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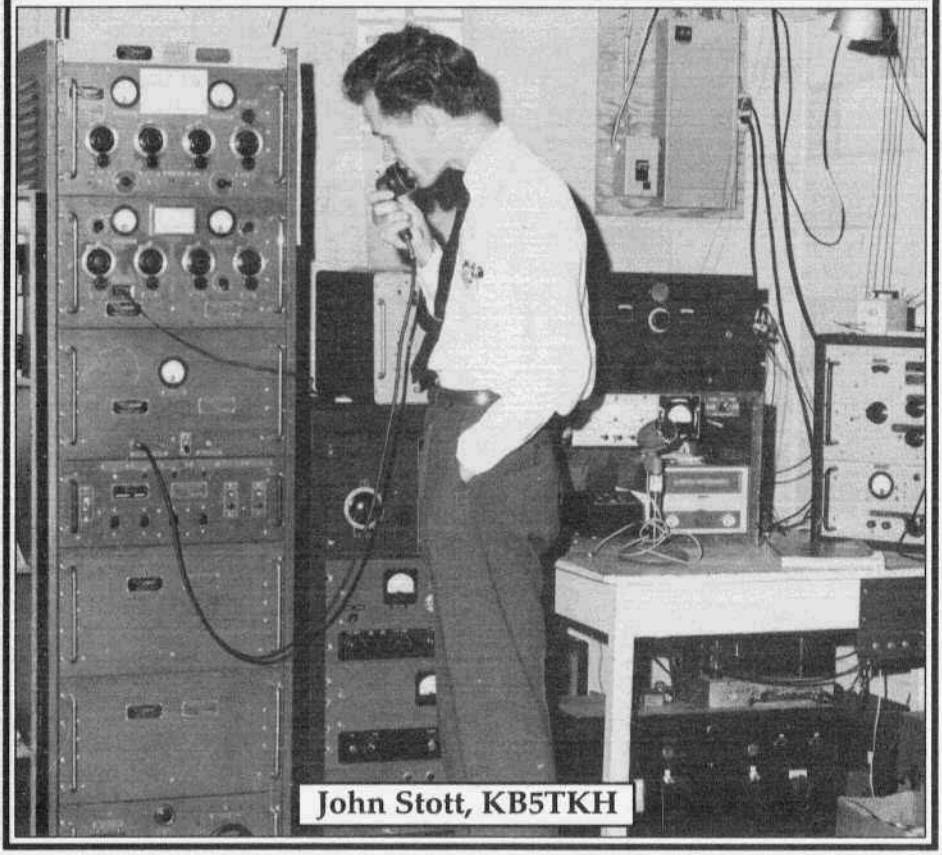
ELECTRIC RADIO

celebrating a bygone era

Number 106 February 1998



John Stott, KB5TKH

ELECTRIC RADIO

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Electric Radio is published primarily for those who appreciate vintage gear and those who are interested in the history of radio. It is hoped that the magazine will provide inspiration and encouragement to collectors, restorers and builders.

We depend on our readers to supply material for ER. Our primary interest is in articles that pertain to vintage equipment/operating with an emphasis on AM, but articles on CW and SSB are also needed. Photos of hams in their hamshacks are always appreciated. We invite those interested in writing for ER to write or call.

Regular contributors include:

Walt Hutchens, KJ4KV; Bill Kleronomos, KDØHG; Ray Osterwald, NØDMS; Dave Ishmael, WA6VVL; Jim Hanlon, W8KGI; Chuck Penson, WA7ZZE; Dennis Petrich, KØEOO; Bob Dennison, W2HBE; Dale Gagnon, KW1I; Rob Brownstein, K6RB; Don Meadows, N6DM; Lew McCoy, W1ICP; Kurt Miska, N8WGW; Warren Bruene, W5OLY; Brian Harris, WA5UEK and others.

Editor's Comments

The Eighth Annual Electric Radio/N2KSZ Memorial 160-Meter AM Contest held on Dec. 27/28 was a big success. Here are the results: Michael "Brownie" Brown, W8DJY, won first prize with 85 points. He said, "I really enjoyed this 160-Meter Jamboree. The contact I made with Denny, KØRAV, who was running 12 watts using a Globe Trotter, was just terrific. I was running a DX-100 transmitter and an HQ-129X receiver. The antenna was a dipole. What a great weekend!" Second prize goes to David Humbertson, W3NP, who scored 57 points. He commented that CO5FP, near Havana was heard by quite a few AM'ers during the contest. Larry Szendrei, NE1S, won third prize with 29 points. Congratulations to all the winners and thanks to all the entrants who sent in logs. Certificates and copies of Ray Moore's new book, "Communications Receivers, 4th Edition" will be going out to the winners in the very near future.

The next contest we're planning is for 15 meters. I'd like to receive some input on what weekend would be best during the month of April. It would be best to have the contest on a weekend that will be free of other contests. I'll announce the dates in the March issue. Then in the April issue I'll announce the dates for the "Second Annual ER Sponsored Vintage Field Day" to be held in June. This year I want to give everyone lots of notice. I welcome any input on this as well. Last year we held VFD on Father's Day and that was a mistake. If anyone has suggestions on how we can make VFD better this year please let me know.

The article in last month's issue on Supermodulation drew a tremendous response. We received many letters, calls and e-mails. Unfortunately, I don't have the time to respond to everyone; let me just thank everyone and say that I appreciated all the comments.

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COVER: John Stott, KB5TKH, (then K8LXU) in his shack back in 1965. The big rack-cabinet transmitter is the BC-640 which many hams used on 2 meters. The photo was taken by Vern Wolfe, NØENS.

Looking Back

by Lew McCoy, W1ICP
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Finally, we are starting to get some results from the new sun spot cycle. I cannot help but do a lot of reminiscing as I tune around on the 10 meter band. I was first licensed just at the end of WW2 and started operating immediately on 10 meters. I had built a rig, CW only, using a 6AG7 oscillator (crystal of course), into a 6L6, which served as a multiplier, and then drove an 807 to about 50 watts output. My class of license was Class B, which had some limitations (which I certainly didn't like but the only answer was to wait a year and then take the Class A exam). Meanwhile, Class B operators were permitted to run narrow band FM on 10 meters so I guess I was a phone man at heart. I acquired my first FM rig - I believe it was a SONAR - from Allied Radio in Chicago. We were allowed to operate FM phone above 29 MHz - excuse me, make that MC-Megacycles, Hertz was not honored until much later.

I clearly remember calling my first CQ (DX) on 10 meters-I made several calls and finally a station, HZ1AB, came back to me. I might add that this was my very first DX contact. I also remember the guy at HZ1AB asked me to make a phone call for him and I remember piping the phone audio out to him by holding the phone up to my D-104 - and it worked. Of course I didn't realize that such transmissions - not even called phone patches - were illegal in those days.

I was new to ham radio and just waiting to be "imprinted" by the hobby. Of course I assume that 10 meters would always be open like it was then - I had to learn the hard way about sunspots and cycles. But I was ignorant of all these nuances of amateur radio and I quickly became determined to become an outstanding DXer.

My first goal was to get a good antenna. Bill Schooly, who was an engineer with a broadcast station, had a welding setup and he put together a 3-element beam for me made from electrician's thin wall tubing. I mounted the antenna on my roof and ran two lines down to a wheel (from an old sewing machine) and used the wheel to rotate the beam. Meanwhile, my mentor (or should I say "Elmer") was W9RRX who ran very high power and was a dedicated DXer. I fashioned myself after Bob, W9RRX.

It wasn't long before I had power, a pair of 810s modulated by a pair of 805s, a beautiful big rack and panel job. I recall using my existing transmitter, the 807, to drive the 810s. Everyone told me I couldn't get enough drive but nobody bothered to tell me that I shouldn't run 1000 volts on the 807, but 807s were cheap in surplus.

Ten meters was a marvelous band. I quickly approached DXCC plus WAZ. Here is a sample of page of my log, this is one day, actually about six hours of operating. C1CH, TF3EA, G2AAU, VU2AF, F8KI, G8SB, UA0VH, LA2UA, J9ABK ,GM5KQ, XZ2KM, MD5AF, UA1BE, G2HAC, G2RH, and HB9BE. I did a little more than a year of operating as W9FHZ. Business got tough so I decided to move to Missouri and try my luck at electrical contracting. The trouble was that everybody else thought they could make a living out in Missouri too and there was just not enough work to go around. So, I had a lot of free time and did an awful lot of operating on 10 meters and 75 as WØICP, my new call. Ten would open up early in the morning and stay open until quite a while after dark.

I had not sent my W9FHZ cards into

This is my first station setup (W9FHZ) at Blue Island, Illinois, in 1946. There's a few things in the photo I'd like to comment about. First of all, if you look very carefully at the wall on the left you'll see two ropes. These ropes rotated my 10-meter beam. I don't suppose anyone uses this method today but it was really very simple and worked quite well. Something else I'll comment on is the ashtray next to the mic. Back then, even as a young man, I smoked 3 packs a day. I didn't quit until the early '60's. I know that if I would have continued to smoke I probably wouldn't be around today. [Editor: Lew will be 82 in June.]

ARRL until after I had moved to Missouri. I knew the top Dxers around the country and I realized that I had acquired well over 100 countries on 10 meters. I finally sent my cards into ARRL and received DXCC number 30. Charlie Mellen, W1FH, had gotten Number 1, and later, when I went to work at ARRL I checked and found that if I had been prompt, I would have obtained DXCC, not number 1, but number 2. But more important, I realized that I was the only one who had gotten all 100 plus on 10 meters. It would be years before the League started to issue single-band DXCC awards.

So here I am still around for Cycle 23 and starting to get excited about 10 meters again. I've been monitoring 29.0 and it's really exciting to hear the AM activity when the band opens up. I haven't experienced any great openings but expect that conditions will be much better next winter.

My present station consists of all the latest gear with all the bells and whistles (and I don't turn my beam with ropes and wheels anymore) but I still have a few pieces of vintage gear. I'm going to set up a ten-meter AM station using a Viking Ranger and an SX-28. I plan to spend a lot of time over the next few years operating up in the AM window - 29.0 - 29.2. When you hear me on, please give me a call. W1ICP

ELECTRIC RADIO IN UNIFORM

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Review of "RADIO NEWS, Special U. S. Army Signal Corps Issue", November 1942.

It's 1942, the U.S. has been at War for less than a year, mobilization is well underway, and patriotic fervor and support to the war effort are the order of the day. In the latter part of that year, the Ziff-Davis magazine "RADIO NEWS" published the first of two special wartime Signal Corps issues, proudly presented (in the words of the editor) to "...one of the most brilliant and powerful branches of the American armed services." This article is a review and commentary on this publication.

OVERVIEW

The special November 1942 issue is made up of 284 pages devoted to thirty-two Signal Corps related articles and advertising by more than 200 companies. Most of the articles are written by military authors and the issue includes a short introduction by Under Secretary of War Robert P. Patterson.

The issue begins with a series of five historical articles tracing the history of the Signal Corps from its establishment in 1860 up to the start of WW-2. This section is followed by two articles on "The New Signal Corps" and "Radio in This War." A very interesting six-page color photo section comes next followed by the remaining articles covering such topics as training, equipment design and development, photography, procurement and wire communications. A full table of contents is included at the end of this (ER) article.

EARLY HISTORY

The lead-off article entitled "How It All Began" is by Maj. General Dawson Olmstead who became Chief Signal Officer in 1941. Earlier, Gen. Olmstead (then a Colonel) played a pivotal role in the decision to adapt the Hallicrafters HT-4 into the Signal Corps inventory as the famous BC-610 (see Ref. at end). In his article, Gen. Olmstead sketches the Corps' beginnings in 1860 and briefly describes activities of the organization up through the Spanish and American War.

The first Signal Officer was one Maj. Albert J. Meyer who was originally trained as a surgeon. In the beginning, wire telegraphy and signal flags represented state-of-the-art technology. The Corps introduced the use of balloons during the Civil War and the crossed signal flag insignia dates to that period. The heliograph was introduced and perfected during the Indian campaigns in the Southwest. During the 1880s the Signal Corps was also engaged in meteorological research including the establishment of data gathering sites in the Polar regions of Alaska and Canada. Maj. Meyer subsequently rose to the rank of Brig. General and served as Chief Signal Officer until his death in

1880. Ft. Meyer, Virginia is named in his honor (a fact that I did not know before despite being a long-time area resident).

The 1890s and early 1900s saw the adoption of telephone technology and a significant expansion of wire communications. One article reports that by 1900, 3475 miles of land-line and submarine cable were being maintained by the Signal Corps. The use of balloons (abandoned after the Civil War) was also reintroduced during this period, and tests with the "Wright Flyer" began in 1908.

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Experiments with radio began in 1899. Early systems were successfully operated in San Francisco in 1900 and Alaska in 1903. By 1908 the Corps had six stations operating in the United States, eight in Alaska, one in Cuba, two in the Philippines and five on Army transports. By 1916, 105 permanent radio stations were in operation. The first experiments in radio telephony began in 1907 and the first successful test of an airplane radiotelephone set took place in 1917. Two interesting short articles (not listed in the Table of Contents) describe equipment of the period. The first addresses the 1915 type "C" crystal receiver which covered a range of 2400 to 300 meters. The second article describes the Model 1913 Pack Radio Set, a "quenched spark gap" transmitter (wavelength unspecified).

THE FIRST WORLD WAR

World War I activities are addressed in an article by Lt. Milton R. Herr. From the information presented in this piece it would appear that radio, while present and in use, did not play much of a role in this conflict. The author reports the Corps strung more than 100,000 miles of wire in France and handled peak loads of 47,555 telegrams a day during this period. Judging from this article and accompanying pictures, it would appear that signal flags (semaphore and wig-wag), lights, flares and even heliographs were still in widespread use at this time. The article also includes an interesting picture of a radio intercept station in operation and reports briefly on early experiments with tank radios. (A later article notes that the American Expeditionary Forces also made extensive use of commercial wireless and cable services during this conflict.)

BETWEEN THE WARS

The period between the Wars was characterized by reduced budgets and manpower drawdowns. Research and development activities during this period took place at the Signal Corps laboratories established at Fort Monmouth, NJ, in 1917. The Washington to Alaska cable (laid in 1903) was upgraded 1932-34. Alaskan land wire networks were replaced by radio in 1928 as were submarine cable links by 1931. Significant attention was also given to the acquisition, breeding and use of carrier pigeons during this period.

The Army Amateur Radio System (AARS) was established in 1925. After a slow beginning the service was reorganized in 1929 with the primary objective of providing disaster relief radio communications in cooperation with the Red Cross. There were 2500 amateur members by Pearl harbor at which time on-the-air activities ceased. (Does anybody know if WERS was part of AARS?)

THE SECOND WORLD WAR

The War Department Radio Net was established during the interim period described above and by 1942 included over 300 stations covering the continental U.S., Alaska, Puerto Rico, Hawaii, the Philippines, the Canal Zone, Greenland, Iceland, Bermuda and the West Indies. This net along with the Service and Department nets formed the Army Communications Service. Station W-A-R (located in one of the "Southern" states) was the central transmitting and receiving site for this system and fed into the War Department Signal Center in Washington, D.C. This center reportedly handled messages for the War Department and 50 other government agencies.

The Signal Corps Aircraft Signal Service was established at Wright Field, Dayton, OH, "... to handle all research and development, procurement, inspection, storage, and issue of aircraft radio and ground radio used for navigational purposes." The start date is not given but the operation was apparently up and running by the end of 1942. Extensive training activities also took place at this facility.

Four articles and a special "insert" section are devoted to the extensive training efforts that were underway by the end of 1942. (A fifth "training" article entitled "The Greatest Opportunity of All Time" is essentially a pep-talk by a Bell Telephone V. P.) The Corps had four established training centers by the end of 1942 in addition to the school at Wright Field (see above). One of these was at Fort Monmouth and new facilities had been established at Camp Crowder in MO, Camp Murphy in FL and Camp Kohler in CA. There was heavy emphasis on code training, of course, and complete curricula had been developed covering everything from basic mechanical, electric and electronic skills through the installation, operation and maintenance of the complete wire and radio communications equipments and systems in use at the time.

The training insert section mentioned above gave a somewhat more detailed description of the types of schooling an enlisted man could expect to receive and includes many pictures of GIs in class and poking around in various pieces of equipment. Pictures of electronic parts, simple circuit diagrams, test equipment, etc. are also to be seen. This section also included a sales pitch for a two level "pre-service" civilian training program "...to prepare men and women to take positions in the field installations of the Signal Corps for overhaul, maintenance, repair and inspection of miscellaneous Signal Corps equipment."

This program was under the U.S. Civil Service. Entry level selectees received a salary of $1,020 per year which increased to $1,440 at the advanced level.

A short article entitled "Laboratories to Develop Final Victory" describes in a very general way the activities of General Development Laboratory at Ft. Monmouth. Nice pictures of SCR-506 and SCR-508 sets are included but not identified (more on this below). A related article on "Military Radio Design" points up the difficult and demanding design requirements of military equipment and the lengthy and stringent testing such equipment was required to endure. The author goes on to relate the story of the first "Walkie-Talkie" which was assembled by an artillery sergeant on his own and modeled after VHF superregenerative equipment in use by hams at the time. This finally evolved into an operational Army portable field set (unidentified). The article also includes a very interesting picture of what has to be an early version of the BC-611.

Another short article entitled "Procurement" reveals that the Signal Corps catalog of the period covered some 60,000 items including everything from semaphore flags and pigeons to complete 100 KW broadcast stations. The author goes on to report a shortage of industrial capacity to produce transmitters for the War Effort. This was attributed to the fact that most U.S. plants at the time were primarily devoted to the production of home receiving sets.

In "Photo by U.S. Army Signal Corps" we learn that the Corps began work with photography in 1881. In 1942, Signal Corps photographic efforts were the responsibility of the Army Pictorial Service which provided all such services for the Army including equipment and supplies (except for aerial photography).

The Signal Corps Photographic Center was located at Astoria, Long Island, with additional laboratory facilities in Washington, D.C. The Long Island facility included a training school for combat photographers. A major responsibility of the center was the production of training films and film strips. The article reported that 275 different films had been produced over the "past year" and 70,000 prints distributed. Appropriately, most (if not all) of the pictures

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in the magazine are Signal Corps products.

The Signal Corps was responsible for all U. S. meteorological studies and weather forecasts during a 20 year period between 1870 and 1890, but was limited thereafter to military studies and reporting. Beyond this, an article on Signal Corps efforts in this area was not very informative. We learn a bit about radiosondes but nothing on other subjects such as numbers of weather stations, personnel, nets, whether or not the Air Corps had its own reporting system, etc.

Finally, wire communications played a larger part in WW-2 than many readers may appreciate. Wire was immune to atmospheric static and the vagaries of propagation and was also more secure than radio. Extensive resources were devoted to this medium and these efforts are addressed in an article entitled "Wire Communications." Carrier telephony and telegraph, terminal amplifiers, repeaters, field switchboards, and wire laying techniques and equipment in use at the time are briefly discussed. Training was a major concern as well, and the author reports an immediate need for 15,000 additional "pole linemen."

DISCUSSION

I found this special issue of Radio News to be extremely interesting reading but also frustrating. On the positive side, the magazine provides a fascinating glimpse into the premier crisis period of our century and the vast efforts mounted in response. As a devoted "surplus hound" I particularly enjoyed the many fine pictures of Signal Corps equipment in complete form and as originally configured. In particular, the issue includes good views of complete systems such as the SCR-197, 245 and 193 that I had never seen before. Some equipment appeared again and again, both in articles and advertisements. The most common example of this was the receiver half of the SCR-177B (BC-312 and 314 receivers in a wooden transport/operating chest). I also learned a lot of Signal Corps history that was new to me.

At the same time, I was surprised by how little real information was provided. Most articles were long on rhetoric and vague pronouncements and very short on useful detail. For example, one article solemnly pronounces that "The vacuum tube and the radio wave are instrumentalities of great versatility and great potency. They can be put to use for military purposes in innumerable ways." It was necessary to wade through an awfully lot of this kind of thing to find the all too few interesting bits, especially with the military authors.

I found the pictures to be more interesting than the text but NOTHING is identified. In fact, not a single SCR-***, BC-*** or VT number is to be found anywhere in the entire issue. The SCR-508 and SCR-506 mentioned above are only identified (respectively) as frequency modulated and amplitude modulated "tank sets." An SCR-245 in a beautiful color shot is not mentioned at all, an SCR-299 bears the caption "A complete gasoline-driven motor-generator follows this radio unit." and in a picture of a BC-191 the 211 (VT-4-C) tubes are identified only as "fifty watters." I guess this was in line with the "Loose Lips Sink Ships" philosophy of the period, but it took some poring through TM 11-487, 11-310 and other sources to identify much of the pictured equipment.

Most of the photographs also appeared to be posed with sometimes humorous results. The best of these is a shot of a GI (supposedly) talking into a T-17 mic through a gas mask. We also have the fellow busily "soldering" away holding the iron by the metal barrel and several shots of GIs intently listening to BC-312s that are clearly turned off.

In conclusion, however, I would

highly recommend this special issue of Radio News to anyone interested in WW-2 military communications equipment and Signal Corps history. Unfortunately, the magazine is hard to find and I am indebted to my friend Ted Young, W3PWW, for letting me borrow his copy. **ER**

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A New Approach to Servicing the 516F-2

by Edwin M. Schaad, W3WDF
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There are many sick Collins power supplies in the field powering the S-Line and the KWM-2( ). After a period of time and 24 to 36 years of reliable service, the electrolytics and that other capacitor, the .05 MFD 1000 DCWV, are deteriorating and collectively or individually becoming unserviceable. The operator may not even be aware of faulty capacitors developing unless it is advised that there is a hum on the signal.

The "New Approach" to servicing the 516F-2 is obviously not for the individual owners and it is not suggested that they follow it. The equipment described is just far too expensive for everyone to own. The Analysis Unit was developed and the Sencor capacitor tester purchased because the author restores many, many 516F-2 power supplies.

The first part of the new approach is by initially scrutinizing the power supply with test equipment specially designed (Figures 1 & 2) to read and compare all circuit data developed from a near perfect 516F-2 referred to as a Standard. The test equipment was designed as the Collins 32S( )/KWM-2( )/516F-2 Analysis Unit hence referred to as the Analysis Unit. The Analysis Unit will provide a great deal of information about the condition of the 516F-2 under examination, and not just a means for a quick-fix of the 516F-2.

A word about the establishment of a standard and its data, the related data of the 516F-2 under test, and the description of the primary power facility and of the Analysis Unit functions. First a search was made to obtain one of the latest 516F-2 models manufactured about 1973 or 1974. A clean slightly used one was obtained. All resistors were examined to ensure that they were within tolerance. Each capacitor was tested to ensure conformity with EIA (Electronic Industries Association) data and manufacturers' specifications, more on this subject in the second part of the new approach. The 5U4 and 5R4 tested were well within the acceptance value. (Many Collins collectors will not convert solid-state rectifiers.)

Now that the standard has been checked for acceptable components, it follows to make the most accurate electrical measurements possible with the equipment at hand. It is essential to establish a primary power source to guarantee, within reason, the exact power input upon which the 516F-2 was designed to operate. The local AC power source is connected to the input of a Sola CVS 500 volt-ampere constant voltage transformer with an output of 120 VAC. Since Collins equipment was designed to operate on 115/230 VAC, the output is then connected to a General Radio type 100-Q Variac and adjusted to 115 VAC. All data taken from the standard was measured with the Analysis Unit and recorded as a standard to compare with other power supplies to be tested as outlined below. The Analysis Unit has ten Simpson meters for observation and recording. They consist of: AC Wattmeter, AC Line Ammeter, AC Line Voltmeter, Bias DC Voltmeter, Filament AC Voltmeter, Filament AC Ammeter, Lower Plate Voltmeter, Lower Plate Current Meter, Final Plate Voltmeter, and a Final Plate Current Meter.

The 516F-2, under test, draws its primary power from the Analysis Unit to

Figure 1.

Figure 2.

enable measurement of the nominal power consumed and levels of line voltage and current. The AC power circuit in the Analysis Unit is totally isolated from the rest of the test circuits except to power the muffin fan and to turn on the 516F-2. The Analysis Unit has the ability to turn on or off the 516F-2 from a selective switch that will empower either an exciter and its metering or the dummy loads and their respective metering. It is impossible to switch both dummy loads and exciter power at the same time. The on and off selective switch bridges terminals 5 and 7 on the 11 pin male recessed receptacle in the

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Analysis Unit which the high voltage cable from the power supply is plugged into. The AC power to the Analysis Unit is enabled by a double pole single throw switch from the line cord. From there to a 4 ampere fuse and to a pilot lamp, then to the wattmeter complex and through the AC current meter, to the AC voltmeter and out to the 516F-2. The wattmeter has a double pole single throw shorting switch which protects the current coil. The other leg of the switch shorts across the AC line current meter terminals. This is necessary in case of any severe shorts within the 516F-2 upon initial turn on.

The Analysis Unit may be power switched, in one operation, disconnecting all circuits from their metered dummy loads to straight through to the exciter while at the same time maintaining the individual metered circuits to the exciter. The bias circuit remains metered in both modes and no dummy load is involved. Should an exciter require examination, the particular Collins Manual, Section 4, Voltage Charts should be consulted.

In the examination of the 516F-2 only, there are four progressive steps to be taken with the Analysis Unit. In the preparation for the tests, all individual dummy load circuits are to be switched to the off position. Ensure that the exciter-off-load power switch is in the off position, and that the master exciter/load switch is in the load position. The FIRST STEP is to turn on the switch for the line power to the Analysis Unit then turn on the 516F-2 power at the exciter-off-load switch to the load side. (Having blown no fuses, etc., switch off the watt meter protect switch). This will enable all voltmeters to read the static no load voltage of all the circuits plus the no load line current and the power at wattmeter. (This initial step should be recorded and progressively used to compare with other standard data).

The SECOND STEP is to switch on the dummy load to the filament circuit. Note the current and any voltage drop across the rest of the circuits.

The THIRD STEP. Switch on the dummy load for the lower plate circuit. Leave the previous step and this step as well as the last step in place in order to compare voltage drop, the plate current and the total power consumed under full load conditions.

The FOURTH STEP is to switch a dummy load onto the final plate circuit. There will be a significant voltage drop in the final plate circuit (this switch activates a vacuum relay switch to quench any arcing and to keep the high voltage from the load control switch). Observe all the fully loaded circuit readings and look for excessive voltage drop and the total power consumed. If the total power as read on the wattmeter exceeds the standard data by 5% or more, there is a problem of leakage or a short. The first time the Analysis Unit was used with the standard data, the wattmeter read about 25 watts over the standard. The final plate voltage was somewhat higher than the norm. It appeared to be a shorted but not grounded choke. It was shorted except when examining C1, it represented a short across L1. Quick fix? Well, maybe... However, that's not the end of the tests, examination and servicing the 516F-2.

The Analysis Unit will not identify the degree of leakage in the filter capacitors of the plate circuits that may otherwise disqualify them individually from service unless the leakage, for example, is cumulatively severe perhaps involving all three capacitors C2, C3 and C4 in which case the final plate voltage and current would noticeably fall across its dummy load and the AC power consumed would rise above the 5% margin.

The Analysis Unit can be depended upon to identify faulty plate transformers, chokes, poor grounds, carbon paths within rectifier sockets, drifting CR1

Date _____ 516F-2 Power Supply - Serial No. _____ Name of Owner _____

☐ Old Capacitors in the 516F2

☐ New Capacitors for the 516F2

SENCORE LC102 CAPACITOR - TEST REPORT* - IN OR FOR THE 516F-2

Circuit Symbol	Capacitor Identification	Manfacturer	% of Tolerance Value	Kind	Actual value in MICROFARADS	Dielectric Absorption in %	Equivalent Series Resistance In OHMS	Capacitor Leakage in MICROAMPERES	Accept/Reject Good Bad	Notes
C 1	05 MFD 1000 DCWV	Sprague Mallory	+50/ -15	Paper Ceramic Film		See notes Ceramics up to 10%	N/A	Ceramic only (see notes) Reject all others for leakage		Reject all types of paper and film capacitors for any leakage and any dielectric absorption exceeing 1% Ceramic disc capacitors voltage ratings above 50 working volts should have less than 1 microampere of leakage
C 2	30 MFD 400 DCWV	Sprague Mallory	+40/ -10	Electrolytic		Up to 15%	22 MFD 120 33 MFD 8.040	22 MFD 563* 33 MFD 689*		◊ EIA Standards maximum in OHMS *In MICROAMPS - maximum from manufacturer's data
C 3	30 MFD 400 DCWV	Sprague Mallory	+40/ -10	Electrolytic		Up to 15%	22 MFD 120 33 MFD 8.040	22 MFD 563* 33 MFD 689*		◊ EIA Standards maximum in OHMS *In MICROAMPS - maximum from manufacturer's data
C 4	30 MFD 400 DCWV	Sprague Mallory	+40/ -10	Electrolytic		Up to 15%	22 MFD 120 33 MFD 8.040	22 MFD 563* 33 MFD 689*		◊ EIA Standards maximum in OHMS *In MICROAMPS - maximum from manufacturer's data
C 5 Green	30 MFD 400 DCWV	Sprague Mallory	+100/ -10	Electrolytic (Dual)		Up to 15%	22 MFD 120 33 MFD 8.040	22 MFD 563* 33 MFD 689*		◊ EIA Standards maximum in OHMS *In MICROAMPS - maximum from manufacturer's data
C 5 Red	15 MFD 400 DCWV 16 MFD 475 DCWV 20 MFD 450 DCWV	Sprague Mallory	+100/ -10 +80/ -10 +80/ -10	Electrolytic (Dual)		Up to 15%	15 MFD 180 16 MFD 150 20 MFD 120	15 MFD 463* 16 MFD 535* 20 MFD 520*		◊ EIA Standards maximum in OHMS *In MICROAMPS - maximum from manufacturer's data
C 6	10 MFD 250 DCWV	Sprague Mallory	+100/ -10	Electrolytic		Up to 15%	10 MFD 27 ◊	10 MFD 300*		◊ EIA Standards maximum in OHMS *In MICROAMPS - maximum from manufacturer's data
C 7	10 MFD 150 DCWV	Sprague Mallory	+100/ -10	Electrolytic		Up to 15%	10 MFD 27 ◊	10 MFD 210*		◊ EIA Standards MAXIMUM in OHMS *In MICROAMPS - maximum from manufacturer's data

* All test accept/reject data are established within the publications of Sencore Operation/Application Manual and the Sencore Servicer's Handbook of Component Analyzing. These data are determined by the EIA and Manufacturer's specifications. The same data has been designed into the Microprocessor of the LC-102 and will display visually the actual values of each element of the capacitor examined along with accept/reject symbols "good" or "bad". This function has been designed to inform the owner why the capacitor(s) were removed and the status of new capacitors installed. This protects the repairman and the owner from obtaining new capacitors where extended shelf life or a production defect may have caused a capacitor to be out of tolerance and /or beyond serviceable limitations.

continued next page

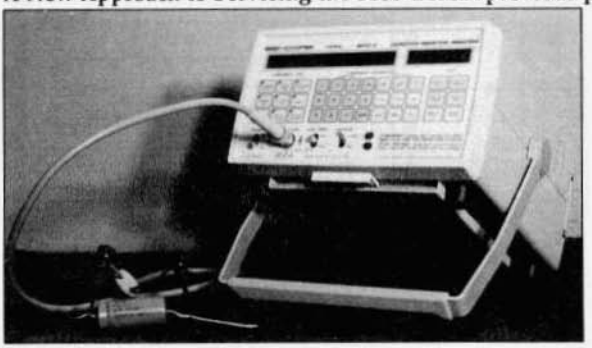

Figure 3. SENCOR LC102

selenium bias rectifier, open resistors, and the like.

To do a good job of servicing and, hopefully, keeping within the dictates of the owner, the servicer should, on older models, replace the obsolete bias circuitry. On later models, the improved bias circuit is within the newer 516F-2. This involves the replacement of resistors R8 to a 3300 ohm 2 watt, R9 to a 5000 ohm potentiometer, R10 to a 5600 ohm 2 watt and, if you will, replace that old CR1 selenium rectifier with a silicon diode, e.g., 1N4007. This will improve the bias capture area and eliminate bias voltage from drifting downhill.

Check and align, if necessary, the chassis rails. They are found mostly out of alignment due to shipping the 516F-2 in the cabinet without proper packaging. Replace the gray or black power cord, if required. They are found to be either color dependent upon date of manufacturer and where produced. Remove the old metal shell at the end of the high voltage cable and replace with the later model strain relief type manufactured by WPI. Check to make sure the high voltage cable is secure within the nylon cable strap as it is fastened to the chassis for retention. Remove the three threaded rods securing the three bleeder resistors R4, R5 and R6. Discard the old baked, burned out and broken fiber washers and replace with Seastrom teflon shoulder washers. They will outlast the 516F-2. Clean the three threaded rods from corrosion as they are made of brass not stainless steel. Install a chassis ground terminal on the front right of the chassis if none is found. Install the C8 and C9 ceramic capacitors (Sprague 125LS type) to each side of ground on the primary power input. These are RF bypass capacitors found on the very late models with serial numbers in about the sixty thousand range.

THE SECOND PART OF THE NEW APPROACH comes as a very important phase of testing. In order to ensure that the 516F-2 has the capability for long term reliability as it had demonstrated in the past 25 to 35 years, each electrolytic capacitor and others must be isolated by detaching one of the two conductors (either polarity) for thorough testing.

Here, now, let's take a moment to look back to those colorful and interesting years of the All Electric AM Broadcast Band Radios of the early thirties and forties and to the radio servicemen who serviced them. Perhaps they had in their possession one of the following: Solar Capacity Analyzer, Thordarson Condenser Capacity and Leakage Tester, Potter Universal Condenser Tester, Model 76 Capacity Analyzer by Aerovox, Tobe Condenser Analyzer, Capacitor Analyzer BF-50 by Cornell-Dubilier, Telohmike by Sprague, HeathKit Condenser Checker and EICO model 950 resistance-capacitance-comparator bridge. All of these fine old testers of their time have been rendered obsolete when compared to the very best capacitor testers available today. One of the reasons being the great expansion in the electronics field and the necessity for greater reliability. The electronic component and parts industry

continued on page 38

12BW4 Rectifier Tubes in the Collins R-390/390A

by Dexter Francis, NØYLJ
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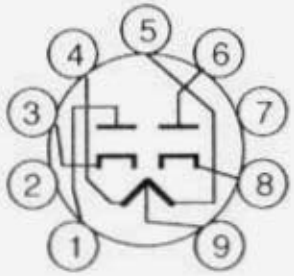
(801) 363-8823

When I finally added a Motorola R-390 to my collection (S.N. 960) I found that the power supply needed a full rebuild. Rather than stay with the increasingly rare and costly 26Z5Ws, I decided to try to find a less expensive and more common full wave rectifier tube. A pair of nine pin miniatures, with 12 or 13 volt filaments in series, with similar base connections to the 26Z5W, would be perfect. The 1964 RCA Tube Data book (RC-23) indicated that the 12BW4 was a good candidate, having a similar base diagram and a 25% higher peak plate current capacity. The only big "hitches" were the differences in the base connection diagrams; The 12BW4's cathode connection is on pin 9, the 26Z5's cathodes are on pins 1 & 8. The 12BW4's plates are on pins 1 & 7, the 26Z5W's plates are on pins 3 & 8. If not for the 26Z5's filament center-tap, you could just connect pin 1 to pins 6 and 7, pin 3 to pins 8 and 9 and rewire the filament supply to provide 12 volts.

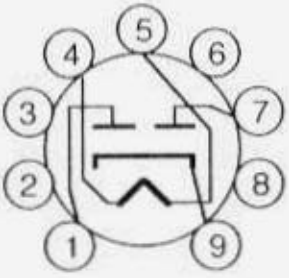
26Z5W Characteristics
(From GE "Essential Characteristics")
Base: 9BS
Envelope Height: 1 15/16"
Filament: 26.5 V @ 200 ma.
(Total 400 ma. load on supply.)
Voltage Drop: 22 Volts at 100 ma. Max DC current: 50 ma. (per plate)
PIV: 1250 Volts.
Max Peak Current: 300 ma.(per plate)
RMS supply voltage: 325 (per plate)
Note that a 26Z5 (9BS) has two separate cathodes with a pin for each (3&8) while the 12BW4 (9DJ) has one cathode connection (pin 9).



26Z5W Base Connections

The R-390 did not take advantage of the center-tapped filament (pin 9) on the 26Z5W by connecting it to the center-tap of the 25.2 volt filament winding of the power supply. (Pin 9)

12BW4 Characteristics
(From RCA Data book RC-27)
Base: 9DJ
Envelope Height: 2 3/8"
Filament: 12.6 V @ 450 ma.
(Estimated from 6BW4 specs as the data book shows 6.3 V @ 900 ma.!!!)
Max DC current per plate: 62.5 ma.
PIV: 1275 Volts.
Peak Current: 350 ma. (per plate) RMS supply voltage: 325 (per plate)



12BW4 Base Connections

The 26Z5W had an internal resistance of 220 ohms at 100 ma. (22V = 0.100 A x 220*). The 12BW4 has a total impedance of 82 * per plate or 41 * for two plates in parallel, so it appears the voltage drop across the 12BW4's should be lower than the 26Z5W's.

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AMI Update - February

by Dale Gagnon, KW1I, President

AM International starts the new year with just short of 1100 members. ANI has received mail from as far away as Australia and the UK. There is interest in setting up scheduled times and frequencies for DX AM contacts. Ed Sieb, VA3ES, AMI Canadian Regional Director reports the massive ice storm in January destroyed all his antennas. He wrote, "Oh well, I had plans for new antennas in the spring anyway." Ed is working on a plan for a Canadian AM QSO party. Stay tuned!

One sure sign of next spring's eventual arrival is to find the Dayton Hamvention announcement and flea market applications in your mail. I have contacted the forum committee about getting the old mid-Saturday time and Hara Arena location slot back for the AM Forum. This year's forum staff is new and, so far, has been very encouraging.

I guess you would classify the Collins Collector Association Net, AM Activity Night, 3875 kHz, on January 8 as a great success. The frequency was a mass of heterodynes for much of the evening! Amateurs from all over the US called in to contact WØCXX, Art Collins' old call sign, now the call sign of the Collins Amateur Radio Club in Cedar Rapids, IA. This was the second occurrence of an AM Activity Night. The low noise winter conditions we had hoped for here in the Northeast were not realized but WØCXX signals were great.

Here are highlights of the logs received from the 1997 Thanksgiving AM Jamboree. Tom Thomson, now W9CHP, sent in his log of 27 contacts, all on 40 meters. He reports that 40 meter AM is a new home on the weekends for a lot of the midwest AM ops. Bruce Howes, KG2IC, made 34 contacts on 160, 75 and 40 meters. He is new to AM having been active only eight months. He really enjoyed the Jamboree and concludes his letter with, "It's great to be an AMer". Michael Brown, W8DJY, sent in a log with 37 contacts for 75 and 20 meter contacts. About 2/3 of Brownie's contacts had AMI numbers. The winning log was from Paul Courson, WA3VJB, with 45 AM stations worked, 28 being AMI stations. Paul's contacts were on 160 and 75 meters. It's a privilege to receive these logs and read the comments and see the great variation of equipment in use.

If you have changed your call sign, AM International will issue you another certificate if you promise to display it prominently in your shack!! A number of AM ops have lost track of their AMI certificate number because they did not immediately frame and hang their certificates in an important place in their home. If you are one of these send mail to dgagnon@concentric.net and I will e-mail back your number. ER

To join AMI send $2 to:
AMI
Box 1500
Merrimack, NH 03054

Collins Collectors Assoc. AM Night

by Paul Courson, WA3VJB

"AM Night" sounded like a great success Thursday, Jan. 8th thanks to good turnout and great band conditions!

75 meters turned long early, with the long haul spreading to 160 meters as well. The event sponsored jointly by the Collins Collectors Association and AM International featured an appearance by the Collins factory club station, W-Zero-CXX, which is the recently reactivated call sign of the late Art Collins. The club was issued AMI number 1000.

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Ten-Meter News.....

From Bob Rose, K6GKU

Hi Gang: Just a note to let you know that K6GKU has returned to his roots of 43 years ago when I made my first out of state phone contact on 10 meters AM. These days the band is open over half the days observed. Openings have been very brief, requiring almost contest like QSO's and occur between 18 and 22Z here in Arizona. I assembled a "just for the hell of it" station in my garage where I restore old radios, using an HQ-129X, a Globe Scout 65A, and a Globe VFO. Antenna is Gap Titan on the back of the property on my little hilltop here in Fountain Hills. Am on Wed/Thurs/Fri/Sun. scanning 28.9 to 29.1. My first contact with W5KD on 17 January, 1998 gave me the same "upper" I got 43 years ago when I had my first 10 meter QSO with WØFWE on 9 December 1955. AM sounds soooooo good.

From Jerry Burns, K1GUP

I've been procrastinating about sending 10M info, so here it is!

Haven't heard too much for the past three weeks or so, but have caught a few openings. As for December, it was great to catch Andy, W5QXX (ex N5JBT), on the 6th. On the 12th, worked WB3CTC and N3RZU (Pa. and Md....pbly e-skip). Didn't check AM much during the 10M Contest, but worked lots on the low end. On the 28th worked W3YCH (Ga) and WØBMQ (Mo). On Jan 1st answered a CQ by WA7CYC in Las Vegas, who was running 4W to a beam. Copied OK for several minutes. Then worked WDØHCO in Dallas (on a G-28). Also have caught Tom, K5ATT (a 10M regular) a couple of times from San Antonio.

Today (Jan 4th) tried 10M, but could stir up no activity, so called CQ on 21.4 MHz. Was answered by Doug, KH6U, in Hawaii...our first QSO since the demise of the previous cycle. He was doing great on his Ranger. Breakers included W4PGX (Fla) and W0CGJ (Mo). I realize that you're collecting 10M data, Barry, but I hope the gang will do what I had to do today when 10M was flat...try 15M!!! If we make some noise, and don't just silently tune the bands, we'll stir up some action. Went to 20M after 15M, and chatted with Doug (VE4BX), who was on his daily sked with W8VYZ. Others broke in there too when they heard the activity! We can't be heard unless we transmit!! Oh, I was using a Valiant and SX-101 for all of these QSO's.

Keep up the great work out there....73

From Ron Watkins, KØETD

Here's my 10-meter report for 1997. On 10-31 I worked KH6U. I was Doug's first mainland contact in 4 years! Also worked KH6IRT that day. 11-8, AE4RF & W3XY; 11-10, W2NRM; 11-16, KK7TV & K7VZP; 12-3, KH6U again; 12-9, WA2IFS, KC4CFE, WQ9A, WB3CTC, WD4TC; 12-10, WØCAB, W5VMJ, KG7XK, N4EDE, K6BIX, W2NRM; 12,11, N7DME; 12,12, WB3CTC; 12,13, KC4TGQ, W1GZS; 12,29, WB2TTC.

My 10-M station consists of an SP-600JX rcvr, Apache xmtr and a rotary dipole at 44 ft.

From N6CSW

Please keep the 10M reports coming. I'll print a page worth each issue. I think it's a lot of fun to hear who's back on 10 now that we're into the new cycle. I've been monitoring 29.0 and have got on a few times when the band has opened up.

My biggest thrill on 10 so far has been working Andy, W5QXX (ex-N5JBT). During the last cycle I worked Andy almost every day or two but hadn't heard him on in several years. It was just great to hear him on 10 again.

GEORGE WATSON, WØLOB, SILENT KEY

It was just a little over a year ago, in the December 1996 issue of Electric Radio, that WØLOB reported the death of Hank Adams, WØAEE. Hank was a charter member of the Colorado Morning AM Net.

On December 24, 1997, the Colorado Morning AM Net lost another active member when George Watson, WØLOB joined WØAEE as a Silent Key. George had been ill for many months preceding his death. This illness forced him off the air, but I am told that he had a receiver at his bedside.

George has a very special place in my memory. It was he along with Dewey, WØZUS who became the first 80 meter AM contact (ER #89) in my 32 years as a ham.

I had the pleasure of meeting George in person at several hamfests and enjoyed many pleasant chats with him on the Colorado Morning AM Net. He will be sorely missed by all whose lives he touched and enriched.

Horst Geipel, WAØNUH

Before George Watson WØLOB passed away he gave Horst Geipel the choice of one of his receivers and transmitters. Mr. Geipel chose the NC-303 receiver and the Johnson Viking Valiant transmitter. He chose the Valiant because it was still on George's work bench, out of the cabinet and still needed some work done to it.

After some trouble shooting and modifications Horst has it up and running. He plans to do some 160 meter work now and also has it running on the 75-M Colorado Morning Net.

I am pleased to report that the audio is very good and his signal now one of the strongest on the net with his G5RV antenna. Horst reports that the NC-303 has improved his receiving with much better selectivity than his home brewed receiver. We hope that he will continue to home brew and modify his station in the future so that we who do not home brew will have someone to look up to in the future. Thanks George.

Orlin (OJ) Jenkins, KØOJ

VINTAGE NETS

Westcoast AM Net: Meets informally, nightly on 3870 at 9:30 PT. Wednesday at 9:00 PM PT they have their formal AM net which includes a swap session. Net control rotates.
California Early Bird Net: Saturday mornings at 8 AM PST on 3870.
California Vintage SSB Net: Sunday mornings at 8 AM PST on 3835
Southeast Swap Net: Tuesday nights at 7:30 ET on 3885. Net control is Andy, WA4KCY. This same group also has a Sunday afternoon net on 3885 at 2 PM ET.
Eastern AM Swap Net: Thursday evenings on 3885 at 7:30 ET. This net is for the exchange of AM related equipment only.
Northwest AM Net: AM activity daily 3 PM - 5 PM on 3875. This same group meets on 6 meters (50.4) Sundays and Wednesdays at 8:00 PT and on 2 meters (144.4) Tuesdays and Thursdays at 8:00 PT. The formal AM net and swap session is on 3875, Sundays at 3 PM.
K6HQI Memorial Twenty Meter AM Net: This net on 14.286 has been in continuous operation for at least the last 20 years. It starts at 3:00 PM PT, 7 days a week and usually goes for about 2 hours. Net control varies with propagation.
Arizona AM Net: Meets Sundays at 3 PM MT on 3855. On 6 meters (50.4) this group meets at 8 PM MT Saturdays.
Colorado Morning Net: An informal group of AM'ers get together on 3876 Monday, Wednesday Friday, Saturday and Sunday mornings at 7AM MT.
DX-60 Net: This net meets on 7290 at 2 PM ET, Sundays. Net control is Jim, N8LUV. This net is all about entry-level AM rigs like the Heath DX-60.
Eastcoast Military Net: It isn't necessary to check in with military gear but that is what this net is all about. Net control is Dennis, WA3YXN but sometimes it rotates to other ops. Saturday mornings on 1995 at 0500 ET. Will move to 3885 for summer.
Westcoast Military Radio Collectors Net: Meets Sunday mornings at 0930 local on 3975 + or - QRM, except the 1st Sunday of the month when the net meets at 2130 local. Net control is Tom, WA6OPE.
Gray Hair Net: The oldest (or one of the oldest - 44+ years) 160-meter AM nets. It meets on Tuesday nights on 1945 at 8:00 PM EST & 8:30 EDT. URL: http://www.crompton.com/wa3dsp/grayhair.html
Vintage CW Net: Tracy, WB6TMY, who started the net and has acted as net control over the past few years is unable to carry on with it because of his new job. The net is temperarily inactive.
Vintage SSB Net: Net control is Andy, WB0SNF. The Net meets on 14.293 at 1900Z Sunday and is followed by the New Heathkit Net at about 2030Z on the same freq. Net control is Don, WB6LRG.
Collins Collectors Association Nets: Technical and swap session each Sunday, 14.263 MHz, 2000Z, is a long-established net run by call areas. Informal ragchew nets meet at 0100Z Tuesday nights on 3805 and on Thursday nights on 3875.
Collins Swap and Shop Net: Meets every Tuesday at 8PM EST on 3955. Net control is Ed, WA3AMJ.
Drake Users Net: Another relatively new net. This group gets together on 3865 Saturday nights at 8 PM ET. Net controls are Criss, KB8IZX; Don, WZ8O; Rob, KE3EE and Huey, KD3UI.
Swan Users Net: This group meets on 14.250 Sunday afternoons at 4 PM CT. The net control is usually Dean, WA9AZK.
Nostalgia/Hi-Fi Net: Meets on Fridays at 7 PM PT on 1930. This net was started in 1978.
K1JCL 6-Meter AM Repeater: Located in Connecticut it operates on 50.4 in and 50.5 out.
JA AM Net: 14.190 at 0100 UTC, Saturdays and Sundays. Stan Tajima, JA1DNQ is net control.
Fort Wayne Area 6-Meter AM Net: Meets nightly at 7 PM ET on 50.58 MHz. This net has been meeting since the late '50's. Most members are using vintage or homebrew gear.
Southern California Sunday Morning 6 Meter AM Net: 10 AM Sundays on 50.4. Net control is Will, AA6DD.
Westcoast 40-Meter Sunday Net: Net control varies. The group meets on 7160 starting at 4PM PT.
Old Buzzards Net: Meets daily at 10 AM Local time on 3945. This is an informal net in the New England area . Net hosts are George, W1GAC and Paul, W1ECO.
Canadian Boatanchor Net: Meets Saturday afternoons, 3:00 PM EST on 3745. For hams who enjoy using AM, restoring and operating.
Midwest Classic Radio Net: Saturday mornings on 3885 at 8AM Central time. Only AM checkins allowed. Swap/sale, hamfest info and technical help are frequent topics.
Boatanchors CW Group: Meets nightly at 0200Z on 3579.5 Mhz (7050 alternate). Listen for stations calling "CQ BA" or signing "BA" after their callsigns.

Nets that are underlined are new or have changed times or frequency since the last issue.

The Heathkit "Chippewa" AB1 Tetrode Linear
Part 1

by Thomas Bonomo, K6AD
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bonomo@cpici.com

After restoring and modifying my Heathkit Mohawk receiver and Marauder transmitter, I decided that I wanted to find a matching linear to complete my Heathkit operating position in my shack. This gave me two choices as Heath sold two different linear amplifiers in "the big green boxes" that would match: the "Warrior" HA-10 and the earlier "Chippewa" KL-1 (with its separate KS-1 power supply).

Chippewa vs. Warrior

You have probably seen the Warrior at hamfests, as it was Heath's most popular early linear amplifier. It's the big, heavy green box with one front panel meter. You may not, however, have seen a Chippewa, which can be distinguished from the Warrior by its two front panel meters. They are much, much rarer.

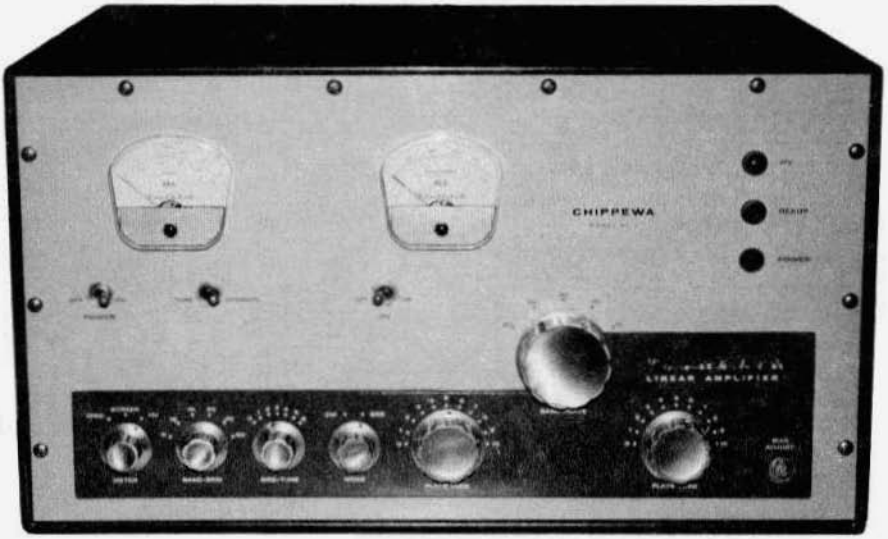
The Warrior was introduced in 1961 as Heath's less expensive replacement for the Chippewa, which only was made in 1960. The Chippewa was regarded by Heath as too big, too expensive, and just too heavy to be competitive in the amateur market unfolding in the early 60s. The Warrior kit was priced at only $229.95, while the Chippewa and power supply kits were priced together at $569.95, a pretty expensive linear for 1960. So, Heath cut costs in the new Warrior by combining the amplifier and power supply into a single cabinet, and by cutting the output power to about half that produced by the Chippewa. While the Warrior used 4 811A triodes to produce 1 KW PEP input (400W AM), the Chippewa used 2 4-400A tetrodes to produce a full 2 KW input legal limit amplifier.

What really distinguishes the Chippewa is that it runs Class AB1, which means that there are screen voltages, grid bias, and other complications not found in most linears. Well, I decided it would really be fun to find the rarer and more complicated Chippewa to complete my station and besides, I really needed another hernia-producing set of boxes to play with (the KL-1 Chippewa weighs 61 pounds and the KS-1 power supply weighs 95 pounds).

Magnificently overdesigned

In his book "Heathkit, A Guide to the Amateur Radio Products", Chuck Pension describes the Chippewa as "magnificently overdesigned." For the most part I agree with this assessment. There is just a lot of "gold-plating" in the design of the Chippewa. Just look at all the knobs and switches on this linear. The Chippewa covers the 80 thru 10 (but not 11) meter bands. It features two large front panel meters, large silver-plated tubing in the final tank coil, a very heavy-duty plate parasitic choke assembly, a centrifugal blower for forced air cooling and an array of lamps indicating the status of the power supply. One panel meter measures plate current, while the other is switchable to read grid current, screen current, or plate voltage.

The KS-1 power supply is very heavy duty compared to those sold with most other 2 KW linears. What a back breaker! It was designed for 866A mercury vapor rectifier tubes and so it includes a



The KL-1 "Chippewa" features tuned and untuned inputs and Class AB1 and Class C operation, requiring only 10 watts input for full legal limit on SSB.

delay relay to allow the tube to heat and vaporize some of the mercury before high voltage is applied. It features an oil-filled hermetically sealed HV plate transformer (to minimize corona effects) and an oil-filled hermetically sealed filter choke for long life and reliable performance (these are probably EPA nightmares, but they appear to be very well sealed). No cheap electrolytics in this power supply either: the HV capacitor is also oil-filled. Interestingly, this power supply uses screw-in lightbulb socket style household fuses instead of the more modern 3AG style fuse used on most equipment of similar vintage. Everything, including the switching relays, is so heavy duty and expensive you get the feeling that you could so some welding with this power supply at the same time you are talking on the radio at the full legal limit. This power supply should last forever. The transformers barely get warm.

There weren't too many commercially sold linear amplifiers which used as many tubes as did the Chippewa: a total of 11. That's right, 11! Its closest cousin is probably the Johnson Viking Thunderbolt, which also used 4-400As but ran Class AB2 whereas the Chippewa ran Class AB1. In addition to the tubes, the Chippewa also used 4 solid-state diodes for bridge rectification of bias voltage. Here's the tube line-up:

2	4-400A	PA Finals
2	0C3	Voltage Regulator
4	0D3	Voltage Regulator
1	6DQ6	Clamp
2	866A	HV Rectifier
11		

Class AB1 and C services

Unlike many popular linears which are configured to run Class B, using zero bias triodes (or tetrodes) in a grounded grid circuit configuration, the Chippewa operates Class AB1 for SSB and AM service. The Chippewa uses 2 4-400A tetrodes for a power input of 2,000 watts PEP for Class AB1 SSB service and 1,000 watts for Class AB1 AM service (AM linear). Power input for Class C CW service is 1,000 watts.

Class AB1 service theoretically provides better linearity and lower TVI than obtained at lower plate voltages or in other classes of operation. A Class

continued next page

The Heathkit "Chippewa" AB1 Tetrode Linear from previous page

Everything is heavy-duty in this overdesigned linear.

AB1 amplifier is one in which the grids are never positive with respect to the cathode. Therefore, no driving power is required - only voltage. A Class AB2 amplifier, such as the Thunderbolt, allows grid current to flow during part of each RF cycle if the applied signal is large and it takes a small amount of driving power. A Class AB2 amplifier has the advantage that it will deliver somewhat more power using the same tubes, but it presents a load to the exciter that is highly variable during part of each r.f. cycle which can cause exciter distortion. A Class AB1 amplifier avoids this problem.

Input configurations

Two different modes are offered for input excitation, depending on how much drive power is available: tuned and untuned (swamped) grid. These modes are conveniently selected from the Grid Band switch on the front panel. As seen in Figure 2, regardless of which grid driving method is used, excitation is fed to the grids of both amplifier tubes through a blocking capacitor and parasitic choke. Bias voltage is conveniently adjustable from the front panel for Class AB1 operation.

In the tuned grid configuration, Class C operation requires an input of 40 watts. But for Class AB1 the tuned grid input requires only 10 watts (voltage equivalent) to produce the full legal limit. I'm thinking of hooking up my Index Labs QRP Plus to the Chippewa just to hear the reactions I get when asked what radio I'm using (". . . . . QSL, I'm running 5W using a QRP Plus on solar power. . . . . uh . . . . . driving a Chippewa linear").

In the untuned grid position, the grid utilizes a high wattage, low resistance swamping resistor. The voltage developed across this resistor provides the required driving voltage for Class AB1 operation. The swamped grid position requires more input power, but saves the trouble of band switching and then tuning the grid input. A full 60 watts peak is required for Class AB1 service using the swamped input. The swamped grid position cannot be used for Class C

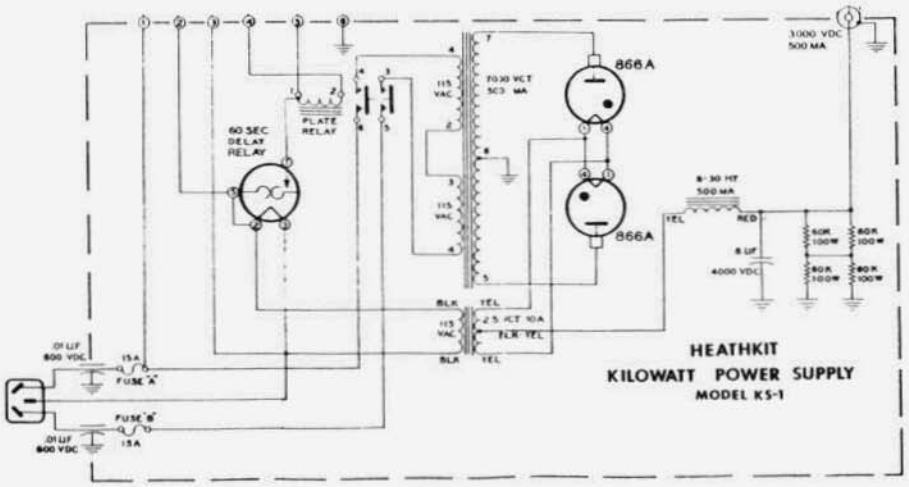


Figure 1

service. No neutralization or grid tuning is required on any band in Class AB1 operation because of the very heavy grid loading provided by the swamping resistor.

Clamp tube operation

Take a look at the schematic in Figure 2 and you'll see that the Chippewa features a 6DQ6 clamp tube which is connected to the screens of the final tubes. In Class AB1 operation the 6DQ6 is inoperative. The cathode and screen of the clamp tube are at ground potential, thus the clamp tube is completely cut off and does not interfere with the action of the VR tubes, which regulate the screen voltage to 810 volts.

During Class C operation, however, the 6DQ6 provides complete cutoff during CW key-up conditions, preventing any final tube noise from appearing in the receiver when operating full break-in CW. The clamp tube cathode is place at a negative fixed bias potential (approx. -125V) but the clamp tube screen is at ground. The sharp cutoff pentode characteristic thus obtained enables the negative voltage developed by the final tube grid current to flow through the final grid leak resistance when drive is applied during key-down conditions to cut the clamp tube off. During key-down, the 4-400A screens thus operate at their normal Class C voltage of about +300 volts. When drive is removed during key-up conditions, the clamp tube grid and cathode are at equal potential, and the clamp tube draws sufficient current through the screen dropping resistors to actually lower the 4-400A screen voltage to a negative potential with respect to ground. The negative screen voltage, along with the fixed negative grid bias completely cuts off the final tubes.

Making this thing work

When I acquire a new piece of gear, I usually put it on a Variac and bring it up slowly the first time. However, since I don't have a 240V Variac, I decided to take the Chippewa apart and check things out first. Checking things is especially important with Heathkits, because you never know who was in it or how well it was built before you get it. So, even after some basic checks with an ohmmeter, I decided it would be best to power it up without the 4-400A tubes installed, so the bias voltages could be checked. Lucky thing I did too. There was 3,000 volts on the screens!

The original builder had made a seri-

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The Heathkit "Chippewa" AB1 Tetrode Linear from previous page

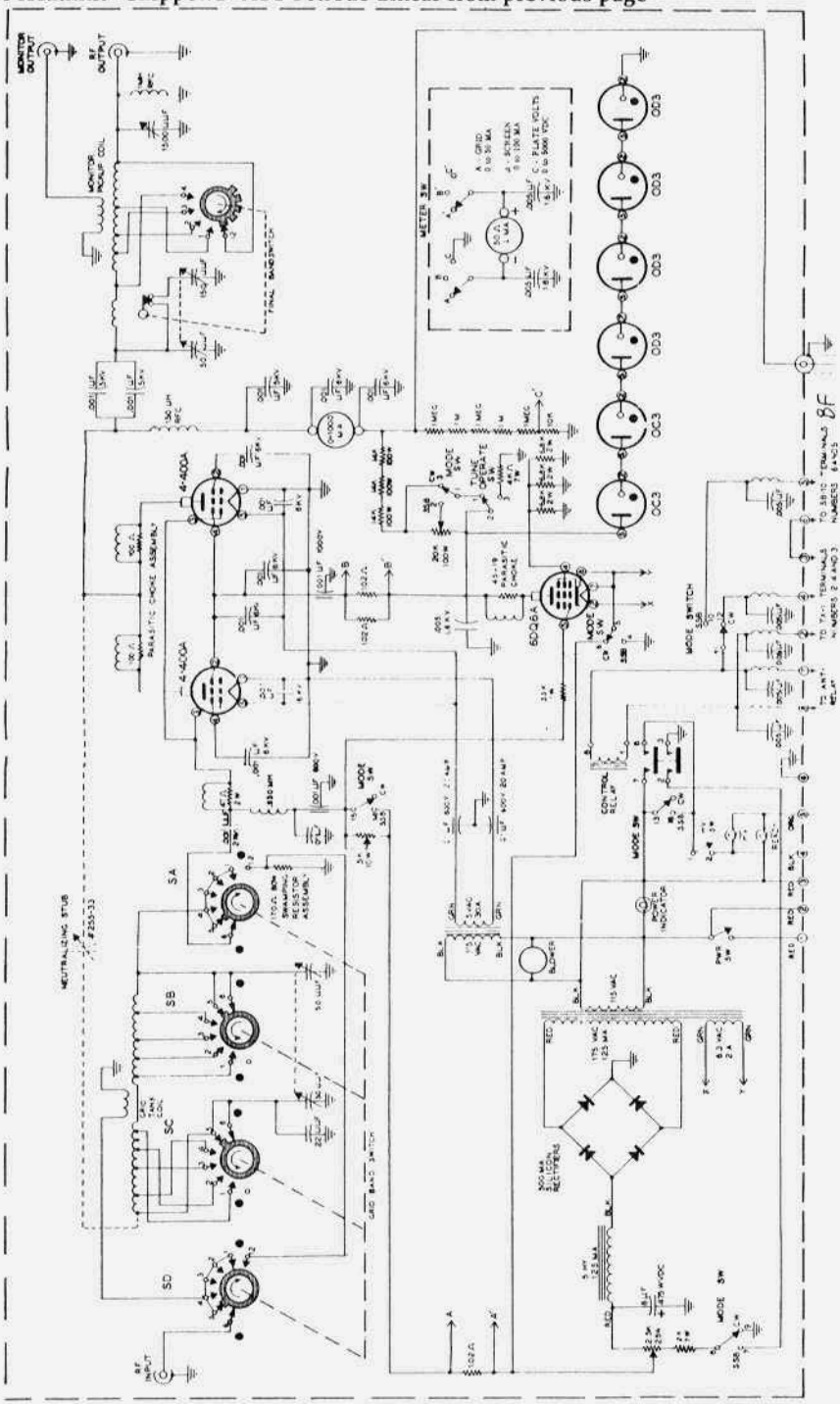

Figure 2

ous wiring mistake that clearly rendered the amplifier completely inoperable. It was easy to see that the correct tube pin had never seen any solder, so this wasn't the result of someone meddling. This thing had just never been on the air! The wiring mistake was in the voltage regulators and the result was that 3,000 volts had been applied to the 4-400A screens and the plate of the 6DQ6 clamp. Hmmm . . . . that's about 2,200 volts over the tube manufacturer's maximum specification. High screen voltage causes secondary emission which causes the screen and plate currents to rise rapidly, putting the tube in a runaway condition (just how fast can you reach for the off switch?). The guy must have built this thing, cooked his brand new 4-400s, and then just stuck it up on a shelf in disgust for the next 37 years. About half the Heathkits I restore have at least one wiring mistake or cold/unsoldered joint. Even after I got it working, I chased instability for hours. I finally resoldered every joint and loosened and then retightened every ground lug in the entire unit.

Improving power supply fusing

While everything was pretty well designed in this linear, I did feel uncomfortable about the fusing in the power supply. Take a look at the schematics in Figures 1 and 2. There is a separate 115V transformer in the Chippewa used to provide filament voltages and another which provides grid bias for the PA tubes. The 115V needed for these transformers is obtained through pin 1 of the interconnecting cable from the KS-1 power supply which is connected to the 15 A household-style fuse. It is doubtful that if any of the solid state rectifiers shorted out (or some other problem arose) either of the small AC transformers in the Chippewa would be capable of opening the 15A fuse before self-destructing.

Someday, this lack of adequate fusing could leave you with a mass of burned wiring and the need to locate a new transformer. So, I decided to add a fuse to provide separate protection for the 115V line going to the Chippewa from the KS-1 supply. It just seemed like good, cheap insurance. I found that a 2.5 A fuse worked well. The socket on my unit was added to the back panel of the KS-1 and the source side of the fuse was moved so that Fuse "A" provides protection exclusively for the HV transformer.

Inrush filament current

Filament failure is one of the primary failure modes in directly heated thoriated-tungsten filament tubes like the 4-400A. Because of the low cold resistance of the filament, the initial surge current at turn-on is extremely high, degrading the filament every time you turn the amp on. In their engineering application notes, EIMAC recommends that for best tube life, the inrush current should be limited to two times normal during turn-on. This minimizes thermal stress on the filament, which otherwise can cause internal tube geometry changes and filament failure with repeated cycling as seen in amateur service.

Most linear manufacturers ignore this recommendation and do nothing to limit inrush current, and Heath was no exception. Inrush current limiters ("CL") solve this problem and provide a "soft start" which can significantly increase the expected life of your tubes. These thermistors have a negative temperature coefficient and are made out of a semiconductor material. The current flowing through the device heats it up causing its resistance to drop rapidly. The typical "heat up" rate for these devices is 60% of steady state value in 600 millisec, reaching 100% in only 1.5 seconds. Cooling rates are about 100 seconds in still air.

With a CL in the circuit, a high percentage of the voltage is initially

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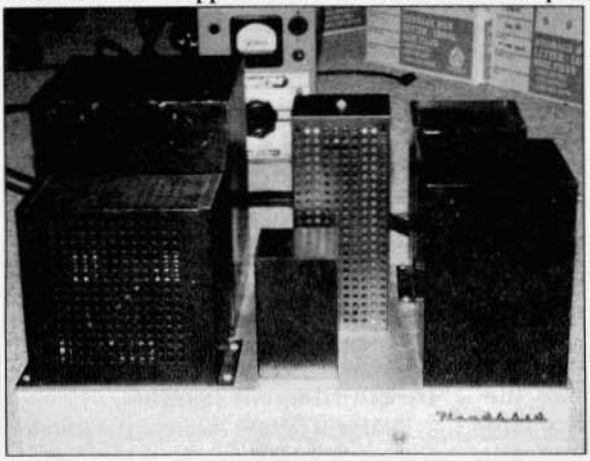

The KS-1 features oil-filled transformers and capacitors. It was not supplied with a cover.

dropped across the CL, limiting current flow. Don't be tempted to use several CLs in parallel to increase the current to rating you need. This is bad design practice. CLs may be used in series, but not in parallel. This is because one CL's impedance will decrease much faster than the other, causing most of the power to go through this one device causing it to overheat and fail sooner (remember, a CL is a positive feedback device).

In the Chippewa, I added a CL in series with the 115 VAC winding of the transformer which supplies 30A at +5 VAC to the 4-400A filaments. On the 115 VAC side, this transformer draws approximately 1.3A. After some experimentation, the CL I selected was a Keystone Thermometrics KC-019L-ND, having a resistance of 25 ohms at 25° C decreasing to 0.41 ohms at Imax. CLs are available from Digi-Key at 800-344-4539 for about $2.58. Very cheap insurance indeed!

HV current inrush

I decided not to use the 866 mercury vapor rectifiers, figuring that I'd either use 3B28s or solid-state plug-in replacements. Since I had a pair of Semicon 1N2637 plug-ins on hand, I decided to give them a try. The solid state replacements gave just about the same output voltage as did the 3B28s.

To help limit inrush current (especially when using solid state-rectifiers), I added a 25 ohm 25W resistor between the center tap of the HV transformer (at pin 6) and ground. At peak plate currents of less than 600 ma, this resistance has little effect on overall regulation. As an added measure of protection for this irreplaceable HV transformer, I added a 1.5 amp fuse in series with this resistor at the centertap. Since we are dealing with very high voltages here if the fuse opens, I chose not to mount this fuse on the rear panel. Instead, I glued a fuse block neatly to the underside of the chassis using GOOP (even though the short, stiff wires were alone sufficient to keep it in place). If you haven't used GOOP before, you should really give this product a try. It looks like a silicone sealer but is nearly as strong as epoxy and yet nowhere near as brittle.

Occasionally, the KS-1 power supply would still trip the house circuit breakers when it was first turned on. This got tiresome, so I added a CL in series with the AC side of the high voltage transformer to further limit inrush current at turn-on. This neatly solved the problem. Use Keystone KC022L-ND, rated at 12A (0.7 ohms at 25° C, decreasing to .02 ohms at Imax).

The reason I chose to use a 25 ohm resistor on the centertap instead of a CL is to cover situations when the high voltage is turned off and then back on several seconds later. A CL would not have had time to recover. I've therefore set an absolute current limit, which is further helped along by the CL added

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Understanding Super-Modulation

by John K. McCord, W1BIJ

Reprinted from the February 1950 issue of *Radio and Television News*

How it works, tuning instructions, and a comparison with other modulation methods, as seen on a Panadaptor.

A NEW method of amplitude modulation has appeared recently. It is simple and efficient and readily adapted to amateur use. In building a low-power transmitter using the "super-modulation" principles and getting it on the air, several major differences, compared to regular AM methods, were noticed. This article will explain in practical "ham" language what happens in a super-modulated rig that makes it so different from conventional AM transmitters. A step-by-step tuning method and panoramic comparison with other systems will also be covered. Fig. 2 is the home station final using 807 tubes in super-modulation. For a basic understanding of super-modulation operation see Fig.1. The unfamiliar tank circuit is electrically the same but redrawn to simplify an understanding of the action. The r.f. tube functions as a regular class "C" amplifier. The p.m. or r.f. modulator tube, being biased about four times cut off, doesn't go to work until you speak into the microphone to modulate. The r.f. tube makes the carrier and the p.m. tube puts your voice on it by adding r.f. power to the common tank at an audio rate.

Fig. 4 shows the super-modulation output waveform and its separate components drawn on a common time base. As the p.m. tube's fixed grid bias is series-fed through the modulation transformer secondary, and the r.f. tube bias is in shunt to the transformer center tap (see Fig. 2), the first audio voltage cycle from the modulation transformer secondary being a.c., alternately

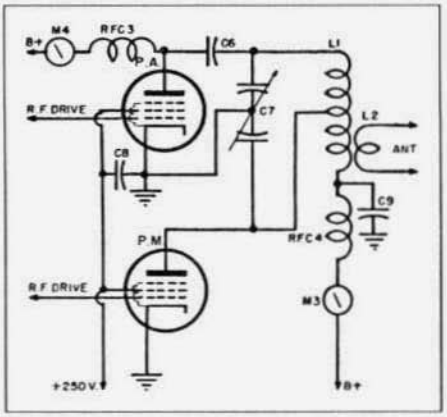

Fig.1. The r.f. tube plate is shunt-fed and the p.m. plate series-fed to allow use of separate plate current meters. For a diagram of complete unit and an identification of parts see the schematic shown in Fig. 2.

adds and subtracts from the fixed bias supply voltage. As a result both the r.f. and p.m. tube outputs increase and decrease accordingly. At time instant "A" in Fig. 4, an unmodulated carrier from the r.f. tube is shown. At "B," the start of the first positive audio alternation increases the r.f. carrier slightly to provide a cushion for the coming p.m. tube operation. At "C" the full peak of the positive audio alternation has cancelled out the p.m. tube's fixed bias and driven the grid positive resulting in a very large amount of power released. At this point the p.m. tube demands maximum r.f. grid drive. By preference less drive is left for the r.f. tube grid and its output drops, suppressing the carrier. At "D" the p.m. tube's power cycle is ending and the r.f. tube's carrier rises as a result of returned grid r.f. drive and provides

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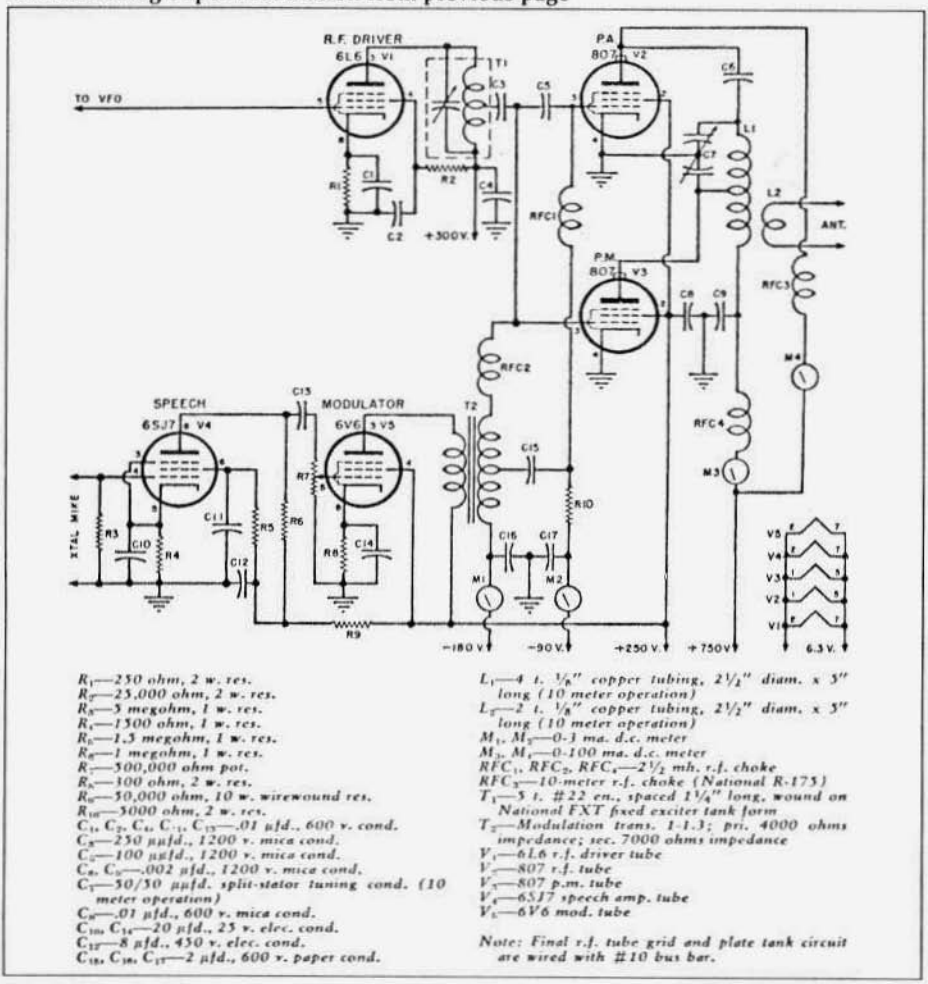

R_1—250 ohm, 2 w. res.
R_2—25,000 ohm, 2 w. res.
R_3—5 megohm, 1 w. res.
R_4—1500 ohm, 1 w. res.
R_5—1.5 megohm, 1 w. res.
R_6—1 megohm, 1 w. res.
R_7—500,000 ohm pot.
R_8—100 ohm, 2 w. res.
R_9—50,000 ohm, 10 w. wirewound res.
R_{10}—5000 ohm, 2 w. res.
C_1, C_2, C_{11}, C_{13}—.01 µfd., 600 v. cond.
C_3—250 µµfd., 1200 v. mica cond.
C_5—100 µµfd., 1200 v. mica cond.
C_6, C_9—.002 µfd., 1200 v. mica cond.
C_7—50/50 µµfd. split-stator tuning cond. (10 meter operation)
C_8—.01 µfd., 600 v. mica cond.
C_{10}, C_{14}—20 µfd., 25 v. elec. cond.
C_{12}—8 µfd., 450 v. elec. cond.
C_{15}, C_{16}, C_{17}—2 µfd., 600 v. paper cond.

L_1—4 t. 1/8" copper tubing, 2 1/2" diam. x 5" long (10 meter operation)
L_2—2 t. 1/8" copper tubing, 2 1/2" diam. x 5" long (10 meter operation)
M_1, M_2—0-3 ma. d.c. meter
M_3, M_4—0-100 ma. d.c. meter
RFC_1, RFC_2, RFC_4—2 1/2 mh. r.f. choke
RFC_3—10-meter r.f. choke (National R-175)
T_1—5 t. #22 en., spaced 1 1/4" long, wound on National FXT fixed exciter tank form
T_2—Modulation trans. 1-1.3; pri. 4000 ohms impedance; sec. 7000 ohms impedance
V_1—6L6 r.f. driver tube
V_2—807 r.f. tube
V_3—807 p.m. tube
V_4—6SJ7 speech amp. tube
V_5—6V6 mod. tube

Note: Final r.f. tube grid and plate tank circuit are wired with #10 bus bar.

Fig. 2. Circuit diagram and parts list for the super-modulation final amplifier and modulator.

the final cushioning. At "E" the negative audio alternation adds to the p.m. tube's fixed bias and the p.m. grid is momentarily about eight times cut-off. Through the modulation transformer center tap this same negative voltage adds to the r.f. tube's fixed bias and decreases its output, forming the negative or valley portion of the output waveform. This completes one cycle of audio voltage from the modulator and this is repeated for each succeeding cycle. This method of AM modulation has the following advantages. The positive waveform peaks can be extended to a point only limited by the p.m. tube's plate saturation point and the r.f. carrier can be suppressed at the same time. Using regular AM methods, extending the positive peaks beyond the 100% modulation level would result in a clipped carrier. With super-modulation the r.f. tube supplies some carrier at all times and fills in between modulation peaks, preventing carrier clipping regardless of how high we extend the

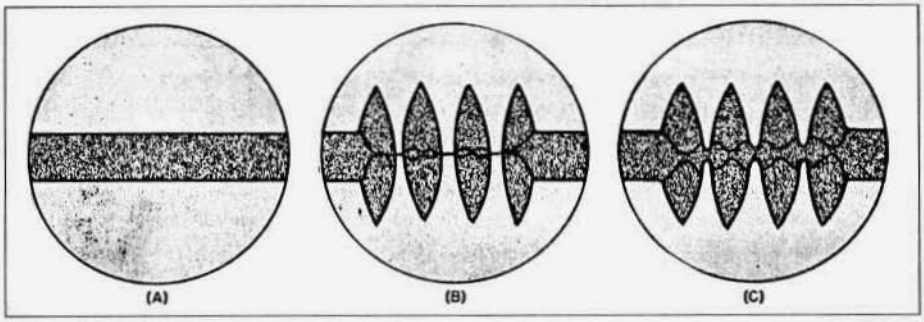

Fig. 3. How r.f. tube drive should be adjusted to prevent carrier clipping yet retain high modulation peaks. (A) Carrier only, (B) overmodulation with clipping, (C) under 100% modulation.

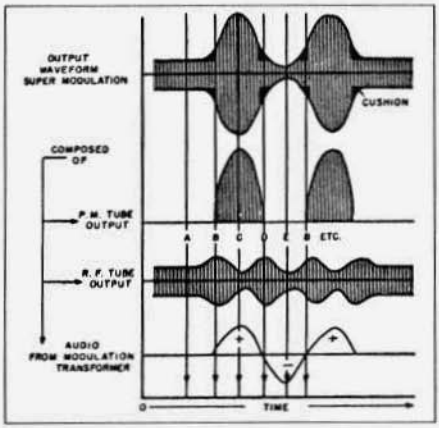

Fig. 4. Graph showing the super-modulated output waveform and its separate components, drawn on a common time basis.

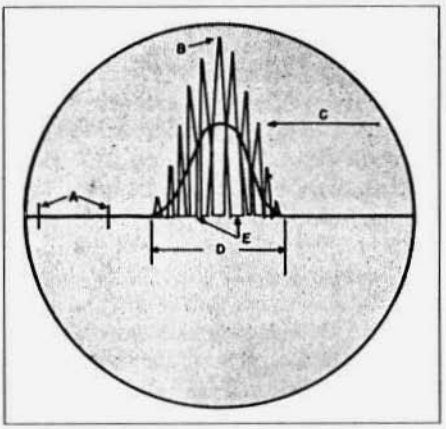

Fig. 5. Panadaptor image showing method of determining relative carrier strength, percent modulation and bandwidth. Point "A" is 10 kc. marker, "B" voice peak, "C" carrier level, "D" bandwidth, and "E" carrier clipped showing overmodulation. This signal is overmodulated as shown by flattening at "E".

positive peaks, and it's the peaks that carry the voice intelligence.

Regarding power supply requirements, two plate supplies are not needed. The r.f. and p.m. tubes do not draw maximum plate current at the same time, so any supply adequate for a single tube will be OK. Grid bias can be supplied either by batteries or a separate supply. I tap mine off of the driver power supply bleeder. The r.f. tube can operate with grid-leak bias, but the p.m. tube must have a fixed supply and a means of varying the bias voltage over a small range. Tuning the super-modulated transmitter is quite different from usual procedure and the method is given step-by-step below. It is assumed bugs and parasitics have been eliminated from your super-modulated final and enough r.f. drive is available for a single tube. Both finals do not require maximum drive at the same time. Start with final plate voltage *off*.

1. Vary the r.f. grid drive and grid

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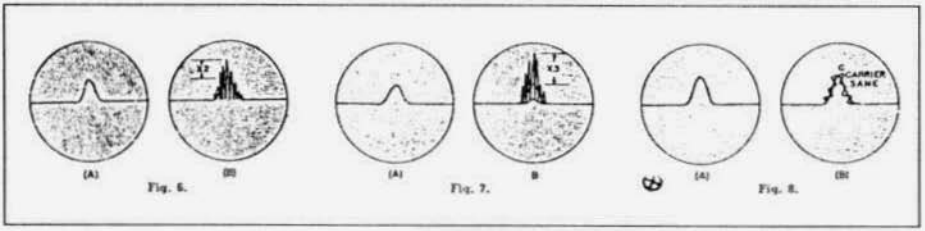

Fig. 6. (A) Unmodulated regular method AM carrier only. (B) Same signal 100% modulated, as seen on Panadaptor screen. Fig. 7. (A) Carrier only, super-modulated signal. (B) Fully modulated "super" as seen on Panadaptor. Notice extended positive peaks and suppressed carrier (lower peak). Fig. 8. (A) NBFM signal without modulation. (B) Same signal modulated +/- 3 kc. Notice dead spot at "C."

bias voltage until the r.f. tube grid draws 1/2 normal drive and the p.m. grid is zero or just starting to draw current. This balance is important. Run the r.f. tube cool and let the p.m. tube do the work.

2. Closely couple a dummy antenna to the final tank and switch *on* plate voltage. The r.f. tube should load normally like a c.w. rig with the key down. Reduce grid drive rather than antenna coupling to decrease loading. The amount of coupling affects the tank impedance into which the p.m. tube works.

Keep the r.f. tube running cool at about half c.w. rating, but enough to prevent carrier clipping during modulation. An oscilloscope check will show the right point.

3. Now apply modulation while increasing the audio gain. The p.m. tube grid and plate current should both kick upward to high values. The r.f. tube grid and plate current should show a downward movement, indicating carrier suppression. My 807 p.m. tube shows plate current peaks of 80 to 100 ma. and over. As the meter indicates an average value, the true peak current is about twice that shown.

4. Disconnect the dummy antenna and load the regular antenna to approximately the same tuning values.

The oscilloscope pattern of Fig. 3 shows how the r.f. tube drive should be adjusted to prevent carrier clipping and still retain high modulation peaks. The vertical scope plates were directly link-coupled to the final tank which was loaded with the dummy antenna. *WARNING* - If scope is left coupled to tank when using antenna, r.f. may be fed to the power lines or the connecting leads may radiate, causing TVI, etc., so check this point carefully.

Checks have been made using a 5-inch Panadaptor to compare super-modulation waveforms with other signals on the air. The human ear is quite unreliable, even though we all use it for this purpose. Being logarithmic in function and having poor retaining qualities we shelved it along with the average receiver "S" meter and found the Panadaptor to be a decided improvement. Using this visual method small changes in both carrier and modulation could be seen. A change in amount of modulation not noticed by the ear can make a real difference in signal-to-noise ratio at a distant receiving location. It can mean the difference between being readable and not readable. The Panadaptor shows this difference. Fig. 5 is a mock-up waveform showing method used to determine relative signal characteristics with the panoramic image.

An average regular-method AM signal

on the air appears as shown in Fig. 6. Notice that the modulation peaks extend just to *twice* the carrier height without modulation, and recede to the zero base line. This represents 100% modulation. Extending the peaks higher would also make the bottom peaks go lower which they can't do without hitting the zero base line and clipping the carrier. Fig. 7 shows a super-modulated signal of about the same power or pip height. Notice the positive peaks extended to *three* times the unmodulated carrier level, yet the carrier is a long way from being clipped. The carrier has even been suppressed to minimize heterodyne tendencies with other carriers. This is still amplitude modulation, but with greatly extended positive peaks. Fig. 8 is an average NBFM signal with narrow deviation, and no splatter when received on an AM receiver. The amount of voice power is small and even using a discriminator for correct reception results in low audio content because of the small deviation allowable. Wideband commercial FM stations, of course, are very efficient. NBFM has many advantages, but voice efficiency is low. It is evident that super-modulation delivers far more "talk-power," as Mr. Taylor calls it, than any of the other types of signals shown. Perhaps some day we may report a received signal as: "Fine business OM or coming in 10 db. over 9 on my Panadaptor. Your modulation is about 80% and your bandwidth is 8 kc." This report would give the operator real information.

While operating a super-modulated transmitter some major differences were noted compared to the operation of a conventional plate-modulated AM rig.

1. Using regular AM methods the final r.f. plate meter should not vary with modulation. With super-modulation it should, and does, vary. In fact, they vary, both the r.f. and p.m. tube plate milliammeters. If they don't, you are not modulating.

2. When receiving a regular method AM signal the "S" meter indicates carrier strength. A strong movement of the needle with modulation could indicate overmodulation. With super-modulation a large needle movement is normal, indicating extended positive signal peaks. On one transmission check with super-modulation the "S" read S-9 with the carrier and only reached 15 db. over on peaks. "S" meters are relative indicators only and should not be depended upon for accurate measurements.

3. In modulating the usual plate-modulated AM transmitter, an audio power equal to 50% of the r.f. final stage power is required of the modulator. With super-modulation the modulating power is r.f., not audio, and is supplied by the p.m. tube. A comparatively small amount of audio power is sufficient to trigger the p.m. tube into releasing its power into the common final tank circuit.

When receiving super-modulated signals on a conventional receiver equipped with a.v.c. the background noise will tend to rise during periods of reduced carrier. This action will cause no difficulty in the majority of cases unless the carrier suppression is severe. In any event, the turning off of the a.v.c. will result in a much more readable signal when this occurs. It is advisable to try both ways.

I have heard super-modulation referred to as a form of pulse modulation and unlawful for amateurs. Super is definitely amplitude modulation. The word "pulse" could just as readily describe the driving power to a pair of class "B" modulators. One works as much on a pulse basis as the other. Super has been referred to as a form of low-level grid modulation, perhaps as a result of a hasty glance at the schematic diagram. Because the modulation is added to the carrier in the final transmitter stage, this insures its being high level. Although audio is applied to the tube grids, the p.m. tube is not a class "C" amplifier making a constant

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The Clockie-Talkie Transmitter

by Chuck Teeters, W4MEW
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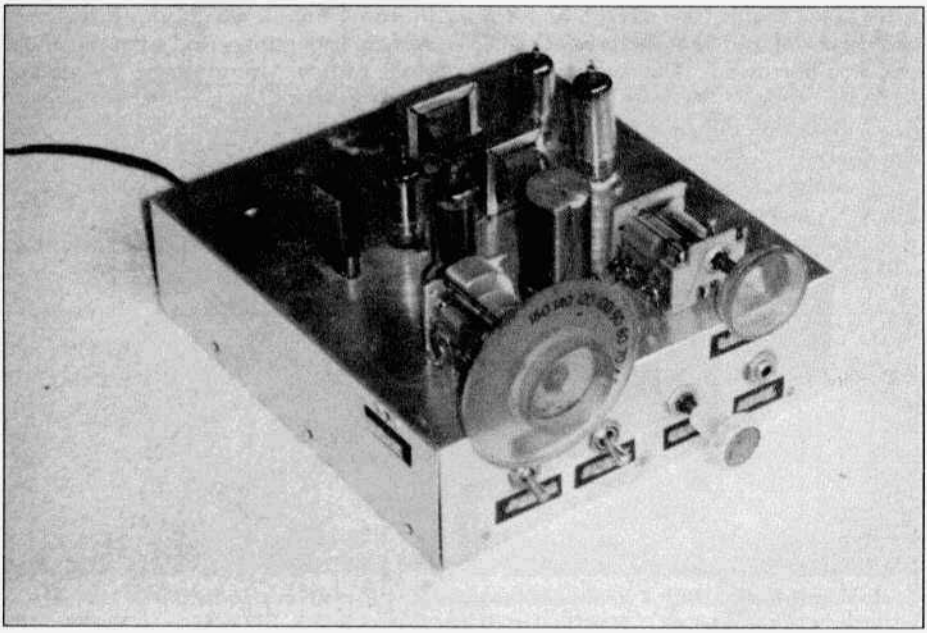
A remark from my wife about our church rummage sale being a clearing house for old clock radios got my attention. People junked old radios in the 50s and 60s as replacement cost less than repair. But when upgrading or replacing clock radios, they apparently kept the old ones around for quite a few years, as a spare, or for the back bedroom. Maybe people didn't like to throw away clocks. At church I found a table with analog clock radios. Most had five 7-pin miniature tubes, a 50C5, 35W4, and three 12 somethings. I bought three for $5.

Back in the 30s QST had many articles on simple, cheap, low powered transmitters built from discarded broadcast receiver parts. The best were by Fred Sutter, W8QBW/QDK, who wrote many AC/DC transmitter articles using receiver parts. **(Before we go on I should remind readers that these sets pose greater risk from electrical shock and that an isolation transformer should be used.)** Those of us with a limited income always looked forward to his next AC/DC transmitter project. Fred could do more with a 25L6 or 117N7 than most hams with 6L6s and T-40s. A check of the RCA tube manual showed the clock radios 50C5 had 7 watts plate dissipation and promised it should work on 160 and 75. It also said the maximum plate voltage was 150 volts, a bit low, but that never stopped a ham from running the voltage up a little. As the last bastion of recyclable vacuum tube broadcast receivers, the clock radios promised to provide the tubes and parts to build a 1996 W8QBW AC/DC transmitter.

Taking two of the clock radios apart made an interesting evenings work. Looking over the collected parts there was a problem. I wanted to build an AM transmitter but no modulation transformer. I tried the two audio outputs back to back, voice coil to voice coil, and got a usable modulation transformer. A serious concern was the AC/DC power supply. I needed a voltage doubler to get enough voltage on the 50C5s to get some power, and that would mean one side of the AC line would be connected to the chassis. I would have to use a polarized plug in a GFI outlet and be careful. [Ed. An isolation transformer would provide foolproof protection.]

The transmitter grew from the clock radio parts. A 12BA6 electron coupled pierce crystal oscillator, driving a 50C5 PA with pi output. One BC tuning cap for the input and one for the output. A tank coil wound on a plastic pill bottle with wire from a loop antenna. A 12BA6 speech amplifier and a 50C5 modulator. That added up to 124 volts for the filament string which was OK, but no way to light up 2 35W4s. No combination of tubes worked right, so two Radio Shack silicon diode rectifiers. That is cheaper and cooler than a series filament resistor. The IF transformers were taken apart and the coils series connected to make RF chokes.

I used an aluminum shield from a discarded VCR for a 5 x 6 inch chassis. I had to make small brackets to hold the PC tube sockets, otherwise everything was easy. The expression, keep all leads short, is an archaism when using parts removed from PC boards. It really tests



The Clockie-Talkie is made almost entirely from old clock radios.

your ingenuity using stuff with 1/4 inch leads. I had to make a few (?) splices. I bought some terminal strips and 2 resistors along with the two silicon diodes at Radio Shack. With clock radios there is no power switch on the volume control, so I bought two toggle switches, one for filaments and the other for a plate power switch. The parts list shows the component combinations I used to get close to correct values. The schematic shows two different mike inputs, one for a carbon, the other for a crystal mic. Both work, but I prefer the carbon with an Fl button.

The voltage doubler power supply provides 250 volts. The oscillator produced .3 mA PA grid current. Metering showed 12 watts PA input. I could load it up more but the 50C5 got red hot at 20 watts input. The 50C5 is a great tube but it does run hot. With the 50C5 modulator operating class A, the audio is lacking a bit. The modulator output is about 3-4 watts of audio. I couldn't figure out any way to got more audio, so by loading the final to only 7-8 watts input, the modulation is 100% and it doesn't sound bad. Second harmonic was way down, and no spurious emissions could be found. A #47 pilot lamp was connected to a 3 turn link on the PA tank for a tuning and modulation indicator, as the use of meters would be frowned on by Fred.

On the air checks worked out great. Everyone is surprised at the signal produced by 4 watts of AM. Our local AM historian, W1SUJ, suggested the name, "Clockie-talkie", which has stuck. I've worked some DX (Columbia, TN, 325 miles). It may be the height of optimism to call CQ on 75 phone with 4 watts, but I get answers if there is not to much QRN or QRM. For local contacts it can't be beat. It works on 160 just as well, maybe even a little better. It's fun to run a rig where the power input to the PA filament is more than the plate, and the knobs are art deco, marked for 640 and 1240 conelrad.

Adding up the cost, it was $5 for the

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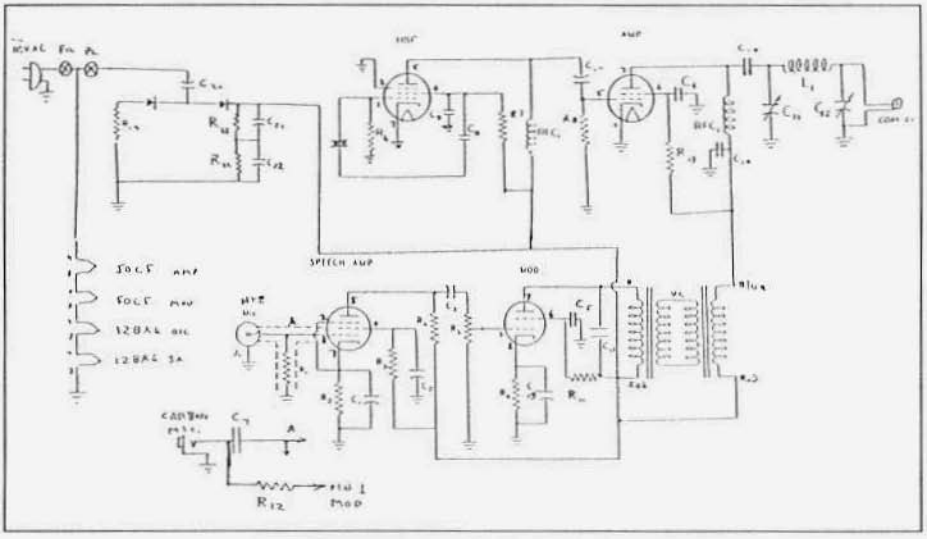
The Clockie-Talkie Transmitter from previous page

three clock radios (one spare), $7 for a 3885 kHz xtal, and $6 at Radio Shack (the mic was borrowed). That works out to $4.50 per watt, or 5.5 cents per mile (to date). Based on our local electric rate, I can run the rig 22 hours for a dime. I think Fred would like it if he was still with us, but he would want to know why I made it so big, and where was the key jack?

If you are in a back to the future tube building mood, and find a low power AM rig intriguing, find a couple of old clock radios. My rummage and garage sale associates assure me that there is a good supply of old clock radios available if you get out and look. Emersons seem to predominate, followed closely by RCA, with Zeniths a rarity. And when you get a chance, listen for me on 3885, carefully. **ER**

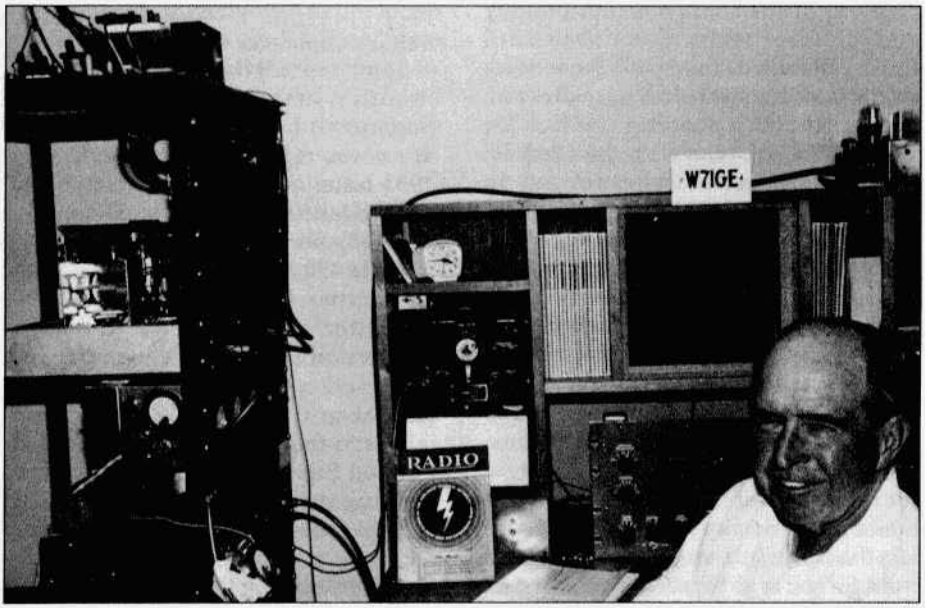


PARTS LIST

C 1	.05	R 1	3.3M
C 2	.02	R 2	2.4K (2x1.2 Ser)
C 3	.02	R 3	940K (2x470K SER)
C 4	.002	R4	470K
C 5	.01	R5	500K var
C 7	.05	R6	100K
C 8	.002	R7	47K
C 9	150 pf	R8	110K (2x220K Par)
C 10	.01	R9	600 (2x1200 Par)
C 11	365 pf var (one section)	R 10	22K
C 12	730 pf var (both sections)	R12	300 (2x150 Ser)
C 13	300 pf (2 X 150 Par)	R 13	1.8K
C 14	660 pf (2 X 330 Par)	R 19	50 (2x100 Par)
C 15	30/50	R 21	50K (2x100K 1/2W Par)*
C 18	.002	R 22	50K (2x100K 1/2W Par)*
C 20	50/150	RFC 1	IF Trans coils
C 21	30/150	T1 and T2	audio output xfms
C 22	30/150	D1 and 2	1N5404 diodes*
L 1	60 turns 1"D 160 meters	SW 1 and 2	SPST 3A toggle*
L 1	40 turns 1"D 75 meters		

All parts from 2 clock radios except those marked

Northwest AM'ers at Puyallup, Wash. Annual Hamfair, 3-1997. Standing, left to right: W7ZGH, WA7EHE, KA7FFB, K7YIR, K7IEY, WØLU, KD6B, KI7SM, K7LD, W7JHS, WB7BNZ. Kneeling, left to right: KB7WW, W7JKY, WA7HMU, W7PCK, AA7V, KF7EH, W7WXW. *Photo courtesy of Al Norton, K7IEY.*



Dan Knipe, W7IGE, with his 1930's homebrew transmitter. He worked CW DXCC and WAZ with this rig during the period from 1976 to 1988.

Collins AM Night from page 16

Things were scheduled to start at around 9pm, Eastern time on 3875. It made sense to establish a beachhead somewhat sooner, so K8OMO and myself got a roundtable going with about five fairly strong stations, starting around 7:30pm.

Around 8:15, I thought that I heard a nine-area station say the calls of the Collins factory station! We paused, and if it was them, it must have been only a preliminary test because nothing further was heard.

Finally, at around 8:30, K8OMO paused to check whether CXX was on the frequency, and sure enough LOUD & CLEAR they were heard at Annapolis and across the eastern region by those on frequency.

The bedlam began immediately.

One station, who shall remain nameless, suddenly appeared and chanted the suffix to his calls at every opportunity, possibly in an attempt to be among the first worked by CXX.

Barry, at the Collins setup, politely and diplomatically demurred until those assembled could shift the activity over to an early start of the special event. This included a favored contact for Hank, W2IQ/4, who with the addition of Iowa now has 41 states toward an award for Worked-All-States on AM.

The Collins station was a 32V-3 transmitter and a 75A-4 receiver. Signals were fantastic on the path from Iowa to Maryland, considering the transmitter was at less than 100 watts.

I had been lucky to work the factory station some time earlier when the club first reactivated Art's calls. At the time, the station did not have any AM gear for transmit, but my AM contact cross-mode was officially the "first" AM contact the club made under the reassigned calls. So last night I worked them again on full AM, and then fled to 160....

There, we discovered 160 propagation was very long, with some static crashes related to a heavy storm in the Midwest. An Ohio station even reported a January thunderstorm that forced him off the air for a half hour or so that evening.

Much of the 160m activity was anchored by the KW-1 of Butch, K-Zero-BS at Rochester, Minnesota. The East Coast signals were dominated by Jerry, KG2BK, with the inaugural voyage of his new "big rig," consisting of a pair of 833A's modulating a single 833A. (sounded great!)

After working a variety of stations, Jerry and I repaired up the band a little (1925 kc) and were joined by Frank, WA1GFZ at Enfield, Connecticut, on his solid state Pulse Duration Modulation rig (also sounding great!).

I'm sure I speak for others in appreciating the time spent by Collins factory club members to staff the CXX station for "AM Night," and hope that we will have a chance for more contacts in the future. **ER**

Editor's Comments from page 1

Some corrections regarding last month's article "150W Phone-CW Supermodulated Transmitter": First of all it was reprinted from the October 1953 issue of the "CD Capacitor" and not the January 1955 issue. Then it was pointed out to me that there was an error in Figure 3, the schematic of the transmitter. In a following issue of "The Capacitor" a correction was printed, "A connection should be shown between the junction of capacitors C15 and C16 and the grid of the 807W (PM) tube."

Due to the response that the first article on Supermodulation drew we're running another one this month. Hopefully before long, we'll be hearing from someone who has built and is using a transmitter using the Supermodulation scheme.

Thanks again to all those that sent letters, particularly to those that sent packets of information. N6CSW

12BW4 Rectifier Tubes from page 15

Details

Since my R-390's power supply was completely carbonized, I decided to disconnect all the wires to the sockets, clean it all up, and start fresh. The R-390 power supply can be removed from the chassis, so the changes are fairly easy to do.

Move the wires on both sockets from pin 6 to pin 7 and pin 8 to pin 9. Add a jumper from pin 1 to pin 7. Move the filament circuit feed wire from pin 4 on one socket to pin 5 of the other socket, and break the connection from pin 5 to pin 5 between the sockets. (This will put the filaments in series.)

George Rancourt (K1ANX) tells me he has also done this mod on one of his R-390A's and that it worked very well. He also checked the plate voltage using solid-state rectifiers (268.5V), the 26Z5s (253.7) and the 12BW4s (240V). The manual lists the DC plate voltage as 240V!

After nearly 50 years of modifications and "improvements" to the R-390 it was gratifying to find a "new" one that increases the reliability of the power supply, reduces stress on the tubes, and is fairly easy to do. Using less expensive tubes than the 26Z5W was a welcome bonus. **ER**

Dexter Francis is the owner of CWest Tube Sales and enjoys listening to International Short Wave, Ham, and military signals on all bands.

Dear ER

My husband, Steve Edwards, WB9QED, died in January. He was only 47, but had bravely fought every major complication of severe diabetes for 40 of those years. He wore out and let go. Steve loved ham radi and was excited to become part of the "Electric Radio" family. He became severely ill shortly after aquiring his Heathkits last year. Nonetheless, I'd like to think his Spirit can ride any radio wave at any time now.

73, Jerri McPherson

Super-Modulation from page 31

carrier as would be found in grid modulation systems. The p.m. tube is actually an r.f. modulator and can be thought of as taking the place of the usual class "B" modulators used in regular-method AM transmitters. In conclusion, supermodulation represents real efficiency. The p.m. or modulator tube is dead until you speak. Then it releases r.f. power at an audio rate only half of the time, on the positive audio voltage alternations. On the negative alternations it is cooling. Expensive audio transformers are not required. It's still cheaper to obtain say 100 watts of r.f. power than the same amount of audio power. **ER**

Chippewa from page 26

to the primary. A cold start will therefore have less inrush current than a warm one, but at least the warm start current has been partially limited.

High/low power switch

The last modification I added to the power supply was a high/low switch to allow switching the HV from a nominal 3,000 to 1,500 volts. I find that most of the time, I don't need the full output of the linear, and this provides a very convenient way to reduce it. As shown in Figure 1, the switch is inserted between pin 5 of the relay and Fuse "B". In the low position, the transformer is returned (through the relay) to the ground connection, providing only 120V to the transformer instead of 240V. The high position allows full legal limit, while the low position in AB1 gives about 500 W output.

Part 2 next month

In Part 2 we'll look at modifications to the cooling system to quiet this beast down and then finish with some observations about measuring plate current, operating, and tuning up the Chippewa. Until then, . . . keep your soldering iron warm. **ER**

516F-2 from page 14
has demonstrated responsively to those demands. So has the electronic test equipment industry responded with newer designs to ensure compliance with EIA standards and manufacturers specifications for systems, equipment, components and parts. Thus referring to testing activity for both single component analyzing in maintenance work or for the testing and inspection of incoming parts, e.g., electrolytic capacitors, ensures only acceptable ones are used.

Capacitor actual value and tolerances are just one important parameter. In today's high performance circuits, DIELECTRIC ABSORPTION, EQUIVALENT SERIES RESISTANCE (ESR) and of course LEAKAGE are necessary indications of a capacitor's ability to perform properly within an equipment's life cycle.

In order to ensure the future longevity for the 516F-2, the capacitors should be tested and evaluated with the recent SENCOR LC102 AUTO-Z (Figure 3) which eliminates all guesswork and ensures a serviceable capacitor by conforming to within the acceptable limits of the four test elements cited above. The LC102 has a microprocessor designed within so that when all the required indices are entered for a given type capacitor, the selected test elements of: 1) capacitor actual value, 2) dielectric absorption in percentage, 3) ESR indicated in ohms and 4) Leakage indicated as microamperes become visually displayed along with a "good" or "bad" presentation. All of these indicators for all types of capacitors are coded into the microprocessor based upon EIA standards and manufacturers' specifications including the cut-off points established to ensure evaluation for each type and kind of capacitor, its stated capacity value within specified tolerance for its rated DC working voltage. The author is not aware of any other instrument that will perform all of the four test elements.

A report is prepared (Figure 4) to indicate for each capacitor C1 through C7 (and sometimes C8 and C9), the accept or reject (good or bad) status and for the actual technical findings for each test element. The report also details the evaluation of any new capacitors to be installed to assure the owner, as well as the servicer, that good capacitors are installed and warehouse shelf life defective ones are not.

To some, the Analysis Unit and the LC102 may appear to be luxury items, however, in the practical sense, they are extremely beneficial as proof of completed work and an assurance to the service as well as to the owner that he is obtaining the best possible workmanship and reliability for his equipment.

The 516F-2 serviced, as outlined in this article, should render its usefulness perhaps for another 25 years. **ER Author's Note:** It must be recognized that the discussion of the SENCORE LC102 was limited to the technology in the testing of capacitors within the four stated elements, etc. The LC102 has many more functions for the testing of other electronic parts too numerous to discuss in this article.

Appreciation is conveyed to Eric Dahl and Dave Buss of Sencore for their personal interest and technical advisory assistance.

A special thanks to George Carle, N7ARY for his efforts in assisting with the arrangement of the Sencore LC102 Capacitor Test Report.

Net Control Needed For Vintage CW Net

Tracy Reese, WB6TMY can no longer run the Vintage CW Net because of the demands placed upon him by a new job. If anyone would like to volunteer to take over net control and other duties please contact Tracy at (707) 527-8124 or radions@jps.net

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FOR SALE: Hundreds of WWII communications items, lge catalog, 52 pgs - $3 US, $5 Foreign. Sam Hevener, W8KBF, 3583 Everett Rd., Richfield, OH 44286-9723. (330) 659-3244

FOR SALE: ART-13, good orig condx, no LF. Gerry Higgins, W7ES, AZ, (602) 488-2650 ghigg93225@aol.com

FOR SALE: Johnson Ranger 1+2 parts: 2 pwr xfmrs; 1 HV, 2 LV chokes; 120RD18 + 360R12 var cap; 10uf@700 cap; buffer coils; 20K mod/scrn res; 2 final tank coils intact; DPDT key relay (LM11); 0-5ma meter+shield can; 7 pos coupling sw; bandswitch (SW33); cabinet (maroon) no VFO mechanism. Partial chassis with HV choke; mod xfmr; all var caps, keying relay bias rect sub-chassis intact V11+V12 and wiring; function switch (SW4a+b), bandswitch with wiring intact, all back panel sockets, rf connectors with wiring intact; most V6 + V10 wiring intact, lower half chassis pots, switches, air variables intact with wiring; chassis no rust or corrosion. Prefer to wholesale whole lot best offer for all; if necessary will piecemeal. Lou K1RAK, (781)767-1638) or lsavoie@gis.net

FOR SALE: BC610 w/ BC614 and T368 vfo, SX-28; NC303. All working. Pick up only, South Dakota. Al, (605) 342-6920, w0pu!@rapidcity.com

FOR SALE: 32S1, 75S1 w/ CW filter, 516F2, original manuals, exc condx - $950. Fred, W6YM, (209) 296-4994, fhornold@juno.com

FOR SALE: Military HS-16A Headset - NIB - foil sealed 12/65 - $65 PPD. Chuck, NZ5M, (806) 798-1452

FOR SALE: Drake TR-4 - $160; AC-4 - $95; R-4A (avg) - $100; partial Collins CP-1 - $105; Shure 450 (nib) - $85. +UPS. Bill, WA1APX/8, (810)781-9717.

FOR SALE: Watkins-Johnson WJ-8718 HF digital memory scanning rcvr. Excellent working condx - $500 + s/h or trade for Scott SLR, KWM-2 or 51S-1 including s/h. Dong-Hyun Cho, HL2DDK, Biology Department, Kang Won National University, Chun Chon 200-701, Korea (South), dhcho@cc.kangwon.ac.kr

FOR SALE: Collins 30L-1, VGC - $485, shpd conus. Mike, CA, (209) 322-0459.

FOR SALE: 75A-4 MHz drum decals, 20.5 or 20.8 MHz (you specify), buff color, install instructions - $8.50 ppd. W3HM, Rt 3 Box 712, Harpers ferry, WV 25425

FOR SALE: Collins 51J series drum overlay - $10 ea, specify which. Ron Hankins, KK4PK, 555 Seminole Woods Blvd., Geneva, FL 32732. (407) 349-9150

FOR SALE: Hallicrafters S-38 - $85; S-38 A, B, or C - $75; Includes shpg & schematic info; B&W T-R switch 380B - $45 + shpg; ARRL Handbooks & several AM rcvrs 7 xmtrs, LSASE for list. WA7IHN, POB 442, Aumsville, OR 97325. (503) 749-1149

FOR SALE: Heath DX100 xmtr. **WANTED:** Hammarlund HQ100 rcvr. Hoover, SC, (803) 726-5762.

FOR SALE: Military surplus xtals, 7290 kc CR-1A/AR type holder (larger than FT-243) - $2 ea, includes shpg; other amateur & many non-amateur frequencies available form 19 kc to 100 mc. Ron Skipper, W8ACR, 524 7th Ave. SE, Rugby, ND 58368. (701) 776-5492. skipperclan@stellarnet.com

FOR SALE: March 1939 Japanese 0-200 milliampmeter, EC - $300; TU-6-B tuning unit 3000-4500 kc - $50. Gary, WA9IYF, 11102 N. Hwy 421, Madison, IN 47250.

FOR SALE: HP 411A RF millivolter, nice; nice Heath IG-82 sine-square generator, book. Fred Clinger, WA8KJJ, OH, (419) 468-6117, after 6 PM EST

FOR SALE: Repair! Radio repair, tube or solid state, reasonable rates. Jim Rupe, AB7DR, Western Amateur Radio Repair Co., (WARRC), 998 Whipple, Grayland, WA 98547-0697. (360) 267-4011

FOR SALE: Collins repair: FCC Licensed Technician, we repair the Collins Gray Line i.e. S-Line, KWM-2/2A etc. & other select models. Merle, W1GZS, FL, (352) 568-1676

FOR SALE: R-390A Repro nameplates - $9 shpd. N5OFF, 111 Destiny, Lafayette, LA 70506. trinit698idt.net, (318) 989-3430

FOR SALE: Heath Mohican GC-1A rcvr - $75; Heath HW-12, no PS - $50; cabinet for HW-12 - $25; National NC-57 rcvr - $75; Select-O-Ject - $35; Lafayette HA-460, 6 mtrs - $65. Norbert C. Wokasch, WA0KJE, 3312 W. Bijou, Colorado Springs, CO 80904. (719) 633-5661.

FOR SALE: Globe King 500C, partially restored - $650 + UPS; 1 kw AM xmtr, 813s/X810s - $550. Bill, NY, (914) 356-6553.

FOR SALE: Collins Radio 1958 to 1966 Avionics & Ground Communications Service manuals, specifications, tech data. Bill Coolahan, 1450 Miami Dr. NE, Cedar Rapids, IA 52402-2933. (319) 393-8075

FOR SALE: HQ170C & lge spkr, very good - $200; Hallicrafters S85 near mint - $130. Gary Schafer, K4PUX, 10435 NW 1 Place, Coral Springs, FL 33071. (954) 753-6776. gschafer@mindspring.com

WANTED: Very early Hallicrafters and Hallicrafters/Silver Marshall equipment including Skyriders with entire front panel dull aluminum color, S-30 radio compass, S-33 Skytrainer, S-35 panadaptor, wood console speakers - R-8 & R-12, HT-2, HT-3, BC-939 antenna tuner, parts, advertising signs, paper memorabilia of Hallicrafters. Also want RCA model AVR-11 airport tower receiver. Chuck Dachis, WD5EOG, "The Hallicrafters Collector", 4500 Russell Dr., Austin, TX 78745. (512) 443-5027

WANTED: Visitors and tubes by museum. Old and odd amateur or commercial tubes, foreign and domestic purchased, traded or donations welcome. All correspondence answered. K6DIA, Ye Olde Transmitting Tube Museum, POB 97, Crescent City, CA 95531. (707) 464-6470

WANTED: WW II Japanese, German, Italian radios & communication equip for display in intelligence museum. LTC William L. Howard, 219 Harborview Ln., Largo, FL 33770. (813) 585-7756, wlhoward@gte.net

WANTED: JW Miller RF coils, IF trans, chokes. Buying JW Miller & Millen parts, esp. need Miller B-727, B-727C, S-27, 912-C2, 912-C4, 912-C5. WA5THJ, Rt9 Box 163, Alvin, TX 77511. (281) 331-2956.

WANTED: B&K mod 606 checker, 2-201A tubes; Drake 2AC xtal cal for 2B Jack, AZ, (520) 634-2028.

WANTED: WW-2 German ENIGMA coding machine, completed one w/no missing parts. Takashi Doi, 1-21-4, Minsaidai, Sayaku, Yokohama, 246 Japan. Fax, 011-8145-301-8069. taka-doi@kk.iijlu.or.jp

WANTED: Filter for PRC-74; James Comm. year book, 1982, '83 & '87-'91; orig SP600JX manual. shigaki@mxw.meshnet.or.jp

WANTED: Johnson 250-39 TR switch; Dowkey relay. John, W8VBQ, OH, (513) 831-4996.

WANTED: Front panels: DX-100; DX-100B; HT-37; SX-101. John, W7KPA, 2445 S. Hillsdale Dr., Springfield, MO 65804. (417) 889-0233

WANTED: BC611, cosmetically exc, w/no or reversible mods. John Gibson, 1075 Sterling Ave., Berkeley, CA 94708. (510) 849-1051

WANTED: Swan antenna tuner, any condx; any other interesting Swan stuff, parts, etc. Eric, KB0XP, Box 98, Stanton, IA 51573. (712) 829-2446

WANTED: BC348, EH Scott rcvrs only in very good condx. EA4JL, contact in the States, Kurt Keller, CT, (203) 431-6850.

WANTED: Lafayette HA-750 6 meter AM; Did you buy my mobile rig w/portable battery pack, nicads & 5 xtals 6 years ago? Tired of it? Call me! Howard Kraus, K2UD, 372 Callodine Ave., Amherst, NY 14226. (716) 838-2406.

WANTED: Kleinschmidt teleprinter models: 311, 321, (AN/FGC-40, AN/GGC-16, AN/UGC-39...) Tom Kleinschmidt, 506 N. Maple St., Prospect Hts., IL 60070-1321. (847) 255-8128

WANTED: Old tube amps & xfmr's by Western Electric, UTC, Acro, Peerless, Thordarson, Jensen, JBL, EV, Altec, WE spkr's. Mike Somers, 2432 W. Fargo, Chicago, IL 60645. (312) 338-0153

WANTED: CB radio equip. I am looking for all types of old/vintage CB radio, amps, manuals, magazines, mics etc. Walter, CA, (818) 297-7249

WANTED: Valiant II; Swan 600R Custom; Hammarlund SP600-JX21A; TMC GPR-92. Ric, C6ANI, POB N4106, Nassau NP, Bahamas.

WANTED: Nixie tubes, National Electronics NL9058, NL5859CS, or Burroughs B5859S. Jim Clifford, KE4DSP, 108 Bayfield Dr., Brandon, FL 33511. (813) 654-7531. j.c.clifford@juno.com

WANTED: Antenna tuner/transmatch suitable for 100 watt xmtr. Ellsworth Johnson, 364 S. Coeur Dalene St., Spokane, WA 99204. (509) 838-2161, Fax 838-5159, ecjohnsonww2@worldnet.att.net

WANTED: RADIO Handbook, First Edition, published May 1935. Lynn Stolz, N8AJ, 428 Hopewell Dr., Powell, OH 43065. (614) 885-5428

WANTED: NC/300 4H4C current stabilizer (or?), chain for dial drum drive cord. Thanks. Carl, KN6AL, CA, kn6al@ecst.csuchico.edu

WANTED: Simpson 2 3/8" panel meters: #157 0-10VAC and #127 0-10 mADC. Jack Shutt, N9GT 1820 Dawn Ave., Ft. Wayne, IN 46815. (219) 493-3901.

WANTED: LS-7 & LS-203 spkrs; copy of ARRL 'Considerate Operator's Guide'; copy of Vol. 2 Surplus Radio Conversion Manual. KA1ZQR, CT, (860) 535-1286.

WANTED: Hammarlund SP600-JX17; XC-100P xtal calibrator; HC-10 or SPC-10 converter; ARRL Antenna Handbook 2nd-Edition; manuals for Mackay Marine 3020A. Brian, IL, (888) 851-4202.

WANTED: Babcock MT-5B xmtr + PS-1B sply. B.G. Martin, N4YYP, 127 S. Oliver St., Elberton, GA 30635. (706) 283-5087

WANTED: BC-610, BC-614, BC-939, TU49, TU52 & BC-614 manual. Pete Hamersma, WB2JWU, 87 Philip Ave., Elmwood Park, NJ 07407.

WANTED: Six inch ceramic feeder spreaders by EFJ, National or Birnbach; EFJ or B&W kw coils; UTC LS185 or CG309 plate xfmr. Martin Piepenburg, W9OLD, 5536E 500N, Monterey, IN 46960. (219) 542-2591

WANTED: HH Scott Model 296 Dual Channel Laboratory Amp w/wocabinet. Jeff Kyle, KF6WX, 4268 FM 36 S., Caddo Mills, TX 75135. (903) 527-4196

FOR SALE: New list -hundreds of manuals, schematics and service information. Send 2-stamp LSASE. David Crowell, KA1EDP, 40 Briarwood Rd., North Scituate, RI 02857-2805. (401) 934-1845

FOR SALE: Join SPAM, the Society for Promotion of AM. Learn about Advanced Modulation Certificate, Circuits - $1 plus large SASE 3 stamps. W4CJL, 202 Baker Dr., Florence, AL 35630.

FOR SALE: Galena xtal radios &/or parts to make your own. Len Gardner, 458 Two Mile Creek Rd., Tonawanda, NY 14150. (716) 873-0447

FOR SALE/TRADE: Hickok #198, 288X, 610 sig gen, Sprague Tel-omike, mod 16 test gear. Ray, MO, (314) 428-1963.

FOR SALE: Viking 500, mint, new Dahl xfmrs, capacitors, 3B28's, rewired, paint & silk screened. Sid, W4EGE, CA, (714) 498-4988.

FOR SALE: HP 524D 10 MHz vacuum tube counter - $10; Teletype 28KSR - $20. Both clean. U PU or I'll deliver nearby. Location: Los Angeles area, near Torrance. **WANTED:** Manual for a Kay 154C Mega-Sweep. Will pay $20. Jim Hill, W6IVW, 3801 Palos Verdes Dr. N., Palos Verdes Estates, CA 90274-1159. (310) 378-4411. jshillwtivw@earthlink.net

FOR SALE: Drake TR-3 - $225. **WANTED:** Heath 6M Lunchbox; tube CB sets/accessories. C. Zafonte, N1FRX, RR3 Box 2075, Fort Kent, ME 04743. (207) 834-6273

FOR SALE: New Collins 500 kHz filters 2.75 kHz wide, plugs into 51J-4 for extra 12 dB gain - $125. Walter M. Chambers, K5OP, POB 241371, Memphis, TN 38124-1371. (901) 761-9381

FOR SALE: Hundreds of books: ARRL; Rad; Lab; RCA, Receiver Design, 2-stamp SASE for list. Charles Brett, 5980 Old Ranch Rd., Colorado Springs, CO 80908. (719) 495-8660

FOR SALE: New Release: Send 2-stamp LSASE for Olde Tyme Radio's latest flyer NO. 197 to: Olde Tyme Radio Co., 2445 Lyttonsville Rd., Ste 317, Silver Spring, MD 20910. Ph/Fax (301) 527-5280

FOR SALE: Ancient (30s - 40s) neons, one watt 110V, size 1-1/4 inch globe - $5 ea, 7.50 for two, etc. Request info. Charles Graham, 4 Fieldwood Dr., Bedford Hills, NY 10507. (914) 666-4523

FOR SALE: Drake TR-4C w/AC-4, MS-4, D-104 mic, cables, manuals, spare tubes, exc + condx - $400; Hallicrafters SX-43 w/R-42 spkr, manual, mint condx - $350; (2) British Wireless sets No 19 MKII w/ps, connectors, manual, exc condx - $250 & $300. All + pkg/shpg. Ed Feild, K4GPK, RR2 Box 825, Palmyra, VA 22963. (804) 589-1293

FOR SALE: Classic Hygain CB service manuals from authorized Hygain repair center & 17S Sams CB photo facts, sell or partial trade, won't split up. Walter Schivo, KB6BKN, 560 Eldridge Ave., Novato, CA 94947. (415) 897-4088. kb6bkn@juno.com

WANTED: Anything related to Tecraft & Ameco, cheap stuff only; Tecraft pwr sply & manuals. Bud Fritz, N3SFE, 104 2nd St., Montgomery, PA 17752.

WANTED: Military sets WS #29 Canadian A set; US DAS-2 Loran rcvr-indicator. Leroy Sparks, W6SYC, 924 W. McFadden Ave., Santa Ana, CA 92707-1114. (714) 540-8123

WANTED: Collins R389, 30K-, 310-, 399C-1, KW-1, HF80 i.e. HF8014, 851S-1, Hallicrafters SX-115. Richard, WAØAKG, NE, (402) 464-8682.

WANTED: Schematic for Roberts 720 Reel-Reel recorder. **FOR SALE:** T4/FRC 400W AM xmtr w/ all coils & pwr sply, all in exc condx - $300. Neil Webster, POB 1065, Guttenberg, IA 52052. (319) 252-3786 ph/fx

WANTED: Electronic TR switch (Johnson, etc). Peter Doherty, W1UO, 304 Trelawney Ln., Apex, NC 27502. (919) 387-9323 eves

WANTED: 500W AM xmtr for on-air use; HQ-180, TS-520 w/VFO available for trade. Dave, W4QCU, E. TN, (423) 483-1722.

WANTED: Method of removing fungicide varnish & spare parts for refurbishing BC-312. David Boardman, 10 Lemaistre, Sainte-Foy, Quebec G2G 1B4, Canada, (418) 877-1316

WANTED: Viking Ranger, Gonset G-28, good condx; Viking Challenger kit manual. Dan, K3XR, 218 Balthaser Rd., Sinking Spring, PA 19608. (610) 670-2980

WANTED: SBE sweeptube amp SBLA-1 or SBLA-2; nice SX96 or SX100. Bill, KD4AF, NC, (910) 699-8699.

WANTED: National SW-3 model 1, 2 volt version; Taylor 203Z, T-21 tubes. Dean Showalter, W5PJR, 72 Buckboard Rd., Tijeras, NM 87059. (505) 286-1370

WANTED: A source of bead chain for NC-300 dial cord. Alex, WA2BMB, NJ, (908) 236-0734.

WANTED: Huge Navy equipment: shipboard & shore radio, radar, & sonar, mint thru junkers. William Donzelli, 304 S. Chester Ave., Park Ridge, IL 60068. (847) 825-2630, integrat@usr.com

WANTED: Military electronics, RDF, radar, communications, test, manuals, literature, etc. What have you got? William Van Lennep, POB 211, Pepperell, MA 01463. (508) 433-6031

WANTED: Watkins-Johnson or Communications Electronics Inc. info, catalogs, manuals or equipment. Terry O'Laughlin, WB9GVB, P.O. Box 3461, Madison, WI, 53704-0461, 608-244-3135

WANTED: Globe King 500, A, B or C xmtrs, any condx., reasonably priced. Terry Collins, KB9AUP, 18 N. Tomahawk Ave., Tomahawk, WI 54487. (715) 453-3707 d, 453-4633 eves

WANTED: In pristine condx.: Collins 32V3, 75A1, 30S1, 270G-1, 32S3A (RE), 310B3, 30K1, mech filter adapters. Lee, W9VTC, IL, (847) 439-4700 d, 726-1660 eves.

WANTED: Hallicrafters HT-1, HT-9, HT-31, S-T, SX-11, SX-17, SX-25; Howard rcvrs; Harvey xmtrs. Ken Seymour, KA7OSM, 9115 SW 176th Ave., Beaverton, OR 97007. (503) 306-7439 24 hrs. ken.seymour@attws.com

WANTED: Cash for Collins: SM-1, 2, 3; 312A-1, 2; 55G-1; 625-1; 399C-1; 51S-1; 302C-3; KWM-1; KWM-380; also buy estates. Leo, KJ6HI, CA, Ph/Fax (310) 670-6969.

WANTED: Manuals, manuals, manuals for radio-related equipment to buy or swap. Catalog available. Pete Markavage, WA2CWA, 27 Walling St., Sayreville, NJ 08872. (908) 238-8964

WANTED: Broadcast gear, compressors, limiters, old mics, consoles, EQ, tube recorders, thanks! Mike States, Box 81485, Fairbanks, AK 99708. (907) 456-3419 ph/fax.

WANTED: Navy xmtrs: MQ, TCA, TCE, TCN, TCX, TDE; rcvrs: RAW, RAX, RBD, RBJ. Steve Finelli, 37 Stonecroft Dr., Easton, PA 18045. (610) 252-8211. navrad@enter.net

WANTED: Squires-Sanders SS-1R, SS-1T, SS-1V, SS-1S, see my web page tulsa.oklahoma.net/~wd5jfr. Hank, WD5JFR, OK, (800) 364-4265

WANTED: ElectroVoice 664 mic; Johnson or other commerical TR switch. Steve Taylor, N4CE, 103 E. Oak St., Alexandria, VA 22301. (703) 299-8569.

WANTED: Neutralizing capacitors, disk type, especially National NC-75, 150, 500. Bill Crawford, Cushman Rd., Patterson, NY 12563. (914) 878-4653. wrcraw@ibm.net

WANTED: To provide a good home for a 500W AM xmtr, the radio will receive TLC & frequent exercise to prevent atrophy. Handsome dowry for a very clean radio. Dave, W4QCU, E. TN, (423) 483-1722.

FOR SALE/TRADE: Xmtg/rcvg tubes, new & used. 55¢ LSASE for list. I collect old & unique tubes of any type. **WANTED:** Taylor & Heintz-Kaufman types & large tubes from the old Eimac line; 152T thru 2000T for display. John H. Walker Jr., 16112 W. 125th St., Olathe, KS 66062. (913) 782-6455, johnh.walker@alliedsignal.com

FOR TRADE: Two good RCA 833A's for one Taylor 833A; also looking for Taylor 803, 813, 875A. John H. Walker Jr., 16112 W. 125th St., Olathe, KS 66062. (913) 782-6455, johnh.walker@alliedsignal.com

FOR SALE: HAL RS-2100 RTTY scope - $130. Robert, CA, (562) 928-8820, rrjlife@earthlink.net

FOR SALE: Repair & restoration, tube & transistor vintage radio. FCC licensed. Mike Zuccaro, 8795 Corvus Pl., San Diego, CA 92126. (619) 271-8294

FOR SALE: Large stock vacuum tubes in boxes, all tested, sell as unit to highest bidder, SASE for list. Bill Riley, 863 W. 38th Ave., Eugene, OR 97405-2375. (541) 345-2169

FOR SALE: Hy-Gain 18TD tape doublet - $110; Millen 90651 grid dip meter - $85. U shp. Boyd, KØLGG, NE, (402) 551-3085.

FOR SALE: Bird P/N 4522-002-2 dual directional coupler as new - $85 ppd; RCA 8510 15-650 kc VLF rcvr - $150 + UPS. Parker Heinemann, W1YG, 87 Cove Rd., Lyme, CT 06371.

The Radio Finder©

11803 Priscilla, Plymouth, MI 48170

TEL/FAX 313-454-1890, e-mail: thurtelljh@aol.com

FEBRUARY SPECIALS

AMATEUR TRANSMITTERS: **COLLINS** KW-1, #70, works FB; KW-1, #31, needs work; 30-K w/ 31A-3 exciter; 30S-1; 32S-1; **DRAKE** T4-X; **JOHNSON** Invader 2000; Valiant; Thunderbolt; Johnson mobile VFO; **GONSET** GSB-100; **HALLICRAFTERS** HT-32; HT-37; HT-40; **HEATH** DX-100; HA-10 Warrior amp; **CENTRAL ELECTRONICS** 100-V; **MULTI-ELMAC** AF-67; AF-68; **DENTRON** GLA-1000 amp; Command transmitters

AMATEUR RECEIVERS: **COLLINS** 75A-4 #5,275; 75A-3; 75A-2; 75A-1; 75S-3B; 75S-3; 312B-3 speaker; 312B-4 console; 516F-2 case only w/speaker; CP-1; **HALLICRAFTERS** SX-88; SX-71; SX-17; S-40B; R46/R46B speakers; **HAMMARLUND** SP-600-JX, souped up; SP-200 (BC-779) w/power supply; military HQ-180-X; **NATIONAL** HRO-60; NC-300; NATIONAL WW II LF receiver; **NATIONAL** speaker; **SCOTT** SLR-F "anti-submarine" receiver

TRANSCEIVERS: **COLLINS** KWM-1; 516F-1 AC; 516E-1 DC; 312B-1 speaker; KWM-2 w/blanker, Waters; KWM-2; KWM-2A; 312B-5 prototype; **DRAKE** TR-4C; TR-7; **GONSET** Communicator II, III, IV; **HALLICRAFTERS** SR-150; **HEATH** SB-102; HW-16, Twoer; **NATIONAL** NCX-1000; **SBE** SB-34; **YAESU** FT-101-ZD; FT-101-E; FT-101-E accessories: remote VFO, monitor scope, Landliner phonepatch, digital readout; FTDX-560

MILITARY RECEIVERS: **COLLINS/Miltronix** R-390-A; Arvin/Miltronix R-725; Good just-serviced, working R-390; R-390-A; CV-157A/Miltronix; CEI 354; **WATKINS-JOHNSON** DMS 105A; BC-348-Q; BC-453 Command receivers; **MOTOROLA** R-644/URR 20-30 MHz AM/FM receiver; Command receiver racks.

ACCESSORIES: SM-1 Mic; DL-1 dummy load; 516E-1 DC supply; MP-1 mobile supply

FILTERS: 75A-3 -- 6 khz, 800 hz; **DRAKE** R4C -- 250 hz.

WANTED: Good used rigs

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FOR SALE: Tube list, new & used, wide variety audio, ham. Recently expanded. SASE 52¢. Bill McCombs, WB0WNQ, 10532 Bartlett Ct., Wichita, KS 67212-1212.

FOR SALE: AM/FM/LW/SW Fisher tuner - $150 + shpg. L. Schimmel, POB 1234, Spanaway, WA 98387.

FOR SALE: Collins 32V owners, new Raytheon 4D32 tubes - $19 while they last. Don Gies, W4GIT, FL, (352) 475-1950

FOR SALE: Homebrew amplifier, ex-K4ENQ(SK) in Premier 36" cabinet, appears complete & like new w/paperwork, utilizes 2 8802/3-500Z, 10-75 meters, (+MARS), SSB output 2400 watts, 4500 watts (PEP), 100 watt exciter required. PU or truck freight - $300. May take military TMs on trade on radios preferred, other subjects too. Military Marketing, Inc., POB 741, Norcross, GA 30091-0741. (770) 729-9315

FOR SALE: Swan 350, exc - $325. **WANTED**: Johnson Invader 200 & Central Electronics 600L amp. Robert Braza, N1PRS, 23 Harvard St., Pawtucket, RI 02860. (401) 723-1603

FOR SALE: Hammarlund HQ-150 - $240; Tecraft Cascode VHF converter model C3/21 - $35. Larry Wright, N4QY, 170 Heritage Ln., Salisbury, NC 28147. (704) 633-3881

FOR SALE: Classic gear - SASE for list. **WANTED:** Vintage rigs. The Radio Finder, Joel Thurtell, 11803 Priscilla, Plymouth, MI 48170. Tel/Fax (313) 454-1890

FOR SALE: Copies: Hard to find schematics for radios, also kit radios 1922-1950; manuals: test equip. ham gear. Contact me for prices, availability. Duane Ballew, KB7QZK, 6813 152nd St. Ct., NW, Gig Harbor, WA 98332. (206) 851-4505

FOR SALE: Vintage Heath test equip, parts, more! 2-stamp SASE or $1 for list. Jim Miccolis, N2EY, 126 Summit Ave., Upper Darby, PA 19082. (610) 352-5247

FOR SALE: Convert any wattmeter to read PEP! Perfect for AM/SSB - $19.99 ppd for complete kit! HI-RES, 8232 Woodview, Clarkston, MI 48348. (248) 391-6660, hires@trust.net

FOR SALE: RIT for KWM-2 and S-Line. No modifications for KWM-2. $59.95 tested/42.95 for kit. SASE for details and order info. John Webb, W1ETC, Box 747, Amherst, NH 03031.

FOR SALE: HQ129X, no cabinet, works, nice, orig knobs - $85 + UPS. Dave Metz, VA, (540) 885-7914, eves til 10 PM. metzd@cfw.com

FOR SALE: Measurements 110B modulated xtal calibrator, manual - $25; big sale list on diskette - $2 (refundable). Joe Orgnero, VE6RST, Box 32 Site 7 SS1, Calgary, AB T2M 4N3 Canada. (403) 239-0489

FOR SALE: Hallicrafters SR42A 2m AM xcvr, manual - $75; 1925 International Call Book - $20. Dave, W1DWZ, MA (508) 378-3619.

FOR SALE: SB-10 sideband adaptor - $75; National HFS parts radio - $50, +UPS. Dave, W4QCU, E. TN, (423) 483-1722.

FOR SALE: HQ-180C w/noise immunizer, works fine, new tubes, cabinet & panel very nice - $375 + UPS, cash or partial trade for 32V2/3 or 5100B. Dave, W4QCU, E. TN, (423) 483-1722.

FOR SALE: ARC-5 xmtr T-21 orig condx - $75 + shpg. Ken Kolthoff, K8AXH, 8967 Scott Dr., Desoto, KS 66018. (916) 585-1196

FOR SALE: Ameco CD-1 Conelrad monitor, NIB w/instruction - $30; Heath MM-1 VOM - $30. K1BOX, MA, (508) 624-4340.

WANTED: Triplett Modulation Monitor 1696A; Chicago splatter choke SR-500; Chicago modulation transformer CMS-3; UTC bias transformer S-51; Triad splatter chokes C-26X. Mike Ruggiero, W2NVR, Rd 3, Box 3358, Saylorsburg, PA 18353. (610) 381-3211, w2nvr@ptd.net

FOR SALE: New orig PJ-068 mic plugs for Collins S-line/KWM-2A/HF-380 shp'd in USA - $8 ea. Clint Hancock, KD6HH, 6567 Ashfield Ct., San Jose, CA 95120-4502.

FOR SALE: Heath: VF1, QF1, HR10B, HS1661, SB600, DX20, DX35, DX40, HO-5404 station monitor; Millen: 90651 w/case & coil set, 90501 secondary frequency standard, 90700 variarm VFO; Gonset: 2 meter Communicator, 6 meter xcvr; Harvey Wells Bandmaster Deluxe, Bandmaster Senior, Factory P/S; Mosley CM1 Amateur rcvr; Hallicrafters: CB3A, Sky Buddy, HA4 keyer; Sonar VFO120 Conair 400 CW xmtr; Johnson: VFO122, mint Valient, Desk kilowatt (modified); Collins 75A4; Esco 722 VFO; Ten Tec 160 meter converter, (looks new); Lysco model 50 antenna tuner; Drake: 2B rcvr w/2BQ multiplier, nice, UV-3 144/220/440 xcvr w/PS3; Stancor: ST202A 80-10 xmtr; ST203A 10 meter AM xmtr; Wilcox CW3 Communications rcvr w/2-4&16-32 MHz modules (or will buy your modules); Lafayette HE40 .55-30 MHz rcvr, 6 meter VFO; Spectronics DD1 Digital frequency display for Yaesu; Bretting "9" rcvr; Zenith ZE1 B Eliminator (like new). Please send SASE w/specific questions to: Parker, W1YG, 87 Cove Rd., Lyme CT 06371.

FOR SALE: Collins, Hallicrafters, etc, to many to list, collector out of space. Gary, N6VDR, CA, (818) 707-3701

FOR SALE: Rcvr's: S-19R - $100; SX25 recondx - $175; CRX5 Civic Patrol VHF - $50; SX99 - $100; SX101A - $175; National NC1-10 1-meter to 10 meters w/coils/PS, like new - $275; NC100A - $175; NC183 - $175; NC300 - $175; HRO60 a/b/c/d - $375; HQ129X recondx - $175; Lafayette HE30 - $80; HA600A - $95; Johnson Ranger 1 - $250 ex clean have 2; Ranger 2, collector quality - $700; AT1 & AR2 untested - $150 pr; all + shpg; following for PU only; 2 Viking I, 4 Viking 2, 122 VFO's available w/xmtrs. 2) Valiant 1, Invador 200, 2) Invador 2000's; 2) Johnson 500's; Johnson Mobile; 2) B&W 5100's, B&W 5100B; Hammerlund HX50; Hall HT40; WRL Globe Scout 40A, 150 Champion, G/K 400+VFO, G/K 500A+VFO; BC610-F & BC610-H; Collins URC32/KWT6/5; some xmtrs work, some don't, some untested. Remember, PU only SE Kansas. Jim, WØNKL, KS, (913) 471-4644

FOR SALE: 1959 Hallicrafters promotion "The Amazing World of Short Wave Radio", on cassett, great gift - $7 ea ppd. Neil E. Borg, WØMXX, 2219 Ridgewood Dr. NW, Alexandria, MN 56308.

The Collins Video Library

featuring Dennis Brothers, WAØCBK assisted by Floyd Soo, W8RO

The Collins KWM-2 Video 4 hours
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The Collins Amateur Radio Equipment Video Spotter's Guide 1 hour, 40 minutes
Close to 90 individual pieces of Collins Radio equipment are shown in the video. Examples of some of the gear covered are: KW-1, KWS-1, 30K-1, 20V-3, 75A-4, KWM-2, S/Line, KWM-1, 30S-1, 30L-1, KWM-380 and much more!
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The Collins KWS-1 Video 2 hours
This video is the perfect companion to the 75A-4 video for owners of the "Gold Dust Twins"! Butch Schartau, KØBS, shows you how to operate, maintain and repair your KWS-1. Watch as Butch goes through the entire alignment and neutralization process, as well as showing you how to properly operate this famous transmitter.
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The Collins 75A-4 Video 4 hours
This video is four hours of information on how to repair, maintain and restore this classic receiver. Butch Schartau, KØBS, guides you through all aspects of keeping your own 75A-4 running like a top.
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Here it is! Long awaited by serious "boatanchor" enthusiasts! The ultimate receiver now has the ultimate video to go along with it. R-390A expert Chuck Rippel, WA4HHG, covers an absolutely incredible array of information in this "heavy duty" video. This video looks at operation, its modules, circuit description, front and rear panel details, complete mechanical and electrical alignment, PTOs, performance evaluation, modifications, troubleshooting and restoration. There is nothing like this video available today, at any price!
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ER Bookstore, 14643 County Road G, Cortez, CO 81321

FOR SALE: Mint BC-312-N w/cover, shock mount, spkr, spares & manual - $300; pair Hallicrafters HT-2A handheld paramilitary xcvr's w/manual - $225. Harve Nye, OR (541) 334-1784.

FOR SALE: RCA WV-77-E Voltohmyst, WO-33-A scope, WR-59-C sweep gen - $25 ea + UPS. Ken, TX, (254) 772-2307.

FOR SALE: Echophone EC-1, very nice condx, recapped - $75. Karl, KA1RM, MA, (508) 636-3281.

FOR SALE: Heath SB-303 rcvr w/all 3 filters, very nice - $140 + shpg. James Shank, W3CNS, 21 Terrace Ln., Elizabethtown, PA 17022. (717) 367-3149

FOR SALE: Mic stand adjustable w/switch, fits D104 mic - $20. Joe, W6CAS, CA, (916) 731-8261.

FOR TRADE: Silver-Marshall SM-220 audio xfmr for audio xfmrs for Tuska model 225 radio. Pat Stewart, W7EVC, 1404 Ruth Ave., Walla Walla, WA 99362. (509) 525-1699

WANTED: National coils, dog house pwr splys & NIB parts. I love National. Sylvia K. Thompson, N1WVJ, 33 Lawton-Foster Rd., Hopkinton, RI 02833. (401) 377-4912

WANTED: To buy or trade military surveillance & countermeasures rcvrs & jammer or related gear 1960 - present. Tony Snider, VA, (757) 721-7129.

WANTED: Compressor amplifiers & other pro-audio gear: mics, preamps etc-tube or solidstate. Mark Linett, CA, (818) 244-1909.

WANTED: Collector/builder seeks lge & small vacuum tubes & vacuum tube collections, sockets, etc. Will pay good prices. Please call Marc, OR, (800) 330-2004.

WANTED: MS military connectors, unused, khaki or olive drab color, quantities, door knob capacitors, amphenol octal-size sockets, 11-pin & plugs, 9-pin, send SASE for new tubes. **FOR SALE:** List V; tube sockets & extenders. Typetronics, Box 8873, Ft. Lauderdale, FL 33310-8873. (954) 583-1340, fx 583-0777

WANTED: 304-TL sockets, 866-Globe-RCA or Taylor (not A's), Northern Electric-R205D triode/PR., WE-437A's Stancor-A-4762 driver trans, Stancor-A-3829 modulation, Stancor C-2317 splatter choke; Eimac 75-TL. Robert, CA, (562) 928-8820, rrjlife@earthlink.net

WANTED: AC spark plug Achieverphone radiotelephone control head & cable, or complete set. Geoff Fors, WB6NVH, POB 342, Monterey, CA 93942. (408) 373-7636

WANTED: Nems Clark radio rcvrs, service & operating manuals, parts, etc, any condx. Chuck Dachis, The Hallicrafter Collector, 4500 Russell Dr., Austin, TX 78745. (512) 443-5027

WANTED: Xmtg tube sockets, 813s, etc. Send SASE for list 4 tubes & socket extenders. Typetronics, POB 8873, Ft. Lauderdale, FL 33310-8873. (954) 583-1340, fax 583-0777

WANTED: WW II Japanese xmtrs & rcvrs (parts, plug-in coils) for restoration & ER articles. Ken Lakin, KD6B, 63140 Britta St., Ste. C106, Bend, OR 97701. (541) 923-1013. klakin@aol.com

WANTED: Keyer paddles of all kinds. Cap, WØXC, CO, (970) 247-0088. capallen@frontier.net

WANTED: Collins S-line, KWM2A, 30L-1, etc. Mark pays the most for clean gear. WD4AAS, FL, (954) 776-5996 (d), 566-0014 (n).

WANTED: Command sets ART-13's; Collins radios & all accessories top $ paid; also most radios repaired reasonable. FCC licensed. WA1DEJ, MA, (781) 485-1414 eves, hobfact@tiac.net

WANTED: Squires-Sanders equip. H. Weber, 4845 W. 107th, Oak Lawn, IL 60453-5252.

WANTED: UTC A-12, copy of MIL-T-27A spec; Fairchild, Langevin, B'cast gear. R. Robinson, 868 S. Main St., Plantsville, CT 06479. (860) 276-8763,

WANTED: Temco 75GA; Supreme AF100, both are post WWII amateur desktop xmtr's. Robert Perlstein, W1IV, POB 642, Old Orchard Beach, ME 04064. (207) 934-9206, perls@compuserve.com

FOR SALE: Knight: T-150A - $145; P-2 SWR - $25; Z-bridge - $18; Heath: HD-20 calibrator - $40; AM-2 SWR - $25; Cheyenne - $75; MM-1 VOM - $35; HD-1416 unbuilt - $45; Eldico antenna scope - $40; Lafayette Starflite - $95; more, free list. Richard Prester, 131 Ridge Rd., W. Milford, NJ 07480. (973) 728-2454

FOR SALE: Heath: IG-4505 scope calibrator - $50; ID-4555 scope - $100; IG-1272 audio gen - $75; IN-17 decade box - $15; AG-9A audio gen - $35; S-3 electronic switch - $25; ID-4101, still a kit - $50; complete electronic course - $50; HQ-170 - $100. Ron, K6LLQ, CA, (510) 682-2838.

FOR SALE: DX-60 - $75; VHF 152 - $25; HQ-100 w/band spanner - $175; NC-125 - $70; S-40 - $60; Unique wire tuner - $75; Dentron 2000A - $65. Ron, K6LLQ, CA, (510) 682-2838.

FOR SALE: R-441A/SRR-13A, inop for parts - Offer; LM-13 HET freq meters, 2 ea w/110 VAC ps & cable - take offer; LM-4 freq meter - Offer; ME-165 wattmeter SWR - Offer; R-109 GRC FM rcvr 27-54 MHz w/24V ps module - Offer. Al Jenkins, WA1RWB, 5 Daley Ct. Box 1162, Nantucket, MA 02554. (508) 325-7122

FOR SALE: Hallicrafters Commandline FM-xcvr OSB-30-2 fixed frequency 148-174 MHz w/ Hallicrafters desk mic, extra Hallicrafters mobile spkr - $65. Allan Lurie, W9KCB, 605 E. Armstrong Ave., Peoria, IL 61603. (309) 682-1674

FOR SALE: SX140 & HT40 package, manuals, very exc - $195; Drake TR4C, AC4 PS, MS4 spkr, manual, exc - $300; RME45 & spkr, very good - $125; WRL Globe Sidebander, works, good condx - offer; NC300 & spkr, manual copy - $200; Viking Challenger, manual copy, very good - $100; S19R Sky Buddy, orig manual, very good - $95; HW101 w/pwr sply, manual copy, clean, xmtr inop - $95; Heath VF1 VFO, works & clean, manual copy - $35; SX71, manual copy, clean panel, knobs missing - $75; all + UPS. Dick Dixon, W7QZO, 16032 Lost Coyote Ln., Mitchell, OR 97750. (541) 462-3078

FOR SALE: Communications & military radios, test equipment & some radar items. Send long SASE for large list. No sales until you have received my list, looking for some trade items. Ray Chase, 1350 Marlborough Ave., Plainfield, NJ 07060. (908) 757-9741

FOR SALE: Silver #904 Res/cab bridge, needs restoration, cosmetically nice - $19 + shpg. Henry Mohr, W3NCX, 1005 W. Wyoming, Allentown, PA 18103.

FOR SALE: HX-500 Hammarlund xmtr, fair - $150. **WANTED:** Hook-up info on Navy's DU-1 RDF. Keith Perry, 384 S. 48th St., Springfield, OR 97478. (541) 726-1512

FOR SALE: Lettine model 240, 1 working, 1 could work, 1 box of parts & 20 coils for Lettine - $225. Ron, K6LLQ, CA, (510) 682-2838.

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Collins promotional literature, catalogs and manuals for the period 1933-1993. Jim Stitzinger, WA3CEX, 23800 Via Irana, Valencia, CA 91355. (805) 259-2011. FAX (805) 259-3830

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FOR SALE: Collins meatball lapel pin - $5.95 + $.75 S & H. George Pugsley, W6ZZ, 1362 Via Rancho Prky, Escondido, CA 92029.

FOR SALE: Radio & electronics related books, 160 titles, call or write for list. Paul Washa, WØTOK, 4916 Three Points Blvd., Mound, MN 55364-1245. (612) 472-3389

FOR SALE: R-390As complete units, modules, small parts, call & ask, no covers or meters; M/C, Visa,Discover. Howard or Tony, NC, (919) 441-1360. fax 441-7322. 9 AM - 6 PM EST.

FOR SALE: Boatanchor paints; Heathkit Tech Journal Subscriptions; phone filters - call or write for free catalog. R&R Designs, 202 Midvale, Marshall, WI 53559. (800) 372-4287

FOR SALE: Very rare Drake PS-4 frequency synthesizer for the 4-line, like new - $375. Steve, W4IJ, SC, (803) 873-2499 x 200 days, 871-7749 eves.

WANTED

Vintage AM equipment for personal use. Must be collector quality or mint. Prefer Collins, will consider others. Bob Tapper, K1YJK, 5 Polo Club Dr., Denver, CO 80209-3309. (303) 740-2272, FAX (303) 777-6491

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FOR SALE: Knight Star-Roamer - $50; Heath Seneca - $150; exc w/manuals; maintance kit for T-195/GRC-19, see ER#104 - $15. Gary, MN, (612) 496-3794.

FOR SALE: Genuine new surplus: Unused R-390A cabinets #CY-979A/URR w/shock supports and misc hardware package - $305; top and bottom cover sets - $75. Mac McCullough, TX (214) 324-4849, Fax - 324-4844

FOR SALE: Everything to build a late 30's style high pwr TX in 30x22x56 inch cabinet using Johnson Invader 2k RF amp, using pair of new Eimac 4-400A tubes modulated by pair of 4-125A tubes, spare tubes for both; 6 ea 3-1/2" meters from old AM BC TX, very heavy iron in p/s & modulator decks, electronically identical to Johnston Desk kw, weighs over 700 lbs, works CW, high level modulated AM, SSB, driven by Collins T-368 exciter, 3 windows showing RF, mod, p/s tubes, 2 variacs for tube filament & screen voltages, on HD casters. Call or write for complete details; BC-610 speach amp; BC-610 mod xfmr; T-368 exciter; T-368 SWR/pwr meter w/ dummy load; 4 ea 4 KV filter caps; 4-400A, 4-125A, 866A, 3B28 tubes; Johnson Invader 2k p/s, will work as Johnson Desk kw p/s; 2 ea Hallicrafters SX-28 rcvr, 1 w/out case. J. Davis, WE5I, 64 Chief White Eagle Ln., Cherokee Vlg, AR 72529-5416. (870) 257-2839

FOR SALE: Exc Hallicrafters SX101A - $200, exc HW104 ps/spkr/mic/CW filter/manuals - $225; AN/URM-9D precision LRC bridge/manual - $50; repackaged R-174/URR rcvr/ps/orig manual, mint Knight KG625 VTVM/probe/manuals - $25; exc Eico signal generator 324/manual - $25; Heath GDO 1B - $15; 19x9x14 hinged top cabinet - $25. All equip at minimum repaired/retubes. U shp. No delaers please. David Bertman, AB7B, 1314 SW Hall #E, Portland, OR 97201. (503) 223-5295

FOR SALE: Harris RF-550 rcvrs, AM, LSB, USB, ISB, RF-583 tuning option, mint condx, checked, serviced - $795. Shawn Daniels, MO, (314) 343-5263.

FOR SALE: Control box CAY 23220 - $25 ppd. R.J. Eastwick, N2AWC, 224 Chestnut St., Haddonfield, NJ 08033. (609) 429-2477

FOR SALE: Drake AC-4 - $100; W-4 - $75; MN7/B1000 - $150; MS-4 - $50; 2C - $100. K1BW, MA, (413) 538-7861.

FOR SALE: Xtal radios, very sensitive & selective, parts available. L. Gardner, 458 Two Mile Creek Rd., Tonawanda, NY 14150. (716) 873-0447

FOR SALE: Yeasu FTDX-560 80-10 meters, needs work - $175; Tram D-201A, manual, D-104 mic, nice shape - $375; Ham III rotor & control box, clean & VGC - $175; Heathkit HP-1144 pwr xfmr - $30. All items, U-ship. **WANTED:** L4-B amplifier working or not. Dan Langston, KO4RA, GA, (912) 453-9066.

FOR SALE: Viking Valiant in orig. box - $425. Prefer pickup. Bob Napoli, K2LGO, Box 158, Riverhead, NY 11901. napoli@i-2000.com

FOR SALE: 3-500Z linear amp w/pwr sply, beautifully built -$150, prefer PU. George Shute, W4BDG, 2910 Virginia St. NE, Albuquerque, NM 87110. (505) 298-7347

FOR SALE: BCB, 100MW AM xmtr, Realty type w/endless tape loop, like new w/box - $50. Harry Blesy, N9CQX, 95740 Clarendon Hills, Rd., Hinsdale, IL 60521. (630) 789-1793

FOR SALE: Globe VFO - $45; Motorola tube-type comm FM xcvr (2); Hickok 456 Tracesometer - $75; NIDA400 mini-lab - $125; B&K sine sq wave gen - $40. All + shpg. Greg Richardson, WA8JPC, POB 405, Gallipolis Ferry, WV 25515.

FOR SALE: HQ-120X, HQ-150, HT-32. **WANTED:** Heath SA2040 tuner. W7RBF, AZ, (602) 864-9987.

FOR SALE: Free K7FF Super List parts/equipment, e-mail: <k7ff@inreach.com>, or two first-class stamps/mailing label: Derek, K7FF, 5191 Rimwood Dr., Fair Oaks, CA 95628. (916) 965-4904

FOR SALE: Large number of military radio TO's, $11.50 each, U.S. Postage paid. For list, e-mail <karenski@inreach.com>, or $2./mailing label to Ski, 7966 Vintage Way, Fair Oaks, CA 95628. (916) 966-4749

WANTED: Entertainment radios, espey TRR-5; Zenith R-520; Jetronics R-853; Belmont REA; Ansley model ?. Henry Engstrom, KD6KWH, POB 5846, Santa Rosa, CA 95402. (707) 544-5179, ph/fx.

WANTED: Globe Scout Model 66. Richard, K1MD, RI, (401) 732-4026, eves, rich@ids.net

WANTED: Converted BC-458 VFO for Central Electronics 20A. CHUCK, N6FX, CA, (909) 593-1861 nites, (714) 956-9200 x309 days.

WANTED: VFO &AC pwr sply for my Harvey Wells TBS-50D; 1957 or 1958 WRL catalog. George Shute, W4BDG, 2910 Virginia St. NE, Albuquerque, NM 87110. (505) 298-7347

WANTED: Coils for HRO-60 rcvr. Winston Burt, N1WNB, 185 N. Poland Rd., Conway, MA 01341. (413) 369-4469

WANTED: S-meter for Hammarlund HQ-129-X. Robert Jenkinson, W6IOZ, 10156 12-1/2 Ave., Hanford, CA 93230

WANTED: WRL "Meteor" SB-175 xmtr; manuals for SB-175 & PSA 63A pwr sply. Al Bernard, NI4Q, POB 690098, Orlando, FL 32869-0098. (407) 351-5536

WANTED: S-meter, audio xfmr, audio gain knob for Hammarlund SP-600. Art Delibert, (301) 270-6775, delibert3a@aol.com.

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WANTED: BC-610, BC-614, BC-939, TU49, TU52, & BC-614 manual. Pete Hamersma, WB2JWU, 87 Philip Ave., Elmwood Park, NJ 07407.

WANTED: UTC A-12, H.I.T., Collins 26U/W; other B'cast gear. R. Robinson, 868 S. Main St., Plantsville, CT 06479. (860) 276-8763, richmix@erols.com

WANTED: Knife switches - Leviton, white porcelain base, copper, SPST 1-1/8" X 3-1/8", SPDT 1-3/8" X 3-7/8". Charles A. Hill, Rt 3 Box 400, Buhl, ID 83316. (208) 543-6081.

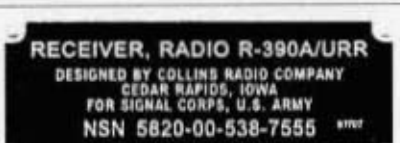
WANTED: Vacuum tube only homebrew rcvrs & low pwr xmtr's from Q5T, working preferred. Louis D'Antuono, 8802 Ridge Blvd., Brooklyn, NY 11209. (718) 748-9612

WANTED: Drake R4 rcvr, working or not but no parts missing; orig R4A manual. Orn Arnason, Quebec, Canada, collect (514) 243-6934.

WANTED: 3051 thermal relay; housing for B+ cannon plug J402 on KWS-1; xmtr kits. Brian Roberts, K9VKY, 130 Tara Dr., Fombell, PA 16123. (412) 758-2688

WANTED: Set of spline wrenches, prefer long ones, used on military gear. John Snow, 4539 N. Bartlett Ave., Shorewood, WI 53211. (414) 964-0194

WANTED: HRO Doghouse pwr sply #697 in very good orig condx. Harve Nye, OR, (541) 334-1784, mornings.



Repro 390A Nameplates $9 ea, two for $16, five for $35, w/screws, shipped. Tom Marcotte N5OFF, 111 Destiny, Lafayette, LA 70506

WANTED: Swan pwr sply model 117X, 400-G or Swan 230 pwr sply. Bimo, K5CIS, CA, (805) 765-7683.

WANTED: Manuals or copies for Heath AV-2, IG-72, IP-20. Howard Hood, 5670 SW 44th St., Port Orchard, WA 98367. (360) 674-2179

WANTED: Looking for BC-348R, ART-13 shockmount. Greg, KB9ENH, IN, (219) 980-4532

WANTED: Meissner 2 BK or 3 BK rcvr in any condx if all parts included. Neil Berg, WØMXX, 2219 Ridgewood Dr. NW, Alexandria, MN 56308.

WANTED: HQ-100 rcvr, HW-32, HW-22 & HW-12. Pete Cullum, KØWRX, 1332 Harlem Blvd., Rockford, IL 61103. (815) 965-6677.

WANTED: Condenser, carbon and other early broadcast microphones; cash or trade. James Steele, Box 620, Kingsland, GA 31548. (912) 729-2242

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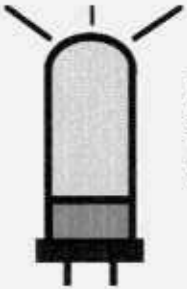

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