extraction process) involved in saving the monstrous 821A-1 Collins/VOA shortwave transmitter and then our work on the Collins Radio Heritage Group alliance with the AWA. At the same time, there were two *Signal* issues to get out and get in the mail.

Now, I know opportunity when I see it. Many folks have been requesting reprints of the long out of print "Care and Feeding of Your KWS-1 and Other Trivia" magazine that Jay Roman produced years ago. In addition – apparent from all of the activity on the reflector and questions aimed at yours truly – there has been a resurgence of interest in bringing up and rescuing KWS-1s that need attention. Yea!

Ah ha, I thought. I can do a reprint issue of that quarterly and maybe add a few new things here and there (again one or two things that are already "in the can") – and save a little time. Thus allowing me to get the Q3 issue print-ready in August. This is necessary because assuming that the immigration process proceeds in a timely manner, I may be in Beijing at our other home for the months of September and October - when I would normally be orchestrating and editing the Q3 issue for mailing at the end of Q3. The Q3 issue must be finished by the end of August.

So, here you have the result of that. It should prove very useful and there are many folks to thank for that. Scott Kerr did us a wonderful service by developing and documenting the process for rebuilding a HVB-1 HV KWS-1 fuse. Jerry Block has provided us with permission to print his nice offering of advice on bringing up a KWS-1. There is also a short biography of Gene Senti—the father of the KWS-1.

So, I admit it – shortcut time and vacation of me. I hope you find the work useful and interesting. I could not resist some additions along the way.

I want to thank Jay Roman, the producer and editor of the original *Care & Feeding* production (Q2 1992) for his permission to reprint and update some of the figures and the older recommendations regarding the support and parts suppliers. These were very out of date and we did not want to propagate dated information. Additionally, Jay did some Photoshop work related to this issue that I know took a lot of time.

Finally, as always,, we look forward to your feedback and writings. We love to hear what you want to see. For now, and as always . . . .

Best 73, de Bill, N7OTQ/K0CXX

email: wcarns@austin.rr.com

From the Desk of W5QN

We are now well along with our 20th birthday year and its features and themes. As we approach 2015, it is our intent to move the general focus of things back toward restoration and service of the amateur radio gear. We can't do this without your help. Whether it is a technical piece that might fit in the Service Line series, or a standalone project contribution, or even a feature article on some aspect of Collins, its history, or its equipment, we sure would like to talk with you about it. Drop me an email, or send in a rough draft and let's talk. This *Signal Magazine* has a great tradition to live up to. It was started by Art Collins and then published by the Collins Radio Company for many years. We are privileged to be able to continue the tradition. It can only continue to happen if our members (that is you) contribute when you have something to share. Do not be worried about time pressure. We schedule and work on content out several issues so that no one gets put in a bind.

I also am ever on the hunt for nice shacks that show off your Collins. If you would like to have your shack featured in the magazine, that starts with you also. Do not be shy.

73s - Don, W5QN

email: w5qn@verizon.net

The Signal Magazine

OFFICIAL JOURNAL OF THE COLLINS COLLECTORS ASSOCIATION

Issue Number Seventy Five - 3rd Quarter 2014

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*

Published quarterly by the
Collins Collectors Association

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

CCA Board of Directors* & Staff

Bill Carns, N7OTQ*	President & Editor
Scott Kerr, KE1RR*	Vice President & IT
Paul Kluwe, W8ZO*	Project Consultant
Dennis Kidder, W6DQ*	Secretary
James Green. WA3DJU*	Treasurer
Bill Wheeler, K0DEW,	CCA Advisor & President Emeritus
Kharma & Jesse Palmer	Staff Photographers
Danielle Toynette	Graphic Artist

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

Come Visit Our CCA Website

www.collinsradio.org

See our Features & Members Area.

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

KWS-1 2014

Back by Popular Demand

It seems like the KWS-1 is one of the all time favorite pieces of equipment in the wealth of offerings from Collins over the years. It is not hard to imagine why. The combination of the historical perspective and the saga involved with the development, combined with the quality and magnificent physical presence of this fine transmitter are just hard to ignore. I would venture that, if the "KWS-1" bug has not bitten you yet, it will be coming soon.

This issue - fitting because on our birthday it harkens back to our beginnings - is a combination of a reprint from the Spring 1992 of The *Collins Collectors Magazine* (predecessor of the *Signal Magazine* that we have now) and some more recent material that is very relevant. We would be remiss if we did not significantly credit Jay Roman, the originator of the Collins Collectors Magazine series. Jay was, at the time, not associated with any Collins Radio collecting organization - because there was none. It was his passion, and foresight, that helped bring us to where we are today. Jay's magazine, and the early net formation of the Collins Collectors Sunday Afternoon 20 Meter Net by Bill Wheeler, was what eventually merged - becoming the Collins Collectors Association (and *Signal Magazine*) that you see today.

The Collins collecting community has changed and grown over the past 22 years. It is very gratifying to see that - in spite of recession and many changes in our hobby of Ham Radio, that the passion for collecting Collins (and actually using a tuning knob or two) has not diminished, but rather prospered significantly. Quality - both in the equipment and people of Collins - and in the past management of our association has a way of fostering that kind of loyalty.

Over the years, there have been many requests for copies of the original quarterly issue of the *Collins Collectors Magazine* Spring 1992 issue. It is long out of print and they are hard to come by. The pdf version can be downloaded from the CCA website in both its full and abbreviated versions, but it is not the same as having a hard copy right in your hand - not to mention something to display with that KWS-1. It is hoped that this new version - Our KWS-1 Special Edition of the *Signal* - satisfies that need.

Enjoy - and hopefully some new editor, and a whole new group of collectors, will be clamoring for the next reprint another 20 years from now.

It is, as always, a privilege to work with you all. I hope to see as many of you as possible at the remaining CCA events for 2014.

Best 73s, Bill Carns, N7OTQ

A Quick Look in This Issue

Issue No. 75
Third Quarter 2014 Signal Magazine

CONTENTS

CONTRIBUTORS

Tony Brock-Fisher, K1KP
"Bringing Up a KWS-1" *pg. 20*

Tony Brock writes for the Signal for the first time. He is a published author with a fine "fictional Biography" of a KWS-1 Collins Transmitter article that was published in CQ magazine in March of 2004. Many of you have asked for copies of this current article so here it is in print for your collection. Tony has been a ham since 1967 and been into Collins since about 2001 when he got his first 75A-4. He now has his Gold Dust Twins, which he commonly operates, a KWM-1 and a KWM-2 to keep his Collins lust in check. He is a retired EE in the medical engineering field and is now enjoying his retirement and empty nest by rebuilding his long time home.

Scott Kerr
"Rebuilding the HVB-1 HV Fuse" *pg. 24*

Scott Kerr, KE1RR, is currently serving as a CCA board member and as our Vice President. He is very active in the collecting of Collins equipment and memorabilia. As a result, he is often found on the bench going through a new acquisition. It was on one of these forays through a KWS-1 that he was motivated to solve the expense problem with blown HVB-1s. Thanks Scott!

COVER - Famous line sketch promoting the Gold Dust Twins value in the May 1956 QST advertisement

BIRTHDAY

FEATURES

Regulars

Once More with Feeling -

Has it really been 22 years

The Collins

Collector's Quarterly Magazine

Volume 1 Issue 4 Spring 1992

Inside:

KWS-1

The care and feeding, and other trivia

Contents

Publisher/Editor
Jay Roman, KBØATQ

Assistant Editor/Production Manager
Sharon Bishop

Technical Editor
Dick Uhrmacher, KØVKH

Data Base Development
Dennis Williams, NØMND

Bookkeeper
Joan Roman

Editorial and Business Office
Collins Collector's Magazine
2465 W. Chicago Street
Rapid City, SD 57702
PHONE: 605/341-6831
FAX: 605/341-1943

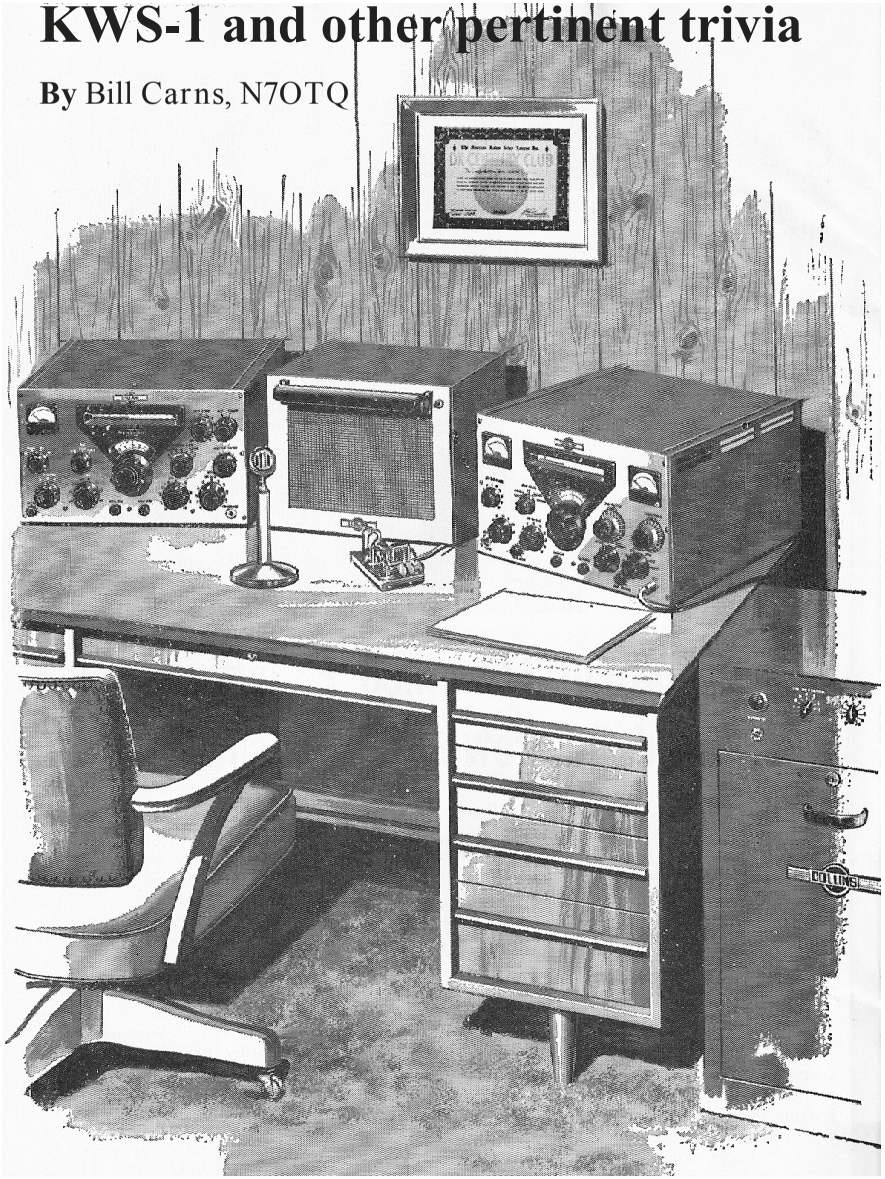
On the Cover

General Partridges at the controls of an air-mobile KWS-1, 75A-4. Installed in a DC-6–note the shock mounts and shields.

Subscription rates: 1 year-$35 (U.S. residents); $35 (Canadian residents); and $75 (other foreign countries). All subscriptions payable in U.S. funds. CCM assumes that such material as letters, new product information, etc., is contributed **gratis.** Requests and information about submitting articles should be directed to the publisher.

The Care and Feeding of your KWS-1 and other pertinent trivia

By Bill Carns, N7OTQ



My first exposure to the Collins KWS-1 came in 1955, about the same time that I got my novice license in highschool. I opened my March '55 QST and fell in love. Like many others, that was as close as I got to the real thing until several years ago when an old receiver in my garage lured me back into the hobby.

Prompted by memories of those old ads and one brief demonstration at a professor's house in 1960 (where, by the way, it seemed like he could talk to anywhere he wanted to), I immediately went looking for a used KWS-1 and 75A-4. Three months later I was in the KWS-1 restoration business. That was three years, and several more KWS-1s, ago.

As the interest in Collins gear has increased over the last two years, so has the demand for KWS-1s along with the number of units being brought back into active service.

This has prompted me to share some of the information that I have gleaned from many helpful sources or have developed over the last few years. I'm sure that it is by no means complete. I hope that others with experience with the KWS-1 will take the time to write down their hints and experiences and send them to Jay or the author where they will be compiled and then made available. The intent is to help preserve the remaining units in as good and as original condition as possible.

There follows a compilation of some historical notes, production information, suggestions and maintenance hints and a list of information/parts sources.

This will probably be the subject of a separate future article, but let me summarize here a brief history of the KWS-1.

Figure 1.
Bill Carns, N7OTQ's main KWS-1 and 75A-4 operating position.

Figure 2
Gene Senti, Project Design Leader during the transfer of the KWS-1 to production, inspects one of the units.

Brief history of Collins KWS-1

Art Collins' disenchantment with AM and his shift of emphasis to single-sideband accelerated suddenly in the very early 1950's. By 1952, Art had set up what he called his "green room"–his skunk-works for SSB. A number of people worked on various elements of the project. Among them were:

Warren Bruene (employed by Collins from 1939 thru 1984) was the most tenured employee of Collins Radio and was responsible for the preliminary engineering work leading to the selection of the Eimac 4X150 final amplifier tubes, the development of the RF feedback technique employed, and much of the initial SSB theory work. (Reference 1.) The culmination of this work was in large part responsible for the excellent linearity achieved with the final design.

Walt Zarris (employed by Collins from about 1945 to 1953) was the initial design project leader managing the project until he left. The project was completed and taken to production by Gene Senti (Collins-1942 thru 1972). Production was commenced in 1955.

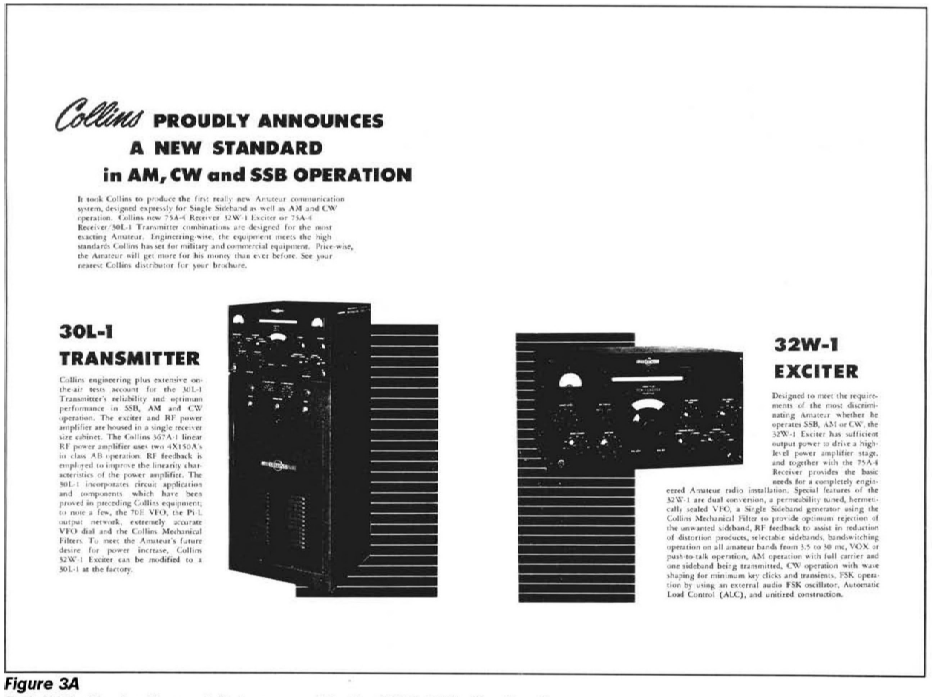


Figure 3A
Early "30L-1" advertisement that appeared in the 1955 ARRL Handbook.

Figure 3B.
Introduction advertisement for the KWS-1 appearing in the March 1955 QST.

By late 1954, Collins Radio's marketing stategy had shifted away from advertising the 75A-3 and 32V-3 AM gear to publishing SSB engineering notes in their ad space. It was clear that change was in the making.

Early in the introduction stategy of the KWS-1, the marketing group was calling it the "30L-1" (Ref. 2.), the next logical product model after the AM 30K-1 thru 5 transmitters. There followed an embarrassing product announcement of the "30L-1" (sic) 1 KW SSB transmitter in the 1955 ARRL Handbook, actually layed out in late 1954. See Figure 3A.

About that time, Art Collins decided he wanted the model number of his first KW SSB transmitter/exciter to reflect the kilowatt (KW) and the SSB (S)-model (1) nomenclature.

The KWS-1 was born and introduced to the world in the March 1955 issue of QST (Figure 3B). Actually, afraid that the rather large price would reduce the market acceptance, the introduction included a series of building block products starting with the low end 32W-1 exciter only. This was a KWS-1 exciter without HV power supply and with the low voltage supply in the PA cage area. Figure 4 shows another 32W-1 configuration. The 32W-1, introduced also in March, apparently never went into production.

Note the difference in front panel control configuration between the 32W-1 prototype in Figure 4 and the intro model pictured in the QST advertisement. There was also a power supply location difference. It is evident that the marketing strategy for this version was never clear.

The next block in the line-up, introduced one month later in April, was the KWS-1K which was basically a KWS-1 complete with power pedestal but with the 4X150s (expensive) removed and without the high voltage portion of the power supply. This could be purchased later in either wired form (the 428A-1), or as a kit (the 428A-2) and added by the owner, or the unit could be returned to the factory and converted. Finally if you mortgaged your house, you could buy the entire KWS-1 at one time for $1,995.00. Thereby, paired with the 75A-4 receiver for $595.00, earning the lasting nickname of the "Golddust twins".

A few KWS-1Ks were manufactured (the highest serial number observed is #550) and numbered consecutively with the KWS-1. Several people have told me that they believed, like the 32W-1 exciter, no KWS-1Ks were manufactured either. Three units have been seen by the author and one subsequently purchased. These were spread across the country. All were identical with the exception of the serial number and none was being hustled for profit. We believe them not to be fakes.

Ken Roland, still employed by Collins Rockwell and employed there during the KWS-1 days, also believes that some KWS-1Ks were made as they were ordered.

Figure 4.
Collins public relations photo of 32W-1 mock-up or prototype - none were produced. Robert C. Miedke, Engineering Group Head, shown seated.

This building block marketing strategy was soon deemed unsuccessful and had disappeared from the Collins promotional material by the fall of 1955.

Shortly after the introduction of the KWS-1, Collins was selected by General Curtis LeMay of the Air Force to develop, test and install a complete single-sideband air-to-ground and point-to-point communication system to support the Cold War Strategic Air Command (SAC) Mission.

During the next two years, SAC, Collins Radio and radio amateurs around the world cooperated to demonstrate the effectiveness of SSB global communication.

For this demonstration, standard KWS-1 and 75A-4 amateur equipment was installed in the passenger compartment of both General LeMay's C97 and General Partridges DC-6 aircraft. See this quarterly's cover. These aircraft and subsequently, others were then flown throughout the North Polar region, the Far East, Europe, and Africa communicating reliably with North American test sites.

The KWS-1 went on to serve SAC successfully, leading to the establishment of a Collins Radio equipped, multi-service HF SSB communication network code named Liberty/Rasputin. This

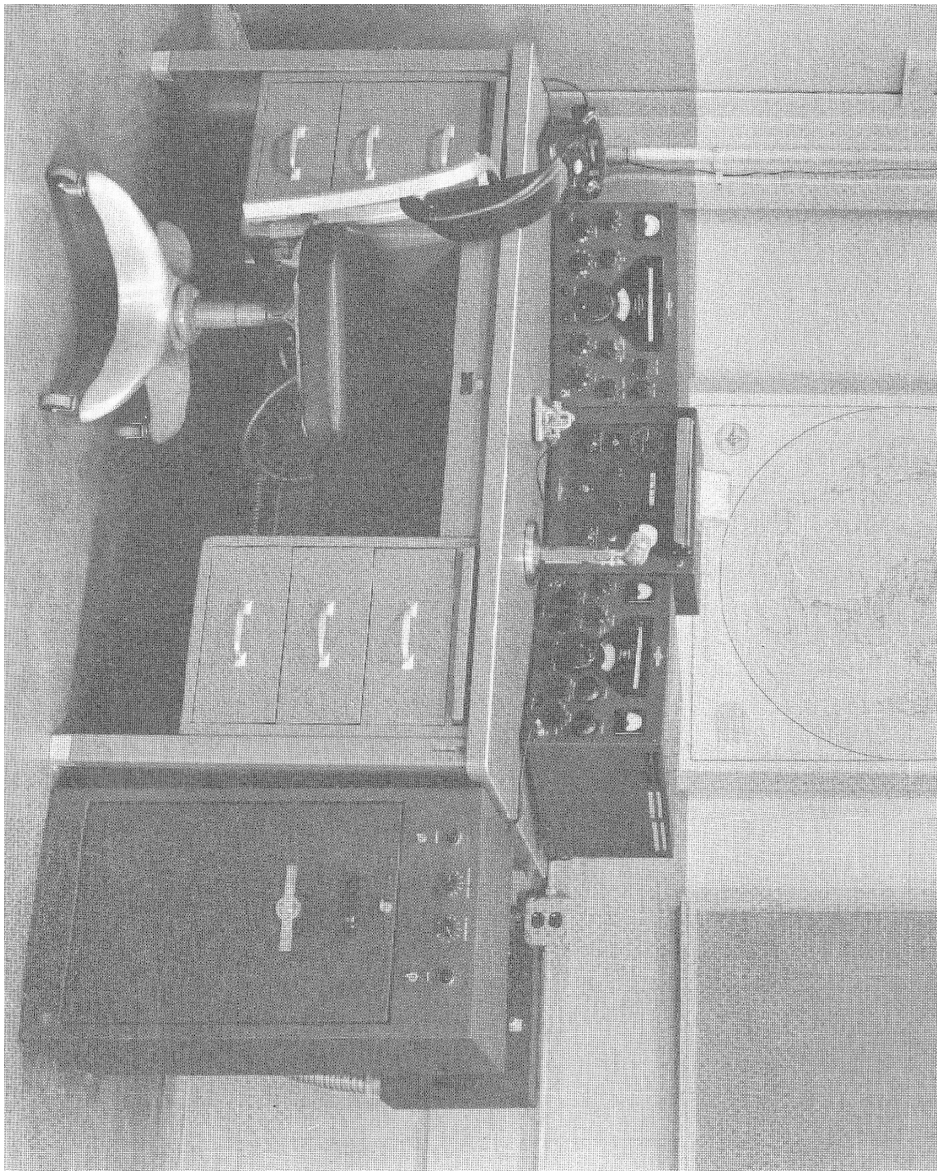


Figure 5.
The infamous Gold Dust Twins with the companion SC-101 station control

Table I

Summary of significant changes and service bulletins

Change	Description	Date	Applies Before	Factory installed after
Factory	Removed louvers in front door	3-55		55*
Factory	Removed TB504 & changed key & control cable to P104	?		96*
Ser Bul #1	Eliminates oscillation on output	4-56	400*	400*
Ser Bul #2	K101 arc surpression (crystal MIC use & tube shield change)	1-57	695	695
Ser Bul #3	Improved K101 arc surpression & ALC/VOX timing	6-57	1248 1083	1248 1083
Ser Bul #4	Plate XMFR arcing	9-57	ALL	
Ser Bul #5	L705 10 m tracking with 4CX250B changes & F503/504 SLO-BLO change	11-57	1000	1000
Ser Bul #6	Various includes PA cage insulation removal and P.A. roller coil and capacitor synchronization	2-59	ALL	
Factory	6X4 to 6AL5 ALC	11-56		1100-1200*
Factory	4X150 to 4CX250B	11-56		" "
Factory	Fixed ALC-key lock	11-56		" "

* Indicates that serial # shown is approximate.

network was eventually equipped with military auto-tune airborne and S-Line base station equipment.

It is believed that ultimately about 1600 KWS-1s (and KWS-1K's) were built with production ending in about mid 1958.

Relatively few variations or design changes occurred during the production run of the KWS-1. This, along with the condition and survival rate of the equipment 35 years later, is testimony to the quality and durability of the initial design.

Early in the design and introduction of the KWS-1, the power pedestal had a louvered front door and a power reset control centered between the filament and high voltage switches. These had disappeared by the time volume floor production commenced. The 6X4 rectifier was eventually changed to a 6AL5 for more stable ALC operation, and other than the original 4X150 PA tubes changing to the more rugged 4CX250B, the only other significant change was the removal of panel adjustable ALC and the replacement of the ALC control with a key lock switch (See Figure 6.). This later change occurred at about serial number 1100. Table I below summarizes significant change and service bulletin timing. Only 6 service bulletins were ever issued. Discussion of some of these is included in the following maintenance text.

At the end of this article is a plot of estimated date of manufacture vs. serial number. This estimate is based on a combination of date code information supplied by owners and serial number data contained in service bulletins and inferred from owners manual revision dates. See Figure 9.

The author solicits more specific information regarding the serial numbers relating to the changes discussed and listed in the table below. Please fill in the requested information on the registration form included with this issue. Note the discussion of serial number registration by name of owner that is also requested in the survey.

(Ref.1.) Report on single sideband techniques and design requirements by W.B. Bruene, May 26, 1964. Collins Research Report.

(Ref. 2.) Collins Collector's Magazine, October 1991, Page 27 note on "30L-1" (sic)

Along with the changes summarized above, there are a number of service bulletins, or other subjects requiring comment, which will improve the performance or future reliability of your KWS-1. These are presented below and divided by: power pedestal, exciter, and general.

Power pedestal related

▪ L501 tuned HV choke

One of the highest failure rate items in the power supply is the high voltage tuned input filter choke. This results from the proximity of the high voltage within the potted choke winding, to the chokes mounting bolts. This subject was dealt with early on unofficially by Collins - recommending that the owner loosen the bolts and move them to the outer most edge limit of their movement within their mounting hole. This problem still remains and is aggrevated by age and the drying out of the potting compound. The Collins recommendation does not eliminate the problem.

Solution

Remove the mounting bolts one at a time and slip a 6 inch length of 3/16th inch heat shrink tubing over the bolt and replace it. Note: it is not recommended that you mount a failed choke on ceramic stand-offs to eliminate the problem. This is an accident waiting to happen, even if it's to the next unsuspecting owner. If the choke has failed, rewind or replace it (Ref. 3). Clear heat shrink eliminates the potential failure and it is almost undetectable.

▪ HV transformer baffle

Most KWS-1s will have a grey steel baffle plate hanging down from the top left of the plate transformer. Arcing can occur between the winding or the 2.0 KV lead wire and this baffle.

Solution

Loosen the mounting hardware and move this plate as far from the winding as possible and retighten. Keep the surface of the top and sides of the potted winding as clean as possible. See service bulletin #4. It is recommended that you not remove this baffle which reduces hum coupling and noise in the cabinet. Point arc sources can be cured using corona dope. See the following discussion about the 2 KV tap leads. I recommend that you do not use silicone. This works, but is very unsightly and difficult to remove later.

▪ HV transformer leads (T503)

Another high voltage failure point is arcing from the 2.0 KV tap leads that come out of the potted high voltage secondary, turn out and attach to the terminal block. These are very close to the edge of the grounded core and with age and stress cracking, failure can occur.

Solution

Keep the top of the core near the leads very clean. If arcing does occur or if stress cracking is observed, first fill the void in the arced or cracked lead with corona dope - let dry - and then coat the lead, flat core surface along the path, and the corner of the core with another coat. I like to use a preventative coat on the core and winding surface. Corona dope comes in either black or red and is available from your local TV supply house. If you use the black, repairs are undetectable.

▪ 3B28 high voltage rectifiers

The older 866 mercury vapor rectifier, while original, is prone to flash-over and has a higher failure rate than the 3B28. This is particularly true if the 866s are old and service has been or will be intermittent. Flash-over can cause failure of T502.

Solution–Change to 3B28s

▪ HV rectifier filament transformer (T502)

This transformer is the second highest failure rate component in the power supply - the screen transformer is reputed to be next, however I have never lost one. (Knock on wood.)

(Ref. 3.) Chokes can be rewound by Peter Dahl. See listing at the end of the article.

Solution

Keep your fingers crossed and use 3B28s. There seems to be no root cause for this except age. External arcing can contribute, however, so do the following. Make sure the transformer primary leads are attached to the bottom of the primary shunt straps and routed away from the high voltage stand-off filament connections that are just above. We've seen several units that were misrouted, probably from changes after they left the factory. It does appear that Collins made their connection to the top of the straps. Move them down.

▪ Miscellaneous comments

Every time that you work on the high voltage, check the bleeder resistors, blow out the high voltage areas, wipe off the transformer surfaces (alcohol will remove greasy film and not damage the decals and markings), and be careful... Forgive me if this is obvious, but for those not raised on tubes, 275 volts can be a real eye opener and 2 KV can be deadly. When you must work around the active 2 KV, have a buddy present and work with one hand behind your back while wearing tennis shoes.

If any two things will minimize what I like to call high voltage "events", it is cleanliness and a good warm-up period - at least 20 minutes. This helps to drive out moisture, minimizes arcing and sure helps PTO stability, too.

▪ 120 volt antenna relay power supply

The 100 ohm smoothing resistor comes as a 1/2 watt. This resistor has a very high failure rate and will often be found darkened or cracked. Even though calculation shows the 1/2 watt to be adequate, AC current due to a failed or marginal selenium rectifier, leaking C510, or shorting the relay voltage at the relay cover, leads to short life.

Solution

Check the selenium for good forward and reverse characteristic or replace for prevention with a 1N4007 silicon diode. Also check C510 and change the 100 ohm resistor to 1 watt.

▪ Low voltages

Take the time to measure the voltages coming from the power supply. These can be measured or

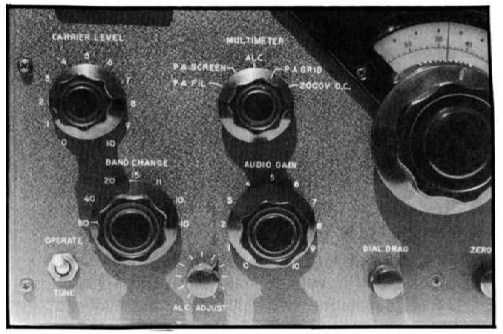


Figure 6A.
Early series exciter with variable ALC control.

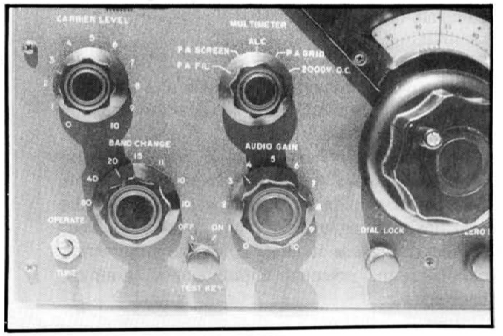


Figure 6B.
Late series exciter with fixed ALC and Test-Key (key lock) switch.

checked easily without removing the back power supply cover as follows:

Low voltage (275 V.)
Located at pin 6 of V104 with the tube removed.

Screen Voltage (350 V.)
Located at plus terminal stud of multimeter with meter in screen position, tune-operate in operate and high voltage in on position.

Bias Voltage (-150 V.)
Check at top of R139 on keying network - see Fig 6-3 of owners manual. Will read minus 30 - 31 volts with emission SW = SSB.

Filament voltage for the final amplifiers should always be set at 6.0 volts + zero/- 0.2 V. This will not reduce emission and will significantly extend the life of the 4CX250B tubes.

■ Feeding the KWS-1

Finally, remember that this equipment was designed when line voltage was 110 volts. Today, 120 volts is more typical and sometimes higher. Jay, KBØATQ, saw more than 140 V the other day while he was operating his KWS-1. At just 125 volts, this is a 14% increase above the design specs for any of the unregulated supply voltages. Any higher can severly damage your unit and a step down transformer or a call to your local power company should be considered. Note that with today's line voltages, the high voltage supply typically runs 2.3 KV unloaded. The high voltage feed-thru capacitor to the RF deck is only rated at 2.5 KV. This is a high failure rate component and is no longer available. A substitute fix is described later.

Finally, the KWS-1 functions much better on 220 volts. Be generous with the wire size.

Exciter related

■ P.A. cage related

First, be sure that you have complied with service bulletin #6A and removed the insulation that is inside the P.A. cage. This insulation draws moisture and traps dirt.

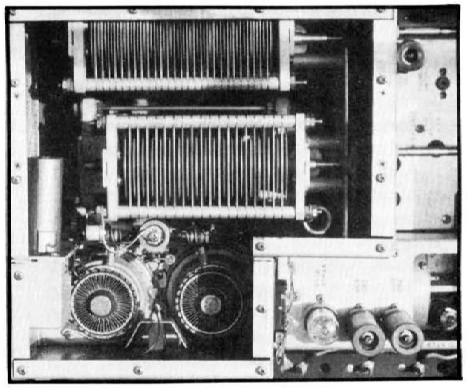


Figure 7A.
Final amplifier shown with cover off.

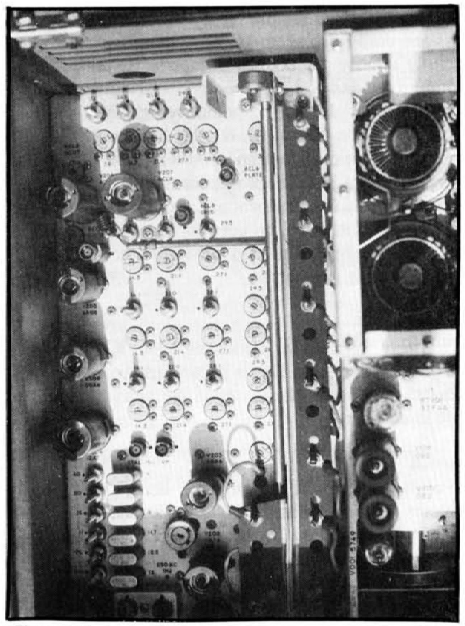


Figure 7B.
Exciter/IF stages.

Also, always check the P.A. tuning and loading alignment of the roller inductors and capacitors to each other and the dial settings. Particularly the loading inductor roller can be bounced off of the coil during rough handling or going against the end stops too hard. The alignment check is covered in service bulletin #6G. With an antenna close to 50 ohms, your P.A. Tune and load settings should closely match the preset chart that is under the lid. A post script on loading: never reduce loading to run at reduced power output. This results in the plate voltage swinging below the screen level and causes the screen to source current. The screen current handling capability of the 4CX250B is easily exceeded. Reduce power out with the carrier control on cw or the audio gain control on sideband.
Use minimal to no lubrication inside the RF cage. Most tuning roughness is usually in the turns counters.

Caution: The gears on the turns counters are soft brass and easily damaged. If your tuning is rough, carefully remove the counter components, remove all old grease and dirt and lubricate sparingly with a good grade lithium automotive grease and reassemble. Note that the brass gears have probably established a wear pattern and you will have to try several different gear mesh relationships and knob depths on the shaft to find smooth. Do this carefully and it is worth it. Also, be very careful not to lose the little tiny pointer screws. I have never been able to find a source for them.

■ Relays

It is very common for the keying relay, K101, to give contact problems. This is particularly true after extended periods of storage or if the relay clamp diode is not there.

Solution

Following periods of storage, or if keying problems are encountered, the contacts should be cleaned with a good quality, non-lubricating contact cleaner on a business card followed with a dry strip of card until the card comes out clean. Blow out any potential paper fibers. The most aggressive cleaning or polishing instrument that you should use is a commercial relay contact "file". You should not be able to feel the roughness with your fingernail. Harsher, even fine sandpaper, will take off the contact plating and eventually make the problem worse.

The offending set of contacts will probably be the ones keying the antenna relay (inductive load). Unfortunately, these contacts are on the back row and difficult to reach. These contacts can successfully be cleaned by reaching thru the first row of open contacts and closing each individual set of back contacts with a probe. This saves removing the relay. See the following section on the antenna relay keying contact clamp diode.

The antenna relay provided by collins is external and contains a set of feedback contacts which provide a positive keying bias. The KWS-1 will not operate properly without closure of this feedback line.

These contacts need to be properly timed to close with, but after, the antenna transmit contacts. Properly timed, this protects the transmitter from transmitting full power into an open relay. These contacts are easily damaged and are often found out of time.

Solution

Carefully check timing and clean both the feedback and the transmit-receive contacts. Check the security of the relay cover and assure that none of the relay leads can short to ground.

Note: When replacing the screws for the relay cover, do not use screws that are longer than necessary. They will go thru the relay frame and bore a little hole in, and short out the 115 volt coil.....Anybody have a bad relay with a good coil??? Some things are best not learned from personal experience.

■ Antenna relay clamp diode

- Service Bulletin #3 covers addition of a selenium rectifier (little black potted cube -stud mounted) clamp diode located in the rear plug compartment. This diode is electrically across the antenna keying contacts on K101. If this service bulletin has not been done or the selenium rectifier has failed open (common), you will be cleaning K101 a lot.

Solution

Either perform Service Bulletin #3 using a 1N4007 and a 2 lug ungrounded small terminal strip mounted in the available hole, or if the selenium is there and failed open, just mount the 1N4007 across the terminals of the failed diode. The arc surpression network installed per SB #2 may be left in place.

■ Switches

While you are cleaning relay contacts, or if the unit has been in storage, clean all the switch contacts with a non-lubricating switch contact cleaner. You can then go back and very carefully put a small amount of contact lubricant on just the contact itself. Avoid getting lubricant on the switch frames. At the same time, put a small amount of white lithium grease on the ball/detent area of the switch.

Caution: A word of warning about the emission switch. With normal assembly tolerances, the back contacts of the switch can come very close to the internal front face of the main chassis. Improper assembly of the switch to the front panel - extra or thick washer -or getting the side panels full back against their tolerances can result in electrical shorts or roughness and damage to the wiper or contacts. Any sign of switch grabbing or erratic electrical operation during switching is grounds for investigation. Many of these switches have been found damaged.

Another caution here: During front panel disassembly, be careful to polish any set screw burrs off the PTO shaft prior to pulling the shaft back thru the panel bearing. Failing to do this will result in a rough running PTO or a sloppy one if you have to go in and polish out the shaft bearing.

■ Alignment

Alignment is straight forward with but a few exceptions. The KWS-1 manual is quite good and should be followed as required with one very important exception. This will be covered, along with some other comments.

First, don't attempt alignment without the correct equipment. In addition to what is listed in the manual, you should also have either a scope or a spectrum analyzer. You should also have a clear understanding of the frequency conversion scheme, the units function and intermediate frequency bandswitching.

Be sure whether you are adjusting a peaked circuit or a trap. I have found several KWS-1s with peaked traps.

I have included a top view location diagram, see Figure 8, for the tuning inductors called out in the alignment procedure. This will save a lot of hunting around. I suggest making a copy and putting it with your manual. Also, included is a table of typical AC (both audio and RF) signal levels encountered throughout a good unit.

See Table II. These values have been derived from measurements on five different units and should be fairly representative.

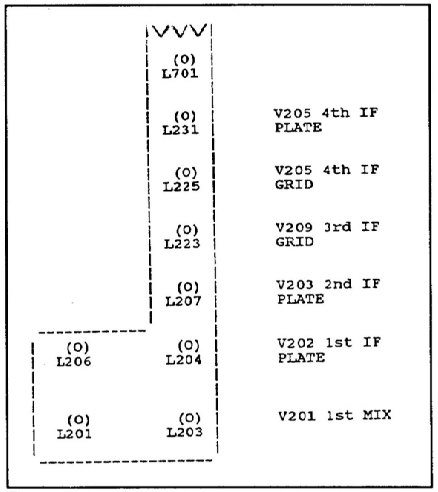


Figure 8.
Top view of slug rack tuning inductors labeled by function.

Be careful when putting test cables on the available BNC test points. Almost all these nodes are high impedance. Running a length of 50 ohm cable to a high impedance scope or microvolt meter, for instance, will load down the node and invalidate the measurements.

TABLE II

Typical AC signal levels in properly functioning KWS-1
(Measurements taken @ 14.25 MHz f_{PTO} and conditions shown)

Test Point	Indication	Conditions
250 KHz INJ.	85 mV @ 3.0 MHz feedthru with < 50 mV 60 Hz	Emiss = SSB HV Off XMIT not keyed
	300 mV & 250 KHz	Emiss = CAL HV off
	1.0 Vpp @ 250 KHz	Emiss = SSB HV on, XMIT keyed, full 2 KHz mod to 500 mA final plate current
VFO INJ.	6.8 Vpp @ 3.0 MHz Slight distortion normal	Independent of emission & XMIT status
XTAL INJ.	4.6 Vpp @ 11 MHz	Independent of emission & XMIT status
VIF	2.0 V at 3.0 MHz feedthru from PTO	Emission = CAL (HV Off)
	< 100 mV of modulation--hum and noise	Emission = SSB HV on XMIT keyed No modulation - open MIC
	1.25 Vpp (modulated) @ first IF frequency	Emission = SSB HV on, XMIT keyed Full modulation @ 2 KHz to 500 MA final plate current - ALC set
6CL6 CATH	18 Vpp @ 14.25 MHz	Same as above
6CL6 PLATE	22 Vpp @14.25 MHz	Same as above
	52 Vpp @ 14.25 MHz	Emission = CAL No modulation
AUDIO P6 V101	7.9 Vpp @ 2KHz	MIC gain @ 4 (11:00) Emission = SSB HV on, XMIT keyed Modulation to full 500 mA output ALC set & driven to midscale
P2 V101	16 mV @ 2 KHz	
P1 V101	440 mV @ 2 KHz	
P3 V102	480 mV @ 2 KHz	

Caution: There is one strong caution that must be heeded. On almost 50% of the KWS-1s that I've aligned, the manual procedure will result in a oscillating or marginally stable 2nd IF stage (V203). This will result in, at the best, spurious emissions and at worse, full output with no modulation on SSB. This will appear on a frequency very close to the units true "transmit frequency".

Solution

When aligning L207 and the corresponding 3.1 MHz trimmer, monitor the IF waveform at the 6CL6 driver plate with a scope or spectrum analyzer. If any sign of instability (a beat frequency on a scope or spurs on the spectrum analyzer) is present, de-tune L207 until the instability disappears. After tuning (or de-tuning), the stability should be checked CW and under modulation across the full frequency range of the PTO, not just the alignment points. As a final check of stability, remove the PTO oscillator tube and monitoring both the scope and final grid current, there should be no output across the full PTO/slug rack tuning range. Ample drive will still exist after any required de-tuning.

▪ Bad aligning problems

For a unit where aligning tinkering is suspected - it is very easy to accidently get the first IF tuned to the PTO frequency - a good way to start your alignment is by pulling both the PTO (V001) and the 250 KHz oscillator (V104) tubes thus disabling these oscillators.

Still setting the dead PTO at the correct 80m alignment points - this positions the slug rack correctly - inject 100 mV_{p-p} at the 80m alignment frequency into the 250 KHz injection test point. Use a good signal generator with a frequency counter and follow the aligning procedure in the manual. This requires a bit of juggling of generator frequency and slug rack position but will quickly sort out any alignment questions in the first IF.

▪ Grounds

It is a good idea, while you are in for alignment, or if IF oscillation or other grounding problems are suspected, to move and retighten all suspected ground lugs. Collins used silver plated ground lugs and many are positioned against the steel irridited chassis or tube sockets. Over the years contact resistance has gone up. Simply moving and retightening these will correct most of the problem. This problem is also found in the S-line series.

General

▪ Molded paper capacitors

Many of the problems encountered in the audio sections (modulation thru to balanced mixer and Vox/Anti-vox) or ALC function can be traced to leaky paper molded capacitors. These caps are typically black molded tubulars with color code bands. Several of the higher value caps are light green with color codes.

In any one rig, if more than one or two capacitors are found bad, all should be checked and probably changed. There are not that many and their failure rate is high.

While looking in-circuit for bad capacitors, leakage can be inferred by looking at the associated DC voltages in the voltage table (Table 5-4) shown in your instruction manual. Measured voltages should agree very closely with the table.

Table III below shows some of the highest failure rate capacitors, their location and the normal symptoms produced by the failure.

When replacing these caps, use high quality polystyrene caps of equal or higher voltage rating. Careful voltage and signal tracing, and the subsequent capacitor replacement will reward you with hum free clean modulation and reliable Vox/Antivox and ALC operation.

Again, most complaints of difficult VOX operation - including erratic manual PTT - can be traced to leaky caps or AC hum being fed into the antivox circuit from the receiver.

▪ C416 replacement

If C416, the 2.5 KV rated .01 mfd feed-thru fails, a replacement must be fabricated. Rudy Kerl, K2MVW, has done a very nice job by covering the existing hole with a 1 3/8" by 2 1/8" piece of .250" Teflon drilled to mount in the existing C416 flange holes and having a 10-32 stud run down the center from close to J402 to the bus wire from L403 (existing). A .01 mfd 4KV disk is then mounted

Continued on Pg. 31

TABLE III

Leaking capacitor symptom table - Common failure locations

Symptom	Capacitor	Function
VOX will not set properly. Mike PTT switch may not pull in K101	AC Hum on anitvox line	-------
VOX touchy to set up and K101 hangs up	C113	Leaky VOX amp to VOX rectifier coupling
	or	
	hum on MIC line C104A/B or ground loop	MIC amp AC filtering
Distorted or weak audio-MIC input to balanced modulator	C103, C105, C132, C106 (Particularly C106)	Audio coupling
Improper keying (BIAS)	C127, C134	CW shaping and phone cutoff bias
Erratic (very sensitive) or bad ALC	C413 with 6X4	ALC time constant
	C403,C413, with 6AL5	(NOTE: In later KWS-1s check also C325 and C324)
P.A. screen 350 V. supply cannot be adjusted to spec with R511	C506	Regulator Loop Stability
	Replace with 600 V. .022 mfd	
Shorted high voltage at J402 feedthru Blown HV fuse	C416 NOTE: See text for replacement	High Voltage 2.3 KV to P.A. cage

Inside the cage from the stud to a ground lug on one of the Teflon plate-mount screws. This problem was creatively solved by Jack Kennedy, W5DJ (now SK - Editor's Note), by using a ceramic insulator feed-thru and running the disk bypass in the same manner as Rudy did, Both methods work well.

In summary, to close out this article, on the following page is a list of recommended resources that has been updated in 2014 - as much as possible.

TUBES & CAPAPCITORS

Antique Electronics Supply
6221 S. Maple Ave
Tempe, AZ 85283
(480) 820-5411
General Information: info@tubesandmore.com
Customer Service: custservice@tubesandmore.com

TUBES

NOS - **Frank Krize**, K5SVC
1373 Chapel Rd
Church Hill,, MS 39120
(601) 442-0973
k5svc@natchez.net

NOS - **Jonathon Edwards**
937 Reinli, Suite 15
Austin, TX 78705
(512) 423-9643 (Cell)
(512) 358-1542 Business
je2@grandecom.net

CAPACITORS

MOUSER Electronics
(800) 346-6873
http://www.mouser.com/

HAYSEED HAMFEST COMPANY
Tom NØJMY
606 Clover Lane
Fredericksburg, IA 50630
http://www.hayseedhamfest.com/
Contact: sales@hayseedhamfest.com

GENERAL PARTS

Dennis Brothers, WA0CBK
839 Sherman St, PO BOX 286
Potter, NE 69156
(308) 879-4552 – Best time 8 PM his time
pat1bro@embarq.mail

Surplus Sales of Nebraska
Misc. Parts, Manuals, St. James Grey Paint, Dust Covers and Coaxial Relays
1218 Nicholas St.
Omaha, NE 68102
(402) 346-4750

Mark Olson, KE9PQ
1490 Norfield Road
Suamico, Wisconsin 54173
Phone: (920) 434-8097
Web Site: http://www.ke9pq.com/
email: ke9pq@new.rr.com

GENERAL REPAIR AND RESTORATION

Howard Mills, W3HM
Repair and restoration of A-Line
570 Acorn Circle
Harpers Ferry, WV 25425
Phone: (304) 876-6483
email: w3hm@frontiernet.

METERS
(Note: Most of the older meters were made by either the Bartlett Instrument Company or by Simpson. Bartlett no longer supports these meters and Simpson, only though distributors).

METER OVERHAUL
Newark In One Services (Simpson Distributor)
Phoenix, AZ
Andy Augustyniak
480-820-1500

TRANSFORMERS

Peter Dahl (now SK) **Company**
El Paso, Texas
Now out of business & sold thru to Hammond of Canada

Hammond Transformer (Offer many of the Dahl replacements)
Hammond Mfg. Co. Ltd.
394 Edinburgh Road, North
Guelph, Ontario N1H 1E5
CANADA
Phone: (519) 822-2960
Fax: (519) 822-0715
e-mail: CA-info@hammondmfg.com

Gary Brown Rewinding
dba "Transformer Rewinding Service"
P.O. Box 175
Stillwater, Maine 04489-0175
xfrmrs@roadrunner.com

KWS-1 FAN BEARINGS

Johnson Bearing Company
Internet Sales located in Sparks & Las Vegas, NV
(Ask for WC87038 (8 x 22 x .406) felt seal ball bearings for about $6.00)
(800) 827-1049 or (775) 359-1049 or (702) 834-6474 (Bob Baker).
http://johnsonbearing.com/home.htm
email general: sales@johnsonbearing.com

Micro-miniature Bearing Company (old Part No. 70882-Z)
7 Jocama Blvd
Old Bridge, NJ 08857
MMB MAIN OFFICE
PH: (800) 526-2353
Fax: (888) 999-9017
NEW ENGLAND
PH: (800) 922-1060
Fax: (802) 860-7500

HVB-1 FUSES

See this issue article on rebuilding the HVB-1

Available through several electronics Suppliers

Mechanical Filters

Surplus Sales of Nebraska

Mark Olson, KE9PQ (See above)

Longwave Products (Filters)
Offering current Rockwell Collins filters in vintage packaging
Dave Curry
P.O. Box 1884
Burbank, California 91507
http://www.75a-4.com/

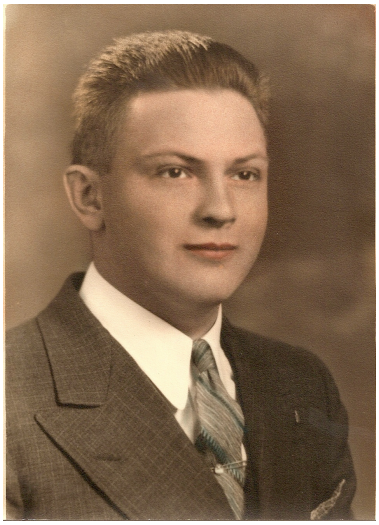
You can also find more recommended sources of repair and parts on our CCA website in the support directory at:
http://www.collinsradio.org/information/directory/


Rare look at a complete KWS-1
SC-101 Operating System
- Rear ductwork inset -
COLLINS

Thanks to Pete Zillox, K5PZ

Gene Senti—A Biographical Extract

By W. Carns, N7OTQ (As published in full - Q2 2008 *Signal Magazine*)



Gene was a somewhat shy and very humble man. In spite of his accomplishments, he never viewed his efforts and results as anything other than what was expected of him. Later in his life, when approached about his inventiveness and the development of the KWS-1, KWM-1 and the 30L-1, he just did not see what all the fuss was about. It is nice to know though, as time passed and as his peers and the members of the CCA talked with him at various times about his work, he grew to enjoy a little notoriety. It was well deserved.

Eugene C. Senti was born on August 17, 1917, in Burlington, Iowa, to Jacob and Hazel Meyer Senti. His parents were farmers in the old sense. They raised both crops and livestock, as well as making raspberry and boysenberry wine, to sell. After Gene's Father's early death, his Mother worked at the lunch counter for the local department store. There was a lot of work to do on the farm and Gene did his share. As was often the case in the depression days, there was not a lot of money. He was, apparently, along with the work, also a typical boy. His son Sam relates that one day Gene tried to play Tarzan and swung out of the loft on a handy rope – target hay stack. But, he missed the hay mound, only to hit the wood floor of the barn and break his ankle.

Like Art Collins, somewhere - out of nowhere - Gene became interested in electronics at an early age. Sam believes it was about in the 6th grade. He built crystal sets and primitive receivers using parts at hand and old oatmeal boxes as coil forms. By high school he was working on his ham license and he was first licensed in about 1933, first as W9ROW and then, with the change in zone definition, W0ROW. He held this call sign, and an advanced ticket, until his death.

At age 17, his Father Jacob passed away. When it came time to go to college, Gene was highly motivated, but there was little money. He attended a local Junior College in Burlington for a year and then transferred to Iowa State University where he worked his way through school bussing tables in a local fraternity house. In 1939 he graduated from Iowa State with an Electrical Engineering degree. It is interesting to note that due to available curriculum, he received his degree in Electrical (Power) Engineering and not Electronics. He was entirely self-taught in Electronics. Applying at Collins Radio, he was turned down and went to work for the Dubuque Power Company. Not particularly liking this kind of work, and with the war upturn in opportunities at Collins, Gene reapplied in 1941 and was accepted. Little is known of what projects he worked on during the war, but he did have one notable accomplishment - meeting and marrying his wife Mary on September 24, 1943. It was a love to last a lifetime – some 60 years.

When first hired at Collins, Gene went to work in the test group, a common job entry point at Collins for fresh-out engineers. This was during the war. At some point, there are indications he went into engineering and did some work on the TCS equipment. Following the war, in late 1945, there is one organization reference that shows he was an engineer in the Quality Group. This was a time when all existing government contracts were cancelled, civilian market production was just starting again, and there was severe downsizing going on. Collins employment dropped almost a factor of two, from around 5500 peak to less than 3000 just following the war. One can only surmise that Art was trying to find places to shelter his talented engineers until commercial production could resume.

Arlo Meyer is a long time, and now retired, Collins mechanical engineer and friend of Gene's. He remembers that in the early '50s, Gene was the project lead on the R-392 receiver, while Arlo was the Mechanical Engineer on the T-195 GRC-19 companion transmitter. To quote Arlo regarding Gene, "Great guy and a great engineer".

In 1953, Gene took over the KWS-1 as Project Lead when the previous project leader, Walt Zarris, left the company. Gene finished getting the KWS-1 ready for its introduction in 1955. Not long after the introduction of the KWS-1 and 75A-4, Gene was playing with a new idea in the basement workshop at his home. Playing with ideas, be it mechanical or electrical, was to be his forte. By 1956, Gene had called Art to his basement one evening to see his new "transceiver". Art loved it, wanted it for a mobile rig, and the KWM-1 was born. Sam, his son, remembers Art coming over that night and the excitement that ensued.

By the mid-50s, Gene was working on components of the S-Line, eventually becoming the Project Lead on the 32S-1 which he carried through design before turning it over to Joe Vanous (Q1 2008 Bio *Signal Magazine*) when Gene was promoted to Group Head, Amateur Radio Products, in February, 1959.

Although Gene was often described as aloof and hard to get to know, those that knew him well attributed this to his creativity and his constantly working mind. Their last comment is always that he was a wonderful friend and often did get-away trips with peers and their families. Arlo remembers one joint family trip down to Mississippi to stay with, and visit, 2 hams that Gene had met on the air. They both were KWM-2 owners. Both Gene and Arlo, and their families, were treated to some good old southern hospitality. Arlo also relates that he and Gene once took their families to Chicago to see the Museums and big city sights, and that despite being totally worn out by the kids and the day's activities, Gene hung in there in good spirits and thoroughly enjoyed the day.

Gene is remembered fondly and with respect by those that worked for him. He was, as a manager, prone to allow his engineers to use their own initiative to improve on products, or come up with new ideas. Dennis Day relates that he most often would go to his peers and those with the required expertise of the moment, to work through a new engineering problem. The organization at Collins appears to have been very un-siloed, with a lot of cross

sharing of expertise, and Gene encouraged this. He would often spend his time in his office, always with an open door, working on new ideas for tuning and operational features using the always present pile of alarm clock parts and gears – etc. – on his desk. He would also always work on the "Birdie" analysis for new products, most often contributing the new frequency conversion schemes. This was another one of his loves.

Those that worked under him viewed him as critical and a hard performance grader, but very fair. He expected of others what he expected of himself. It is testimony to his management style that almost everyone that worked for him remained his close friend (and their family's friends) until his death. That fact, and the obvious excellent performance of his group, says much about his management style.

During the '60s, Gene managed his group through the heydays at Collins - producing the later 75S receivers, the 32S-3, 51S-1 and 55G-1. He guided the maturity of the S-Line tube products.

In the late '60s, things started to turn down. The recession hit - and hit hard - at Collins, with severe cutbacks due to the general slowdown of business and the very bad turndown in the aviation industry. Gene was offered an early out package at that time, and he took it, retiring at the age of 54. Gene briefly went back to work as a DCAS source inspector assigned to Collins, but that next year he retired for good to spend time with his family. He was well prepared for this, his son commented, due to his consistent frugal ways. The years following his retirement were difficult for Gene. His nest was emptying fast and his career was at a turning point. He struggled to refocus his life and spent increasing time with his family, a period that they remember with warm memories.

Gene also was a giver and a good neighbor. He commonly helped the older people in his neighborhood by repairing their lawn mowers or other appliances. Dennis Day recounts several stories about Gene during the early '60s. He mentioned to Gene one day at work that they were going to paint their first home that weekend. Saturday morning about 9 o'clock, as Dennis and Pat (wife) were getting ready to paint, Gene showed up with his whole family and announced, "Fill our buckets and show us where to paint." By the end of the day, they all had painted almost the entire house. Dennis also recounts that when his old Plymouth needed a paint job, Gene said one day, "Bring that car over this weekend and I will paint it for you." He did. Later when Dennis was restoring an old Mustang, Gene again volunteered his help, but this time told Dennis he would show him how to do it. This was his method with his kids also. The first time Dad and the kids did a fix-it job, Gene would do it and explain what he was doing. The next time, the kids got to do some of it, until they were doing the job themselves. Both sons got their first cars this way, buying older fixer uppers and going through them with Dad.

As the years passed into the 21st century, Mary, Gene's wife, fell ill and Gene was her full time caregiver. On August 22nd of 2003, Mary passed away after spending some time in an assisted living facility. Gene went to see her every day. Mary's passing brought another deep change to Gene's life and he spent the remaining years at home and visiting with family. He would take care of his home a bit at a time due to a bad heart valve and sit in his easy chair and watch over his neighborhood - making sure everything was OK.

When Gene passed away suddenly on October 20, 2005, he was 88 years old and had enjoyed a wonderfully productive life and 60 years of a wonderful marriage. He had also raised a family he was very proud of and close to. He had lifelong friends that he cared for and who cared for him. This was, and is, Gene Senti.

So, the next time you use your KWS-1, KWM-1, 30L-1 (the list goes on), you will not have to ask where that quality came from. It came from Gene and he was a gentleman and a loving, inquisitive, productive man. Art thought a lot of him. His friends do also, and I know we will all look at our equipment a bit differently from this day on – and remember a fine man. Thank you Gene.

Contributors to the KWS-1 Development

Gene Senti - Project Engineering Lead at the completion
Walt Zarris - Original Project Engineering Lead
Duane Hoffa - Mechanical Engineer
Chuck Carney - Marketing Mgr. - HF Commercial & Ham Products
Butch Griswald - General, US Air Force Strategic Air Command
Curtis LeMay - General, US Air Force Strategic Air Command
Both Generals Curtis LeMay and Butch Griswald had significant impact on the definition and performance requirements of the new SSB offering of Collins Radio.
Robert C. Miedke - HF Comm Group Head at the time
Art Collins—Significant Contributor and "Test Engineer"

Did You Know?

Well, perhaps a better title for this "Did You Know?" would be "Did You Realize?" - because all of these facts are kind of out there right in front of our noses.

We tend to think of the Gold Dust Twins as just that – Twins. But, in fact, they are not twins by any means. While their perceived market and intended use was certainly focused on Collins Radio's push into the Single Sideband Communication marketplace, the eventual application of these units would be something quite different. Additionally, while the KWS-1 made passable "AM" with its SSB-Injected Carrier approach, the 75A-4 was a true AM receiver when so configured.

The hint of what may be concluded (Hence the "Did You Realize") lies in the number of units produced of the transmitter compared to the receiver.

There were just over 1600 (Serial Number 1603 is believed to be the lasts one observed) KWS-1 transmitters produced starting in 1955 and running through 1958. The production rate can be seen on page 31 of this issue. By 1958, the S-Line was well into the planning stages, sales had tapered off significantly and there is no evidence that the KWS-1 line ran after the end of 1958.

The statistics regarding the paired receiver – the 75A-4 – are a bit different. The final production volume was somewhere around 6000 units. The survey data is not as accurate for the receiver but good enough to make the point. We know that production ran well into 1959 even after the introduction of the S-Line. In the end, the line was moved from Cedar Rapids to the Toronto plant for a period of time, and then back to Cedar Rapids for the final runs.

What is relevant is that the receiver production volume was four times that of the transmitter – in spite of the high price tag for its day. One should ask why.

The fact is that AM died hard. As noted elsewhere in this issue, much to Art's chagrin, the October 1957 QST cover featured a Collins 75A-4 paired with a Johnson AM transmitter. The fact is that the combination of remaining AM market applications, the price of the stalwart KWS-1, and the availability of competing less expensive phasing SSB rigs to serve the "new" SSB marketplace, meant that there were many 75A-4s sold for other than KWS-1 pairing service.

The assumption would have to be that the observation of this fact – along with the loud comments from potential customers about the price tags of both the KWS-1 and the A-4, was what drove the development of the KWM-1 to a certain extent, but certainly the S-Line – in spades. - - - - - - - - - - CCA - - - - - - - - - -

Bringing Up a KWS-1

by Tony Brock-Fisher, K1KP

The following procedure may serve as a useful guideline to bringing up a long-dormant KWS-1 for the first time. It is a guideline only; the author assumes no liability for damage to equipment or personal injury resulting from the use of this procedure.

REMEMBER SAFETY FIRST!
-One hand in your pocket!
-Don't defeat interlocks!

First, check out the power supply alone without the RF deck connected. This will allow you to check the LV supply, bias supply, and filament outputs. If you have a Variac, you may want to initially bring up power slowly over time to allow the electrolytic caps to 'reform'.

Before applying any voltages to the power supply, it might be a good idea to 'ohm out' the supplies. Using a VTVM, or a DVM on a 100K scale, measure the resistance to ground of the LV and bias supplies. They should charge up to several 10's of Kohms as the caps charge. Any low readings indicate shorts and should be investigated before applying power. Then, if the unit is new to you, you may want to double check the primary wiring. The power supply can be wired for either 115 or 230V. It would certainly ruin your day to plug it into 230 when it's set up for 115V!

With the Power Supply disconnected from the RF deck, the Filament switch will apply power to the LV supply, PA bias supply, blower, HV rectifier filaments, and PA filaments. The green light should come on over the switch.

When you get the unit up to 115V, check the appropriate voltages on TB502 and TB501. Note that the LV may be very high without a load on it – don't run the supply too long this way or you may zorch the electrolytics from excessive voltage. While the power is on, check that you can control the PA bias voltage with the front panel pot.

You can't check out the HV supply or PA screen supply without the RF deck, as those voltages are enabled by a 110V contactor controlled by the Emission switch on the RF deck. There are also interlocks on the PS doors and the PA compartment cover that interrupt this line. (Editor's Note: If you carefully determine the pin connections, the required pins can be jumped and the HV brought up for some checking. Do not do this unless you are experiences at High Voltage diagnostics and have a "Safety Buddy" present).

Before you get started on the RF deck, I want to tell you a few things about the switches and what they do, so you'll understand how to set them for a given measurement:

EMISSION- You'll see that this switch has all the modes, SSB, AM, and CW. Also, between each mode is a CAL position.

- All the CAL positions are the same; they just put two of them so you can get to CAL from any mode.
- In CAL, the HV and PA screen voltage is turned off, but all the RF circuits are running. This is so you can hear your transmit frequency in your receiver for zero -beating (spotting).
- In order to get PA voltages on, you have to have the EMISSION switch in either of SSB, AM, or CW; the PLATE switch on the PS must be up; AND all the interlocks must be in place.

OPERATE/TUNE – this toggle switch in the lower left corner sets the PA screen voltage. This is used to reduce PA gain for tune-up so you don't fry the finals before you get the tuning in the ballpark.

CARRIER CONTROL- In AM and CW, this adjusts the amount of drive to the finals.

PA FILIMENT VOLTAGE CHECK

It's time to hook the RF deck back up to the PS unit. Hook everything up, and don't forget the hose and HV lead. Hook up a 1KW dummy load to the antenna connector just in case you go into transmit in any of the testing.

Next, prior to the initial checks, we're going to set all the controls in such a way as to minimize the chances of hurting the finals if voltages are incorrect.

Switches: Set EMISSION to CAL, Set CARRIER CONTROL to 0, Set OPERATE/TUNE to TUNE.

For the subsequent PA FILAMENT VOLTAGE CHECK

- Set the MULTIMETER to PA FILAMENT.
- Set the FILAMENT VOLTAGE switch on the PS to 1.
- Make sure all panels are in place on the PS so the interlocks are happy.
- Turn on the rig! The fan should come on & the green light on the PS should come on.

Check the multi-meter on the rig. It should come up to between 5 and 6, indicating the PA filament voltage. You can adjust this with the FILAMENT VOLTAGE switch on the PS for a reading of 6 on the multimeter. (My KWS-1 is at 3 or 4).

Note that the shunt resistors for the multi-meter are known to drift. For maximum PA tube life, you should measure the PA filament voltage directly on the bypass cap (C418) to ground; set the Filament Adjust for 6.0 (NOT 6.3) volts AC.

If you have problems here, check connections to the RF deck. Check TB501 pin 2 in the PS for 6 volts AC.

PA BIAS SUPPLY CHECK

Connect your VOM between either of the meter terminals on the front panel multi-meter and ground. Set the VOM to read –150 volts

- Set the multi-meter switch to PA GRID.

With the power on, you should read approximately –100 volts or so.

You should be able to adjust this voltage over an approximate range of about –100 to –50 volts using the PA BIAS control on the PS unit. After you check this, reset the PA BIAS control to 0. This keeps the finals in cutoff, to protect them until we are ready to adjust the idle current.

If you have problems here, check the connections to the RF deck. If you get –150 volts on PS TB502 pin 19 with the RF deck disconnected (as you already did), but it disappears with the RF deck connected, assume there's a interconnect problem somewhere going to, or in, the RF deck and look for that.

HV SUPPLY SMOKE TEST

In this test, you're going to be turning on the HV supplies. Make sure the HV lead is properly connected to the RF deck. Note that 2000 volts is present on this connector when the HV is on, so a disconnected 'live' connector is an accident waiting to happen!

This is also not a bad time to have a friend present.

Check the following settings:

- Set EMISSION to the CAL nearest SSB, set CARRIER CONTROL to 0, set OPERATE/TUNE to TUNE. Set PA BIAS to 0.
- Set the MULTIMETER switch to PA 2000 V.
- Make sure all interlocks are in place.
- Turn on the PS and wait at least 1 minute for the time delay relay to kick in. You always have to wait a minute for the 866's to warm up. There's a time delay relay in the HV primary to make sure.
- Set the PLATE switch to UP. (Nothing should happen yet).
- Switch the EMISSION switch to SSB. You should hear the HV contactor click in. The Red light should come on. The meter should read around 2100 volts.
- The PA PLATE CURRENT meter should read 0. IF THE METER PEGS, immediately switch EMISSION to CAL

Return the EMISSION switch to CAL. If you have had trouble here check the following:

PLEASE BE REALLY CAREFUL WITH THE HV! DON'T DEFEAT THE INTERLOCKS WITH POWER ON!

If the red light comes on, this says the primary side of the HV transformer is OK. If the red light comes on, but there's no reading on the MULTIMETER, then suspect fuse F506, the HV connection to the RF deck, or some problem in the secondary side of the HV supply (V501/502; T502; L501).

If you get no red light, check F501. If this blows repeatedly, pull F506 and try again. If you get red light and F501 survives with F506 out, then suspect a short to ground downstream from F506. Also, check the time delay relay K503. If this is bad, you can jumper pins 7 and 5 of K503, BUT REMEMBER TO MANUALLY WAIT 1 MINUTE AFTER POWER-ON BEFORE HITTING THE PLATE SWITCH.

If the Plate current meter pegged, look for a HV short in the PA cage or bad PA tube(s).

PA SCREEN SUPPLY TEST

I hope you've reached this point, because it means you've got HV!

Set the switches as follows:

- Set EMISSION to the CAL nearest SSB, set CARRIER CONTROL to 0, set OPERATE/TUNE to TUNE. Set PA BIAS to 0.
- Connect your VOM to either of the meter terminals on the MULTI meter and ground. Set the VOM to read +350 volts.
- Set the MULTIMETER switch to PA SCREEN.
- Make sure all interlocks are in place.
- Turn on the PS and wait at least 1 minute for the time delay relay to kick in.
- Set the PLATE switch to UP. (Nothing should happen yet).
- Switch the EMISSION switch to SSB. Key the rig by closing the PTT circuit or using the Test Key switch. You should hear the HV contactor click in. The Red light should come on.
- The VOM should read around +175 volts.
- Return the EMISSION switch to CAL.
- Set the OPERATE/TUNE switch to OPERATE.
- Switch the EMISSION switch to SSB. You should hear the HV contactor click in. The Red light should come on.
- The VOM should read very close to +350 volts.
- Return the EMISSION switch to CAL.

If you have had trouble here, check the following:

If the voltage is there but not correct, you should be able to adjust it with R511 in the PS. You can turn off the PLATE switch, wait 1 minute for the HV caps to discharge, pull off the front door of the PS, tweak the pot, replace the door, and turn on the PLATE switch again to measure. Repeat this until you get +350 volts.

If you get voltage but can't adjust it, suspect components in the area of R511 in the PS. I had a leaky C506 and a bad R511. This screen regulator circuit is very sensitive to capacitor leakage.

If you get no volts, check T504, V503, L503, V504, F505.

My KWS-1 blows F505 often. Nothing wrong, just keep replacing it with same size fuse (it protects final screens from meltdown). (Editor's Comment: There is something wrong – just subtle – keep looking)

PA FINAL CHECK

This test will see if the finals are at least good on a DC basis by testing to see if they respond to bias voltage on the grids with some plate current. For this test, you will actually key the transmitter. You will need to connect either a CW key or a mike with a PTT switch to get the rig to go into transmit. **Make sure you have a dummy load connected.**

Set the switches as follows:

- Set EMISSION to the CAL nearest SSB, set CARRIER CONTROL to 0, set OPERATE/TUNE to OPERATE. Set PA BIAS to 0.
- Set the MULTIMETER switch to PA 2000.
- Make sure all interlocks are in place.
- Turn on the PS and wait at least 1 minute for the time delay relay to kick in.
- Set the PLATE switch to UP. (Nothing should happen yet).
- Switch the EMISSION switch to SSB. You should hear the HV contactor click in. The Red light should come on.
- Key the rig. You should hear a relay inside the RF deck click. (The PA PLATE CURRENT meter should read zero)
- Slowly increase the PA BIAS control. At around 5-6 you should start to see some indication of plate current. You should be able to adjust it to 100 mA on the plate current meter.
- If you can get this, and repeat the PA BIAS SUPPLY measurement at the same time, you should see around –65 volts on the MULTIMETER terminal when you get 100 mA plate current. This indicates your finals are probably OK.
- Return the EMISSION switch to CAL.

If this doesn't work, suspect the finals or circuitry around them. You can check the RF performance below, but probably not tune up the rig. END OF PA VOLTAGES TESTING

Congratulations, if you've made it this far, you're in great shape!

RF CHECKS – 80 METERS **

First a word about how the KWS-1 works. The second (Variable) IF operates in the 80 meter band frequencies, and for 80 meter transmit operation is fed straight to the driver stage. For the bands 40-10, this second IF is converted with a crystal oscillator up to the band of interest. This means that it is essential to get 80 meters working first, before you can expect 40-10 to work.

Set the switches as follows:

- Set EMISSION to the CAL nearest SSB, set CARRIER CONTROL to 0, set OPERATE/TUNE to TUNE. Set PA BIAS to 0.
- Turn the unit on.
- Set the BAND switch to 80.
- Set the MULTIMETER switch to PA GRID.
- Gradually increase the CARRIER CONTROL. You should see the MULTIMETER swing upscale as RF is applied to the grids of the PA and they start to draw grid current. (They will draw grid current even though the HV is off).

(Use your station receiver to listen around the frequency indicated on the dial. You should be able to hear the RF from the RF deck in the station receiver.)

If you have trouble here, you can look for RF at the various stages of the RF chain. There are a bunch of BNC on the RF deck. You can lightly couple the station receiver to these BNC's to check the various points in the RF chain:

- 250 KC INJ – should be 250 KC +/- 1.5 KC. This is a crystal oscillator, check V104.
- VFO INJ – should be indicated frequency (on 80 only) minus 250 KC.
- Driver Grid – indicated frequency, varies with CARRIER control.
- Driver Plate – indicated frequency, lots of voltage, varies with CARRIER control .

RF CHECK – 40 Meters and up **

If you've gotten this far, you're really cooking!

Set the switches as follows:

- Set EMISSION to the CAL nearest SSB, set CARRIER CONTROL to 0, set OPERATE/TUNE to TUNE. Set PA BIAS to 0.
- Turn the unit on.
- Set the BAND switch to 40.
- Set the MULTIMETER switch to PA GRID.
- Gradually increase the CARRIER CONTROL. You should see the MULTIMETER swing upscale as RF is applied to the grids of the PA and they start to draw grid current.

(Use your station receiver to listen around the frequency indicated on the dial. You should be able to hear the RF from the RF deck in the station receiver.)

If you have trouble here, suspect second mixer V204, 3rd amp V209, or 4th amp V205.

If you get through all of this, then everything is looking really good. You should be able to follow the manual instructions and try to tune up the rig into a dummy load. If that works, then try to get on the air and make a QSO! I'd suggest trying 80 meters first, as this requires that less of the circuits work. It's also the most stable band for the PA.

I'd be happy to exchange emails with folks working on KWS-1's.

73, Tony, K1KP

** For the RF CHECK 80 & 40 and up, make sure there is a dummy load connected to the antenna output

The Collins Night Dinner at the AWA 2014 Meet

Above, Bob Hobday, Deputy Director of the Antique Wireless Association heads up the front table (Center back dark jacket) during the evening celebration of the Collins Radio Heritage Group (CRHG) alliance and its successful save of the VOA/Collins Radio Model 821A-1 250 KW Shortwave Transmitter.

During the evening's presentation to a full house, Bob and Bruce Roleson (AWA Museum Curator - above) shared the details of the "save", and talked about the path going forward as the CRHG supports the AWA efforts to develop the space required to set up and display the magnificent 821A-1 and the VOA Master Studio board and environment.

During Bob's presentation, he stressed the importance of the alliance (CRHG) that had developed between the AWA and the CCA, and how that alliance, combined with the relationship and support of the folks from the Arthur A. Collins Legacy Group in Cedar Rapids, had enabled the success of the acquisition, extraction and move of three truckloads of equipment from the VOA site in Delano California.

The next year is going to be a busy one as we continue to raise the funds necessary to modify the existing museum space , reassemble the studio and transmitter equipment into display configuration and then finish the display and audio-visual work linking the displays to the CRHG website.

Your CCA - 2014 - A Third Quarter Report

Without a doubt, the accomplishments to date are ones that we - as members of the CCA and associates of the CRHG - can be proud of.

The year ahead of us will be challenging, but also gratifying, as we see the next phase of this project come to fruition. According to the State of New York (GSA related accession regulations), the VOA studio and the transmitter have to be on display and inspected by the end of the 12 month period starting when we moved the transmitter.

We have achieved what we have done so far with the support of many people—both physically and financially. The next year will require the same. Please, if you are able to, consider supporting this effort financially. If you interested in more details, contact either Bob Hobday, Bill Carns, or Paul Kluwe regarding your support. You can get more details on the CRHG website under OUR PROJECTS category - then select VOA Transmitter Rescue. Remember that any amount helps us and, often, big meals are consumed in very small bites. The extraction of that VOA/Collins equipment was a good example.

General 2014 CCA Business & Election Notice

Fundraising Need & Progress CRHG

The fund raising for the VOA/Collins Model 821A-1 Collins Radio Heritage Group project continues to bear fruit. We are closing on having the extraction costs covered, and then we will start working on the monies to build out the AWA Bloomfield Museum display facilities that will make the AWA Museum presentations possible.

This project, as you know if you have been following the reporting, has several levels of objectives. The first was to save the 821A-1 and the VOA historical artifacts associated with the VOA history and the 821A-1. DONE! The second level objective is to build out the displays and tell the stories in Bloomfield and in Cedar Rapids. The third, and highest level, objective is to use the horsepower and momentum that we have mustered to do all of this in order to engage middle-school age kids in technology exploration on a large volume scale. We will do that by writing free downloadable applications for smart phones, Kindles, iPads and other smart tablets (that kids like to play with) and expose them to yesterdays and today's technology excitement. The goal there is to get more kids into the sciences and math/engineering (STEM) educational paths. *We are excited especially about the endgame with the kids. Come and help us. One down and two to go.*

Go to the CRHG website and read more about the project at http://www.collinsradioheritagegroup.org/ where you can track our progress and needs. We solicit your help and anything that you care to donate will certainly help.

Election Business

Well, it had to happen eventually.

Scan to see more about the CCA

With the end of Q4 2014, one of our Board of Directors positions will roll over. As you know, other than the one allowed appointed board member, elected board members of the CCA are allowed to only hold two consecutive elected terms of two years each. Yours truly, your current President, has reached that limit. As a result, I will have to stand down for at least one term of two years. My board slot is the only one timing out this year. It is with some sadness that I realize how fast the last four years has gone. It has been an amazing ride and I could not have asked for better team support or a better class of membership. It has been fun.

Please note that, while I have to stand down from active membership in the CCA board, I will continue as the Editor of the *Signal Magazine* with the good help of the staff that we have in place.

In addition, I have been asked to serve as a consultant during the next two years in order to also provide the kind of continuity that is required to assure success of the CRHG projects and the continued success of the CCA. I have told the board that I will certainly provide all of the help that I can, but that I hope that the newly constituted board lets new ideas and new blood percolate to the surface. This will continue to refresh our approach to serving you – the membership.

Following the election of a new board member by the end of Q4, and the installation on the CCA board as of January 31, 2015, there will be an election held by the serving board members to elect new officers. I certainly hope that you and the board will support my recommendation that our serving Vice President, Scott Kerr – KE1RR – be elected as your new President. This will provide continuity and continued dedicated service regarding our current efforts, both internally and with the CRHG alliance and other associates.

As is customary, nominations will be accepted during the fourth quarter ending November 31 and then a ballot will be included in the Q4 *Signal* mailing. Results of the election will be announced in the Q1 2015 *Signal* and on the website following the count at the end of January. Please submit your nominations via email to any board member. We prefer to not use the open reflector for this business.

At the same time that I encourage nominations for the one opening position, please also observe that we continue to need help on projects, recruiting, events around the country and fundraising for the 821A-1 CRHG project and the display build out at the AWA museum.

It is the work on these projects that will bring new blood into the process and continue to keep our organization vibrant and healthy. Don't be shy! We need you and your help.

The Service Line

Rebuilding that Expensive HVB-1

by Scott Kerr, KE1RR AC10-12478

I have to say that, of all my Collins gear, my KWS-1 and 30K-5 are two of my favorite pieces. When I first started collecting Collins gear, a fully functional set of Gold Dust Twins was high on my list. I don't know if that is due to the era that I grew up in, my love for black boxes full of tubes, or the art deco design. It is probably a combination of all three. But you soon learn that the KWS-1 is much like owning a boat. It is a joy when working, but it is going to need some tender care to keep it that way. It also has a tendency to develop a bad habit of smoking, and not the cheap run of the mill cigarette, but more like a very expensive cigar – the HVB-1 variety.

The HVB-1's very existence is really a conundrum. In talking with all of the Collins gurus, it is the only fuse in a high voltage line that we can think of. The primary of both the plate transformer, T503 and the Plate Filament Transformer (that feeds the filaments of the two 866-A rectifiers), are fused on the primary side with F501 and F502 respectively. Why then did the Collins engineers decide to put an expensive fuse on the 2,000 volt line in between the center tap of the filament transformer and the plate choke? This is not done on broadcast transmitters or the big linear amplifiers like the 204F-1. The only reason that I can think of is that the power supply is housed in a separate cabinet from the transmitter itself and the 2,000 plus volts run through a RG-58 cable up to the RF Deck. It may be that the possibility of a cable not hooked up correctly or knocked off the back of the KWS-1 carrying that much voltage produced an extra amount of caution in the design team. If anyone has first-hand knowledge of the reasoning behind this design, the author and staff of the *Signal* would love some feedback.

The Bussmann HVB-1 is rated at 2500 volts and 1 amp. The data sheet for the fuse states that it is a non-time delay fuse and will run at 110 percent of rated capacity for 4 hours and 135 percent for one hour. At 0.41 inches in diameter and 4.5 inches long, it is physically large for a fuse. The reason for the length is important to know. Voltages this high can, and will, arc over – or even form a sustained plasma current path - over the length of a standard fuse. The internal design of the HVB-1 fuse discourages this – more on this later.

Figure 1 - HVB-1

Anyone that has experience with the KWS-1 knows that anything wrong in the RF final amplifier stage will smoke the HVB-1 in a heartbeat. The price at www.Mouser.com is currently $22.74 each (Mouser part number 504-HVB-1). When troubleshooting the problem you could easily go through 4 or five of these things – and that is an expensive habit!! It might be tempting to just insert a standard fuse between the supporting connections with wires soldered to each end. After all the troubleshooting then put in a real HVB-1. Don't do it! The 2,000 plus volts will have no problem skipping right through the blown smaller glass fuse and causing all sorts of grief and damage! A look at the internal design of the larger HVB-1 use shows how that is discouraged - both by the length and the construction.

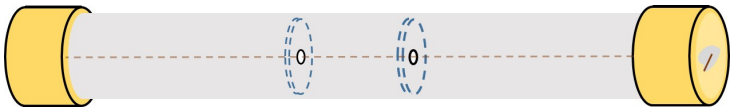


Figure 2 - HVB-1 Cross-section showing the wire baffles

A look at Figure 2 (left) will show that what appears to be a hollow tube with a fuse wire down the middle. The tube actually has two baffles in the center of the tube with small holes that discourage the plasma arcing across the space between the two end caps. It is these baffles plus the length between the caps that gives the fuse its HV properties.

So what can we do - other than spending $40-$100 dollars on fuses - while diagnosing a problem with the high voltage in our KWS-1? The answer is easy. Just rebuild the fuse. First you will need the correct fuse wire. Bussmann sells 1 amp fuse wire in ½ pound rolls for about $115 (www.mouser.com part number 504-BFW-1). This is enough wire to meet all of our members needs for a couple of years! We are working with Mark Olsen, KE9PQ, and wire will soon be available from him for $15.00 / 5 feet of wire. This should be enough to rebuild at least 10 fuses and the process is simple.

Bussmann MFW-1 Fuse Wire

First, before we start, I suggest that you consider making a little inexpensive temperature control for your soldering iron if you do not have a soldering station that controls tip temperature. This is easily done by buying a standard incandescent lamp dimmer at the local big-box store and mounting it in a metal double gang switch box with a cover plate. Mount an outlet for the iron on one side of the box and the dimmer on the other and cover it all with the appropriate plate.

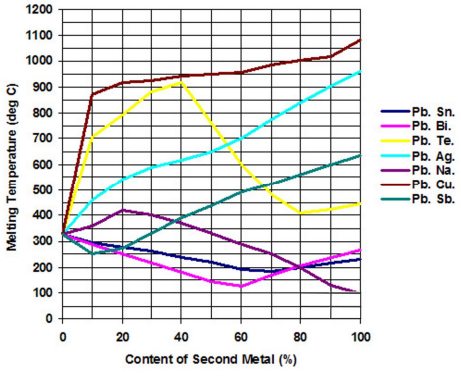


Figure 3 - Lead Alloy Melting Point

Temperature control during the re-soldering operation is going to be very crucial. We need to take a quick lesson in alloy metallurgy. The Bussmann fuse wire is made out of almost pure lead doped with about 1% antimony. As you can see from Fig. 3 (dark green) line for Pb-Sb, the melting point of the fuse wire is just slightly lower than the melting point of pure lead which is 327 degrees C. The antimony doping reduces the melting temperature until the doping reaches 10% and then it starts to increase again. The meting temperature of the typical 50/50 lead-tin solder can be seen to be about 220 degrees C. Therefore you need to keep your iron above 220 and below 300 deg. C. to be on the safe side as you work on repairing these fuses.

The next step in the preparation is to make a quick and dirty fixture to hold a few fuses as you work on them. I did this by taking a piece of 1 x 2 about 12 inches long and drilling two 3/8 inch holes spaced out about 1 1/2 inches for working room. Ream them out carefully until they fit the fuse body (about 0.380). Drill the holes down the exact center of the 1 1/2 inch wide side. The fuse body will then fit the radius of the fixture. Then I ripped the piece exactly in half. You can use a table saw, band saw or even a skill or jig saw to do the job. You wind up with two pieces that are then screwed back together at just one end. Or, you can stop the rip just short of the end. Prying open the unfastened end allows you to slip two fuses in and then clamp the entire piece in your vice with the fuses vertical. I would not try for three fuses in your fixture because this will make the fit very critical and the middle one will probably wind up loose. If you use a 1/8 inch blade to rip the piece, you may have to put a washer in between the two halves to keep the fixture halves parallel. Now you are ready to start. Of course you can do the following operations by hand holding the fuse in one hand and juggling the cap and the wire, but the fixture is a lot easier.

Step 1 – Heat up a medium tipped soldering iron to about 280 deg. C. and carefully remove the solder on each end cap using solder wick and the temperature controlled iron. If you are using the el cheapo controller from the hardware department, you will have to sneak up on the solder melt point and then make sure it will not melt the fuse wire. Alternatively use a de-soldering gun that has good temperature control (my favorite). Carefully lift up the wire end and remove the remnant fuse wire from the blown element. This, and the next, operation are best done before mounting in the fixture.

Step 2 – Try holding the fuse firmly in one hand and use a fingernail on the other hand to pry off one of the caps. It is likely that you will have to resort to using the vise and making a gap that will pass the fuse body and not the cap and use more force to get the cap off. Using a good quality knife blade to relieve the crimp on the cap first will help this process. Turn the fuse around and repeat on the other side. At this time I take a Sharpie and put a ring around the fuse to signify that this is a rebuilt fuse. I use these fuses for troubleshooting and then put in a 'real' one for normal operation. Each time you rebuild, you add another ring thus keeping track of the number of rebuilds. There is some residual contamination left in the fuse body in between the two baffles and this could eventually effect the performance of the fuse.

Using a just slightly damp Q-tip (DI Water from that good distilled drinking water you buy), clean the side walls of both ends of the tube to remove contamination from the previous blown element. DO NOT USE any alcohol or cleaner as this will leave a hydrocarbon behind that will lead to internal arcing and an eventual carbon track after the fuse blows. When you are finished cleaning the inner fuse bodies, mount the fuses in the fixture with the end clamped in the vise and the fuses out where you can work on them.

In the fixture - See Figure 4 (Lower right):

Step 3 – Using vinyl or Nitrile gloves so you do not contaminate the fuse wire with oils from the hand, cut off about 6 inches of fuse wire. Gently straighten (Do not pull hard enough to risk stretching) the fuse wire and place the new fuse wire stock on a clean paper towel. Be careful not to set it next to solder on your bench as the two look the same. Do not nick the wire!

Now, with the fuse held vertically with the fixture, carefully feed the fuse wire down through the tube threading it through the holes in the baffles in the center of the tube. This is not as hard as it first sounds. Make sure the fuse tube is exactly vertical and the fuse wire is VERY straight and it will slide right through.

Step 4 – Hold the newly inserted wire with your left hand with enough wire protruding up to work with and make sure the wire does not drop though the tube. Feed one cap onto the fuse wire from the top and - holding the wire from the top - press the cap back into place on the fuse body. Bend the fuse wire over at 90 degrees to keep it from falling back into the tube end. Be sure and leave enough wire sticking out the bottom that you can hold it easily while you are recapping that end. After soldering you will repeat this top operation on the bottom for as many fuses as you have in your fixture.

Step 5 – Here is the reason you have heated your iron to 280 degrees C. - or just hot enough to melt solder and not the wire. Since the end cap already has been soldered during its original assembly, the end cap is tinned. Just get some solder melted on your iron and then roll the tip of the iron into the solder well on the end cap (rolling from cap to just touching the fuse wire) and for a fraction of a second let your iron touch the wire until it wets - and you are done. It is important to get the cap up to melting temp first before touching the wire. You DO NOT WANT a cold solder joint. Trim off any of the excess fuse wire.

Now flip the fixture over in your vice and repeat the same operations on the lower wire and cap assembly. There - you have just saved yourself about 20 bucks per fuse.

In conclusion, always be safe. Never use a glass fuse to shunt a high voltage fuse. You are asking for disaster to happen.

The CCA has worked with Mark Olsen, KE9PQ, and he will be selling small quantities of the wire in an affordable 5 foot roll for about $15.00 shipped. That will make a lot of HVB-1 repairs and you will be money ahead.

Contact Mark at email: Mark (ke9pq@new.rr.com) or by phone at (920) 434-8097.

Figure 4. In the test fixture & feeding fuse wire in

In the KWS-1 Shack - 60 Years Later

Bill Carns, N7OTQ/K0CXX, displays twin KWS-1/75A-4 Gold Dust Twins operating in this position. It features the original KWS-1K on the right and the later KWS-1 "ALC Adjust" version of the production run. Also displayed is the ARRL handbook from 1955 containing the advertising blooper where the marketing group got ahead of the game and gave the new transmitter the 30L-1 number.

The microphone used is the "correct" EV 605 that Collins used in many of their promotion photos of the KWS-1 and the speaker is a rare dual A-Line speaker model 271B-3. On the wall above the position on the left is one of the promotional line drawings, and on the right hangs a photo and tribute to young engineer Gene Senti. Dennis day joins him as part of the S-Line display on the right.

John Firey, W5ZG, sits at home in the comfort of his vintage collection of Collins. Rightfully, John is as proud of the fact that all of his gear is used on a continuous basis. He does not mind sharing - as you can see - and I suspect that the warmth of the environment has much to do with the smiles on the faces of the two station mascots.

Below, John Firey's Gold Dust Twins share their table

Pete Zilliox, K5PZ, is a past CCA Board of Directors member and long time supporter of the CCA through his Membership Chairman work over almost 15 years. Pete is the consummate Collins collector in that he is compulsive about getting everything original and properly configured. We see this here in his meticulous SC-101 presentation, display of a 9CXX card, and even an elephant as Art had.

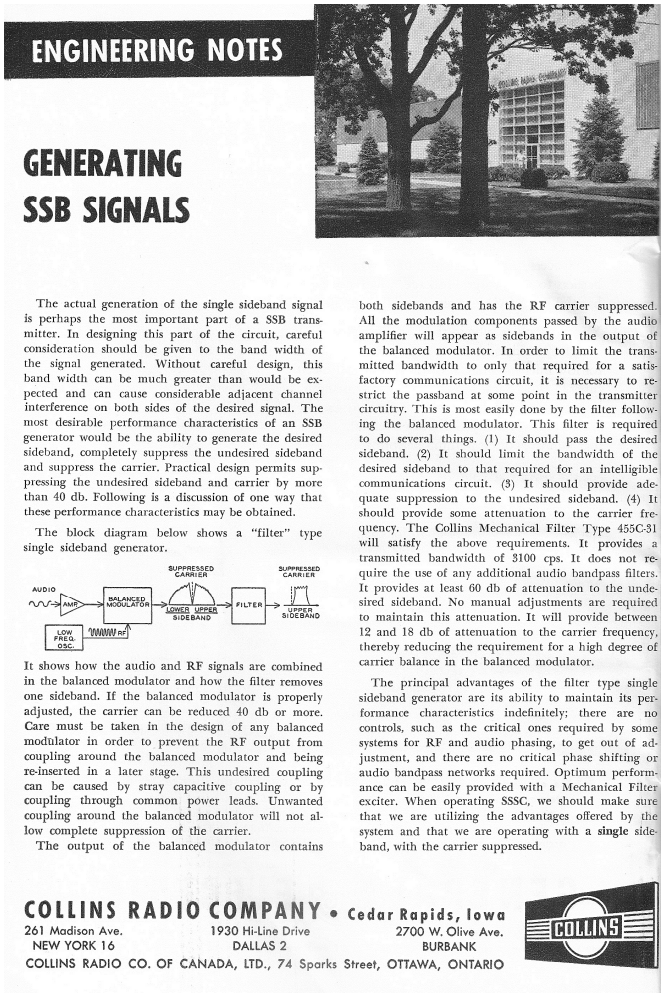
George Ulm, W9EVT, is semi-retired and now living on Washington Island in Wisconsin. He has an extensive collection of, not only Collins gear, but equipment representing almost every manufacturer known. He operates a "Come and Play" Bed and Breakfast with his wife and the trip is worth taking. You can see more of George's collection and home operation at his website at http://www.w9evt.com/

A Look Back at the Promotional Perspective of the Gold Dust Twins

Being closely associated with the advertising world, it is difficult not to try and glean some trends and information from the advertising strategy used by Collins during the brief production run of the KWS-1.

Having been beaten to the market place - and to the "punch" - by a competing technology and several companies that employed *SSB Phasing* to generate SSB, Collins sought to establish their technical dominance before entering the equipment arena. In October of 1954, the KWS-1 and 75A-4 were "Almost in the can." and Collins Radio started upping the ante and prepping the marketplace and customers for their entry into SSB.

They moved from a single "rear of the magazine" page of advertising to a more coveted "first inside page" of QST. In October they ran an ad promoting SSB technology and establishing their image as a technical "expert". In November 1954, they ran a similar ad in the same new position touting the power and distortion advantages of SSB. Then, in December of '54, they ran the first ad showing why the balanced modulator SSB filtering technique was better than phasing.



ENGINEERING NOTES

GENERATING SSB SIGNALS

The actual generation of the single sideband signal is perhaps the most important part of a SSB transmitter. In designing this part of the circuit, careful consideration should be given to the band width of the signal generated. Without careful design, this band width can be much greater than would be expected and can cause considerable adjacent channel interference on both sides of the desired signal. The most desirable performance characteristics of an SSB generator would be the ability to generate the desired sideband, completely suppress the undesired sideband and suppress the carrier. Practical design permits suppressing the undesired sideband and carrier by more than 40 db. Following is a discussion of one way that these performance characteristics may be obtained.

The block diagram below shows a "filter" type single sideband generator.

It shows how the audio and RF signals are combined in the balanced modulator and how the filter removes one sideband. If the balanced modulator is properly adjusted, the carrier can be reduced 40 db or more. Care must be taken in the design of any balanced modulator in order to prevent the RF output from coupling around the balanced modulator and being re-inserted in a later stage. This undesired coupling can be caused by stray capacitive coupling or by coupling through common power leads. Unwanted coupling around the balanced modulator will not allow complete suppression of the carrier.

The output of the balanced modulator contains both sidebands and has the RF carrier suppressed. All the modulation components passed by the audio amplifier will appear as sidebands in the output of the balanced modulator. In order to limit the transmitted bandwidth to only that required for a satisfactory communications circuit, it is necessary to restrict the passband at some point in the transmitter circuitry. This is most easily done by the filter following the balanced modulator. This filter is required to do several things. (1) It should pass the desired sideband. (2) It should limit the bandwidth of the desired sideband to that required for an intelligible communications circuit. (3) It should provide adequate suppression to the undesired sideband. (4) It should provide some attenuation to the carrier frequency. The Collins Mechanical Filter Type 455C-31 will satisfy the above requirements. It provides a transmitted bandwidth of 3100 cps. It does not require the use of any additional audio bandpass filters. It provides at least 60 db of attenuation to the undesired sideband. No manual adjustments are required to maintain this attenuation. It will provide between 12 and 18 db of attenuation to the carrier frequency, thereby reducing the requirement for a high degree of carrier balance in the balanced modulator.

The principal advantages of the filter type single sideband generator are its ability to maintain its performance characteristics indefinitely; there are no controls, such as the critical ones required by some systems for RF and audio phasing, to get out of adjustment, and there are no critical phase shifting or audio bandpass networks required. Optimum performance can be easily provided with a Mechanical Filter exciter. When operating SSSC, we should make sure that we are utilizing the advantages offered by the system and that we are operating with a **single** sideband, with the carrier suppressed.

COLLINS RADIO COMPANY • Cedar Rapids, Iowa
261 Madison Ave. NEW YORK 16 | 1930 Hi-Line Drive DALLAS 2 | 2700 W. Olive Ave. BURBANK
COLLINS RADIO CO. OF CANADA, LTD., 74 Sparks Street, OTTAWA, ONTARIO

COLLINS

December 1954 QST

As Christmas passed, they proceeded to play receiver catchup as they touted their mechanical filters and adaptors for their previous AM oriented receivers. This was a shrewd move showing off their mechanical filter advantage, offering filter adaptors for previous receivers, and assuring that existing customers did not feel that their equipment was obsolete. It also allowed existing AM customers to sneak in the back door and just buy the coming KWS-1.

In March of 1955, both the key distributors, and also Collins Radio, ran big spreads on the newly announced KWS-1/75A-4 Gold Dust Twins as well as the downscaled 32W-1/KWS-1K approach that marketing at Collins felt might be necessary. Temporarily Collins moved their ad to the rear of QST again in order to get a two page spread. Notice in the intro ads from March that the photos are of the prototypes and that there are some interesting differences between these units and the final "as delivered" units.

Editor's Note: In the earlier version of this CARE & FEEDING issue, it was stated in Figure 4 (showing then Engineering Group Head Robert Meidke sitting with a 75A-4 and 32W-1 combination) that no 32W-1s were ever produced. We now know from personal observation and the first person accounts of J. B. Jenkins – then working in engineering at Collins – at least one and possibly more 32W-1s were actually sold out of the first build of 20 or 25 units. We also know factually that almost all of the 32W-1s made in that run were subsequently torn down and the parts used to construct KWS-1s. Very few exist now. One that I have personally seen was an obvious fake.

Collins for NEW EASE in OPERATION

75A-4 Receiver

KWS-1 Transmitter

The new Collins 75A-4 Receiver, 32W-1 Exciter, and the KWS-1 Kilowatt Transmitter are expressly designed for SSB, AM and CW. Like all Collins Amateur equipment, they meet the same high standards as Military and Commercial equipment.

The 75A-4 Receiver features passband tuning, AVC on SSB, bridged T rejection notch filter, built-in crystal calibrator circuit, separate detectors for AM and SSB, a new noise limiter, and provision for three Mechanical Filters together with time-proven features such as good image rejection, and an accurate linear dial with calibration of 1 kc per division.

Transmitter features include a SSB generator using Collins Mechanical Filters, selectable sideband, band switching from 3.5 to 30 mc, voice control or push-to-talk, automatic load control, and dual conversion with crystal controlled high-frequency oscillator and stable, linear, permeability-tuned low frequency oscillator resulting in a linear dial similar to the 75A-4 Receivers.

Power input is one kw peak envelope power on SSB, one kw on CW, and equivalent to one kw AM when received on narrow-bandwidth receiver.

Several versions of the transmitting equipment are available. The 32W-1 Exciter is capable of driving a kw linear amplifier. With exception of the power supply, which is housed in a separate cabinet, it is complete in a receiver-type cabinet and can be converted into a KWS-1. The KWS-1 is also complete in a receiver-type cabinet except for power supplies, which are mounted in an attractive desk-high cabinet. As an alternate, the KWS-1 is available without the high voltage power supply as type number KWS-1K, and kits are available for converting a 32W-1 or a KWS-1K into a KWS-1.

AMATEUR NET PRICES ARE AS FOLLOWS:

32W-1 Exciter complete	$ 895.00
KWS-1 Transmitter complete	$1,995.00
KWS-1K Transmitter less H.V. power supply and P.A. tubes	$1,225.00
428A-2 H.V. Power supply kit for KWS-1K	$ 545.00
428A-1 Power supply for KWS-1K, wired and tested	$ 700.00
367A-2 P.A. Kit to convert 32W-1 to KWS-1K	$ 215.00

See your nearest Collins distributor for delivery information.

COLLINS

April 1955 QST

By April of 1955, Collins was back at the front of the book and there to stay for many years – eventually migrating to the coveted inside front cover position. In May they ran a great ad that gives us insight into their initial introduction strategy and the details of the intro pricing. June found them pushing the 75A-4 features and then, by July, apparently they were starting to feel the orders surge and they ran an ad just listing all of their distributors. Knowing that it takes at least a couple of months to get an ad completed and laid into the magazine, it is apparent that by May, they were getting a good backlog of orders and not feeling the need to push the features of the twins quite so hard.

By November 1955, they are now about 300 units into production, the photos have lost the center toggle on the KWS-1 PS unit, the louvers are gone from the door of the PS and the A-4 has its upper knobs now aligned – thanks to one AAC. In December they ran the GDT with a feature PTO Features And Benefits theme. Production was just passing through 400 units of the KWS-1 by the time that add hit.

November 1955 QST

January of 1956 started with more "Features & Benefits (FAB)" ads for the GDT. In February Collins took a product timeout and ran a general "Creative Leadership in Communications ad for the Navy Antarctic Expedition thus leaning on their previous Byrd and MacMillen accomplishments.

So far, we have seen Collins start by building their reputation for technology excellence. Then they introduced and hyped the product until orders built up. Then they dropped the push on the alternate price point 32W/KWS-1K approach and went to general "image and distributor" ads. In April of 1956, we see a big change. Everyone knows that the GDTs were pretty pricy for their day. There was a lot of negative feedback pushing for a lower priced product offering from Collins for the new SSB application. April saw the start of what would be a seven month push on the "VALUE – Retained" and the availability of "Easy Payment Plans" to finance entry into the Collins SSB clan. Clearly – as we know now from the history of the development of the S-Line starting in 1957 and culminating in 1959 – the amateur market was clamoring for a more cost conscious approach from the top quality supplier in the business. This comes – in hind sight – as a bit of an enigma since we know at the time Collins had as many orders as they felt they could handle and also that they never made a profit on the GDT offering – so why sell more?

April – "Easy Payment Plan" announced in QST! Then, in July 1956, the 4:1 Knob "Fine Tuning" is announced – followed by more cost consciousness advertising. From August through October, the emphasis was on value and a general sales push. 1957 again started with a very strong – "You can afford it" – ad. After they went back to the A-4 in March and the KWS-1 in April, change was in the air. In May, the KWM-1 broke. They had, in fact, addressed both the cost and "dual tuning" challenge. In August, '57, they went back to their new "Sideband Lineup – the KWS-1, the 75A-4 and the KWM-1.

April 1956 QST

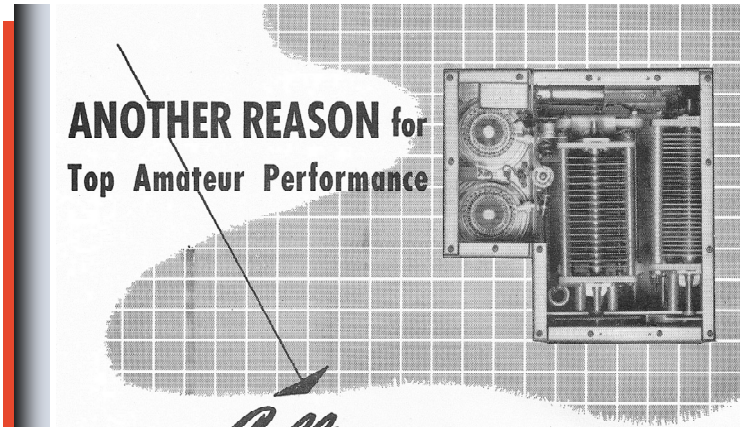
In October, the 75A-4 made an appearance on QSTs cover – but paired with a Johnson AM transmitter. Boy, I bet Art threw a fit.

In November of 1957, the Collins ad featured the GDT with the SC-101 and, again, the performance theme. But . . . the big Christmas "bang" was about the new KWM-1 and so it was written. The future had turned to the little grey boxes.

In January, June and October of 1958, the ads still hyped the GDTs, but the S-line 32S-1 was pre-introduced in February and then the KWM-1 featured several times. By November, 1958 Collins pulled their ad to the back of the book and ran a three page introduction (Pre-intro) on the S-Line. The Gold Dust Twins were gone. As a featured product line, they had lasted just over three years.

On the surface, it would seem to be a short production run, and certainly not a big financial success. But . . . Oh what a legacy. At the first level, amateur radio had itself a fine transmitter receiver pair that would serve the ham community for more than 60 years. Digging deeper though, we see a product line that gave SAC and the military establishment in the US a safer nuclear air and sea arm, led to the evolution of an entire half century of ground and airborne SSB comm gear, and then Collins Radio's dominance of the SSB communication market (and a lot of profit dollars) for HF SSB military and commercial communication. Not a bad investment .

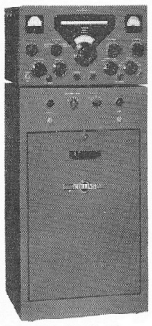
Some would argue that Collins was not first in SSB. Some would say they did not invent SSB. They did not, but they certainly "developed it" – made it viable – for commercial and military purposes. They led big-time in that department. Some would even argue that phasing is a better technology than the balanced modulator/mechanical filter approach chosen by Collins. Hmmmmmm.. Don't see many military airborne, ground or commercial phasing rigs. When it comes right down to it, the precise nature of the balanced modulator, xtal injection and mechanical filter accuracy approach does not require any adjustment, and once built, just sits there and works. Again, Art's engineering had found the solution. Art was not big on elegance always, but he was big on "It's gotta work." - - - - - - - CCA - - - - - - - -



ANOTHER REASON for Top Amateur Performance

Collins KWS-1 SSB LINEAR

75A-4



KWS-1

The reputation for superior performance in the 75A-4 Receiver and KWS-1 Transmitter is no accident. Many problems were met and solved to give you this top Amateur team.

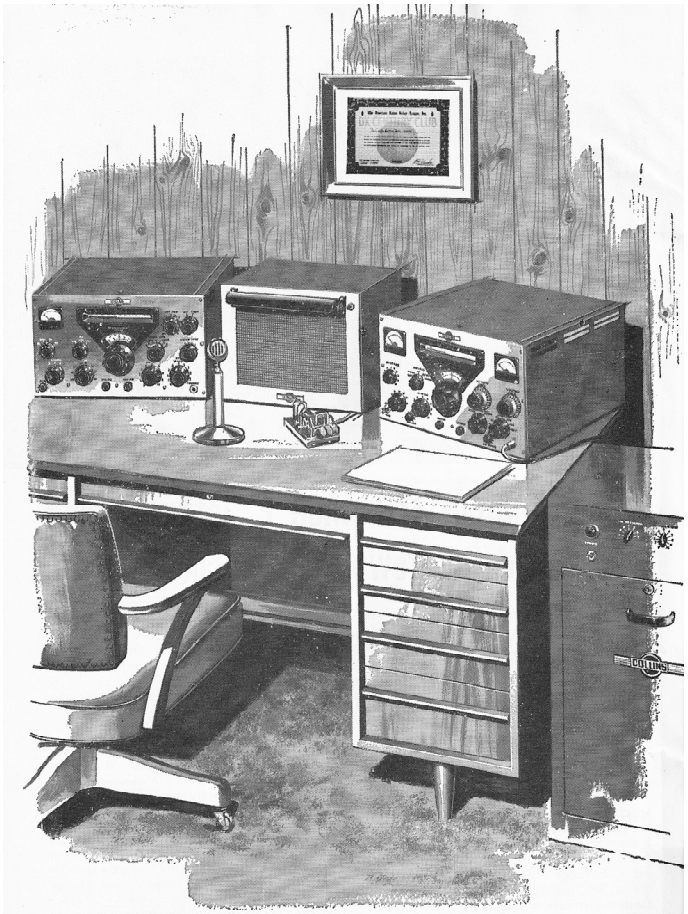
For example: Collins engineers wanted to design a *table-top* kilowatt SSB transmitter. In order to do this, they first had to design a superior linear amplifier in a small package. The result is the Collins KWS-1 linear — efficient, compact, with exceptionally low distortion.

FEATURES

- Inverse r-f feedback used to improve distortion generated in the PA and driver. Third order distortion products better than 35 db down.
- ALC (Automatic Load Control), a circuit similar to AVC in a receiver, prevents modulation peaks from driving the PA into distortion. This permits a high average percentage modulation.
- Bridge neutralizing circuit used to eliminate regeneration and instability.
- Two 4X250B tetrodes used in Class AB1 operation for optimum linearity and low drive requirements.
- Combination Pi-L output network results in excellent harmonic attenuation. This network is continuously tuned and requires no bandswitching.

For complete information and specifications plus price data, contact your nearest Collins distributor.

COLLINS RADIO COMPANY, Cedar Rapids, Iowa



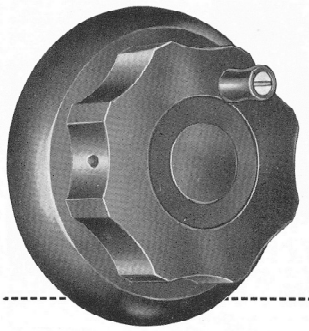
A NEW EXPERIENCE AWAITS YOU IN SSB

Collins CREATIVE LEADER IN COMMUNICATION

ANNOUNCING

Collins Gear Reduction Tuning Knob for

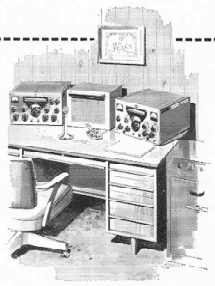
new fine tuning



New ease and accuracy in Sideband tuning are featured in Collins Gear Reduction Tuning Knob for the 75A-4 and KWS-1.

Operating on a 4 to 1 ratio, this quality accessory to the top SSB transmitter-receiver team eliminates the Dial Drag and has no detectable backlash. After simple installation, you'll experience smoothness unsurpassed in tuning any type signal—SSB, CW or AM. The Knob is also adaptable for best tuning of the earlier models in the 75A series.

Available soon at your nearest distributor—$15.00.



It's easy, smart to own Collins

You can now operate the finest SSB station while taking up to 18 months to pay small installments. This is a *sound investment* with Collins' consistently top trade-in value and the resulting low cost per day. Ask your Collins distributor for the figures today.

Visit Collins exhibit at the National ARRL Convention in San Francisco July 6, 7 and 8.

Collins CREATIVE LEADER IN COMMUNICATION

Something new in the picture

COLLINS SC-101

Station Control System

The superior performance of Collins SSB is smoothly coordinated into an orderly system with Collins SC-101. It provides the necessary equipment to connect the transmitter and receiver, beam direction indicator, beam control, phone patch circuit, standing wave ratio meter and remote selection of any one of six antennas.

Like all Collins equipment, the SC-101 can be yours now on the Collins convenient Time Payment Plan. Contact your nearest Collins distributor for complete details.

Collins CREATIVE LEADER IN COMMUNICATION

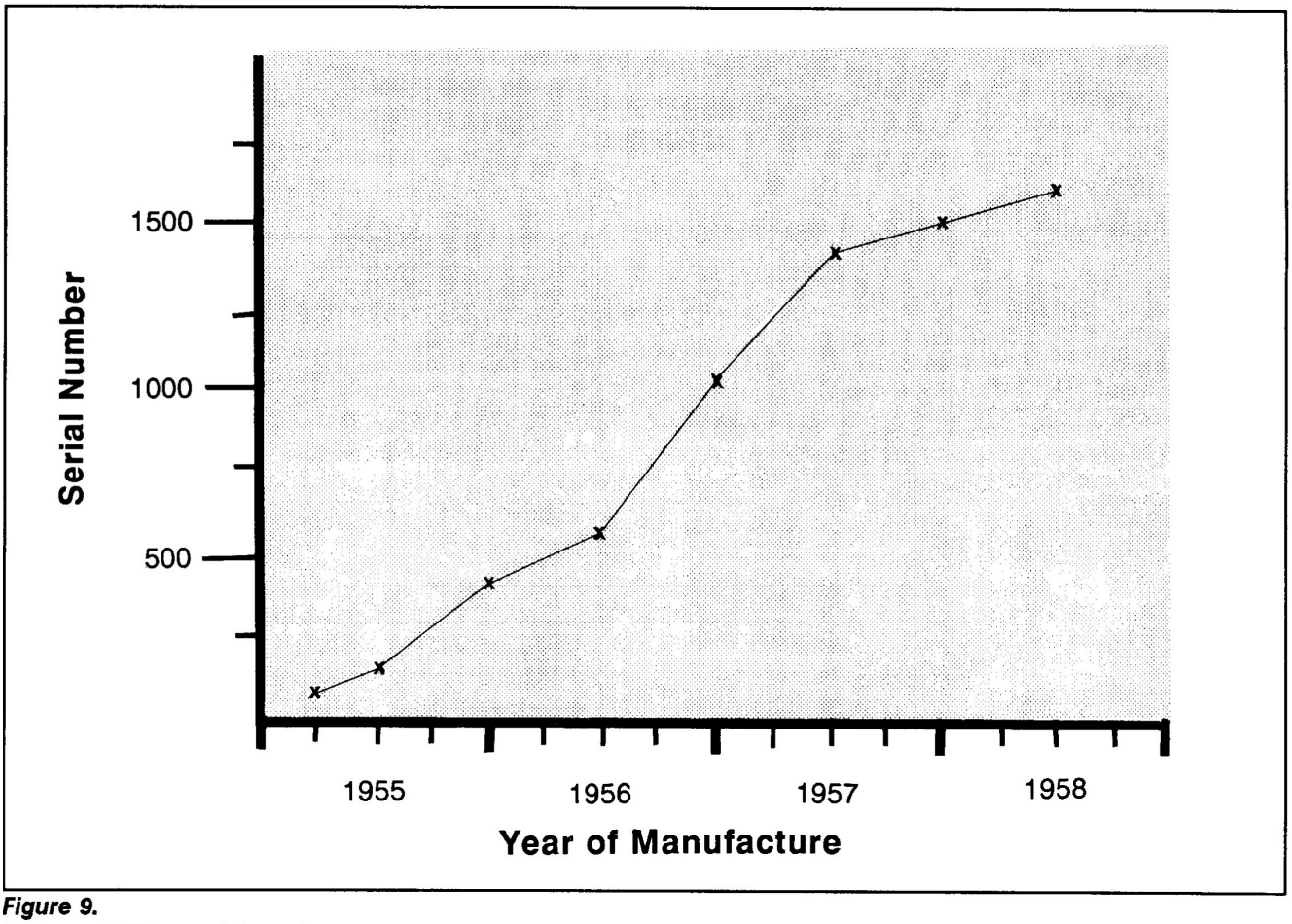
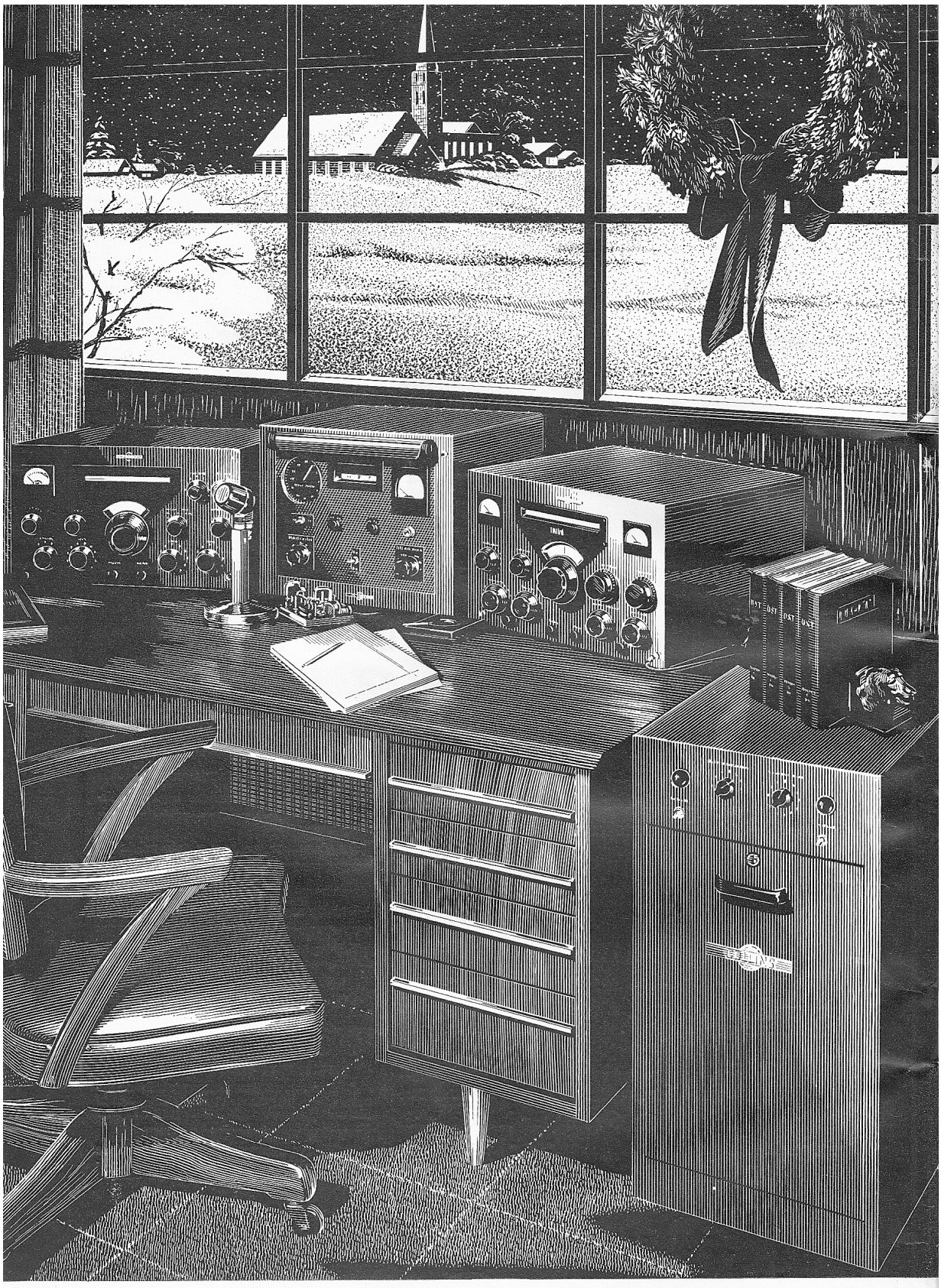


Figure 9.
Estimated KWS-1 serial number vs. manufactured date.

In closing, I hope this helps as you work on, and enjoy, your KWS-1s. I look forward to hearing from you via the survey or otherwise.

de N7OTQ



Best Wishes for the Best Christmas Ever

A COLLINS SSB rig can be yours now with Collins time payment plan.