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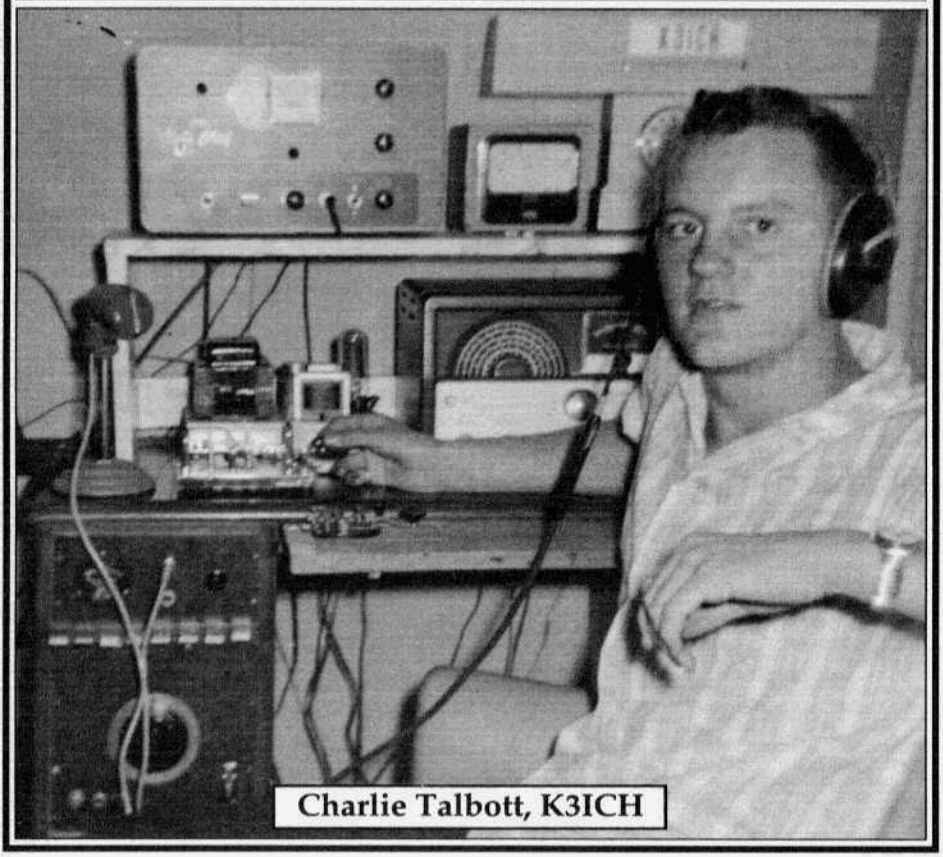
ELECTRIC RADIO

celebrating a bygone era

Number 104 December 1997



Charlie Talbott, K3ICH

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 first thing that long-time ER subscribers will notice about this December issue is that it doesn't have the traditional Robert Beasley, K6BJH, Christmas cover. Every year from our first December issue in 1989, Bob has been supplying his unique, interesting and very attractive artwork for our cover. I'm sorry to say that Bob is no longer able to produce covers or cartoons. In a recent conversation he told me that his time is now taken up by caring for his wife and other family obligations. I'm sure that ER readers are going to miss his presence. I feel that ER has lost a vital ingrediant and will never be quite the same. The input that I received from subscribers over the years is that everyone appreciated the cartoons and covers very much. I've always felt that Bob Beasley was the best amateur radio oriented cartoonist around. We'll miss you Bob.

Three vintage on-the-air events are coming up that I'd like to make everyone aware of. The first event will be the Eighth Annual ER Sponsored 160M AM Contest/Jamboree. This year it will be on Saturday/Sunday, Dec. 27/28. It will start at 9 pm Pacific time (Midnight EST) on Saturday and end 24 hours later on Sunday. The rules have not changed: one point for each contact and an extra point for each AMI member worked. Logs should arrive at ER no later than Jan. 30. They should contain the following information: name, callsign, city, state, time, signal reports, transmitter, receiver, antenna and AMI number. I'll have a full report with 1st, 2nd and 3rd place winners in the February issue. I'll provide award certificates and a copy of Ray Moore's new book Communications Receivers 4th Edition for the winners.

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Cover: Charlie Talbott, K3ICH, in his hamshack back in 1959.

Looking Back

by Lew McCoy, W1ICP
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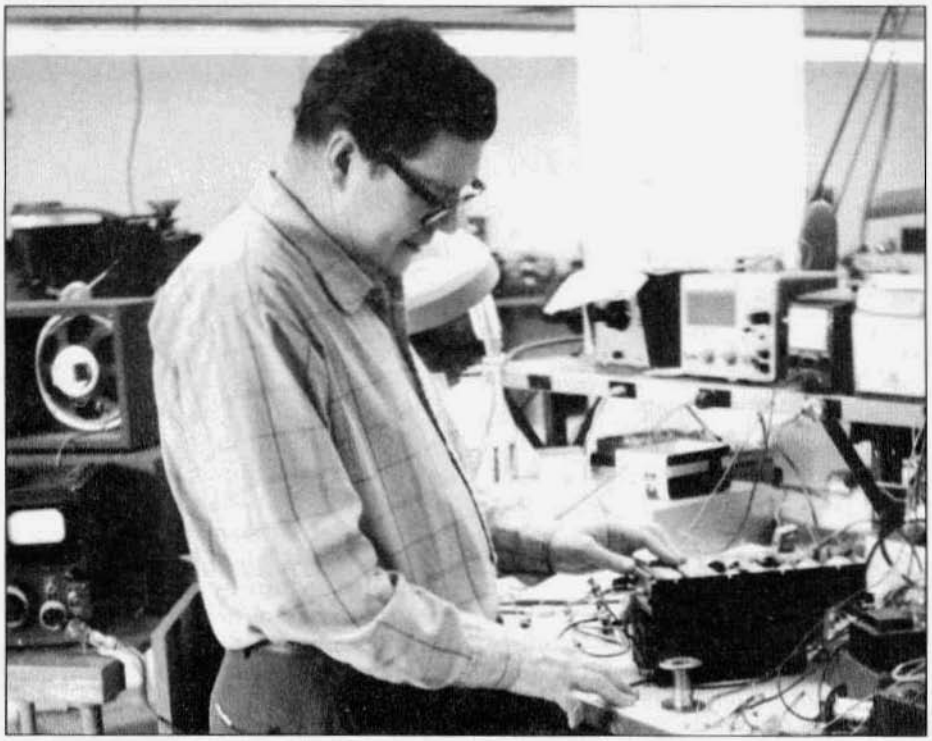
Grayson Evans, KJ7UM, dropped me an e-mail and asked if I could do a column about the makeup of the technical department of ARRL when I worked there and what influenced the excellent technical content of QST during those years. I have been reluctant to criticize the present technical regime at ARRL so in writing this I will try very hard to be polite - I guess that is the best word. And to my readers, keep in mind that this was a different era in ham radio, not at all what we have today. We designed, built, tested and used all our own equipment. As far as I know, the only people still alive from that era who worked in the technical department are By Goodman, W1DX, Laird Campbell, W1CUT and yours truly. I know that Byron gets and reads ER so I am certain that I will hear from him.

I suppose someone should set down in print what happened in those days because without any doubt at all it was the golden era of ARRL. When I went into the technical department there were the following employees: George Grammer, W1DF who was the boss, being technical editor and I believe the only person to ever hold the title Technical Director. He was the chief honcho and set the policy although he left many decisions up to his staff. His immediate assistants were the Assistant Technical Editors By Goodman, W1DX and Don Mix, W1TS. Next were the Technical Assistants, Vernon Chambers, W1JEQ and yours truly (although I soon was assigned the title "Novice Editor"). In addition, Walt Bradley handled TIS which stood for Technical Information Service (or about 5000 letters a year with questions from members). Laird Campbell joined the department a few years later when Vernon retired to go into the real estate business. One of Laird's jobs was handling the Hints and Kinks column. In addition, Ed Tilton, W1HDQ, was the VHF editor.

I have explained this before but bear with me. The Technical Department actually had the most room of any department at ARRL. We had fairly large offices on the second floor at 38 La Salle Road in West Hartford, Conn. In addition, we had most of the basement for a lab.Incidentally, the lab could be locked up and only certain personnel had keys.

All of us in the department had assigned jobs. Mine, at the start, was traveling around the country lecturing on the causes and cures of TVI plus having to write a Novice article every month. We all answered technical correspondence - that was a requirement - something the League no longer does. They now farm such mail out to what are known as technical advisors. There was a very good reason for doing this job in that George always said we are working for the members so by communicating with them on a regular basis we could learn and help at the same time. And most important, we would see a need and attempt to fill it. This of course meant that many of the ideas from members were put into print by the technical department. I would suggest readers think about that and what the League does not do today. Every day, George would walk around to the various desks and dole out the technical information letters. We typed our answers and mailed them. We had a secretary who would retype our articles before sending them to the production department but mostly we did our own typing. Another job, which some of us rebelled at, was being on a list of employees that had to take visitors around and show them Headquarters. We argued with



W1ICP at work in the Technical Department at ARRL.

the General Manager's office that we had more important jobs to do but to no avail. One thing about that chore though was that one got to meet a lot of different hams. One incident I recall worth a chuckle was when I was called out to the reception area to take a visitor around. I went out and introduced myself and at that moment another visitor entered the lobby and I was asked to take them both around at the same time. What turned out to be hilarious was that both of these hams were DXers - avid Dxers - and during the whole tour they did nothing but try to outbrag each other!

In addition to the editors, George, Don, and Byron editing articles, they also had other important jobs to do. Byron was handbook editor; a big job because the handbook had to be gone over each year. I remember that By tried to change about one-third of the book each year and that meant many construction projects which we all took part in. Occasionally, a QST article would do double duty and would appear in QST and then be edited again and put in the handbook.

Keep one thing in mind here, George Grammer read, edited, and passed on everything. As to technical ability, he and Byron were on a par with each other. I always felt that Byron was the better writer-in many ways. I always said that he could have been one of the great authors of novels if he ever put his mind to it. But he was and is a ham. Both he and George were what I would call dedicated amateurs. Now get this; (they both were devoted CW types) in my entire career at ARRL I only heard Grammer on phone once and the same for Byron. They were both testing phone rigs-hi! BUT-and this is the really big BUTT-modulation techniques were con-

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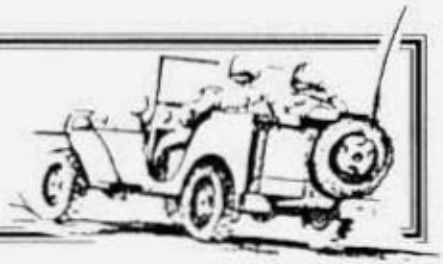
ELECTRIC RADIO IN UNIFORM



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"The T-195/GRC-19 Transmitter"

One of the more interesting equipment groups to show up on the surplus market in recent years is the GRC-19, an HF transmitter and receiver combination designed for vehicular use. The receiver used here is the R-392 which has been covered before (ER #20, December 1990). This article will address the less well known T-195, the transmitting half of the system.

Overview

Radio transmitter T-195/GRC-19 was designed to provide for single channel transmission of CW, AM voice and frequency-shift-keyed (FSK) radio signals. An external modulator (MD-204/GR) is required for the latter mode. The transmitter was intended primarily for vehicular installations.

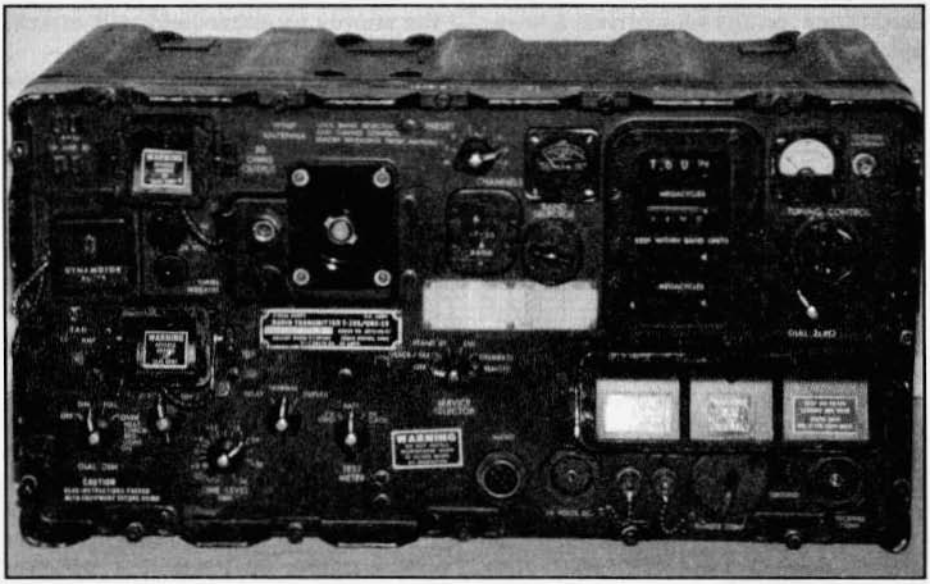
The transmitter measures 12" x 22" x 14" (HWD), weighs in at 115 lbs. and contains 22 tubes. Recommended primary input voltage is 28.5 vdc but the set will function over a range of 22 to 30 volts. Primary current drain is 42 amperes maximum during transmit and 9 amps in standby.

The T-195 provides a nominal 100 watts output over a frequency range of 1.5 to 20 mHz covered in 10 bands. Tuning only requires selection of band and frequency (two knobs), all other tuning and loading functions are automatic. Up to 8 operating channels can be preset and then switch selected as required. The transmitter is designed to operate into either a 15 ft. whip or a 50 ohm unbalanced antenna over the specified frequency range.

Design

As mentioned before there are only two "tuning" knobs on this set, a BAND SELECTOR and a TUNING CONTROL (see Fig. 2). Basically, the RF chain is made up of a Collins 1.5 - 3.0 mHz PTO followed, in turn, by a multiplier chain, PA (power amplifier) driver, PA stage, and an antenna tuning network. The various required combinations of multipliers, driver stages and PA tuned circuit constants for each band are switched in and out via the BAND SELECTOR control. The multipliers and PA driver are contained in a separate chassis as is the PA and the switch sections in these units are coupled to the BAND SELECTOR through a system of mechanical linkages behind the front panel.

The frequency within each band is set by the TUNING CONTROL which tunes both the PTO and the multiplier/driver chain. Individual resonant circuits on the RF driver chassis are tuned by a set of powdered iron slugs mechanically coupled to a moveable rack. The position of this rack, in turn, is controlled by a set of cams which are mechanically linked to the tuning shaft on the PTO. By this arrangement the slugs move in concert with changes in the PTO frequency to maintain resonance across the tuning range of the transmitter. (The RF exciter in the T-368 uses an almost identical arrangement.)



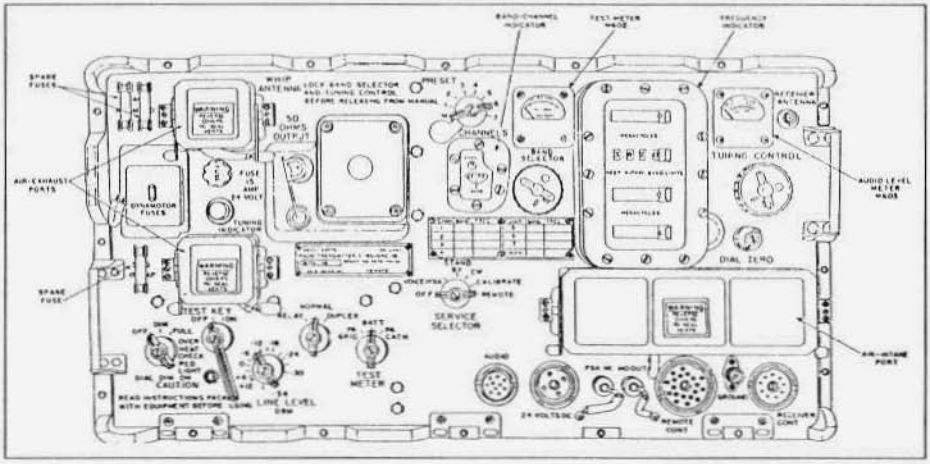


Figure 2. T-195 Front panel layout. (TM 11-806)

The PTO mounts two 6BA6 tubes, one each for the oscillator and buffer amplifier. The first multiplier on the RF driver chassis is a 6AU6, followed by 6AK6 second and third multipliers. The PA driver is a 5763.

Up to this point in the RF chain tuning is a mechanical function, controlled by turning front panel knobs manually or allowing these same knobs to be turned by the mechanical "autotune" assemblies of which more will be said later. From here on through the PA and antenna tuning system, however, adjustments are performed automatically by electronic circuits which make the necessary phase and impedance measurements to determine resonance and loading. These circuits, in turn, drive "servo" amplifiers and motors which actually "dip" and "load" the PA. There are no external controls on the T-195 to

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do this or even any screwdriver adjustments.

The PA tank is a pi-network shunt fed at the high impedance end of the circuit. The "tuning" and "loading" capacitors are ganged together and the circuit constants were selected so as to load the PA to deliver rated power into a 73 ohm resistive load at all frequency settings.

PA resonance is sensed by comparing the phase of the RF input to the grid of the 4X150D final tube to the phase of the RF current on the plate. When the plate tank circuit is resonant at the input frequency these two RF currents will be 180 degrees out of phase. This comparison is made by a circuit called a phase discriminator which produces an "error" voltage whenever the plate and grid RF signals are NOT exactly 180 degrees out of phase. At resonance, then, the error voltage is zero (0). When the plate circuit is tuned to the low side of resonance the discriminator produces a negative error voltage. A positive error voltage is produced when the plate circuit is tuned too high.

These error voltages are then converted to a 400 cycle square wave signal by a "chopper" which is essentially a small, high speed relay being driven on and off by a 400 cps current from one of the set's dynamotors. The output from the chopper will be a 400 cps square wave when the plate tank is tuned above resonance, zero at resonance and 400 cps again below resonance. However, the 400 cps "above" and "below" signals will be 180 degrees out of phase with each other because of the error voltage polarity change.

A word at this point about the servo motors used in the T-195. These are essentially small 400 cps two-phase induction motors. One field is driven by 115 vac 400 cps supplied by one of the set's dynamotors, the same power source driving the chopper discussed above. The other field is driven by the servo amplifier. Reversing the phase of the supply to either field will reverse the direction of rotation.

The output of the chopper is fed to a two stage high gain amplifier (5751 dual triode) and then to a 6005/6AQ5 which drives one field on the PA tuning servo motor. The other field winding is driven by the same 400 cps source that drives the chopper, see above. When the PA is at resonance there is no input to the servo amplifier and hence no input to the field winding driven by the 6005/6AQ5, and the motor does not rotate.

If the PA tank is tuned to a frequency higher than the grid, a positive error voltage is produced by the discriminator. This, in turn, is converted to a 400 cps square wave by the chopper, amplified and applied to the servo motor which rotates the PA tuning capacitor (through a reduction gear train) so as to lower the tank circuit resonate frequency.

If the PA tank is tuned to a frequency LOWER than the grid, a NEGATIVE error voltage is produced by the discriminator. Again, this is converted to a 400 cps square wave by the chopper, amplified and applied to the servo motor which now rotates in the OPPOSITE direction because of the phase reversal in the signal from the servo amplifier, see above. This, in turn, rotates the PA tuning capacitor so as to RAISE the tank circuit resonate frequency. This is the basic means by which the PA is kept "dipped" automatically throughout the tuning range of the transmitter. In operation these tuning corrections take place very rapidly.

We now turn to the antenna tuning system which must provide the PA with a 73 ohm resistive load across the transmitter's operating frequency range. The T-195 was designed to deliver power to two disparate loads as mentioned above, a 15 ft. whip antenna and a 50 ohm unbalanced system. The 50 ohm requirement alone would be a relatively simple design challenge, but the

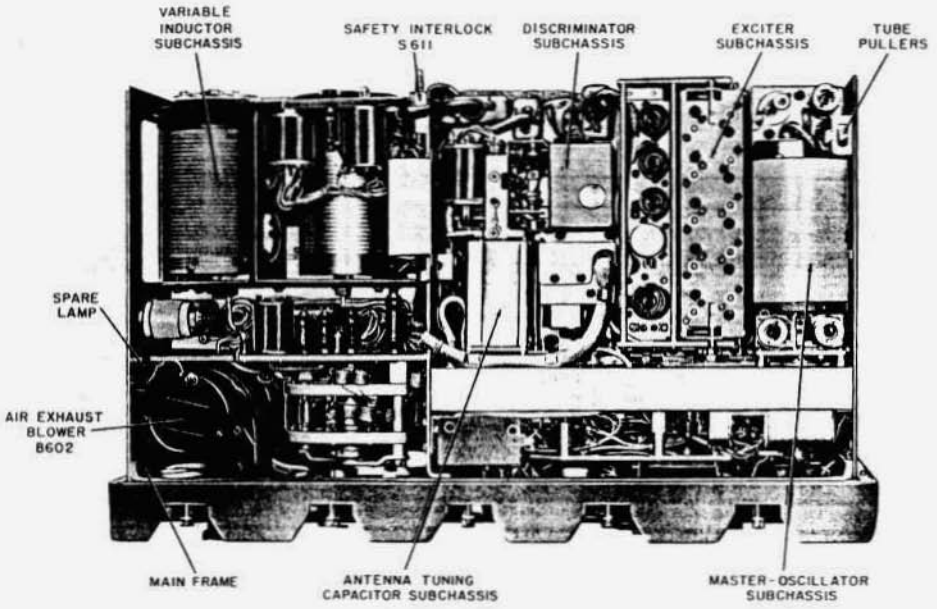

Figure 3. T-195, top view with case removed (TM 11-806)

whip represents a more complex and variable load. At the low frequency end (1500 kHz) this would appear as a very small resistance in series with a very high capacitive reactance. As the frequency rises the resistive component increases in value and the reactive component decreases until the system becomes purely resistive (approx. 35 ohms) around 16 mHz. Above this, the radiation resistance rises accompanied by an increasing inductive component.

The T-195 accommodates all of this with a wide range variable inductor, two ganged variable capacitors, a myriad of fixed capacitors and a lot of switching. Basically, the tuner is configured as a pi-network on bands 1 through 4 (1.5 - 3.0 mHz), as an "L" network on bands 5 through 7 (3 - 9 mHz), as an "L" network with a series output capacitor on band 8 (9 - 12 mHz), and as a pi network with series output capacitors on bands 9 and 10 (12 - 20 mHz).

Resonance of the network is maintained by the variable "antenna" capacitors mentioned above which are always connected to the input side of the circuit (i.e., to the end connected to the PA tank). Resonance is sensed by another discriminator which compares the phase of the voltage and current at the input of the antenna tuner, produces error voltages which are chopped, amplified and applied to a servo motor which drives the antenna capacitors to maintain tuner resonance the same as is done in the PA, see above. Again, corrections take place very rapidly.

Loading is controlled by another discriminator which compares the ratio of voltage to current at the input end of the antenna tuner, i.e., measures impedance. This discriminator produces error voltages when the impedance at the input to the antenna tuning network is greater or less than 73 ohms. These error signals feed yet another chopper/amplifier/motor loop which drives the variable inductor until the PA is presented with the proper 73 ohm

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load which completes tuning and loading cycle.

The electronic and mechanical details required to do all this across the 10 band, 1.5 through 20 mHz operating range are quite complex. In the PA, the required switching involves two split-stator variable capacitors, sixteen fixed capacitors, two PA plate chokes and nine coil taps. Band switching in the antenna tuning circuits is done by a DC motor and the rotary inductor is automatically pre-positioned at different points throughout the frequency range at the beginning of the tune/load sequence (more on this below). Also, switching among two variable and 26 fixed capacitors is required here along with control of the inductor.

The retention and selection of preset channels mentioned before is done by a pair of the "Autotune" heads for which Collins is famous. These are essentially mechanical memories.

One unit is coupled to the BAND SELECTOR shaft and "remembers" the angular position for each of up to eight preselected band settings. The other autotune is coupled to the multi-turn PTO. This unit remembers both the NUMBER of turns and the angular position of the shaft on the LAST turn for each preselected frequency setting.

In the automatic channel selection sequence, the autotune mechanisms activate first to set up the correct band and frequency for each case. PA and antenna tuning then take place automatically as described above.

The modulator uses two 4X150Ds operating AB1. The speech amplifier includes provision for carbon microphone or 600 ohm line input. A series clipper (6AL5) is included along with high and low-pass filters (300 - 3000 Hz bandpass).

Power is supplied by two integral dynamotors. One large unit provides 1000 vdc at 500 mA for the PA and the modulator. The other provides +250 and -45 vdc for the electronic circuits, and 115 vac 400 cps for the servo systems (see above). Solid state replacements for these were developed later. These were included in a "B" model of the T-195 and were retrofitted into many earlier sets.

The T-195 was intended for vehicular use as mentioned before and includes special features to cope with power sources of widely varying quality. The two dynamotor relays, for example, include series windings to preclude drop-out from start-up voltage sags, and the heater voltage to the 4X150D tubes is reduced 10 percent during standby periods (when the voltage would tend to rise).

Mechanically, the T-195 is very compact and rugged. The front panel is a heavy aluminum casting. The 15 lb. cabinet is a heavy gauge reinforced assembly. The electronics are tightly packed inside in eight removable modules mounted on a heavy duty framework of aluminum castings and machined 1/4 in. aluminum plates. A rubber gasket is included between the cabinet and front panel mating surfaces. All control shafts, connectors, bolts, fuse holders, etc. on the front panel are sealed with "O" rings and all other openings are equipped with gaskets. Front panel air intake and exhaust ports (see below) are equipped with cover assemblies which can be reversed to become air deflectors when the set is in operation.

Cooling air enters the cabinet through a vent in the lower RH side of the front panel (see Fig. 2) and exhausts through two vents on the LH side. Two fans are involved here, one in the PA subchassis for the 4X150D final, and a double squirrel-cage unit which cools the modulator tubes and also serves as an exhaust fan for the cabinet as a whole.

Sensors are included in the air flow path of both fans. These are in the form of a bi-metal strip inside a cylindrical heating element and will activate and

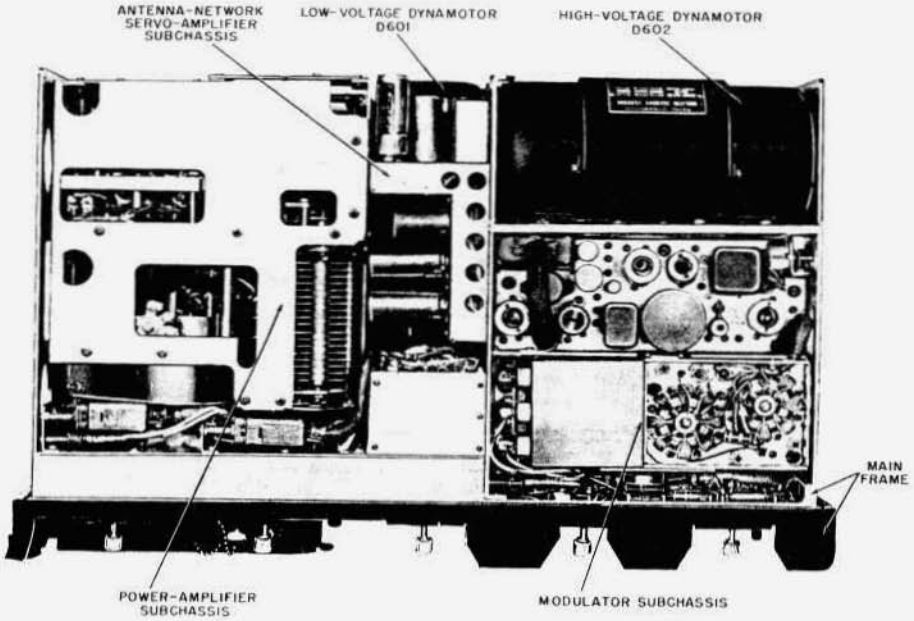

Figure 4. T-195, bottom view with case removed (TM 11-806)

shut down the set within 15 seconds of fan failure or air blockage. Heat sensors are also included at other strategic points on the chassis.

History

The GRC-19 was designed by Collins as a successor to the BC-506. Production started in 1950 or 1951. I am still searching for information on development and production history, quantities, deployment, etc. which will be the subject of a future article. The only manufacturers I have been able to identify to date are Collins and Stromberg-Carlson.

Operating The T-195

The first challenge in putting one of these transmitters on the air is coming up with a suitable power supply. At full strap on AM phone this beast draws more than 40 amperes and units with the original dynamotors will have a starting surge of 250 amps or more. However, in keeping with its vehicular role the set was designed to operate over a wide range of input voltage. It is not particularly fussy about regulation or ripple, and the dynamotor relays were especially designed to hold in under severe start-up voltage sags as mentioned before. A simple "brute force" supply (transformer, solid-state rectifiers and 200,000 mFd or so of filtering) will work just fine. The first supply used here at radio WA3YXN was an old service station "hot-shot" battery charger with a bridge rectifier added and a bunch of computer caps strapped on the side.

It is also possible to use a pair of smaller supplies here. The transmitter load is neatly split at the four-pin power input connector. Pin "B" feeds +28 vdc the high voltage dynamotor only. Pin "A" goes to the low voltage dynamotor and the rest of the set (including the R-392 receiver if connected) and the load division is virtually even. (Pins "C" and "D" provide the primary negative return to chassis ground.)

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The solid state dynamotor substitutes mentioned before are highly desirable. They are 80% efficient as opposed to 65% for the dynamotors and draw no appreciable current surge at startup.

Many sets are turning up on the market with the knobs and meters removed. The knobs are standard military types for the era and are easy to replace. The Audio Level meter (see Fig. 2) can be replaced by standard 1.25" square 600 ohm VU instruments which show up at flea markets with reasonable regularity (at least here on the East Coast). The Test Meter (Fig. 2), however, has custom scales for battery (input) voltage, PA grid current and PA cathode current. Originals of these have the mildly radioactive dial paint of the period and are very hard to find. Another 25 mA movement instrument can be substituted here and in normal operation all readings come up nominally at midscale.

In operation the T-195 is NOISY! The fans appear to have been designed to permit continuous duty RTTY operation in the Sahara. When keyed, the mechanical dynamotors add to the din too even though they are buried deep inside the cabinet. In shelter installations the exhaust ports were vented to the outside of the structure via a pair of flexible hoses which cut down on the noise somewhat.

Operation is fairly straightforward. Preliminary to applying power, make sure the locking bars on the BAND SELECTOR and TUNING CONTROL knobs are screwed down tight clockwise (more on this below). To start, turn the SERVICE SELECTOR switch in the middle of the front panel to STANDBY. This will start the fans and energize the vacuum tube heater circuits. The BAND SELECTOR and TUNING CONTROL knobs may also start to spin by themselves for a few seconds at this point (more on this below also). An internal time delay relay provides a 30-45 second pause before the high voltage and keying circuits can be energized.

Frequency selection and tune-up are accomplished as follows. First, make sure the transmitter is connected to an appropriate antenna (see above) or dummy load and then undertake the following sequence: (1) Unlock the BAND SELECTOR and TUNING CONTROL by turning the bar in the middle of the knobs counterclockwise one turn. (2) Select the desired band as observed in the Band-Channel Indicator window (see Fig. 2). (3) Select the desired frequency (within the band selected) as observed in the Frequency Indicator window. (4) Turn the SERVICE SELECTOR switch to either VOICE/FSK or CW and key the transmitter. This may be done via the PTT switch on the microphone, the KEY switch on the front panel or by depressing an attached key if in the CW mode. (5) Hold "key down" until the red TUNING INDICATOR light on the LH side of the front panel comes on.

When in the VOICE/FSK mode (see above), keying the transmitter will turn on the low voltage dynamotor and the antenna tuning inductor will be prepositioned for the band selected. The latter is done so as to always start tuneup with the final minimally loaded and PA cathode current will only reflect the grid drive (approx 10 mA) at this starting point. Upon completion of pre-positioning (5-10 sec.) the high voltage dynamotor will be energized, the cathode current will jump to approximately 100 mA and an output of 10-15 watts will be observed. The variable inductor motor can now be heard running and the cathode current will slowly rise as loading is automatically increased.

Switching noises may also be heard during this period as the antenna tuning servo system adjusts to maintain resonance (see discussion under "Design" above). At completion, the TUNING INDICATOR light will come on,

the variable inductor motor will stop and the cathode current will come to rest at approximately 250 mA. Power out into a 50 ohm load will be 100 - 110 watts at low end of the operating range dropping to approximately 80 watts at the high end (20 mHz). This sequence takes 30 - 45 seconds depending on the frequency selected and takes longer at the low end of the tuning range.

Once tuneup has been completed, adjustments for frequency changes within the same band take place very rapidly (1-2 sec.).

The T-195 uses a "semi-breakin" system in the CW mode with a delay that keeps the antenna relay closed and the receiver muted as long as a keying rate of about 10 WPM (or more) is maintained. Tuneup generally take place as above except the low voltage dynamotor runs continuously when the SERVICE SELECTOR switch is set to CW.

Channel Presetting and Selection

Setting the preselected channel frequencies is done by first locking the BAND SELECTOR and TUNING CONTROL knobs and moving the PRESET CHANNELS switch to the desired channel number. At this point the knobs will start spinning by themselves. When all motion stops, unlock the two knobs, select the desired band and frequency and relock. The band and frequency for the selected channel are now "set" and the controls will return to these same positions whenever the PRESET CHANNELS switch is returned to this channel number. Keying the transmitter at this point will then initiate the tuning and loading sequence described above.

Up to 8 channels can be preset in this way. The SELECT CHANNEL switch has 7 numbered positions and one labeled "M" for manual operation. Settings in the M position are also retained the same as with the numbered channels. Settings can be changed at any time by switching to the desired channel, unlocking the knobs, selecting a new band and frequency, and relocking.

There are a couple of important things to remember here. First, DON'T MOVE THE SELECT CHANNEL SWITCH WITHOUT FIRST LOCKING THE BAND SELECTOR AND TUNING CONTROL KNOBS! If you forget, ALL previous channel settings will be wiped out. Also, if the SELECT CHANNEL switch is moved when the power is turned off, the autotune system will immediately home in on the new position the instant the set is turned back on. For these reasons it is ALWAYS a good idea to keep the locks ON except when actually changing a frequency setting and T-195 owners tend to become compulsive lock checkers.

Second, be careful to make sure the frequency selected via the TUNING CONTROL is within the limits of the selected band. It is possible to set the frequency well outside of band limits and doing so can result in a situation where the PA is receiving full drive but the final cannot be resonated. PA current under these conditions can peg the meter (500 mA plus).

Also, always make sure the transmitter is connected to a proper load before keying. Be especially careful not to attempt loading into an open circuit. I've inadvertently done this a couple of times and ended up with blown diodes in the discriminators and arc-overs in the output coax connector.

On the Air With the T-195

I currently have two T-195s, one manufactured by Collins with a 1951 contract date and a 1952 Stromberg-Carlson. The only differences between the two sets I have noticed is a lighter shade of paint on the Stromberg-Carlson and a higher speed autotune drive motor in the Collins. All internal modules appear to be completely interchangeable, both sets put out the same power and seem to exhibit identical characteristics in all operational respects. Both my sets have the original low voltage

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R-390A/URR Order Number List No. 5

by Les Locklear
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Ever since the last article in ER No. 89, September, 1996 we know who built the R-390A's and when they were manufactured.

This article will attempt to clear up some of the conflicting information of past articles by myself and others from various publications, and pass along some R-390A "tidbits" and anecdotes from my R-390A "archives".

ALL of the 1968 Dittmore-Freimuth Corp. R-390A's were 1967 EAC receivers with Dittmore-Freimuth mechanical filters.

The Raytheon PTOs mentioned in the last article turned out to be a government rebuild contract. The large decals used covered the original decals entirely. Wally Chambers, K5OP, collects PTOs, and noticed that one of the Raytheon PTOs looked very much like a Cosmos Industries PTO, he carefully peeled the decal back, and it was indeed a Cosmos PTO. When the PTOs were rebuilt, the original PTO serial number was incorporated in the Raytheon decal. Now the list of PTO manufacturers is:

1. Collins Radio Co.
2. Motorola
3. DuBrow Electronics Industres
4. Progressitron Corp.
5. Cosmos Industries

When the Fowler Industries R-390A serial number 2 surfaced on the west coast in 1994, it was revealed that Fowler Industries built five R-390A's on a 1984 contract. Well, now serial number 1 has popped up on the east coast. All modules on it are serial number 1! I believe the odds that two of five receivers built showing up in the surplus market are very slim indeed. It was mentioned that it seemed strange that none of the Helena-Rubenstein R-390A's have been reported. Well, first of all they were shipped to the U.S. Naval Security Group in Bremerhaven, Germany, so they were probably surplused out in Germany. It was common practice to remove nomenclature tags from equipment taken out of service. The R-390A's would have Collins Radio Co. markings on the modules, since Collins actually built them. These R-390A's may have gone the route of many signal intelligence receivers back then, as reported in ER No. 89. Other reports have come in stating that was a very common practice at Wheelus A.F.B. in Tripoli, Libya. That is, "dumping" electronic equipment in the Mediterranean Sea from low flying aircraft.

All of the Fowler Industries R-390A's that were originally installed in the LSD's at Avondale Shipyards were replaced with R-1051 receivers.

For those of you who don't believe that R-390A receivers are still in use, next time you are at Elmendorf A.F.B. in Anchorage, Alaska, check with the U.S. Naval Security Group. They are using a rack of R-390As in a diversity antenna system.

Most of us know that during Desert Storm, several thousand KWM-2A transceivers were flown in to replace the microprocessor controlled rigs that were failing at an alarming rate. It seems that the sandstorm generated static electricity was eating up the front end diodes. It sure didn't seem to bother the tube gear. What does this have to do with R-390As? Well, the electrical repair depot at McClellan A.F.B. in Sacramento, CA, received an order to get 300

A stack of around 1,000 R-390As at the St. Juliens Creek Annex, in Portsmouth, Virginia. These receivers sat outside without any protection from the weather for over a year. ***Photo by Chuck Rippel, WA4HHG.***

R-390A/URR receivers ready for Desert Storm. Due to the abrupt end of Desert Storm, they were never shipped. Look for these to be offered on the surplus market soon.

It was mentioned in the last article that a large number of surplus R-390As were in a military warehouse in the southwestern United States. Well, I may need a geography lesson, they were actually stored outdoors at St. Juliens Creek Annex in Portsmouth, VA. The following excerpts are courtesy of Jim Thompson, W4THU of the Radio Works in Portsmouth, VA.

The story begins, from my point of view, with a gigantic pile of more than 1,000 R-390A receivers (by my estimate), there they were, stacked under the bright Virginia sun on a cold winter day. The pile was perhaps fifty feet square and more than six feet high. It was an incredible sight. To many of us, here stood, row upon row, perhaps the finest receiver ever engineered. Of course, that was before the ravages of a year or more sitting in the rain, snow, sleet and hail took their inevitable toll. The sale took place April 11, 1997.

This will probably be the last large sale of R-390A's ever. Most of them were signal intelligence receivers with the mechanical-digital BFO knobs. Almost all were 1967 EAC R-390A's. The Fowler Industries serial number 1 was in this pile.

Swapping nomenclatures tags was very common in the military to avoid problems with property officers when receivers were sent in for maintenance. Chuck Teeters, W4MEW sent me a letter detailing how this problem was solved. A large number (about 6,500) tags were made up at Ft. Monmouth. Approximately 1,500 were printed with the 14214-PH-51 order number for the Collins R-390 (not A) receivers. 5,000 more were made for R-390A's. The 1955

continued on page 36

Vintage Radios and the Internet Part 2

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E-mail and Mailing Lists

Electronic mail or e-mail is the single most used element on the net. As you know you can send messages to any one or more people with e-mail access in a matter of seconds anywhere in the world. A mail reflector or mailing list is an extension of this process that has interesting possibilities. Stated simply, it works like your local two-meter repeater - a reflector of e-mail messages instead of an RF signal.

The mail reflector is set up on a host machine and is automated with the use of a program called LISTSERV, LISTPROC or MAJORDOMO. If you find a mailing list that suits your interest and wish to participate you must first subscribe. This is usually done by sending an e-mail message to the list server software containing a line in the body of the message giving the software a command, in this case, SUBSCRIBE. For example, to subscribe to the Boatanchors-List you would send an e-mail message to listproc@theporch.com with the line "subscribe boatanchors" in the body of the message. You do not need a subject nor the quotation marks in your command. The list server software will usually send you a confirmation message that your command was successfully received and executed.

Once subscribed you will receive all messages sent to the list submissions address, in this case Boatanchors@Theporch.com. If you want to send a message to the list, called POSTING, you would send it to the same address. Don't make the mistake that many "Net newbies" make - sending listserv commands to the posting address. It will only annoy the list subscribers and it's not the best way to introduce yourself to the group. Best policy to adopt is to read the list's traffic for a few weeks before attempting to post anything.

You can do other things with the list server software - unsubscribe, receive get digests (a collection of traffic instead of messages one-at-a-time), suspend and reinstate your subscription, retrieve archived back issues, etc. You will usually receive an automated message telling what features are available and the commands to access them when you subscribe. Keep these messages for future reference.

Before I describe some of the vintage amateur radio mailing reflectors that you can get I'd like to cover some of the conventions and "netiquette" you should know. First of all, read the list documents, including one called the FAQ (Frequently Asked Questions) file and learn what the objectives, policies and rules are and observe them. Avoid off-topic posts. Do not use the list to reply to a single subscriber unless it would be of interest to the entire list. Some mail software will permit you to quote from the original message you are replying to. If this is the case use your editor to quote only the relevant part of the message. Do not overquote. Also if you create a signature file make sure it is not too long - four lines is generally considered the maximum.

Now, on to the goodies.....

The premier list in my opinion is The Boatanchors List. Today there are three boatanchors lists so a bit of an explanation is necessary. The original boatanchors-list was created in August 1992 by Jim Lockwood, KM6NK (now K4CCF) as a result of several exchanges with four others discussing the differences between the Heathkit DX-100 and the 100-B transmitters.

Jim set up the mail reflector on a machine with the unlikely name of acidqueen.eng.sun.com where it re-

mained for six months after which it moved to a site at M.I.T. under the tutelage of Paul Prescott, N1AAC. During the List's tenure at M.I.T. Paul had to leave for an extended period to deal with pressing family matters and the list ran on autopilot. No list administration could be performed; no one could subscribe and nobody could unsubscribe. The list had grown along with the traffic. Many were receiving it at work and more than one subscriber was summoned to his boss' office and told to put an end to all these extraneous messages and couldn't. Finally after six months of this uncontrolled operation in December 1994 the List was moved to its present site, theporch.com under the direction of Jack Hill, W4PPT (now W4KH). Presently this list is by paid subscription and costs $20 per year. In my opinion it is well worth the cost although there are some who are not in agreement with this policy. New subscribers are given a free trial period of about a month. In addition to the e-mail reflector a digest is available as well as an archive that contains a wealth of good information available to all. These archives can be accessed by e-mail or the Web.

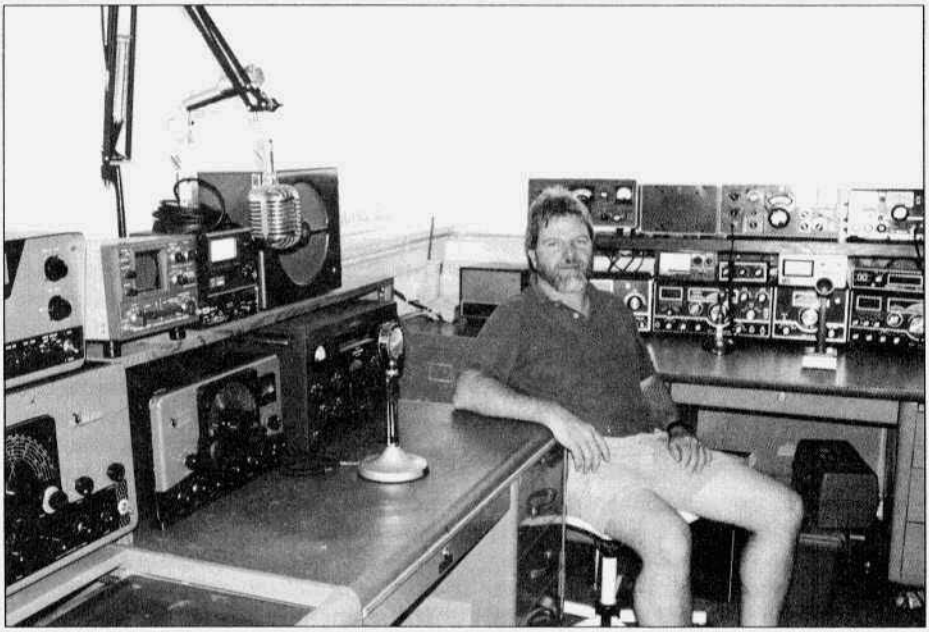
For those who are not in a hurry to receive the postings there are a couple of Web sites that contain the daily and three-day digests as well as the List archives going back to 1994. These are available without fee but be aware that you will not be able to post anything to the Boatanchors-List unless you are a subscriber. These will be covered in more detail in the article dealing with the World Wide Web.

Another good list is the Collins Reflector which can be found on the tempe.gov machine. You do not have to be a member of the Collins Collectors Association (although it is a good club to join if you have any interest in Collins Radio Company's amateur radio products). To subscribe send an e-mail message to listserv@listserv.tempe.gov with the line SUBSCRIBE COLLINS in the body of the message. Archives are available through the Web and are easily searchable as well. There are two other lists served by the tempe.gov server, HEATH and BOATANCHORS. Note this is not the original Boatanchors-List. You may subscribe to either of these lists by following the directions above, substituting the list name for Collins.

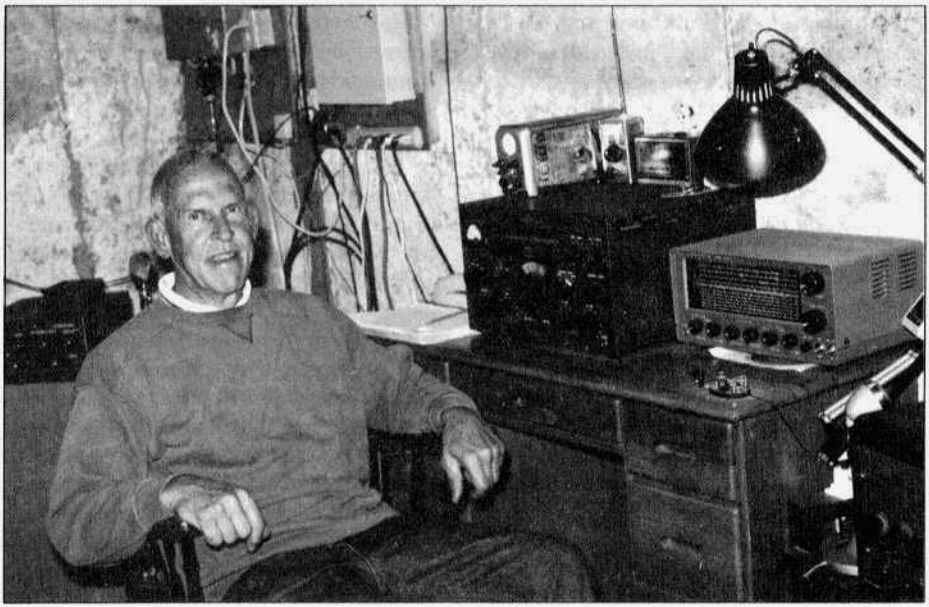
Finally there are a number of mailing lists on the qth.net system operated by Al Waller K3TKJ. Some of the lists that deal with vintage radio subjects include (yet another) Boatanchors, Collins and Heath, which do not seem to generate very much traffic judging from the accumulated material stored in the archives. However, there are several lists on the qth.net server that are of interest. These include the R-390, National, Johnson, Green Keys, Milcom and Spooks lists. To get a list of all the publicly available mailing lists in the system simply send an e-mail message to majordomo@qth.net with the word "lists" in the body of the message. To subscribe send an e-mail message to the same address and the word "subscribe" <list name> line in the message body. Once subscribed you will automatically receive an info message on the mailing list and several more majordomo commands that will let you retrieve archive files, back issues, and more neat tricks.

This is not, by all means, a complete list of all the vintage-radio related mailing lists available. I find that the Boatanchors (theporch.com), Collins (tempe.gov), R-390 and Milcom lists give me more than enough to read every day. Believe me, just the Boatanchors-List is plenty to keep you busy with all the traffic you are going to get - sometimes 30 to 45 messages a day! You may consider subscribing to the digest which is what I do.

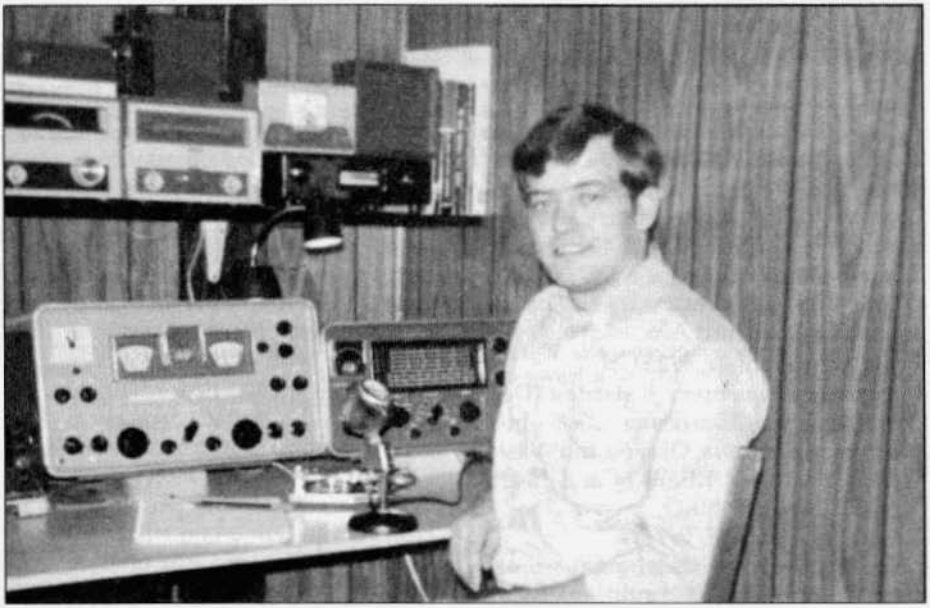
Next month: Usenet news groups and the Web!



Michael McGinnis, N6TYF, in his vintage hamshack. His AM position, on the left, consists of a Desk KW, a Valiant, a Ranger, a Globe Scout and 75A-4 receiver. On the right side his SSB position consists of a Collins S-line, Swan 600 twins and a Swan 700CX.



George Cogswell, W1WAX, in his hamshack. He was the author of last-month's "The Turbo Valiant" article.



A much younger Mike Zonnefeld, WØLTL. This photo was taken in Cedar Rapids, Iowa, 30 years ago, right after he started work with Colliins.

Gerald Morris, K6QY, with some of his vintage gear. For AM he uses the Valiant and SX-28. For SSB he uses the CE 100V with either the SX-28 or R-390A coupled with the CE Sideband Slicer. A Globe Matcher Sr. antenna tuner is shown sitting on top of the Valiant.

Ten-Meter News.....

From George Folse, KB5WWO

I had 2 QSOs tonight (11-18-97) from Gretna, LA on 29.000 at 0100 UTC with John Hall, WA8TPH and George Morrow, W8WFB. Signal reports were 10 over 9. We spoke for about 40 minutes. The rig I was using was a DX-60, HG-10,and HR-10, 35 watts output. The antenna is a Cushcraft A3S.

From Don Flenner, W3YCH

10 meters was open yesterday (Dec. 3) from here (Kennesaw, GA) into Northern California, Oregon and Washington. I worked KB6BKN and heard KA7NGT and W6NRO.

From Gary Gompf, W7FG

In the Midwest (Oklahoma) we are not seeing the good conditions being reported on the east and west coasts. I monitor 29.0 through the weekends, and in November I experienced good condition on only two days. On the best day, the 30th, I heard K7IEY in Washington with a 20 over signal with his 3 watts to a vertical and N4UAD/HR2, a new country on AM for me.

From Merle Crowley, W1GZS

10 Meters was wide open to everywhere from Florida on Nov. 30.

From Andy Howard, WA4KCY

Dec. 3, Carrollton, GA. I just finished several QSO's on 10M AM including one with Jack, KL7GKY. Even worked one mobile station in California. The band was very good for the hour that I was making contacts.

From Dennis DuVall, WA3YXN

GREAT 10 meter openings today, Nov. 27. I worked half a dozen guys in 5, 6 and 7 land. I had one 30 minute QSO with a fellow in Oregon running a DX-60 barefoot, solid S9+ both ways!

Ed: Everyone is invited to send in reports on their 10-Meter activity. Please send information via e-mail, phone, fax or regular mail.

DECEMBER AMI UPDATE

by Dale Gagnon, KW1I, Pres.

Congratulations to all those AM ops who didn't have to be reminded about the Thanksgiving AM Jamboree. I forgot to put notice of one our most popular operating events in November's ER. Activity was up and band conditions cooperated. AM activity on both 15 and 10 meters was very encouraging. Logs submitted with 20 or more AM contacts will earn a special AMI certificate.

Reserve Thursday, January 8, 1998 for the second Collins Collector Association Net, AM Activity Night. WØCCX, the Collins Amateur Radio club station will be on frequency from Cedar Rapids, IA. AM operators are invited to check in and to exchange AMI Certificate Numbers with WØCCX. Activity starts at 2100 EST on 3875 kHz. It is not necessary to be running a Collins transmitter, but it's not a bad idea if you have one!

After you get your signal report on 75 meters, tune into 1885 kHz where several Collins broadcast transmitters across the US are expected to be giving out signal reports starting at 2100 EST.

A Tip from Jim Garland, W8ZR

Here's a "hints and kinks" suggestion: The flocked grill on my "new" Hallicrafters R-46B speaker looked rather dingy, with the flocking worn thin and soiled. Out of curiosity, I removed the grill (two nuts on the inside of the cabinet) and learned that the grill was flocked on both sides. By reversing the grill, I now have like-new flocking.

Unfortunately, one can't do this trick with Collins speakers for the 75A-series (e.g., the 270G-1/2/3) , since the flocking is only on one side of the grill.

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 3880 Sunday mornings at 8 EST. 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 Saturday at 2130 local on or about 3975. Net control is Tom, WA6OPE.
Grey Hair Net: The oldest (or one of the oldest!- 43+ years) 160-meter AM nets. It meets on Tuesday nights on 1945 at 8:30 PM EST & EDST. Call-up at 8 PM.
Vintage CW Net: For CW ops who enjoy using vintage equipment. This is not a traffic net; speed is not important. The net meets on 7037 Sundays at 7 PM Mountain. Net control is Tracy, WB6TMY.
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.

New Hope For Your Heathkit Mohawk

Part Two

by Thomas Bonomo, K6AD
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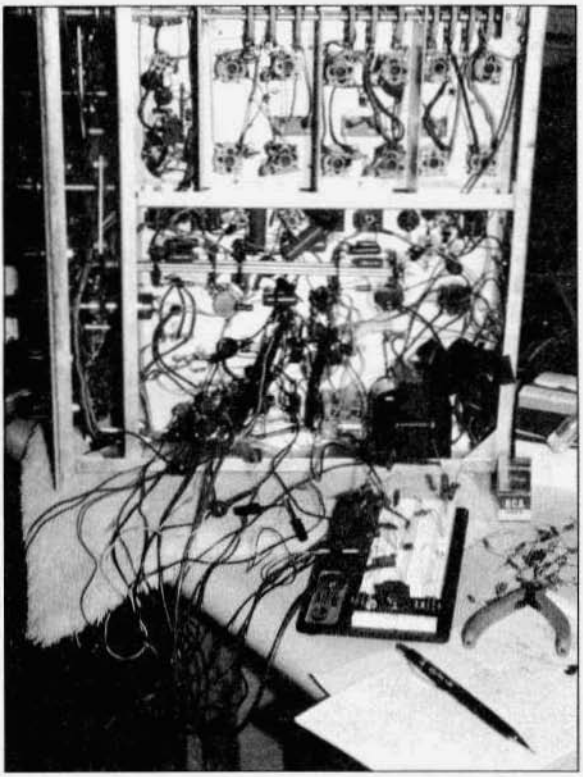
This article continues my attempt to provide some simple engineering changes that will help your Heathkit Mohawk earn a position of respect in your shack. This receiver, which was introduced in 1958 in kit form, was Heath's first ham band-only receiver and was the first Heathkit (along with the matching transmitter, the "Apache" TX-1) that sported the now-famous "Heathkit green" colors. They are both of the big and heavy era. Unfortunately, performance of the Mohawk receiver in many areas was very, very poor. However, as you'll see, it has the potential to be a wonderful receiver with some relatively simple changes and modifications. So pull up a chair, get out your soldering iron, and by the end of the evening you'll have a whole new receiver in your shack (move over, Collins!).

Part One outlined important changes to the AGC system that dramatically improve the performance of the Mohawk. Heath's AGC system was frankly pretty useless for SSB listening. You will want to make these AGC changes first, as many of the modifications outlined in Part Two are dependent on the characteristics of the revised AGC system. As in Part One, at the risk of putting you to sleep, I have provided lots of detail and background information so you will be well equipped when you decide to tackle that Mohawk you find at the next swapmeet.

S-meter improvements

One problem I noticed with the S-meter was that when it was accurately calibrated to a CW signal, the readings on SSB were very, very stingy. Fine for AM, but hardly useful for giving SSB signal reports! The problem is that the S-meter is configured to measure the output of the diode detector, and the meter movement is simply not able to keep up with the momentum of following SSB voice peaks. I constructed a peak-hold meter circuit that would give the meter time to respond to voice peaks, but of course this just duplicated what the AGC circuit was already doing! Since the Mohawk already had everything needed to meter AGC voltage directly, that is exactly what I did. Instead of feeding the S-meter amp with the output of the diode detector, it is fed from the voltage divider formed by the time constant resistors used in the AGC circuit in Figure 2 or 4 (Part One of this article). Now SSB voice peaks and a CW calibration signal give the same meter readings.

When calibrating the meter, it makes a great deal of difference which band you select for calibration, because the Mohawk has much more gain on the lower bands. I chose to calibrate mine on 20 meters which means that the meter will be a bit stingy on the higher bands, while the RF/IF gain controls need to be backed off on 40, 80, and 160 meters for the same meter reading. Unfortunately, the meter doesn't really respond as calibrated on its face, regardless of the circuit used. An S unit on this meter is roughly 4 dB, and depends on signal strength, front panel settings and the



Prototype product detector under evaluation. Notice the AGC amp built on a small board next to the transformer.

band selected. Because the meter is "backward" reading (off=full scale) I failed to come up with a simple way to make it more logarithmic. I found using S7 (-79 dBm at the antenna input) as the calibration point on 20 meters produced the most satisfactory result. But give signal reports with a grain of salt!

Product Detector Improvement

Heathkit's product detector was frankly a poor piece of work. It is about equally useful as a distortion generator as it is a product detector. Distortion was improved by changes to the AGC system, but it was still unacceptably high. With an antenna input signal of -65dBm and the IF and RF gain controls fully on, the output of the product detector was clearly being driven into nonlinearity as can be seen in the oscilloscope waveforms in Figure 5. The input signal to the product detector can be reduced by changing the grid resistor on pin 7 of the 6CS6 product detector from 470K to 22K (see Figure 6). Just this one simple change resulted in much cleaner SSB audio, but to my ears it still sounded rough and had high amounts of intermodulation distortion.

Heath tried to do everything in one tube which acts as both BFO oscillator and product detector. There are two separate problems with this design which contribute to lousy audio. First, oscillator "pulling" within the tube results in very distorted low frequencies, giving it a rough sound. If you look at the output of the product detector on an oscilloscope, you will see that as the audio goes down in frequency, it changes from a sine wave to a series of spikes. The oscillator is literally trying to "sync up" to the frequency of the incoming IF signal, which begins to seriously distort the waveform at about 600 Hz. Second, the BFO waveform seen at the output of the product detector was a sawtooth rather than a sine wave, which resulted in lots of intermodulation distortion. This gets on your nerves very quickly - it sounds like a bad speaker or that something is resonating and buzzing in the audio.

After much experimentation, I can say that I am not a fan of self-excited product detectors that operate at low IF frequencies like the Mohawk's 50 kHz second IF. My attempts to correct their design were only partially successful, so I finally gave up and just redesigned

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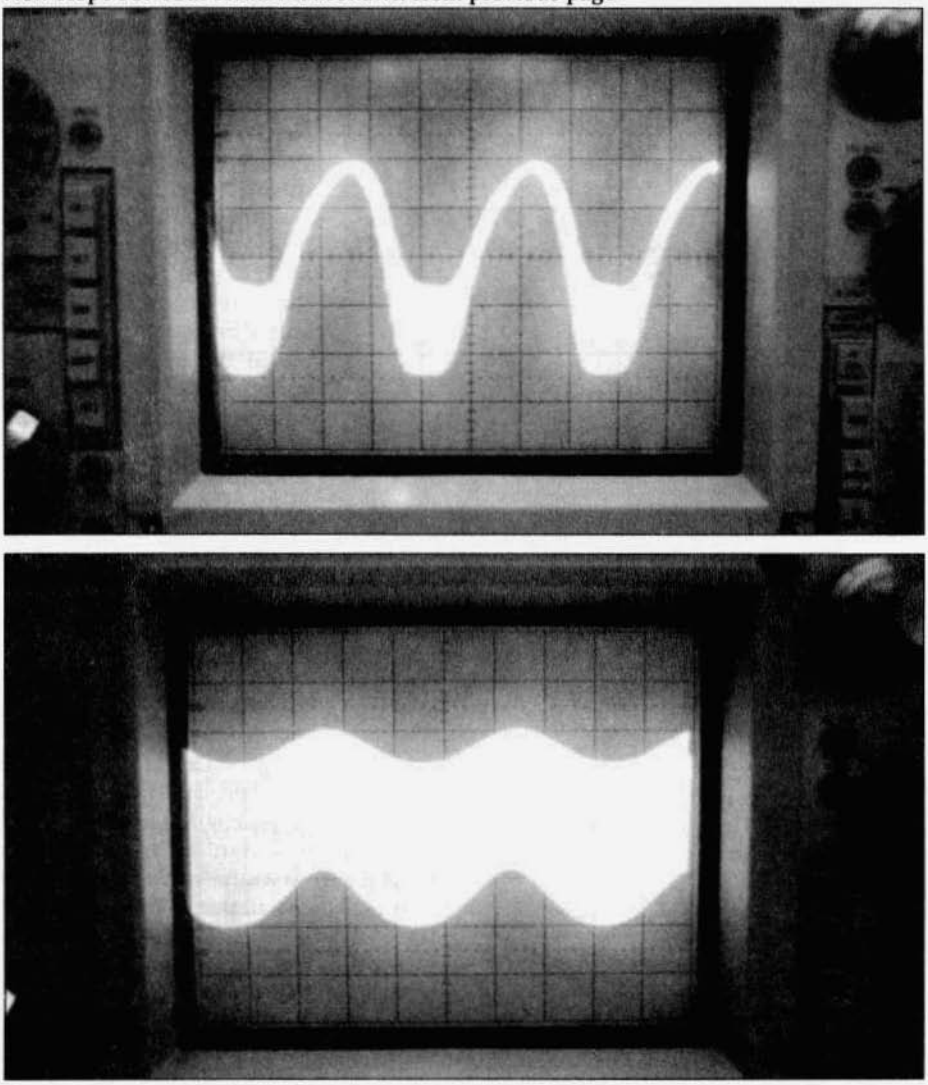

Figure 5. In the top photo the gross nonlinearity is readily apparent in the product detector output. The bottom photo shows the product detector output after modification.

the thing. The best I could get out of it was a triangular waveform, which was an improvement over the sawtooth wave, but it still led to the generation of distortion products.

The new product detector and BFO are shown in Figure 7, which still uses a 6CS6 to make changing it simple. The addition of a MOSFET corrects both problems with Heath's design by separating the BFO and product detector functions. In addition to substantially reducing oscillator pulling, you will notice that the 50 kHz output at the plate of the product detector is a nice clean sine wave rather than a sawtooth, vastly reducing intermodulation distortion (remember that a sawtooth wave

contains the fundamental and lots of odd harmonics which each mix with the incoming IF, creating lots of unwanted distortion products).

For convenience, I used the same MOSFET type as I did for the AGC amp, an International Rectifier IRFD1Z0 N-channel MOSFET. You should be able to use nearly any N-channel type you have on hand, provided the breakdown voltage is at least 100V. The 62K biasing resistor may need to be selected depending on the particular MOSFET that you use. Values which are too high will lead to clipping of the bottom portion of the cycle (as seen at the MOSFET's source) while values which are too low will result in oscillator starting problems. I built the entire thing on one 7 pin terminal strip mounted next to the product detector on the bottom side of the chassis (there is plenty of room).

Notice that the input and BFO signal grids have been switched from Heathkit's design. These signals are injected into the product detector tube on different grids to take advantage of the tube's differing cutoff characteristics for each grid to produce a more linear output. The result is a product detector that produces *great* audio. Now you can listen to this receiver all day without getting irritated!

AM and ANL Problems

There is noticeable distortion of AM signals which becomes completely unacceptable when the ANL is turned on. As you'll see, this circuit could never have worked as designed. Examination of the AM detector and ANL circuits in Figure 6 reveals a rather standard, but simple design which only works in the AM position (it has no effect in the SSB/CW position). Observation of various waveforms revealed that the ANL circuit was the culprit which was causing AM distortion, even when it was turned off!

Before turning to the solution, it is helpful to first understand the operation of the ANL circuit. As seen in Figure 6, the cathode of the ANL diode remains at an average voltage equal to the output of the diode detector. In order for the ANL to work properly, the peak-to-peak input signal on the anode of the ANL diode must remain less than the average potential seen by the cathode. The result is that the ANL diode is always on and the cathode voltage follows the anode. When properly designed, if the peak amplitude of the envelope of the received signal exceeds twice the carrier amplitude (100% modulation), as it would in the case of a noise spike, then the potential at the anode will become less than the bias on the cathode, the ANL diode will become nonconducting, and the audio frequency output will fail to reproduce the excess negative voltage.

So, take a look at the input voltage divider on the plate of the 6BJ7 automatic noise limiter in Figure 6. The diode detector feeds the ANL plate through a 100K resistor which forms the top half of the voltage divider. The maximum theoretical value for the bottom half of the divider would need to be 100K in order for the plate to see a maximum signal of twice the average carrier amplitude appearing on the cathode (ignoring relatively small source impedances). Note that the bottom half of the divider is formed by the resistors feeding the S-meter amp. Since you know how the circuit is supposed to operate, you can readily see that Heath completely miscalculated the resistor divider on the ANL anode - Heath used 780K for the bottom half of this divider! As designed, the anode gets way too much signal, resulting in the diode turning off during a substantial part of each audio cycle - thus the severe distortion when the ANL is turned on.

Now if you'll remember, there was still a fair amount of AM distortion even when the ANL was turned off. As it turns out, it was the differential load-

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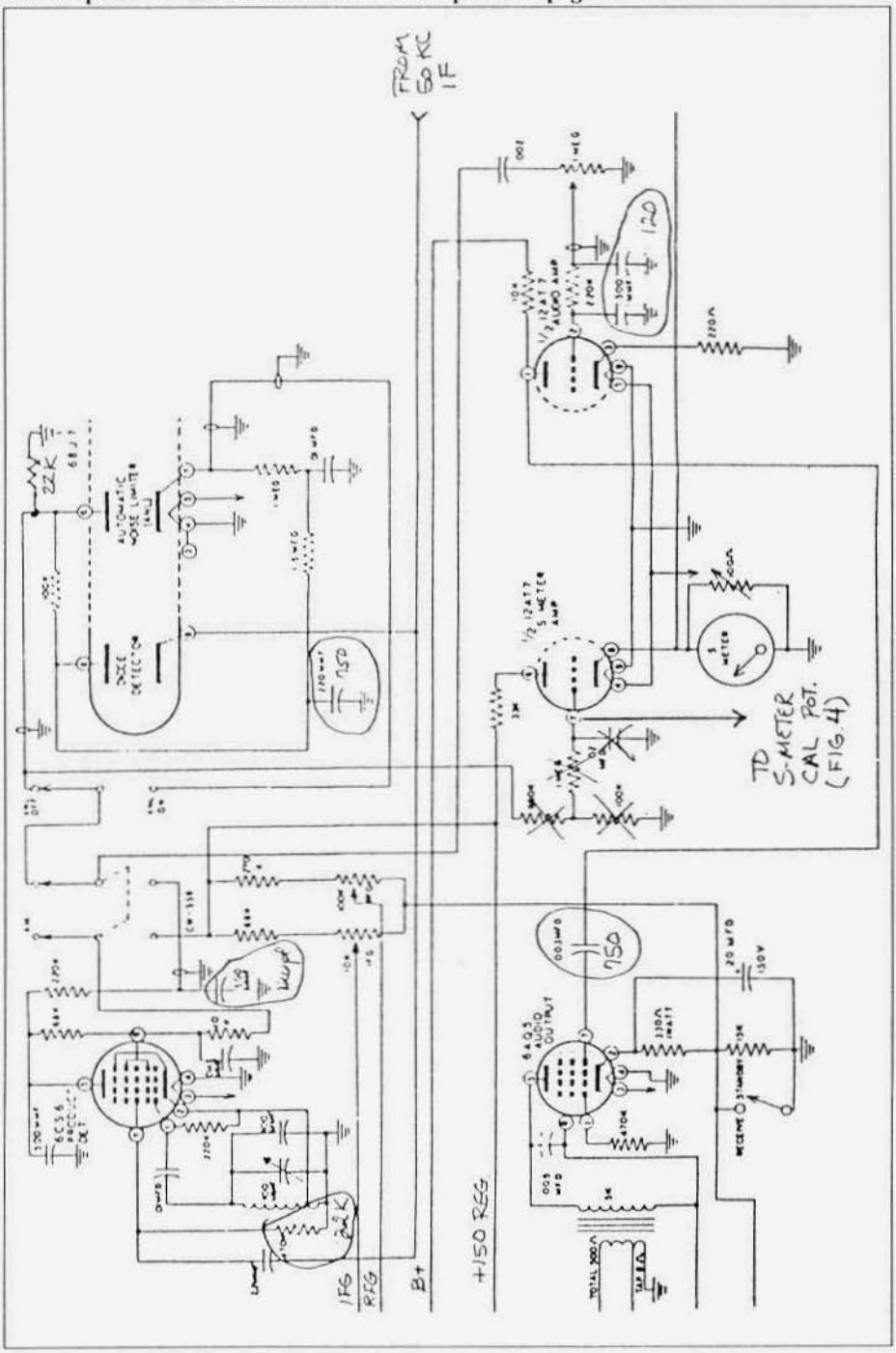

Figure 6. Product detector, S-meter amp, ANL and audio amp.

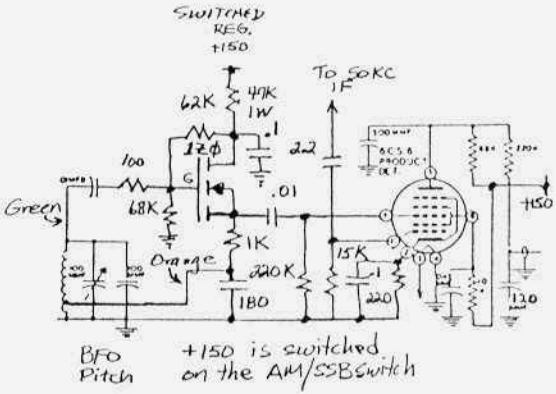

Figure 7. Modified BFO and product detector.

ing on the AM detector by the ANL diode as it turned on and off during each audio cycle (which it shouldn't have been doing) which was causing the AM distortion. Make the ANL work properly, and both forms of distortion will disappear. These are easily fixed by making these changes: remove the 680K and 100K series resistors from the plate of the ANL diode which formerly served as the voltage divider for the S-meter amp. Add a 22K from the anode of the ANL diode (pin 6) to ground (much less than the theoretically correct value of 100K due to circuit losses, source impedances, etc.). Change the 220 pF on pin 8 of the diode detector to 750 pF. With these changes in place, the noise limiter works surprisingly well considering its simplicity. You'll be real happy with the AM audio too, considering that the Mohawk's configuration really only allows one sideband for AM reception.

How could Heath have miscalculated a bias point so critical to this circuit's proper operation? It is clear that it could never have worked as shown on the schematic, and it would be difficult to accept that Heath's engineers simply couldn't hear this much distortion or fail to notice that the ANL just didn't work! Perhaps the ANL anode divider resistor accidentally got changed when they decided it should also feed the S-meter divider. Or perhaps Heath knew about this mistake and released a service bulletin that I've just never discovered.

Fidelity Improvements

Now that my Mohawk was producing undistorted AM and SSB signals, I noticed that the audio had very poor fidelity. Using a Collins 270G-1 speaker, 75 meter static crashes virtually rumbled the cabinets in my shack in the evening. Take a look at the input filters on the 12AT7 audio amp and at the output of the product detector in Figure 6. Using $f = 1/(2\pi RC)$ to calculate the -6 dB point reveals that Heath had rolled off the high frequency response beginning at 677 Hz!! *No wonder* it sounded so muffled. Maybe they thought rolling off all the highs made this receiver sound quieter (which it did, but the cost in fidelity sure wasn't worth it). Changing the two filter capacitors on the input of the 12AT7 audio amp from 500 pF to 120 pF and one of the filter capacitors on the output network of the product detector from 500 pF to 120 pF (see Figure 6) produces much crisper audio with a high frequency rolloff beginning at 2.82 kHz.

The audio still had too much bass, so I reduced the value of the coupling capacitor on pin 7 of the 6AQ5 audio output stage from .003 mFd to 750 pF, beginning a 6 dB/octave low frequency rolloff at 450 Hz. Now the fidelity isn't too bad!

Part Three Next Month

If you've made the changes outlined so far, you now have a usable, but drifty, receiver. Fortunately, you'll only need to continue giving the VFO a tweak every few minutes to keep those SSB signals sounding natural for just one

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A 12 to 24 Volt DC-DC Electric Converter

by John Hartman, NM1H
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Londonderry, NH 03053
john.hartman@analog.com

How many times have you passed up buying a perfectly good 24 volt dynamotor looking for that rare 12 volt one to run off your car battery? How about all those neat 24 volt mobile military rigs you would love to get on the air on field day, campouts or at electronic flea markets but have no way of running portable? How about not being able to conveniently charge two car batteries connected for 24 volts mobile operation off your 12 volt car alternator?

Well, if you have any of these problems this converter may be just for you. Made from Radio Shack relays, surplus computer capacitors and common AC line RFI filters, it will supply 24 volts at 3-4 amps or charge lead acid batteries for much higher intermittent current demands. Furthermore, it exceeds 95% efficiency - eliminating any cooling requirements. Higher output currents are possible with bigger capacitors and higher current relay contacts. It uses no solid state, or hollow state devices. It makes a neat clicking sound to tell you it is running so it needs no pilot light. It is truly "electric".

Theory of Operation

Figure 1 shows the schematic of this simple voltage doubler. The DPDT switching relay, RL1, toggles the 12 volt input alternately across C1 and C2 charging each to 12 volts. The 24 volt output results from the series connection of C1 and C2. The pulse generating relay, RLY2, is wired as a buzzer with R1 and C3 chosen to cycle at about 20 Hz with a duty cycle that makes the switching relay run at a 50% duty cycle for charging C1 and C2 equally. R1 also limits the buzzer contact currents. One set of contacts on RLY2 is used to drive RLY1 in a master-slave configuration. C3 reduces sparking RFI on this contact. Heavy duty AC line filters of the sealed metal can variety are used to reduce RFI from the switching relay pulses. These filters should be mounted backwards (terminals marked "line" towards the switching relay). The idea is to keep the RFI demon contained inside the enclosure.

Construction

I mounted everything in a surplus metal ammunition can. These cans are the right size for most computer capacitors, cheap, rugged, waterproof and the right color and pedigree to go with military rigs! Their hinged lids make them easy to get into. Component mounting is not critical but short, 12 gauge wiring should be used due to high currents and IR losses. I mounted a heavy duty barrier terminal strip at the side the case with wires passing through tight fitting grommets to preserve water tightness. The relays are mounted in sockets to permit field replacements. **Warning:** Do not even think of mounting the batteries to be charged in the same enclosure as the relays. Hydrogen gas buildup and relay sparks guarantee a time bomb complete with a ticking sound!

Relay Selection and Tune Up

Contact sticking is about the only thing that can go wrong in this circuit and there are some tricks to minimize this. First, relay selection is very important. Select only those relays that have short, rigid stationary contacts and short, stiff moving center contacts. Do not use "telephone type" relays where

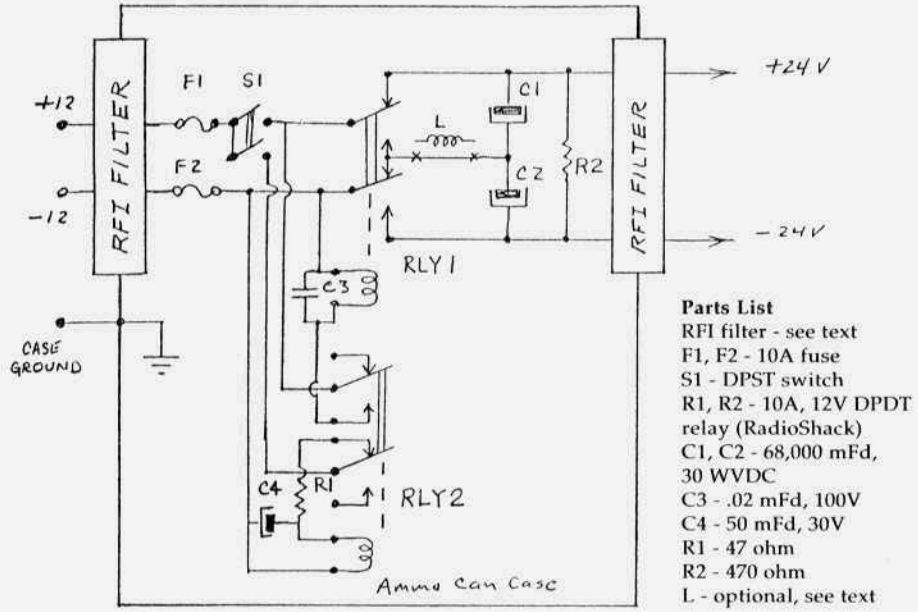


Figure 1. Schematic, 12-24 volt converter.

both the moving and stationary contacts are mounted on long ribbons. This type of relay tends to stick and not pull apart, pulling the "stationary" contacts together resulting in blown fuses. Check to make sure all contacts "break" before "make" with plenty of clearance between open contacts. If not, again, blown fuses. I found that the recommended 10 amp contact, 12V Radio Shack relays meet all these criteria for both the switching and pulse generating relays.

The first thing to tune up is the pulse generating relay, RLY2. The trick here is to watch the switching relay armature, RLY1, while swapping out various values of R1/C3 near the 47 ohm/50 mFd values on RLY2. What you want to see is the blurry image at the top of the swing equal to the image at the bottom of the swing. (An oscilloscope can be used to monitor the 24 volt output waveform under a 2A load and look for 50% duty cycle).

Initially I had some problem with the switching relays sticking and I used a very low resistance inductor (50T #12 copper wound in a 2"x2"x1" iron core) between the two switching contacts wired together and the common point of the two computer batteries. See Figure 1.

This inductor limited the initial contact current surge and "flashed" the contacts clean at break. After a few hours operation, however, it was not necessary to use this inductor. Maybe the initial manufactured relay contacts had a slight roundness that was flattened after use, increasing the contact area? Try running without this inductor a few hours under light load to serve the same purpose. Bottom line, the component values shown for the recommended relays work.

Operation and Results

Initial testing of this unit started with 2 to 4 amp car lamps in series to get 24 volt loads. Under the higher load conditions the output voltage dropped a few volts. Part of this was due to the internal resistance of gel cells I used as

continued on next page

A 12 to 24 Volt DC-DC Electric Converter from previous page

the primary 12 supply. This became less than 1 volt droop when a car battery was substituted. Oscilloscope checks confirmed a significant output ripple of a half volt as might be expected with a direct switching circuit at these high current levels. I was able to bring this down to a few tenths of a volt with massive LC filtering but this is not necessary for running dynamotors, charging 24 volt lead-acid batteries and running rigs with internal power supply filters as we will see.

With no LC filter I ran several 24 volt DC motors as well as several types of dynamotors and inverters under rated load and met specification for these devices. Starting torque and current was no problem. DC input ripple was not transferred to the output of these devices. This confirmed the usefulness of this circuit as a dynamotor and DC motor driver.

Charging lead-acid batteries configured for 24 volts was very successful. Eventually, the 24 volt cells will duplicate the condition of the primary 12 volt cells. As the 24 volt cells float to full charge, their current drops and the converter output approaches 26 volts. It might be a good idea to have a current limiting 4-6 ohm series resistor to charge a fully discharged 24 volt battery. The 12 volt primary battery requires charging too, so keep the car running!

The real acid test was to run a commercial 24 volt transceiver with this circuit. Without further output filtering or a lead-acid battery connected as a buffer, I had my doubts of success. I chose to use my Ten Tec Century 21 as the victim. I tapped the output of the converter into the internal 24 volt Ten Tec power supply before the filter capacitors. Firing up the rig, I could detect no converter buzz in the audio, no sign of RFI across the bands and an absolutely clean RF carrier out! (Things are not supposed to turn out this good!) I spent the rest of the evening getting 599 CW contacts! "Chirp? tone? you sound great, OM."

Final Comments and Conclusion

Whatever your load current requirements are at the output, remember to allow for twice that current at the input. This could be a problem for some primary battery sources. The case ground can be connected to either -12 or -24 but NEVER both. The -12 and -24 terminals cannot be connected in common - this is the reason for F2. For vehicle operation with -12 volt frames, ground the rig and antenna coax with capacitors. This converter is a voltage doubler, so, with capacitor and relay changes, you can do 6 to 12, 24 to 48, etc. The two unused contacts on RLY2 produce 180 degree out-of-phase, high current 12 volt pulses. Maybe a reader can write in and tell us what clever use he found for this? (Hint: start with a center-tapped filament transformer?)

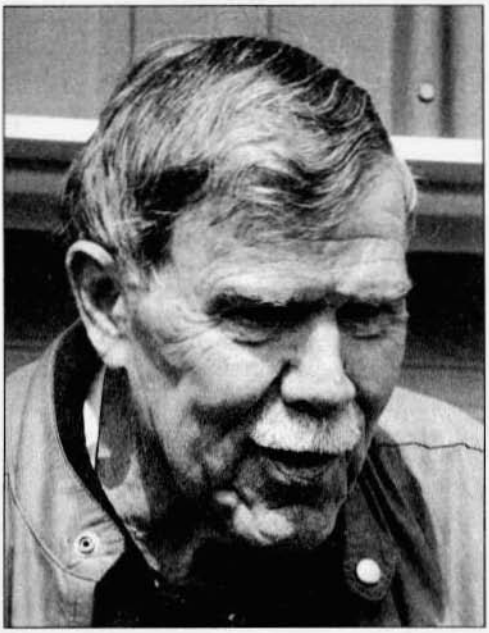
This 12 to 24 volt converter exceeded all my objectives. I have given it a lickin' but it keeps on clickin'. Enjoy! ER

AMI BASH 1997 from page 30

WA9TCD	Harris RF-3200E
WØREO	Kenwood TS-450S
WØCAT	ICOM IC-756
WØRJC	Johnson Valiant
KBØRFA	ICOM IC-756
WB9NJB	Kenwood TS-50S
N7SPH	Yaesu FT-840
KC6GBI	Kenwood TS-440S
NØNFI	Johnson Viking 500
WAØVQM	Drake T-4XB
K8MLV/Ø	Heathkit DX-100
KAØSQY	Homebrew 6AG7
WØAH	B&W 5100B
WA6NLG	ICOM IC-761
KGØKI	Kenwood TS-690S
KIØHC	Yaesu FT-1000MP
WB6IWY	Kenwood TS-850S w/Henry 2K
N7MR	Yaesu FT-890
WA6IQW	Kenwood TS-850S w/Henry 2K
NØBNE	
NYØL	Knight T-150

Bruce Kelley, W2ICE, Silent Key

by John Ward, KE2ST



Bruce Kelley, co-founder and Curator of the Antique Wireless Association's Museum, passed away Thursday, 6 Nov. 1997, at his home in Bloomfield, New York. He was 82.

Bruce was first licensed as W8ACY in 1929. An avid DX-er from the start, by 1933 he had logged 75 countries, using a 5 watt, one tube transmitter. When he relocated in 1935, his call changed to W2ICE, which he retained to the present.

Bruce began collecting tubes in 1936. In 1948 he exhibited some of these at the Rochester NY Hamfest. In 1952, the late George Batterson, W2GB, showed Bruce some of his old ham gear, including a 1922 spark transmitter. Since Bruce already had a fair sized tube collection and a barn, the 2 men decided to pool their artifacts and start a museum. This was the beginning of AWA. Others donated their "old junk", and the exhibit expanded.

As AWA's curator Bruce Kelley applied his seemingly boundless energy to the task, and was active in the museum until ill health forced him to retire less than 2 months ago. His charisma inspired others to help, but he was always in the thick of it, working at what he loved best.

Today, AWA has 4100 members, and the museum has one of the largest and most interesting collections of radio, telegraph and television artifacts in the country. Bruce didn't do it alone, but it would not be half what it is without his inspiration and dedication.

Anyone who knew Bruce would tell you he was quite a character. A good curator must be completely honest, and he was. He was also a natural leader, a great salesman, a con artist (but tongue in cheek; he warned you beforehand), and everyone's friend. Through my association with him I met dozens of the "grand old men" of radio.

For all his accomplishments, I think Bruce's greatest passion was always Ham Radio. He would enthusiastically encourage anyone to get a license, if they showed even a hint of interest. When I moved to Bloomfield in 1989, Bruce got on my case to learn the code. In Jan. 1990, he administered my Novice exam, by Feb. I had passed my Advanced test and was on the air. I'd have never made it without his coaxing and good natured ribbing.

Farewell Bruce, we will miss you.

PS- Ed Gable, K2MP, an AWA member for 20 years and a knowledgeable historian, succeeds Bruce as curator. Ed, we wish you all the best.

Colorado AMI THANKSGIVING DAY BASH 1997

by Orlin (OJ) Jenkins, KØOJ

Things got underway at 6 a.m. with Mary, KGØKO boring a hole in 3875 with his usual big signal from the Globe King 500B from atop Lookout Mountain near Golden, Colo. I showed up at 6:30 and operated as NTS until 11 a.m. when we shut down. We had a total of 54 stations check in.

CALL	AMI#	TRANSMITTER
KGØKO	20	Globe King 500B
WØFD	229	Homebrew 813's
VE5NT		Homebrew 813's
W7XXX		Heathkit DX-100
W7JHS		Heathkit Apache
KFØOW	835	Homebrew Single 813
W8QBG		
WA7HMU		Heathkit Apache
KØAS	681	Globe King 500
KØOJ	155	Collins 32V-3
K1YJK	886	Johnson Ranger II
NØAUB	946	Johnson Valiant
WAØNUH	863	Homebrew 6146 & Swan HF-700S
KBØLHJ		Kenwood 440S
WD5BKO		Henry Tempo I
KBØODM		Johnson Viking II
NØTE	538	Collins 30K-1
KØRZ	803	Johnson Viking II
WØGM	788	Johnson Valiant B&W 5100, Yaesu FT1000D
W5GYJ		Kenwood TS-850S w/ Heathkit SB-220
NØTYL		Heathkit DX-40 w/ BTI LK 2000
KK7CM	873	Yaesu FL-101
KUØE		Kenwood TS-690S
KIØIM		Kenwood TS-430S
KB7RYU	773	JohnsonValiant
ABØFT		Hallicrafters HT-32A
K7DU	206	Johnson Viking I
KGØHS		Yaesu FT-107
KGØMR	780	Collins 32V-1 Johnson Valiant
W7ZSB		Johnson Ranger
KFØOT		Kenwood TS-940S
KØMB		Kenwood TS-940S
W1OPH		Kenwood TS-440S

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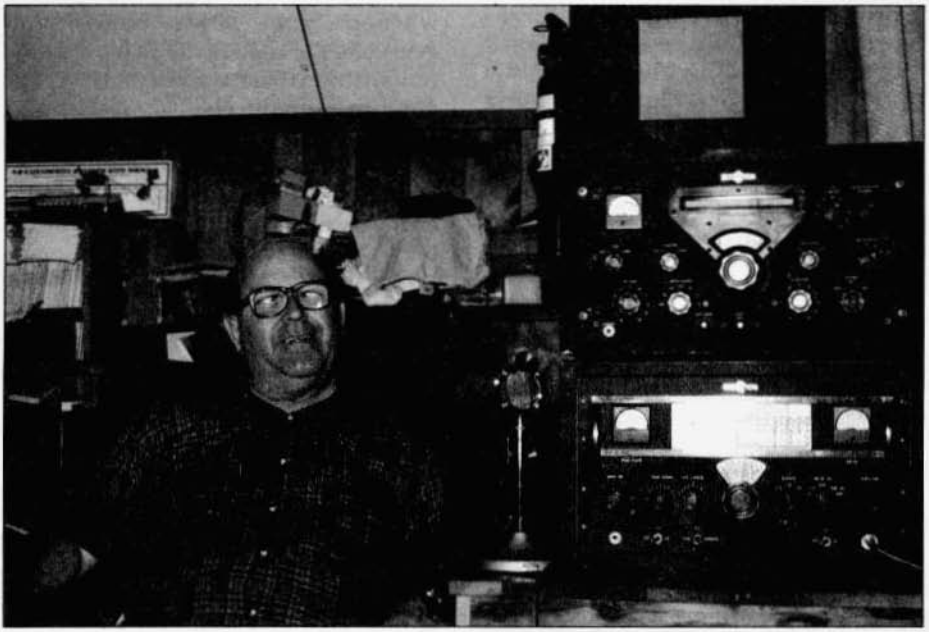


KØOJ at his operating position; Collins 32V-3 transmitter and 75A-2 receiver.

A Review of "Communications Receivers, The Vacuum Tube Era: 1932-1981 4th Edition", by Raymond S. Moore

published by RSM Communications, 136 pages, $19.95 plus S&H from the Electric Radio Bookstore and other book sellers.

by Jim Hanlon, W8KGI

It really is encouraging to see what must have started out as a "labor of love" become so well accepted that it has now appeared in its Fourth Edition! For those of us who have well-worn copies of previous editions, it's really no surprise though. Ray Moore's book documents virtually every American-made, vacuum-tube, superhet Communications Receiver ever offered for sale to radio hams. Whether you collect, remember fondly, or just admire hollow state receivers, this book is an absolute must for your shelf.

What you'll find inside, especially in this Fourth Edition in which Ray has used photo scanning techniques, is the best picture available of each receiver you are interested in, along with a list of pertinent information including the manufacturer and model number, years sold, price, bands covered, IF frequencies, IF filter type, tubes and their functions, and remarks specific to that unit. Added in this new edition is also information on the audio output power and impedance and the antenna input connections and impedance. There is an introduction which weaves the History of vacuum tube Communications Receivers and their makers from the Hammarlund Comet Pro and the National AGS up through the Drake R4-C, the last of the breed in 1980. There's also anywhere from a paragraph to a page of history about each receiver manufacturer.

Noticeable in this new edition is an expanded section detailing 41 suffix numbers for the Hammarlund SP-600 Super Pro, and enhanced detail on the National NC-100 family and its military cousins. You military collectors will find your favorites there too, from Command Sets, to BC-224's, BC-312's, BC-342's, BC-348's, R-388, R-390 and R-390A, R-392 and many more.

One of the things that I personally appreciate about this book is that I can count on just about everything in it to be accurate. For example, several of the contests I enjoy require the first manufacturing date of my equipment. The only date I'll argue with Ray about, for all of my three dozen or so receivers, is my National HRO-50 which I believe was first advertised in December of 1949 and Ray lists as an event of 1950. Big deal!

There's one more piece of good news in the first page of the Preface. Ray is preparing three more books. Communications Receiver Album will have full-page photos of the "100 greatest receivers ever made." (Now that's a good way to start a fight!) Solid State Receivers will span 1956 to 1998. And Designing the Ultimate Receiver will cover philosophy and circuitry required to obtain the ultimate performance from a receiver, with examples from the greatest receivers, vacuum tube and solid state. More of Moore to look forward to! **ER**

QST View: A Dream Come True

QST View, CR ROM archives of QST magazine. Publilshed by the American Radio Relay League, 225 Main Street, Newington, CT 06111-1494. E-mail: pubsales@arrl.org $39.95 per set.

by Chuck Penson, WA7ZZE

Anyone fond of vintage radios probably is also fond of thumbing through vintage radio magazines. But anyone thumbing through vintage magazines looking for some particular article they are sure was published "sometime in the sixties" knows what a long and frustrating job it can be to actually find it.

All this assumes, of course, that you even have back issues through which you can thumb, that you have a place to store and conveniently access your back issues, that the dog has not chewed them up, and that the XYL has not thrown out any or all of "those smelly" magazines. As for having a complete collection, it is probably safe to say that only a handful of libraries and an even a fewer number of hams have complete collections of any given magazine.

Yet in spite of the hassles of dealing with piles of old magazines, they are valuable to collectors and homebrewers who depend on them for research and reference. As someone who has personally turned every page of more than 40 years of QST looking for particular articles, I can tell you that I dreamed blissful dreams of the day I could access that same information on a computer.

That day has arrived.

Beginning about a year ago, the American Radio Relay League began publishing a series of CD ROMs containing back issues of QST magazines. No doubt you have seen the ads. Called QST View, each three disc set contains five years' worth of the magazine. Every page, every story, every picture, every ad, everything. As QST is widely regarded as the defacto standard source of information on almost any facet of the hobby, having back issues on CD ROMs is particularly useful.

As you might imagine, scanning every page of every issue of QST is both labor and time intensive. So while ARRL's goal is to get every issue on disc, they currently go back only to 1950. While more recent years are offered in five years sets, volumes earlier than 1960 contain an entire decade of the magazine. All issues of QST since 1994 were electronically published so they will not have to be scanned. As a result, these newer issues are simple to transfer to CD ROM and will be full-text searchable.

I recently purchased two volumes: 1970 to 1974, and 1975 to 1979. QST View is available only for Windows based computers, and installing volumes on your computer is very simple: just put the installation disc in the drive and run SETUP. The package recommends a 386 or better, 8 megs of RAM, at least 14 megs of free disc space, Windows 3.1 or higher, VGA graphics, and (of course) a CD ROM drive. Depending on the speed of your machine and CD ROM drive, the installation process may take up to a half an hour, but the average Pentium should be able to do it in just a few minutes. The only thing that really gets installed is an index. The index for each 5 year set requires 5 or 6 megs of disk space, so if you eventually get the entire set you could be looking at close to 100 megs on your hard drive. As I will be making heavy use of this data my plan is to dedicate an older machine for this purpose.

Having installed the indices for all volumes purchased, you can get right into browsing. This is the fun part. The software is easy to use (I didn't need to read the manual), and I didn't find the

on-screen help files very useful. The program is fairly intuitive, and the help files don't seem to tell you anything you can't figure out on your own. I guess this is a good thing. In the early days of computing there was a maxim that if you needed to read a manual, the software was poorly designed. To a large extent I still subscribe to this idea.

For my first test of QST View I decided to search for (what else?) the word "Heathkit." To my surprise, no references were found. I then searched simply for "Heath" and found more than a dozen references, but I expected more. I then realized that only the titles of articles are text searchable and not all articles about Heathkit include the actual word "Heath" in the title. To find all the articles about Heath I would have to do several searches. I searched for "SB", "HW", "DX" and so forth. Each of these searches produced more articles. The lesson here is that an exhaustive search may require several different key words.

The search results are listed by title along with the author, date, page number, and so on. You then scroll down the list and double click on the article you want to read. When you select an article, the computer will prompt you to put in the appropriate CD. This is a bit of a hassle if you are jumping around in time from this year to that, but disc swapping will be minimized if you are searching chronologically or just "turning the pages" of a specific month's issue.

The search engine is unsophisticated but satisfactory. There are seven basic categories in which searches can be done. These include article, column (It Seems To Us, Product Review, How's DX, etc.), last name (of author), first name (of author), call sign, year, and month. Search criteria can be entered in any or all of these categories, and while wildcards are supported, Boolean operations are not. Another minor problem is that there is no "stop" button. Once you start a search you are committed, and on my slow computer that could mean a coffee break if I hit the wrong key.

By selecting "Product Review" I got a list of 249 entries in the ten years from 1970 to 1979. When I entered W1ICP in the call sign category I found 122 reference, but when I asked to see everything by Lew McCoy (W1ICP) I found only 21. I didn't take the time to find out why there was such a discrepancy, but it is clear that to do an exhaustive search for a subject or author, one might have to try several different angles. A spokesperson at the League told me a major indexing project is underway in an effort to enhance the searchabilty (my word, not his) of QST View. The enhanced index will probably be released as an upgrade to the current set of disks, but no details are available right now.

Most pictures are of xerographic quality and will be acceptable for most users. Diagrams and schematics are sharp and clear, and a zoom feature lets you enlarge them for easy reading. It is possible to zoom in so far text begins to breakup into bits and pieces. A rotate function permits you to rotate images on the pages. This is useful, for example, when looking at a schematic which, because of its size, has been printed vertically on a page.

All things considered QST View is a remarkable achievement. While its appeal for the casual ham will be limited, QST View is a "must have" for anyone interested in the history of amateur radio, for those researching the evolution of a company or product line, or for those with a serious interest in antenna or construction projects. Those with World Wide Web access can take a closer look at QST View on the League's web site at www.arrl.org/catalog/qstview

It's all here. Just imagine—a thousand pounds of magazines, all in the palm of your hand. ER

A Letter About Crystals

by Jim Riff K7SC, Motorola Inc.

In 1940 when Motorola started to produce the BC-611 they were producing their own crystals from raw quartz obtained from Brazil. Many very large chunks of raw quartz were stored in back of their plant at 4545 Augusta Blvd. in Chicago. When crystals were needed the engineers would go out back and chop off a chunk and bring it to the crystal production area for processing. There the axis was found using X-ray refraction and the bars were cut accordingly. The slices were lapped on a wet grinder plate and an SX28 was used to hear the rough frequency. When the war effort required huge quantities of crystals for the popular BC611, and the shipments of raw quartz from Brazil was not certain due to Axis efforts; new sources were needed. Motorola called upon all available USA companies to support this need, but due to endangered Brazilian supplies of raw quartz new methods were needed.

Research into synthetic or grown quartz was being done by several universities out east, and Motorola hired several scientists and started production of manmade quartz material in Carlisle, PA. This new source along with the support of the the crystal industry provided the hundred of thousands crystals needed needed by the war effort. Since Japan relied on Brazilian quartz for raw material, and had not been able to invent any synthetic sources, the Motorola production area was guarded and off limits to all who did not have a need to know.

Motorola to this day still produces their quartz in their own plant in Carlisle, Pennsylvania. Although all of the current radios use PLL circuits and only one crystal, additional elements are used for filters, TCXO's, VCO's, etc.

Although production methods and equipment have improved, crystals are still produced in much the same way as they were decades earlier. Today no other cost effective method of providing a stable and accurate source of frequency generation has been used in the industry, a tribute to the piezo effect of this unique material.

Editor's Comments from page 1

The next event will be the Colorado Morning Group's annual get togeher on New Year's day starting at 7 a.m. on 3875. The net control will be Ed Nesselroad, NØAUB.

The third upcoming event will be on Thursday, January 8. This will be the second AM Activity Night sponsored by the Collins Collectors Association. It will get underway at 9 pm EST. WØCXX, the Collins Amateur Radio club station will be on frequency from Cedar Rapids. All AM operators (and it isn't necessary to be operating a Collins transmitter) are invited to check in and exchange AMI numbers with WØCCX. That same evening a number of Collins broadcast transmitters from around the country will be firing up on 1885. They'll be giving out signal reports also starting around 9 pm EST.

I recently got an interesting letter from Gerald Morris, K6QY. This letter was in response to my request for input on 10M activity. This is part of his letter:

"I have been listening and calling CQ on 10 and 15 AM a lot these past couple of months, with little result. As we have well known AM calling frequencies, shouldn't we also have well known calling times? Just as a proposal to get some conversation started, I would suggest that on the hour and half hour we monitor and call our CQ's on 10 meters 29.0, and on the quarter hour and three quarters hour we do 15 meters on 21.4. The idea being that everybody in the AM community is listening and/or calling during the same period and on the same band."

I think Gerald has a great idea. This is something we can all participate in and it might create more 10 & 15 meter activity. However I would suggest that we move off the calling frequency of 29.0 to 29.050 and from 21.4 to 21.425. And if we make contact we should quickly move off of these frequencies. We should also avoid using these frequencies for QSOs; at least for the time being until we see how this scheme works out.

I propose that we all start doing what Gerald suggests - monitor and call on the hour and half hour on 29.050 and on the quarter hour and three quarters hour on 15M on 21.425. Everyone should have this issue by Christmas so let's start this routine on December 26. Next issue I'll try to have a report on how it's working out.

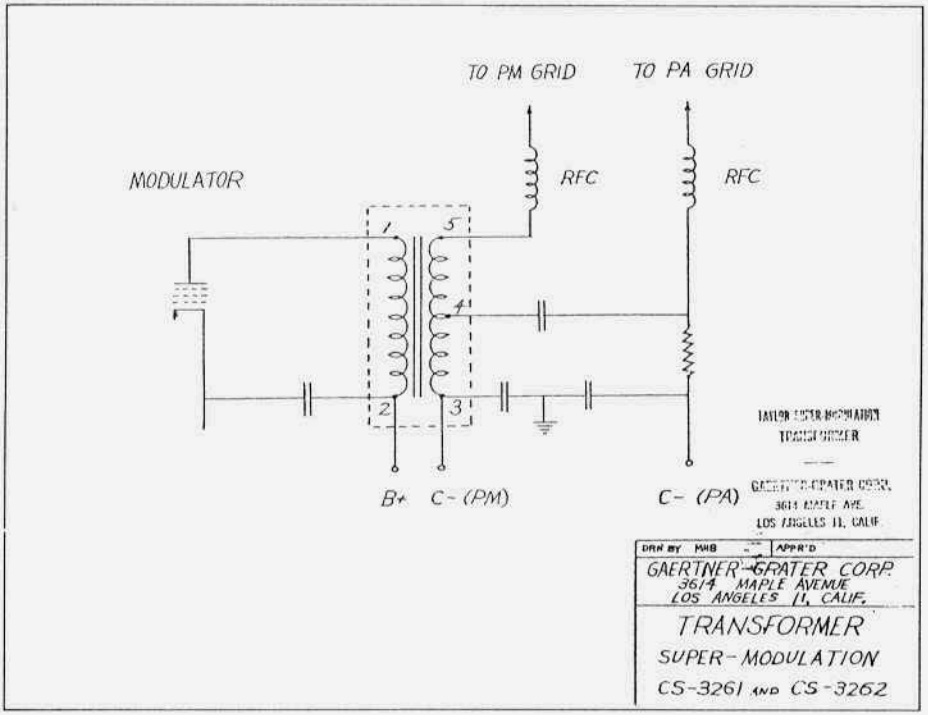
Shirley and I wish everyone a Merry Christmas and a Happy New Year. N6CSW

Mystery Transformer

by Curt Reed, N7AH
411 Olive St., #3
Sandpoint, ID 83864

I found this transformer at a hamfest a couple of years ago and have become very curious about it. I wonder if there is an ER reader who might have some information on it. It is 2.5"H x 1.9"W x 1.75"deep. It weighs .84 pounds and has Taylor Super-Modulation Transformer marked on it.

If I receive any information on this 'mystery' transformer I'll share it with Barry and he can put it in a future issue. **ER**



R-390A/URR Order Number List No. 5 from page 13

Collins Radio Co. order, 08719-PH-55 had 3,500 tags made, the remaining 1,500 were printed for the 1958 Motorola order, 14385-PH-58. All of these tags had a blank where the serial number was. These tags are quite easy to identify, as the photo resist didn't take very well where the black is. Small random pinholes are in the black area of the tags. "How many of these tags were used is anybody's guess. I know for a fact we got letters and calls from all over asking for tags, and thanking us for bailing them out. I remember one call from a civilian engineer saying that they had changed all the tags at the Clark Field receiver site. He said they left them all blank to give the property people fits! If somebody has a receiver with a blank serial number, it probably came from there."

We will probably never again see a receiver built to the level of the R-390A/URR. Regarding the "pile" of R-390A's at St. Juliens Creek Annex, most of the units that had sat out in the harsh elements required little, if any at all, parts to work! Try that with your microprocessor controlled receivers!

My gratitude is extended to all who wrote or called. I just assembled the information, checked it out and put it on paper. Without you it wouldn't have been possible. Special thanks to my "partners in crime", Tom Marcotte, N5OFF and Wally Chambers, K5OP. Also, the following contributors who have been very gracious with their time and information: Mac McCullough; John Miller; George Rancourt, K1ANX; Chuck Rippel, WA4HHG; Jim Thompson, W4THU; Chuck Teeters, W4MEW; and all the Fort Monmouth people who worked on the Improved HF Receiver project and provided the guidance to get the R-390 series through development. More on this in future articles. Thanks guys.

The order number list for the R-390A/URR is shown below. ER

YEAR	MANUFACTURER	ORDER NUMBER
1954	Collins Radio Co.	14214-PH-51
1954	Motorola	363-PH-54
1954	Collins Radio Co.	375-PH-54
1955	Collins Radio Co.	08719-PH-55
1956	Motorola	14-PH-56
1958	Motorola	14385-PH-58
1959	Stewart-Warner Corp.	42428-PC-59
1959?	Helena-Rubenstein (Collins)	UNKNOWN
1960	Stewart-Warner Corp.	20139-PC-60-A1-51
1960	EAC	23137-PC-60
1961	Capehart Corp.	21582-PC-61
1962	Amelco, Inc. (Teledyne bought Amelco)	35064-PC-62
1962	Teledyne Systems	35064-PC-62
1963	Capehart Corp. (Mfd. for Adler Electronics)	20878-PC-63
1967	EAC	FR-36-039-N-6-00189 (E)
1968	Dittmore-Freimuth Corp.	DAAB05-68-C-0040
1984	Fowler Industries	N 00024-84-C-2027

Looking Back from page 3
stant subjects by both these men in QST and the Handbook.

By gets mad at me for saying so, but I really believe that he was the main one for making single sideband what it is today. He was and is an amazing writer; it is no secret any longer but he was Larson E. Rapp who wrote all the good April Fool articles.

All of my early articles were edited and corrected, and discussed with George Grammer. I would get ideas on my own and from other people in the department, plus from TIS mail, as to what I was going to write each month. But George was the final editor until he got tired of reading my stuff and turned me over to Byron.

Let's talk about advertising and its relation to our department. A big rhubarb happened after the invention of the trap beam. Buchanan, W3DZZ, described the antenna in 1953 in QST. Naturally, the idea of having three bands with a single beam caught the attention of several manufacturers, notably Mosley and HyGain. They each produced a tribander but then got into an advertising war as to which company had the beam with the most gain. They started out with 7 dB gain and in about six months time were claiming as much as 12 dB! It's a damn good thing they were not Pinocchio or their yagi booms would have been very, very long. Some of the members who were engineers, started writing in complaining about the false claims. Actually, as I recall, some of us were just not paying attention and the claims in these ads finally woke us up. Grammer called a meeting of our department and then made his decision. He told the advertising department that no more claims of gain on beams would be allowed unless the manufacturer could prove their claim (And, of course, none of them could!). I remember quite clearly that Pete Morrow, W1VG, who was the advertising manager, blew his stack because it meant less advertising commissions and some fights with the beam manufacturers. But the Technical Department had the final say. Naturally, a great hue and cry went up from these advertisers but none ever came in with any proof. Around that time tests made on a very reliable range showed that no trap beam ever exceeded 6.5 dB gain regardless of the number of elements, boom length, or whatever but one still sees these claims.

Any new equipment, receivers or transmitters or other devices had to be submitted to our department for advertising approval. There are many funny stories related to this procedure but one really sticks out. The Heath Company was not allowed to advertise at their beginning because they were primarily into war surplus junk. Of course, the guys at ARRL were just ordinary hams and we thought this was a lousy policy; we all liked war surplus junk. In this case, our General Manager, Budlong, was the one who held out for no surplus advertisers. But Heath came along with that first kit (I believe it was a scope) and then other equipment. Some of us in the department had been secretly talking with the guys from Heath about getting them permission to advertise. Then one day, Pete Morrow came into the department with a real prancing attitude saying that he had just "sold" four pages of advertising to Heath; as if it was a big deal. All it really took was a call to Heath telling them we would accept their advertising! We were all polite enough not to laugh in Pete's face but he never knew the real reason for his sale. **ER**

NOTICE: Don't forget the ER Sponsored 160M AM Contest/ Jamboree on Dec. 27/28 and the Collins Collectors Net AM night on January 8.

ER in Uniform from page 11
dynamotors but had been retrofitted with solid-state high voltage supplies.

Frequency stability is excellent. From a cold start on 3885 kHz, my Collins set drifted upwards 150 cps over the first 10 minutes and then slowly downward stabilizing an hour later less than 30 cps above the original starting point. During this test the transmitter was keyed only momentarily for frequency checks. Over the course of a subsequent 45 minute QSO an initial upward rise of 20 cps was noted followed by a downward drift of 80 cps. Resetability on 75 meters was within 50 cps over 10 autotune test cycles.

I use my transmitters regularly on 160, 75, 40 and 20 meters. These sets modulate fully and have a definite "military" sound, especially when the original M-29 carbon microphone is used. Setting the clipping level at minimum helps the audio quality and using one of the Motorola TMN6054A hand mics provides additional improvement.

I have had relatively little trouble with my T-195s, especially considering the complexity of the set, and other East Coast users report similar experiences. The inner workings are very well protected and units will frequently take right off even after lying around a salvage yard for several months. The tubes are all common types except for the 4X150D (a 28 volt version of the more common 4X150A) but even these have been showing up at flea markets with some regularity. The later 7035 tube with an additional 100 watts of plate dissipation is a good replacement for the PA final and seems to give about 10% more output.

The PA and antenna loading circuits in this set are spread across several chassis, and I have found that many tuning problems can be cured by cleaning and reseating the associated cable connectors. Having a second working unit from which to swap modules is also a great help in isolating faults.

All my antenna systems operate at 50 ohms and I have never tried the 15 ft. whip option. It has been reported that keeping up with whip movement during mobile operation was hard on the PA and the servo motors (see Note 2.).

The set will work all the way down to 22 vdc input as specified but the power output drops 50% at this level.

The only real complaint I have with this equipment is the noise level. For those who have never been near a T-195, the experience can by simulated by operating your rig with a large shopvac running alongside!

Inquiries and comments are welcome. I would be especially interested in hearing from readers who have had military (or other) experience with this equipment. **ER**

Notes:
1. TM 11-806, "RADIO TRANSMITTER T-195/GRC-19" (June 1956)
2. Private communication with Chuck Teeters, W4MEW, (see ER #90, Oct. 1996)

Heathkit Mohawk from page 25
more month. In Part Three we'll attack the last of the Mohawk's serious problems: its horrendous VFO drift. Until then, scour those swap meets and find yourself a Mohawk to restore. They are much scarcer than they were a few years ago, so it will take a bit of digging, but you will be well rewarded because the Mohawk is a really fun vintage receiver to use. **ER**

CLASSIFIEDS

Advertising Information

Subscribers receive 1 free - 20 word- ad per month. **Extra words are .20.** Here's how to count the words in your ad: the heading - For Sale, Wanted, etc count as **1 word**. Your name, call, address and telephone number count as **6 words**. Hyphenated words count as **2 words**. **Please count the words in your ad and if you're over 20 words send payment for the extra words.**

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DEADLINE for the JAN. Issue: JAN. 1

FOR SALE: Repair and restoration on all vintage equipment; 35 years experience. Barney Wooters,W5KSO, 8303 E. Mansfield Ave., Denver, CO 80237. (303) 770-5314

FOR SALE: "AM FOREVER" quality Haynes T-shirts, grey, blue, green & red. Sizes M, L, XL - $15 shpd. Rick, K8MLV/Ø, 1802 W. 17th St., Pueblo, CO 81003. (719) 543-2459

FOR SALE: R-390A Orig. Maint. Manual,TM11-5820-358-35,189 pgs - $28 incl. Dom Priority Mail. Aben, POB 4118, Jersey City, NJ 07304. avidov@aol.com

FOR SALE: Cabinet Heath DX-100 - $75; BC-221 freq meter, looks unused - $60 John, Alaska, (907) 337-9168

FOR SALE: Knight-Kit Space Spanner, exc - $50 plus shpg from 60516. John, IL, WB9OVV, jvercellino@sprynet.com, (708) 431-2693.

FOR SALE: RT-662/GRC-106 $ 285, SG-1144 $ 150, EE-8 (pair) $ 85. Joseph W. Pinner KC5IJD, 201 Ruthwood Dr., Lafayette, LA 70503. (318) 981-7766, kc5ijd@sprintmail.com

FOR SALE: Murch UT-2000A kilowatt tuner with manual - $90 plus shpg. George, NØGH, 515 17th St., SW, Rochester, MN 55902. (507) 288-0242.

FOR TRADE: B&W coils HDVL 10, 15, &20. Need HDVL 40 & 80, BVL 40. Collin, N4TUA, GA, (912) 988-1276, n4tua@juno.com

FOR SALE: Collins S-Line aluminum knob inlays: small (exciter/PA tuning) - $1; 30L-1 - $2; spinner/plain (main tuning) - $3. Charlie, K3ICH, 13192 Pinnacle Lane, Leesburg, VA 20176. (540) 822-5643

FOR SALE: Hallicrafters, RME, Gonset, other. Also power supplies, test equipment,VHF/RF amps, more. LASE, Don Jeffrey, POB 1164, Monrovia, CA 91017.

FOR SALE: New Ranger I, Valiant I and Navigator plastic dials, 160-10, freq. numbers in green, w/all holes, like original - $17.50 ppd. Bruce Kryder 4003 Laurawood Ln., Franklin TN 37067. (615) 794-9692

FOR SALE: National HRO-60R rack mount, no rack, spkrs, XCU-50 calibrator, A,B,C,D,E, F,G,H,AB,AC,AD coils, boxes, manual, works and looks good - $500. Wes, K5APL, TX, (903) 831-4636 nites.

FOR SALE: T599D - $125; SB100/HP23 - $125; PS23 - $50; Millen GDO - $25. Prices include shpg. Marv, AAØHL, Lehr, ND 58460. (701) 378-2581 marvbek@daktel.com

FOR SALE: Collins WE 7583-C, always cared for, factory original, CCA very good - excellent,tuned, simply a superb performer. KX6K, CA, (408) 991-3747, bob.struk@sv.sc.philips.com

FOR SALE: Very good R-1051B rcvr + manual - $150 + ship. Chuck, NZ5M, TX, (806) 798-1452.

FOR SALE: 1000 µF/200V, Rubycon/CEW snaplock caps, used pulls - 12/$16 ppd. Mel Stoller, K2AOQ, 100 Stockton Ln., Rochester, NY 14625. (716) 671-0776

FOR SALE/TRADE: Xmtg/rcvg tubes, new & used - 55¢ LSASE for list. I collect old & unique tubes of any type. **WANTED:** Taylor and Heintz-Kaufman types & lge 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: Good used 4-1000 for several 4-250 or 4-400s. Dave, K9HDQ, IN, (765) 354-2884.

FOR SALE: Heath AM2 - $10; QF1 - $15; HP13, manual - $25; TC2 - $30, all + shpg. Clint, K7LCT, 1642 Cody Dr., Billings, MT 59105. (406) 248-8687

FOR TRADE: Two good RCA 833As 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: NIB 4-125As - $95; RCA 811 - $15; Eimac 4CX250B - $95; 250TL - $75. Frank S. Law, W8SET, 1 Wildacre Rd., Charleston, WV 25314. (304) 343-0415.

FOR SALE: Collins gear: 651S-1; KWM-2A; 1950s 3 ring binders; 1980s 3 ring binders; R-388 for parts. Bill Coolahan, 1450 Miami Dr. NE, Cedar Rapids, IA 52402-2933.

FOR SALE: Heath HO-13 - $135; MT-1 - $75; Clegg 99er - $75; Dentron 160AT - $45; Eldico Antennascope - $40; Vibroplex J-36 - $95; Astatic 200 - $45; JT-30 - $55; 10D & stand - $55. Free list. Richard Prester, 131 Ridge Rd., W. Milford, NJ 07480. (973) 728-2454

FOR SALE: Vibroplex Deluxe bug - $125; Harvey Wells Z-matcher - $125; NCX-3 & ps - $110; Millen 2 kw transmatch - $250. Shpg extra. Larry Wright, N4QY, 170 Heritage Ln., Salisbury, NC 28147. (704) 633-3881

FOR SALE: RBO-2 Navy rcvr (EH Scott) w/ enclosure, shock mount & orig manual - $125, OBO. Keith Perry, 384 S. 48th St., Springfield, OR 97478. (541) 726-1512

FOR SALE: Clegg Venus 6 meter SSB xcvr, 416 AC sply, S/S speech booster, orig manuals - $275; second Venus w/National HCXA sply - $150; extra HCXA sply - $35; Multi Elmac PMR-8 rcvr, ESS-3 external S meter, AF-68 xmtr, M-1070 sply, orig manuals - $275; also many additional items, parts, accessories, send SASE for list. G. Hawrysko, K2AWA, POB 756, Jericho, NY 11753. (516) 921-4990

FOR SALE: Rockwell Collins HF data book, 1978 booklet, 70 pgs - $12 ppd. Harry Blesy, 95740 Clarendon Hills Rd., Hinsdale, IL 60521. (630) 789-1793

FOR SALE: Millen 90700 VFO, Variarm - $100; Heath Cheyenne MT-1 xmtr, Comanche MR-1 rcvr, pwr sply, mic, manuals - $150; crated GRC-109A & spares - $500; SCR-522 AC pwr sply - $100; R-390A rcvr, re-finished front panel & knobs, in good wkg order - $285; AN-WLA-24 Amplifier Group, Radio Frequency, w/C4754A/WLA-2 - $250 or BO. George K1ANX, MA, (413) 527-4304.

FOR SALE: PRC-25/antennas, handset, bag - $225; PRC-10 (A) backpack, accessories, manual - $125; connectors for BC-191/375, 274N/ARC-5, RV/GF & others; ARC-5/274N rcvrs/xmtrs; other military misc; send wants w/SASE. Henry Engstrom, KD6KWH, POB 5846, Santa Rosa, CA 95402. (707) 544-5179

FOR SALE: Magnum Six speech processer for Heath - $45; SW-41W (white, rare) - $95; Minerva Tropic-Master, W-117 - $85; notice, I collect military entertainment radios (Morale rcvrs). **WANTED:** Zenith-R-520, Espey TRR-5, Jetronics R-853/URR, Hallicrafters R-62/PR & R-80/PR, industrial tool model 6000 BAC, or any others that I may not know about. Henry Engstrom, KD6KWH, POB 5846, Santa Rosa, CA 95402. (707) 544-5179

FOR SALE: Globe King 500C, DX-100, HT-9, 75A-3, Navy RBB/RBC/pwr sply. Will sell all together as a package for - $1000 or trade for exc Collins S-line. PU only in Rugby, ND; tubes NIB 5514 - $15; TZ-20 - $15; TZ-40 - $20. Ron Skipper, W8ACR, ND, (701) 776-5492, skipperclan@stellarnet.com

FOR SALE: Globe Chief model 90-A, 160-10 meters, lights up, looks good, not tested - $95 shpd. **WANTED:** Coils, coils, for any National radios, Dog house pwr splys. I love Natiotal. Sylvia K. Thompson, N1WVJ, 33 Lawton-Foster Rd., Hopkinton, RI 02833 (401) 377-4912

FOR SALE: Hallicrafters HT-20 - $425; Millen 92200-BO. Wayne, 12121 7th Rd. NW, New Strawn, KS 66839. (316) 364-5353

FOR SALE: Large number of military radio TO's, $11.50 each, U.S. postage included. For list, e-mail: <karenski@inreach.com, or $2./mailing label to Ski, WA6AME, 7966 Vintage Way, Fair Oaks, CA 95628. (916)966-4749.

WANTED: Manual or schematics, copy OK, for Elmac PMR7 rcvr & pwr splies. Norman E. Hall, W6JOD, 6506 Jetta Ave., Bakersfield, CA 93308. (805) 399-4101

FOR SALE: K7FF Christmas Special Super List parts/equipment, e-mail K7FF@inreach.com, or two first-class stamps/mailing label. Many new items, Christmas Specials. Derek, K7FF, 5191 Rimwood Drive, Fair Oaks, CA 95628. (916) 965-4904.

FOR SALE: Older Aircraft avionics, lots of tubes/parts - BO. SASE/e-mail for list. AA6JN, CA, (209) 675-8320, jdam@psnw.com

The Manual Man wishes Season's Greetings and Happy Holidays to all our supporters and customers throughout the world.

WANTED: Still collecting early WW II radar equip. & manuals, what have you. Allan H. Weiner, 97 High St., Kennebunk, ME 04043. (207) 985-7547

WANTED: QST, CQ, Radio Craft & Radio News magazines, 30s, 40s, 50s. Advise price + shpg. Beni Fernandez, KP4DN, 1674 Atlas St., Summit Hills, PR 00920.

WANTED: Collins - Amateur catalogs, sales literature, manuals, promotional items & Signals. Richard Coyne, POB 2000-200, Mission Viejo, CA 92690.

WANTED: Marantz, McIntosh, or similar tube audio amplifier in any condition; Heath catalogs. Mike Nowlen, WB4UKB, POB 1941, Herndon, VA 20172

WANTED: Western Electric aircraft radios, xmtrs pre-WW II. Also Telephonics RS-76 throat mic. James Treherne, 11909 Chapel Rd., Clifton, VA 20124. (703) 830-6272.

WANTED: Clegg Interceptor spkr. Dick Bean, K1HC, 422 Everett St., Westwood, MA 02090-2218. (781) 461-0101, k1hc@aol.com

WANTED: Output meter or good meter lens for a Hallicrafters HT32 TX. Chuck, WB3LGC, PA, (610) 593-2196, kembring@epix.net

WANTED: Manual and/or schematic for Sylvania CU-1388/FLR-9 antenna multicoupler. Steve Byan, 12 Oak Ridge Rd., Littleton, MA 01460-1412, smb@world.std.com

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

WANTED: Specific pre-1921 issues of QST magazine, pre-1932 ARRL Handbooks. Eddy Swynar, VE3CUI, 3773 Concession Rd 3,RR #8, Newcastle, ONT L1B 1L9, Canada, gswynar@mail.durham.net

WANTED: TRC-10 xmtr/rcvr; Navy RAL rcvr. **FOR SALE:** EICO 710 GDO - $25 plus shpg. Sandy W5TVW, 417 Ridgewood, Metairie, LA 70001. ebjr@worldnet.att.net

WANTED: SX-140 rx; UV-200/w tip; BC-610 RF deck. Cash or trade. KFØAM, SD, (605) 923-5309, kf0am@juno.com

WANTED: Extender boards for Heath SB104, needed to service the plug-in boards. Don, MI, (616) 649-4646 , k8pou@juno.com

WANTED: WW II German, Japanese, Italian, French equipment, tubes, manuals and parts. Bob Graham, 2105 NW 30th, Oklahoma City, OK 73112. (405) 525-3376

WANTED: Tektronix memorabilia & promotional literature or catalogs from 1946-1980. James True, N5ARW, POB 13280, Maumelle, AR 72113. (501) 851-8783, FAX 851-8784.

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 777-6491

WANTED: Hammarlund: Comet, Comet Pro, HQ-66, HQ-88, HQ-225, S-200 & any other Hammarlund rarity's. Charles P. Jedlicka, 1611 Clemens Rd, Darien, IL. 60561-3510. (630) 515-1836. sp6008@aol.com, Hammarlund site: http://home.aol.com/sp600

WANTED: Star rcvrs; schematic & spkrs for Star SR600 & SR700; other Star accessories. Harry Blesy, N9CQX, 9574O Clarendon Hills Rd., Hinsdale, IL 60521. (630) 789-1793

WANTED: Collins 310A-1 &/or 310A-3, any condx; 30J, 30K-(any); 302C-1, 312A-1. **FOR SALE:** 9C-101 lamp hoods & grills. Butch, KØBS, MN, (507) 282-2141

WANTED: Western Electric 20A or 20B rcvr and 27A remote control unit. James Treherne, 11909 Chapel Rd., Clifton, VA 20124. (703) 830-6272, treherne@erols.com

WANTED: Noise blanker for KWM-380 (CPN AC-3801). Toyohiro Haruyama, JA1OZZ, 1641-6 Dainogou-Machi,Ota-city,Gunma-Pref,373,Japan. t_haruyama@afj.mitsumi.co.jp

WANTED: National NC300 service bulletins and mods; chrome Blue Racer bug. JeRB, K8WPI, MI, (616) 382-5401, jerb@iserv.net

WANTED: Drake R-4B, MN-4, EICO 753, working or complete units; R-390A audio deck. Any ER issues 1-75. Jose V. Gavila, EB5AGV, 34-6-3754693, eb5agv@amsat.org

WANTED: Johnson Rangers-scratched/worn panels to mint radios & parts units. Interested in other heavy Johnsons within 3-4 states of my QTH. Dee, W4PNT, VA, (540)249-3161 soundnmind@rica.net

WANTED: Collins 312B2 for KWM1 (would buy a package with KWM1). Hiro Sakai, AD4EC / VE3,(416) 203-8467 after 8:00 PM EST, ad4ec@msn.com

WANTED: Multi Elmac PMR7, PSR1175, M1070 or 1071, would consider complete AF 67 PM7 etc station, working condx preferred but anything or parts considered. Dave Bohlen, NØEDS/6, CA, (707) 263-4806 dys, 274-8444 eves.

ELECTRON TUBES FREE 1997 Catalog, over 2,000 types in stock. **Electron Tube Enterprises,** Box 8311, Essex, VT 05451. (802) 879-1844, FAX (802) 879-7764

FOR SALE: T-Shirts w/Johnson Viking logo - $15, state size. Viking Radio Amateur Radio Society, POB 3, Waseca, MN 56093.

FOR SALE: Used technical books - radio, electronics, math, military, magazines, etc. List: $1 (stamps OK). Softwave, 2 Dept. ER, 1515 Sashabaw, Ortonville, MI 48462.

FOR SALE: WACO-5NWX telephone filters. Just plug in. 1/$13.95, 2/$25.00, 3/$34.00. Money back. Cecil Palmer, 4500 Timbercrest Ln., Waco, Texas 76705. (817) 799-5931. W5NWX@juno.com

FOR SALE: Dial/clock covers. Send bezel, old or drawing, make/model, guaranteed satisfaction - $10 ppd. William P. Turner, WAØABI, 1117 Pike St., St. Charles, MO 63301. (314) 949-2210.

FOR SALE: Please send SASE for long list of radio, electronics books & mags. Vic Edmondson, Rt. 1 Box 2599, Lee, FL 32059.

FOR SALE: Collins 75A3 - $250, 75A1 - $275; Hallicrafters HT32/SX101A - $200, R46A/R46B - $20 each, SX 111 - $50, S120 - $20. Johnson Viking 6N2 w/ext. VFO & 6N2 converter - $100; Heath SB303/SB401 SB600/SB650/HB105 assesories. Phil, WF6L, CA, (760) 757-7008 pleonel@sdcoe.k12.ca.us

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

FOR SALE/TRADE: (5) BC348 rxcrs, AC & other mods - $80 ea + shpg or trade for ARC-5 & parts units. Ken Kolthoff, 8967 Scott Dr., Desoto, KS 66018. (913) 585-1196.

FOR SALE: Military & commercial manuals, schematics & conversions; test equip manuals; older ham radio manuals & schematics. Walt, K1RTS, 149 Southmayd Rd., Waterbury, CT 06705. (203) 756-6376 after 6PM.

FOR SALE: National NC57M rcvr, rare AC/DC HF & Marine band model, orig manual, exc - $125 shpd; Clegg 22'er, manual - $75 shpd. Doug Owen, KC8JT, 1539 North Rd., Troy, OH 45373-1101. (937) 335-1300

FOR SALE: Collins 32V2 xmtr from orig owner, mint condx w/orig manual - $500; two Viking Valiant xmtrs - $200 for both. **WANTED:** Older SSB xcvr in good working condx; FT101, TR4, etc under $300. Ed, UT, (801) 484-5853.

FOR SALE: Magazines, manuals, surplus books, some surplus xtmrs, & other parts. Call your needs. Vic Edmondson, W4MYF, RT 1 Box 2599, Lee, FL, 32059. (904) 971-5580

FOR SALE: Collins R-105A, modified rcvr - $50; RDZ-1 UHF rcvr - $85. **WANTED:** Halli HA-20 VFO, good to mint condx. Greg Richardson, WA8JPC, POB 405, Gallipolis Ferry, WV 25515.

FOR SALE: Collins 516F-2 bias mod, parts/instr - $12, ppd/US. Cory, N2AQS, 1000 E 14th/178, Plano, TX 75074-6249. hinec@ccgate.dl.nec.com

FOR SALE: Used 807 tubes, tested OK-Guaranteed, $5 ea + $3 priority mail. James T Schliestett, W4IMQ, POB 93, Cedartown, GA 30125. (770) 748-5968, imq@bellsouth.net

FOR SALE: Heath Q-Mult GD125 - $25, HD20 xtal calibr - $20; Knight Space Spanner - $60. Dan Merz, 312 Sierra St., Richland, WA 99352. (509) 375-1334.

FOR SALE: National SW3 Model 2 - $250; HQ180C - $175; Knight R100A, near mint - $90. Plus shpg. Larry, Cerritos CA, (562) 860-3131, 110242.1646@compuserve.com

FOR SALE: 5894 tubes, NIB - $15 each; 3B28 solid state replacments, new - $25. **WANTED:** KWM-380 parts rigs. Fred Honnold, W6YM, 17890 Sharon Ct. Pine Grove, CA 95665. (209) 296-5990, fhonnold@juno.com

FOR SALE: Tubes - NOS unless specified otherwise. Eimac 35T - $40, 1 used - $15; pr 100TL - $65pr; 3C24/24G - $25; pr Taylor TZ-40 - $60pr, 1 used good - $12.; (3) Taylor T-20, lo hrs - $10 ea; US 6146(A) - $16; 7- RCA 8008, pulls in orig boxes - make offer; GE 6146B - $24.50; NEW STOCK Svetlana 811A matched quad - $90; Penta Labs 572B - $55; 3-500Z fact-matched pr - $310; (1) Pride 3-500Z - $95. Have Rx, Indust for most BAs. Visa/MC. Dee, W4PNT, VA, (800) 755-2365, soundnmind@rica.net

FOR SALE: Hallicrafters SX-25, Good condition, no speaker, cosmetically very good - $140 plus shpg. Carleton Rand, W1PZI, 85 Black Hall Rd., Epsom, NH 03234. (603) 736-9695.

FOR SALE: SX-42 in very good condx - $300. Brian, KI5SG, (918) 494-6823, jake90130@prodigy.net

TRADE: R/E 312B-4, DX Eng speech processor for S-Line; a 2.1 mech filter for 75A4. Trade each one for any McElroy bug in good condx. John Casale, W2NI, 3 Pickering Ln., Troy, NY 12180. (518) 272-3631.

FOR SALE: BC-611 Motorola 80M handi talkies, look great, not tested, w/manual and battery - $125 ea + UPS. Jim, K7SC, 9411 E. Happy Valley Rd., Scottsdale, AZ 85255. (602) 244-4441

FOR SALE: Hallicrafters SX-42; Galaxy 300 - $100; Clegg 22er - $35. Carter, VA, (804) 979 7383

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: Service. Reproduction dial covers, clock lenses (Hammarlund,etc) old or dimensioned drawing - $10 ppd. William P. Turner, WAØABI, 1117 Pike St., St. Charles, MO 63301. (314) 925-1307

FOR SALE: Original military wall charts/diagrams (up to 17"x28") for R-390/URR rcvr - $23ppd. R.J. Moraine, W5LX, 3700 Cliffwood Dr., Bedford, TX 76021.

FOR SALE: Very nice Drake TR-3, owned by Walt Burdine, CQ Novice Editor in the 70's, orig manual. Fred Clinger, WA8KJJ, OH, (419) 468-6117 after 6 PM EST

FOR SALE: Surplus Conversion Manual III; The Surplus Handbook; & 1938 Jones Radio Handbook -$35 ea; KY-65 keyer w/conversion data - $10; LM-21 w/matching ACPS, shock mounts, book - $25; USM-32 freq meter w/ACPS, book, manual - $60; accessory box for GRC-19 - $10. Gary, MN, (612) 496-3794.

FOR SALE: Collins WE 30L-1 amplifier, vgc, manual - $525 shpd CONUS; Shure 450SL mic - BO. WA6AAJ, CA, (209) 322-0459.

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. trinit698@dt.net, (318) 989-3430

FOR SALE: Cleaning out shack. LSASE for list of ham, military stuff, book, manuals, test equip. G. Cain, POB 521, Shakopee, MN 55379.

FOR SALE: 1940 Taylor Tube Manual, 50 pages, copies - $15; service manuals - SASE for list. DSM Diversified, 909 Walnut St., Erie, PA 16502. dsmdiversified@juno.com

FOR SALE/TRADE: EV664/419 Turner 522D Shure 737A, CR41; Turner 90D-5 Shure 55S. Ray, MO, (314) 961-9088.

FOR SALE: Carved wood call signs, black 3" gold lettering - $24 ppd ck/mo, 2-4 weeks delivery. Jim Allen, POB 107, China, ME 04926. (207) 968-2573

FOR SALE: TU-10B tuning unit, good condx - $30, I ship. **WANTED:** Need manual for Heath HR10 rcvr, copy ok. TNX. Gary Reiss, WAØJRM, RT 1 Box 141, Wilcox, NE 68982. (308) 995-5541

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, WD5EOC, "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: 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: AN/USM-3A tester, incomplete or parts set; circuit for LM-10/13. David Boardman, 10 Lemaistre, Sainte-Foy, Quebec G2G 1B4, Canada. (418) 877-1316 eves.

WANTED: Globe King 500C xmtr, good condx. George Shute, W4BDG, 2910 Virginia St. NE, Albuquerque, NM 87110. (505) 298-7347

WANTED: Spkr for National NC-183D Hammarlund HX-50A. Ron, 10701 W. 54th St., Shawnee, KS 66203. (913) 268-5973

WANTED: Heath's SB110A 6 meter; HM2103 load/wattmeter; SB650 freq-display. Don, N6IDY, phone/fx, CA, (818) 368-7374.

WANTED: Filament xfmr for Heath SB-220 amplifier. Harold Sullivan, 15300 Prairie Rd., NW, Andover, MN 55304. (612) 434-3003

WANTED: Information - WW2 TCS radio, system, design, mfg & operation for article. Any help appreciated. Thanks. Greg Greenwood, WB6FZH, POB 1325, Weaverville, CA 96093. (707) 523-9122 message, greg6fzh@aol.com

WANTED: Type A plug-in coil set for National HRO-7 rcvr, (general coverage 14.0-30mc, bandspread 27.0-30mc), note: any plug-in A coil set for HROs 5, 7, or 50 rcvrs will work; WW II Command sets, BC-454 rcvr & BC-457 or BC-459 xmtr. Doc, W9VVN, MN, (218) 586-2952.

WANTED: Eimac 75TL's; WE-437A; WE-205D; 866 Globe, not A. Robert, CA, (562) 928-8820, rrjlife@earthlink.net

WANTED: Manuals/copies Lafayette HA-50, HA-225; alignment sheets SX-140. Fred, WØBMT, NE, (402) 887-5201.

WANTED: Tektronix 4501 scan converter unit. VE7AEC, (800) 943-9886, ask for Newell.

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: QST Mags 1981 thru 1990, complete - $5/yr. Francis Waggoner, W2PTI, 268 Barben Ave., Watertown, NY 13601. (315) 788-1621

FOR SALE: Hallicrafters SR42A 2M AM xcvr - $85; Heath HX30 Six meter multimode xcvr, like new - $125. Dave, W1DWZ, MA, (508) 378-3619.

FOR SALE: VFO sale: Ameco VF21 3 band (6/2/1-1/4), Globe 6-2, Internal pwr - $29 ea + shpg. H. Mohr, 1005 W. Wyoming, Allentown, PA 18103.

FOR SALE: Drake, T-4XC, AC-4, MS-4, w/cables, mint - $300; Dentron, HF amp w/4 ea 572B's, like new - $700; Dentron, ant tuner MT3000A - $250. U shp. Dwight, CO, draddatz@gwe.net

FOR SALE: Collins 312B/5 WE, Heath HW101, SB101, both w/pwr & manuals. Joe, K2QPR/4, FL, (561) 220-7362.

FOR SALE: Swan 700CX w/spare finals - $250. **WANTED:** Hammarlund HX-50A xmtr that looks & works good, no mods; Hallicrafters HA-20 VFO. Ron, KS, (913) 268-5973. arongv@aol.com

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

FOR SALE: Bird slugs - $40 ea shpd; 2-30 MHz 2500 watts, 150-250 MHz, 2.5W, 200-500 MHz 25 watts. **WANTED:** Hammarlund HX-50A in nice looking & working condx. Ron, KS, (913) 268-5973. arongv@aol.com

FOR SALE: Knight Spanmaster radio, works, fair appearance - $50 + 12 lbs shpg. L. Schimmel, POB 1234, Spanaway, WA 98387.

FOR SALE: Tube testers TV-2U - $200; TV-7U - $60; Drake 2BS spkr - $20; Hammarlund HQ-180 spkr - $35; Collins KWM2-A conversion kit - $150. Wes, K5APL, TX, (903) 831-4636 eves.

FOR SALE: Lge stock vacuum tubes in boxes & tested, worth $2284.89 at present market prices. Wish to sell entire stock to highest bidder. Send SASE for list. Bill Riley, W7EXB, 863 W. 38th Ave., Eugene, OR 97405. (541) 345-2169

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: 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: Tektronix memorabilia & promotional literature or catalogs from 1946-1980. James True, N5ARW, POB820, Hot Springs, AR 71902. (501)318-1844, n5arw@ibm.net

WANTED: A source for crystal blanks for FT-243 holders and other types. Dennis Baker, KEØQM, KS, (913) 782-9092, wbfim@sound.net

WANTED: BC 610 A-E model and BC 729 antenna tuner, working or not working. Paul Thekan, 335 Rutherford Ave., Redwood City, CA 94061. (650) 367-1499, paul.thekan@eimac.cpii.com

WANTED: Heath SB-101 or SB-102 w/ps; Heath desk mic. Tom, W9CHP, WI, (920) 734-1068, tagthomson@aol.com

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, 3051, 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: 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: 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: Top dollar paid for Winchester radios and Winchester related items. Donald Daggett, 918 Casey Cove Dr., Nokomis, FL 34275. (941) 484-7371, wc2e@webtv.com

WANTED: Heath Gear, unassembled kits, catalogs and manuals. Bill Robbins, 5339 Chickadee Dr., Kalamazoo, MI 49009. (616) 375-7978 billrobb@net-link.net

WANTED: WWII German E-5 rcvr for FuG7 set. Also need schematics, manuals, connectors, and accessories for FuG3 and FuG7 aircraft sets. I have WWII German gear for possible trades including FuG3 and FuG16z sets, FuG220 Lichtenstein SN2 radar parts, and more. Bill Strangfeld, WB8YUW, 254 Elm Ave, Cincinnati, OH 45215, (513) 948-1071, bstrang@uc.net

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

The Radio Finder©

11803 Priscilla, Plymouth, MI 48170
TEL/FAX 313-454-1890
e-mail: thurtelljh@aol.com

DECEMBER SPECIALS

AMATEUR TRANSMITTERS: COLLINS KW-1; 30-K w/31A-3 exciter; 30S-1; 32S-1; 30L-1 winged; 30L-1 round; **WRL** Globe King 500-B; **JOHNSON** Invader 2000; Valiant, Thunderbolt; Ranger; Johnson Mobile VFO; **GONSET** GSB-100; **HEATH** DX-100; HA-10 Warrior amp; **CENTRAL ELECTRONICS** 100-V; **HALLICRAFTERS** HT-32; HT-37; **MULTI-ELMAC** AF-67; AF-68; 1935 homebrew transmitter

AMATEUR RECEIVERS: COLLINS 75A-4; 75A-3; 75A-2; 75A-1; 75S-3B; 75S-3; 312B-3 speaker; 516F-2 case w/speaker; CP-1; **HALLICRAFTERS** SX-88; SX-96; SX-73; SX-71; SX-17; S-40B; R46/R46B speakers; **HAMMARLUND** SP-200 (BC-779) w/PS; military HQ-180; **KNIGHT** Ocean Hopper; **NATIONAL** HRO-500 as new in original boxes; HRO-60; NC-300; WW II LF receiver; National speaker; Scott SLR-F "anti-submarine" receiver

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

MILITARY RECEIVERS: COLLINS/Miltronix R-390-A; Arvin/Miltronix R-725; Good just-serviced working stock R-390; R-390-A; CEI 354; **WATKINS-JOHNSON** DMS 105A; BC-348-Q; ARC-5 Command receivers

MILITARY TRANSMITTERS: ARC-5 Command transmitters, racks

FILTERS: 75A-3 – 6 khz, 800 hz; Drake R4C – 250 hz

The Radio Finder is looking for good, working, reasonably priced rigs for re-sale.

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NOTICE: Watch Radio Finder web site http://www.radiofinder.com for new listings of old keys and bugs, including a 1920 Vibroplex, an old McElroy and plenty more. Old QSTs, CQs, and Radio magazines now are part of the web catalog plus many old Handbooks and other radio publications.

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: Western Electric 117-A output xfmr - $30. Pat Stewart, W7GVC, 1404 Ruth Ave., Walla Walla, WA 99362-3558. (509) 525-1699

FOR SALE: Wilkinson AM 1000B broadcast xmtr, use's 4ea 4-400 - $1000. Dan Mason, RRT1 Box 204F, Santa Fe, NM 87501. (505) 455-3416

FOR SALE: Xtals 7010 kHz, type CR-1, NOS military - $2 ea, quantity pricing available. WA5THJ, Rt 9 Box 163, Alvin, TX 77511. (281) 331-2956

FOR SALE: New orig. PJ-068 mic plugs for Collins S-line/KWM-2A/HF-380 shp'd in USA - $8 ea. Clint Hancock, KD6H, 6567 Ashfield Ct., San Jose, CA 95120-4502.

FOR SALE: Drake TR-4C xcvr w/AC-4 pwr sply, MS-4 spkr, D-104 mic on T-VG9 stand, manuals & set of spare tubes, exc condx. Ed Feild, RR2 Box 825, Palmyra, VA 22963. (804) 589-1293

FOR SALE: BC-186 regen rcvr & BC-187 xmtr - $300; PRC-72, includes RT-835 HF SSB & RT-836, RT-837 & RT-838 VHF, all in 11"x16"x6-1/2" case, as is - $200. Norb Wokasch, WAØKJE, 3312 W. Bijou, Colorado Srrings, CO 80904. (719) 633-5661

FOR SALE: Collins repair. I specialize in S-line equipment. Reasonable, & work guaranteed. Steve, N6HK, Box 1136, Goleta, CA 93116. (805) 967-7466

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@rust.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: (2) Signal Corps wireless sets No.19 MKII w/pwr sply & connectors, exc condx. Ed Feild, RR2 Box 825, Palmyra, VA 22963. (804) 589-1293

FOR SALE: All in exc condx w/manuals: Drake TR-4 w/ps - $200; Heath voltage calibrator, condenser checker, test oscillator, electronic switch FM test oscillator - all for $100; VHF 152A - $100; Zenith Transoceanic 80005 - $125; 2M FM TR-7200A - $100; Clegg 99'er - $100; MFJ 941E - $65; phone patch HD-15 - $45; Sixer - $45; Twoer - $45. Robert Mitchum, IN, (317) 881-9083. bobzed@aol.com

FOR SALE: Antique (1935) test equip, Clough-Brengle type CRA 'scope & type OMA signal generator - $50/pair. Don, W7KCK, OR, (503) 289-2326.

FOR SALE: Collins manuals, (copies) R-388, R-390, R-390A & R-391. **WANTED:** Tube CBs. Charles Zafonte, N1FRX, RR3 Box 2075, Fort Kent, ME 04743. (207) 834-6273

FOR SALE: Side trim pieces for National racks, exact duplicates. These cover up the mounting screws & were originally supplied with the National rcvr's when purchased in the rack mount version with the optional spkr & table top rack. Will fit the rack versions of HROs, RAS, 183s, etc - $25/pr, shpd CONUS. Peter Brickey, K6DGH, CA, (408) 353-1925.

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.

FOR SALE: Hallicrafters SX-43 rcvr w/matching R-42 spkr & manual, mint condx. Ed Feild, RR2 Box 825, Palmyra, VA 22963. (804) 589-1293

FOR SALE: National 1-10 HF-VHF rcvr 1940s, no pwr sply, good to exc condx - $120. Tom Berry, K9ZVE, 1617 W. Highland, Chicago, IL 60660. (773) 262-5360, 262-0016

FOR SALE: Collins KWM2A - $650; PM-2 - $125; R388 SN317 - $400; Johnson Pacemaker - $195; Viking I - $85; TMC CV-591A/URR SSB converter w/manual - $350; Hammarlund HQ-150 - $200; Heaths, HW-12A xcvr - $75; HW-30 Twoer - $30; SB-614 station monitor scope - $75; IT-12 signal tracer - $35; IM-11 VTVM - $25; CM-1 capacity meter - $25; HP 400C VTVM w/manual copy - $18; test set I-118B w/manual - $20; Allied Radio Catalogs, '69, '71 - $15 ea; mics, T-17s (3) - $15 ea; N.I. can Eimac 4X150A tubes (3) - $25 ea; CV89A/URA-8A FS converter - $75; Northern Radio Dual FSK Type 153 Model 2 - $45; 42" relay rack cabinet MT-452A/F - $120. All + shpg, PU heavy stuff. George Shute, W4BDG, 2910 Virginia St., NE, Albuquerque, NM 87110. (505) 298-7347

FOR SALE: Eimac 304TL - $50 ea; Eimac 4CX300A - $100 pair; HK (4) E27 - $25 ea; Eimac 4-125A - $75 ea; RCA 833A - $75 ea, all NOS, gntd; X-EC HM-103 Radio-Television Sply Co VFO-exciter (pg 97 Oct 1939 QST) - $75 w/PS; Electrovoice Speech Clipper model 1000 - $35; Morrow 3BR1 converter - $40. **WANTED:** Bandswitch knob for Hallicrafters SX-100; indicator control box for Hygain Roto-Brake 400. + shpg. Donzil, WS4F, AZ (520) 772-1297.

FOR SALE: Heath HW-100 & 23B sply - $180; SA-2040 tuner - $130; HM-15 SWR - $25; Vibroplex Brass Racer keyer & case - $90. Ron, WA2EIO, NY, (516) 546-9884.

FOR SALE: Homebrew Williamson amplifier using Altec-Lansing Peerless S265Q output xfmr - $50, U PU. Joel, W1UGX, POB 391, Cabin John, MD 20818. (301) 469-6562

The Collins Video Library

featuring Dennis Brothers, WAØCBK assisted by Floyd Soo, W8RO

The Collins KWM-2 Video 4 hours
Highly detailed video on operation, rebuilding, alignment, troubleshooting and neutralizing of this classic! A must for anyone who owns and operates a KWM-2 / 2A. Printed documentation included. $89.95

The Collins 75S-3/32S-3 Video 3.5 hours
An in depth examination of the most popular version of the S/Line. Operation, modification, alignment, neutralizing and more! Much of this information applies to all versions of the S/Line!
$74.95

The Collins 30L-1 Video 1 hour
A complete guide to the 30L-1 amplifier. Operation and safety, updates and a discussion of the 811A triode. Learn the secrets to greater performance.
$39.95

The Collins 30S-1 Video 1 hour
Finally, the one everybody has wanted! This extraordinary video describes operation and user safety, maintenance and modifications of this classic Collins amplifier. Very informative - truly a must for all 30S-1 owners. Printed documentation included.
$39.95

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.
$39.95

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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R-390A Video 7 hours
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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Produced by Floyd Soo, W8RO (ex-KF8AT)

ER Bookstore, 14643 County Road G, Cortez, CO 81321

FOR SALE: Parting out Western Electric 443-AR 1 KW, U pay shpg. Don, VE4AY,Canada, (204) 488-7098.

FOR SALE: EFJ parts: 3 Ranger long screws - $8; 4 Valiant long screws - $9.50; 2 pin mic connectors for Collins, EFJ, Heath, BA's - $6; 9 pin plugs & sockets - $6. Cal Eustaquio, N6KYR, 2337 Los Arboles Way, Los Osos, CA 93402-3601. ceustaqu@volta.calpoly.edu

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

FOR SALE: EICO 720 xmtr; EICO 730 modulator in good condx w/manuals, very reasonable. Paul Vaughn, 2317 Williamson Rd., Williamson, GA 30292. (770) 227-9480

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

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

WANTED: HRO, BC 348 rcvrs, only in very good condx. EA4JL contact in the States, Kurt Keller, CT, (203) 431-6850.

WANTED: FT-241 xtals: need Channels 14 thru 18; 45 thru 47; 286 thru 290; & 326 thru 330. Call even if you only have a few. Ken Kinderman, WB9OZR, 50 E. 79th St, New York, NY 10021. (212) 288-1310 or 512-1866. ken.kinderman@hbo.com

WANTED: TV-2/U roll chart & mechanism; URM-25F dial lock. Robert Harding, KC5LHR, 1321 Monte Largo Dr NE, Albuquerque, NM 87112. (505) 291-0950, robert.harding@abq.com

WANTED: Johnson Invader 2000; Sams CBII manual/copy; GPR90 cabinet & spkr; Valiant 2 knobs. Bill, KE7KK, 6712 Lake Dr., Grand Forks, ND 58201.

WANTED: Harvey-Wells Z-match antenna coupler, condx not important as long as complete. A.J. Bernard, N4KQ, POB690098, Orlando, FL 32869-0098. (407) 351-5536

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: Navy xmtrs: TCA, TCE, TCN, TCX, TDE; rcvrs: RAX, RBD, TBM; modulator CAY-50065. Steve Finelli, N3NNG, 37 Stonecroft Dr., Easton, PA 18045. (610) 252-8211

WANTED: Reward for loan of 1930s QSL showing cartoon of W2DNN in prison uniform behind bars operating rig, QTH Ossing, NY. Samuel Macy, W2DNN, 486 Glenwood Trail, Elgin, IL 60120. (847) 695-0218

WANTED: Doerle sets; 1-3 tube 1920's, 1930's homebrew rcvrs; other similar rcvr's. John Heck, KC8ETS, 1009 Dorson Dr., Dayton, OH 45429. (937) 865-7036

FOR SALE: Fiberglass rods, 5/8" dia., 13' long, UV resistant, good standoff insulators, twinlead spreaders, ten ppd - $10. Ron, K5YNR, NM, (505) 327-5646.

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: Johnson Viking I - $100; National NC-183D - $100; Unique Wire Tuner (case corroded) - $25; AEA 300 watt tuner, ET-1 - $50; GRC-109 set - $125; shpg extra; Tektronix 561B scope (almost new) & cart - $100, PU only. **WANTED:** Collins 312B4 & 312B3. Jack, WA2HWJ, NJ (973) 927-7784.

FOR SALE: Genuine new surplus, unused: R-390A cabinets #CY-979A/URR w/shock supports & misc hardware package - $305; top & bottom cover sets - $75; used: 75A2/3 cabinets - $175 ea; 51J-3/4 - $175 ea; R-390A top & bottom cover sets -$40;CY-979A/URR cabinet - $175; 51J-3/4 bottom covers - $15; Collins promotional cigarette lighter -$50, all shpg included via UPS. Mac McCullough, TX, (214) 324-4849, fx 324-4844.

FOR SALE: Drake TR-3 w/pwr sply & spkr - $175, OBO. Scott, CO, (970) 563-0255, days

FOR SALE: SX-140 & HT-40 - $155 + shpg. Ed Sauer, KC9SP, 787 N. Peterman Rd., Greenwood, IN 46142. (317) 881-1483

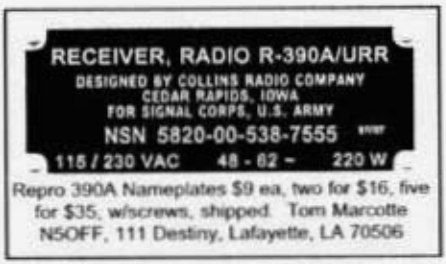
FOR SALE: VT-25 - 10Y tubes, new in wrap - $25 ea shpd. Tim McGuire, N3YSU, Box 460, Summerville, PA 15864. (814) 764-3248

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

TRADE: National FB7 OSC A, B, C, E, F coils for DET coils. Jim Clifford, KE4DSP, 108 Bayfield Dr., Brandon, FL 33511 (813) 654-7531. j.c.clifford@juno.com

FOR SALE: Hallicrafters S20R VG - $100; SX-122, VG - $170 or will consider trade of one for VG or better SX-99; new Amporite 115 NO180 or 115C 180 time delay relays - $20. Neil Berg, WØMXX, 2219 Ridgewood Dr. NW, Alexandria, MN 56308. (320) 763-4857

FOR SALE: Viking II w/122 VFO, very good - $250. **WANTED:** Gonset SSB-GSB-100 xmtr. Robert Braza, N1PRS, 23 Harvard St., Pawtucket, RI 02860. (401) 723-1603



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

FOR SALE: Old Heathkit catalogs;1950's Popular Electronics; old Radio Shack catalogs; RCA tube manuals; Collins 75A4 modifications manual; lots of old radio books, SASE for lists. **WANTED:** Desperately need manual for Polarad 640 Spectrum Analyzer, good copies OK; also looking for Heath SB-634, Heath ID/SD-4850 digital storage scope adaptor &/or software; EIP-371 freq counter; Motorola S-1344 deviation meter. Kirk Ellis, KK4YP, 203 Edgebrook Dr., Pikeville, NC 27863. (919) 242-6000 eves.

TRADE: TenTec QRP 40 meter xcvr kit for any old shortwave rcvr. Jim Mackey, KBØWVL, 1722 5th St. SW, Minot, ND 58701. (701) 852-4809 eves.

FOR SALE: Globe Scout 65A LN - $150; Heath SB10, exc condx - $100; Mohawk RX1, exc condx, PU only - $250; Galaxy R530 w/3 filters, exc condx - $500; Allied AX190 w/spkr, exc condx - $175; National HRO500 - $800, LF10 - $400, or both for $1000; Hammurlund HQ180C & S200 spkr, orig boxes, exc condx, PU only - $500; RME 69 w/spkr, looks new, PU only - $475; Sky Champion S20, exc condx - $175. James A. Weil, KG8SZ, 824 Heather Lake Dr., Clarston, MI 48348-3648. (248) 391-7687, voice/fx

FOR SALE: RBB/RBC rcvrs - $300; T368 VFO - $100; 0-16/ART13 VFO - $50; RT70 - $70; PRC9 - $75; orig manuals: 3253; Pacemaker; G50; HQ200; TCS14; CQ Surplus Conversion manual; R1/ARR-1 - $25. Mel Stoller, K2AOQ, 100 Stockton Ln., Rochester, NY 14625. (716) 671-0776

FOR SALE: Astatic model 335H-34 mic; Stromberg Carlson model SAU7070 watt mono amp; Harmon Kardon stereo AM/FM tuner model ST360; Customusic tape player model CTC-60; Delco table model RI140 radio; RCA table model 125A; Philco table model 41-95; Mopar 6V model 606 car radio; J.H. Bunnell & Western Electric telegraph sounders; Foote Pierson (W.U.T. Co.) telegraph repeater. **WANTED:** Setup switch C or S3 part no. 25S41A for Sencore tube tester TC-142 or part unit w/good S3 switch. Please make offers. E.F. Hayes, WØJFN, 3109 N. Douglas Ave. Loveland, CO 80538-2548

FOR SALE: Hallicrafters S-38B, very good working chassis, holes drilled in cabinet, no knobs - $18. Skipper 718 CB, 13 tubes, not working, very good condx w/manuals - $23. Mervyn Ellsworth, 2309 N. 25th, Boise, ID 83702. (208) 345-6878

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WANTED

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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WANTED: Model 32KSR Teletype machine in running condx; copy of Teletype bullitin 309B vol 1. Wayne LeTourneau, WBØCTE, POB 62, Wannaska, MN 56761. (218) 425-7826

WANTED: WWII German E-5 rcvr for FuG7 set; also need schematics, manuals, connectors, & accessories for FuG3 & FuG7 aircraft sets. I have WWII German gear for possible trades including FuG3 & FuGl6z sets, FuG220 Lichtenstein SN2 radar parts & more. Bill Strangfeld, WB8YUW, 254 Elm Ave, Cincinnati, OH 45215. (513) 948-1071, bstrang@iac.net

WANTED: Tektronix manuals and Heath MR-1 rcvr in good physical shape. Gary, W7FG, OK, (918) 333-3754

WANTED: Inexpensive 4-250 or 4-400. Dave, K9HDQ, IN, (765) 354-2884.

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

R-390A Repair &Restoration
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2341 Herring Ditch Road
Chesapeake, VA 23323 (757) 485-9660
e-mail: crippel@exis.net

ELECTRON TUBES: All types - transmitting, receiving, obsolete, military--Large inventory. **Daily Electronics Corp.**, 10914 NE 39th St., B-6, Vancouver, WA 98682. (800) 346-6667, (360) 896-8856, FAX (360) 896-5476

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FOR SALE: Large variety of older surplus military electronic equipment, communications, radar and test equipment - including receivers, transmitters, modulators, antennas, meters and special purpose tubes, magnetrons, klystrons and technical manuals.

AN/APT-2 jammer - $1000
APS-4 antenna assembly - $350
R11A/APR-5 - $425
RT-45/ARQ-1 - $350
ASB-5 radar, less receiver & antenna, new - $750
WESTERN ELECTRIC - 224 B radiotelephone (1930s) 4-channel dial selection. 115 VAC
AN/APS-20 radar complete, new w/model E antenna
COLLINS TDH-4/231D, 3 sections complete incl. xmtr, modulator and power supply
AN/GPM-14 testset w/borescope-new - $165
RT 555/APX-46 transceiver - $295
RA-90 power supply - $75
RT-323/VRC-24 - $295
SCR-625C mine detector, in "suitcase" container - $166
YG-1 homing beacon - $310
TG-10F keyer - $85
WESTON tube tester w/transconductance meter - $150
C-1155/MRN Litton - constant frequency control- new - $250
BC-617T2 - new - $110
WILCOX 99A Xmtr - 400W, complete radio station, 3 frequency ranges: LF - 125-525 kHz; HF - 2-18 MHz; VHF - 100-160 MHz. Operates from 220V, 60 Hz. Beautiful design with easy access to all components, 10-channel dial selection, special price - $850
BN-1 IFF set responds to IFF Mark III incl. ABK, ABF, AN/APX-1 & APX-2; Army SCR595 & SCR695; British Mark III, IIIG, IIIG(R). Self-contained rcvr and xmtr, 250 lbs crated, new - $165.00
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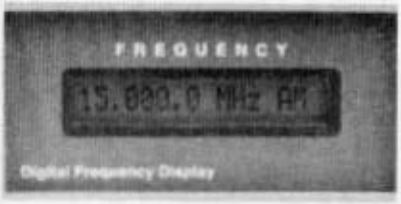
2C39 -	$37	5Z3 -	$3.50	3CX100A5 -	$35	801A -	$55
2C40 -	$20	6A5G -	$19	3D21B -	$24	803 -	$15
2C43/464	$19	6AC7/1852 -	$1	3FP7 CRT -	$49	807 -	$9
2E22 -	$32	6B4G -	$25	3GP1 CRT -	$39	813 -	$24
2J42 -	$100	6L6GA -	$12	3KP1 CRT -	$33	836 -	$16
3B24A -	$9	6V6GT -	$5.95	4C35A -	$80	902A -	$34

Prices are FOB Paterson, NJ. Minimum order $35. Checks or money orders must be made payable to COMPASS TECHNICAL SERVICES, INC. Quantities are limited for most items; some are one of a kind. Condition is surplus, apparently good, but not tested; tubes sold separately are NOS guaranteed. A service charge will be advised for items to be tested.



Digital Frequency Display for Collins S-Line

The C75S Digital Frequency Display, displays the receive **Frequency** and **Mode**, by first counting the crystal HFO, the VFO, and the BFO, it then calculates the receive frequency. The correct frequency is always displayed since all of the oscillators which determine the receive frequency are actually counted. Aged crystals or misaligned VFOs simply don't matter. Installation is simple. Plug in three cables into existing RCA jacks in the receiver and you're done. The unit uses a backlighted LCD display and is 2"H X 4"W X 4"D. Power is from a wall adaptor. The cost is $145.00 plus $5.00 shipping.

Models will be available for 51J, 51S-1, R390 and more.

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Phone: 407-349-9150 • Email: rh8421@usa.net

WANTED: Bottom feeder wants Gonset converters, manuals, parts, and IF strip. James Taylor, KG5LB, POB 126, Los Alamos, NM 87544. (505) 662-5452.

WANTED: Manuals for Sylvania rcvrs type R-1451A/WLR6 & R1414/URR. Weber, 4845 W. 107th St., Oak Lawn, IL 60453-5252.

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

WANTED: Antenna tower about 50' high, but lower or higher considered; tower must be free standing (no guys) & be the crank up type; Tri-Band (10, 15, 20) beam antenna, rotor w/control box, rotator cable, etc. I prefer to buy everything at same location, premium price paid for outstanding units & I will PU. J. Davis, WE5I, AR, (870) 257-2839.

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

WANTED: (2) Eimac HR-3 heat dissipating connectors for 35TG tubes. Dan Knipe, W7IGE, 3750 Highgrove Ln., Nampa, ID 83687. (208) 888-9575

WANTED: Manual, tips, tricks, history, mods on Siltronix 1011C. Tom Mackie, WB2ILA, 14 Washington St., Jamestown, RI 02835. (401) 423-2474

WANTED: WW2 German ENIGMA coding machine, complete w/no missing parts. Takashi Doi, 1-21-4 Minamidai, Seyaku, Yokohama, 246 Japan. Fax, 011-8145-301-8069. taka-doi@kk.iij4u.or.jp

WANTED: Mics: Shure 707/705/520SL, CR80/84, 718; Astatic T-3, JT-30, UT-48; EV638, 605. **FOR SALE:** Cables for old Shure/EV mics. Tom Ellis, Box 140093, Dallas, TX 75214. (214) 328-3225. 74053.3164@compuserve.com

WANTED: Transformer T-1 from BC-610 (E) modulator deck. Andy Miller, KD6TKX, CA, (408) 484-2389

WANTED: B&W coil stock #3008, #3012, #3007 or AirDux #532T, 632T, 516T. Gerry, K4LVZ, FL, (407) 679-4244

WANTED: BC-610, BC-614, BC-939, TU49, TU52 & DM24. Pete Hamersma, WB2JWU, 87 Philip Ave., Elmwood Park, NJ 07407.

WANTED: HRO-5 coils E, F, G, H, J, top $ paid for good condx. Don, MI, (616) 451-9874. fsmv34a@prodigy.com

WANTED: Oil capacitor, 3 kv 4 mfd or higher. C.R. Lackey, W4QBE, HC10 Box 567, Lakemont, GA 30552. (706) 782-3670

WANTED: Harvey Wells VFOs & spkrs; National MCS spkr; military LS-2 spkr. Kelley, W8GFG, IN, (219) 365-4730.

WANTED: McMurdo Silver #802, 801, 800; National S-101 audio couplers, good or bad. Dan Mason, RRT 1 Box 204F, Santa Fe, NM 87501. (505) 455-3416

WANTED: Command sets 274N rcvrs, xmtrs, racks, parts, new or converted. Stuart T. Carter, II, W4NHC, 680 Fernwood Dr., Melbourne, FL 32904-1995. (407) 727-3015

WANTED: Mackay radio mod 3007A & Radiomarine mod AR-8510 rcvr. Mike, 4657 Eastview Dr., Stockton, CA 95212. (209) 931-6059

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

WANTED: Hammarlund HX50A (please, NOT HX-50) in good working, nice looking condx; HA-20 VFO. Ron, 10701 W. 54th St., Shawnee, KS 66203. (913) 268-5973, arongv@aol.com

WANTED: Interested in finding or buying surveillance or countermeaures rcvrs by Racal, WJ, Cubic, etc. Also any manuals. Tony Snider, 512 Princess Anne Rd., Virginia Beach, VA 23457. (757) 567-4108 (Sat-Mon eves), (914) 441-1360 (Tues-Fri eves), Fax (757) 426-6454

WANTED: Tubes, 8417, 807, 6A8GT, 6U5, send SASE for list V of the tubes you need. **FOR SALE:** Tube sockets for 807, 3-500Z, 4-400, octals, miniatures, socket extenders, plate caps, mini plugs, octal-size plugs & sockets, Cinch-Jones, plus varity of air variable capacitors. Typetronics, Fred Schmidt, N4TT, Box 8873, Ft. Lauderdale, FL 33310-8873. (954) 583-1340, fx 583-0777

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WANTED: SSB filter for PRC-74; Collins amplifier 204H-1, must be exc.; HF ant. multicoupler. shigaki@mxw.mesh.ne.jp

FOR SALE: Johnson 6N2 Thunderbolt amp, includes Double Dow relay, very clean - $1500, PU only. Clem DuVal, W8VO, 33727 Brownlea Dr., Sterling Heights, MI 48312-6621. (810) 795-4670

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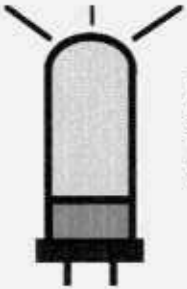

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