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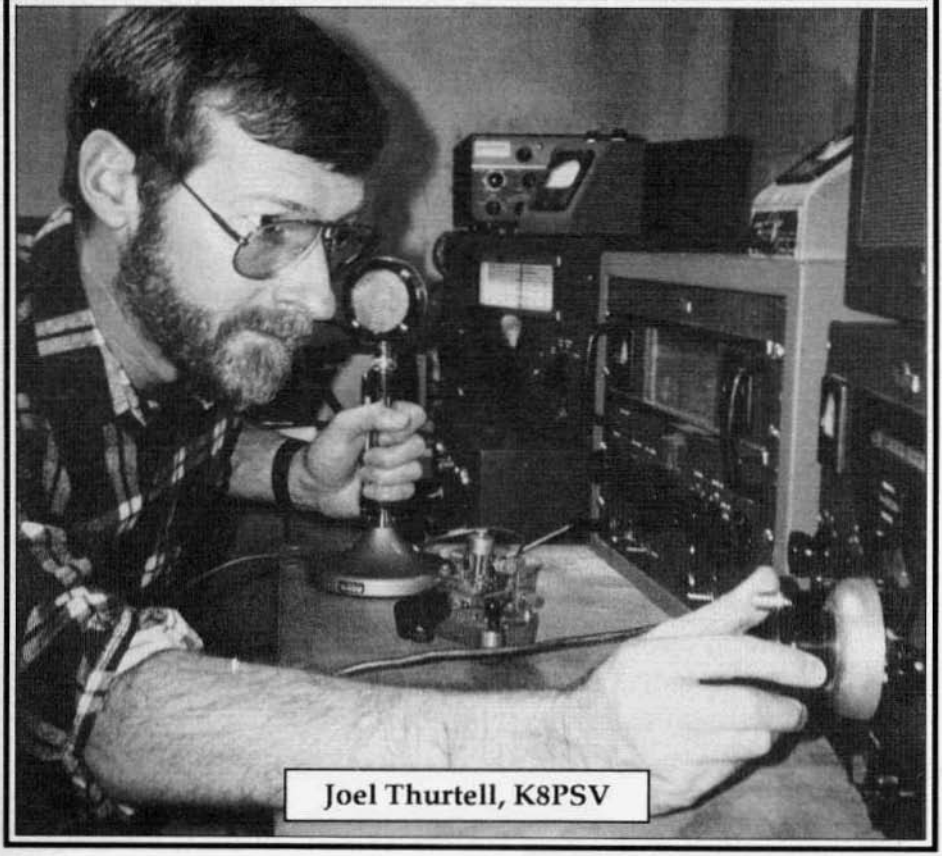
ELECTRIC RADIO

celebrating a bygone era

Number 35 March 1992



Joel Thurtell, K8PSV

ELECTRIC RADIO

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REGULAR CONTRIBUTORS

WALT HUTCHENS,KJ4KV.....ELECTRIC RADIO IN UNIFORM
FRED HUNTLEY,W6RNC.....REFLECTIONS DOWN THE FEED-LINE
BILL KLERONOMOS, KDØHG.....VINTAGE PRODUCT REVIEWS
DALE GAGNON, KW1I..... AM REGULATION UPDATES

Electric Radio is published for amateur radio operators and others who appreciate the older tube type equipment. It is hoped that the magazine will stimulate the collecting of, and interest in, this type of equipment.The magazine will provide information regarding the modification,repair and building of equipment. We will also work to-wards a greater understanding of amplitude modulation and the problems this mode faces.

Electric Radio Solicits Material

We are constantly searching for good material for the magazine. We want articles on almost anything that pertains to the older amateur equipment or AM operation. From time to time we will also have articles and stories relevant to the CW operator and the SWL. Good photo's of ham shacks, home-brew equipment and AM operators (preferably in front of their equipment) are always needed. We also welcome suggestions for stories or information on unusual equipment. For additional information please write us or give us a call.

EDITOR'S COMMENTS Barry Wiseman, N6CSW/Ø

For some time I've been meaning to write about the Parts Unit Directory. I think it needs a little 'promotion'. Although we've had the directory for a couple of years, and it's been steadily growing, I don't think enough people know how it works or what it's all about.

The directory is basically a data base containing a list of rigs - by manufacturer in alphabetical order - that are being 'parted out' along with the address and phone number of the owner. ER provides the list - it's 5 pages now - for an SASE and $2. Anyone who wants to add a parts unit to the directory can do so with a card or a phone call.

I find it very gratifying that the directory has been so useful to so many people. It's used in a number of ways: mostly people use it to find parts for a rig they're restoring or repairing; others sometimes buy the entire parts rig and restore it; and some builders are using the directory to acquire parts for home-brew projects. It can be useful in many ways. In talking with those that have used the directory - buyers and sellers - my impression is that the whole process is hassle free and both parties gain some satisfaction from it.

The only draw-back is that sometimes a parts rig has been stripped of a particular part someone may be trying to find. This may require calls to others who have the same rig on the list. Another problem is that sometimes the entire unit has been sold and the owner has neglected to call me and have it taken off the list.

As time goes by, the parts unit directory will be even more important and useful than it is today. For one thing, vintage restorers will be restoring rigs that are 'real basket cases'; we can already see that happening.

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Cover: Joel Thurtell, K8PSV, tuning his 'homebrew' 75A-4. Next month Joel will provide us with an article describing how this receiver was put together. Photo by Adam Thurtell

Reflections Down the Feedline

by Fred Huntley, W6RNC
POB 478
Nevada City, CA 95959

Taylor Super Modulation is a most unconventional system. In addition, its modulator tubes can also do double-duty by functioning as class C RF amplifiers when using CW operation. R.E. Taylor, the inventor, (no relation to Taylor Tubes) described his amplitude modulation system in the September and October 1948 issues of Radio & Television News.

My very oversimplified explanation of its operation is that there are two grid modulated tubes in parallel. The 'carrier' tube is conventionally biased and operates continuously. The 'peak' tube is biased four times cutoff and only conducts on audio peaks. On audio peaks, the 'peak' tube feeds modulated RF into the mid-tap of the plate tank coil, which acts as an auto-transformer and forms a composite of the two RF outputs. In essence, this system uses modulated RF instead of the conventional modulated DC, to form the output modulated RF signal. The efficiency of the Taylor system is very high - around 85%.

R.E. Taylor stated that during WW II, several hundred broadcast transmitters were built for the Armed Forces, using his system. In 1948, he came out with a very attractive looking amateur model – the type 900A – a long desktop unit containing the RF driver, speech amplifier, RF amplifier/modulator and all the power supplies. For CW operation, a relay switched the 'peak' tube grid bias to normal cutoff. This allowed the 'peak' tube and the 'carrier' tube to both function as class C RF amplifiers. The Type 900A used plug-in coils. Taylor stated that bandswitching was possible but it would be excessively complicated and detrimental to efficiency.

During the 1950's some hams built transmitters using the Taylor system. Some were successful in making them work; others couldn't get them to operate properly. Regardless, it's still an intriguing circuit that warrants re-investigation and revival.

Only about 20 watts of audio is needed to modulate a kilowatt. The modulating audio transformer needs a center tapped secondary. Any common push-pull driver transformer or reversed p-p to 8 ohms output transformer hooked up in reverse, would be satisfactory. The Viking Ranger and the Elmac AF-67 are ideally suited for use as a separate RF driver and speech amplifier to run the Taylor system amplifier. Their 500 ohm output tap allows the two audio output levels required in the Taylor system. The full winding feeds the 'peak' tube grid and the mid-tap winding feeds the 'carrier' tube grid.

Hoisy Hoisington, W4CJL, the founder and Chairman of SPAM, has been an enthusiastic promoter of the Taylor Super Modulation system. He reports very good results from the transmitter he built using a pair of 4-1000A's in the Taylor system. All of the above information was gleaned from material that he so generously supplied to me.

The First Transceiver?

The last issue of ER had an article covering early ham transceivers. Undoubtedly, the first transceiver, ham or commercial, was the early day regenerative receiver. The regenerative detector radiated a signal that in some cases could be heard at quite a distance.

In 1940, while I was on a small rusty and bug ridden banana boat sailing the Caribbean, on one quiet afternoon, while on 500 kc. watch, I heard the CW carrier from a nearby ships receiver. Although the ship was at least 5 miles away and not visible, his signal strength was S8.

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Setting The Record Straight

Editor, Electric Radio:

The March 1992 issue of QST [Correspondence, page 65] contained a letter written by myself regarding AM operation. Although much of the content was edited by the ARRL, I was pleased to see AM being recognized. However, a statement was made that WAS NOT in my original letter, that being the comment regarding the 'goal of spectrum efficiency'.

Although editing is sometimes necessary, nothing should be added to the original. To set the record straight, enclosed is a copy of the original letter sent to the ARRL.

73,
John Martin, W4KYL

Brian Battles, WS1O
Copy Editor
ARRL
Newington, CT 06111
Dear Sir:

The Pennsylvania QSO party is in full swing as I type this letter. As usual, those of us who prefer to operate AM have been constantly interfered with by SSB operators who refuse to recognize our right to operate. Most AM operators stay within an exceptionally narrow frequency range. Most SSB operators recognize these "AM Windows" and stay away from these frequencies. Unfortunately, many SSB operators are unaware of these "gentlmen's agreements" and intrude innocently. Their lack of knowledge regarding amateur radio, indeed, radio in general, is demonstrated when they indicate that the carrier they heard (and zero beated so they were not interfered with!) was thought to be someone tuning up! Don't you SSB'ers listen before you transmit?

The problem of not knowing about "AM Windows" could be alleviated if the ARRL would change its position and publish AS A SERVICE TO ALL AMATEURS the location of these segments of AM operation. In spite of what the ARRL would like to believe, AM operation is growing... both from old timers returning to AM and newcomers discovering another facet to the hobby.

Respectfully,
John Martin, W4KYL
Life Member

Editor's Note:

QST editor's inserted the following: **"Although encouraging widespread use of AM doesn't benefit the goal of spectrum efficiency,"** prior to John's edited text," the ARRL should acknowledge AM frequencies."

On the one hand this may not seem like any big deal; particularly to those who have no interest in AM operation. But John and the rest of us who operate AM, disagree with the "spectrum efficiency" argument that has been used to discourage the use of AM. We believe that if we really wanted "spectrum efficiency" we would all be operating CW and that DXing and contests would be banned.

I called Brian Battles, WS1O, at QST and asked him why the "spectrum efficiency" line had been added to John's letter. He said that they (editors at QST) felt that it was important to convey that information to readers. When I commented that it might have been more appropriate to have added that at the end of John's letter as an editor's comment he agreed that in retrospect that it could have been handled that way.

All of the AM'ers I've talked to were in total agreement with the content of John's letter and very appreciative that QST printed it but they all wondered about the "spectrum efficiency" line. I hope we've "set the record straight" and somehow lessened John's feelings of embarassment.

I hope that QST will continue to acknowledge AM and vintage operation in the future. It's been a long time (years?) since we've seen anything in QST like John's letter. This could be the beginning; AM may be on it's way to returning as a legitimate mode of operation. **N6CSW/Ø**

ELECTRIC RADIO IN UNIFORM

by Walt Hutchens, KJ4KV
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Arlington, VA 22207

'The ATD Transmitter'

On May 20th, it will be 52 years since one of the historic military radio contracts of all time – the Navy's first procurement of the ART-13, then called the ATC. The ATC was the winner in a competition between Collins Radio, the Bendix Radio Division of Bendix Aviation, and Westinghouse for the contract to build a new aircraft long range radio transmitter; since Westinghouse was proposing a new version of an old set (the GP-series, originally developed by RCA in the mid-30's) the real competition was between Collins and Bendix.

The ATC (see ER #7, November 1989) started the modern period in military radios, with stable multichannel remote controlled operation and a list of other achievements too long to repeat here. This month we will look at the 'second place' set, namely the Bendix ATD.

In England, on Monday, May 20, 1940, Prime Minister Churchill was giving orders to prepare for the evacuation of British forces from Dunkirk. So rapid was our military build-up becoming that there was now work for even the second place design: the Navy ordered both the ATC and ATD on the same day with consecutive contract numbers. In fact, a June 27th contract brought even the Westinghouse GP into the action -- but that story is for another day.

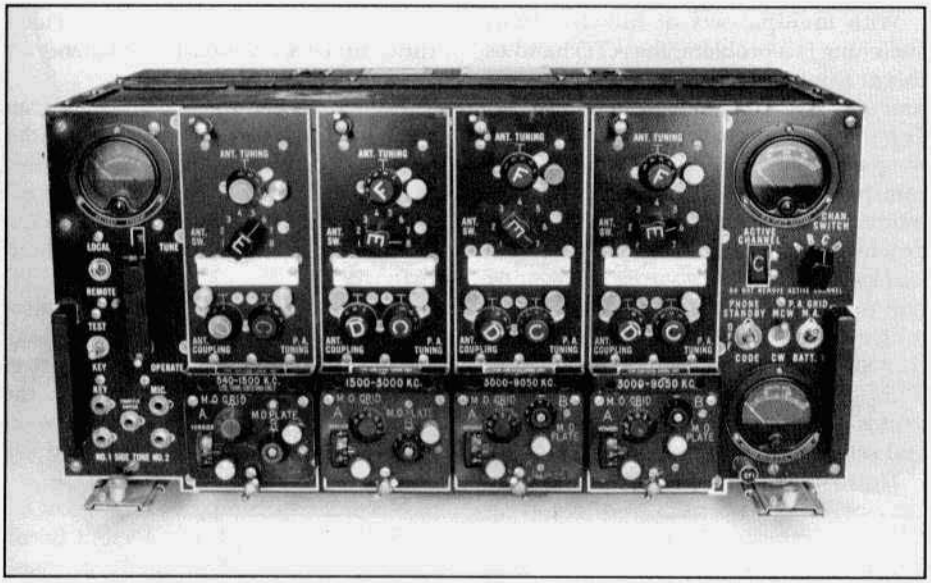
Our extended tour of military radios has taken us on turnpikes and quite a number of potholed dirt roads; the ATD is probably best thought of as a dead end. Even so – and even as 'second place' – it is in some ways a very good design. And because both it and the ART-13 (we will use the more familiar name from now on) were designed to meet the same requirement, it will be interesting to compare the two sets.

Overview

The ATD is a 40 watt liaison' transmitter, that is, it is intended mainly to let long range aircraft communicate with their bases. It operates on CW, MCW and AM and covers 540 kcs to 9.05 Mcs in ranges of 540 to 1500 kcs, 1500 to 3000 kcs, and 3.0 to 9.05 Mcs by means of four plug-in tuning units, normally one each for the two lower ranges and two for the high range. Tuning units for 200-500 kcs and 9.05 to 15.8 Mcs were developed but the manual suggests than the Navy didn't buy them.

The transmitter is 11" x 23-1/2" x 13-3/4" (H x W x D) and weighs about 70 pounds including the tuning units. High voltage is furnished by a separate dynamotor, CRR-21748.

One frequency can be set on each tuning unit; channel selection is done by a motor-driven switching system which connects one of the four units, making the ATD a four-channel set. The MO (master oscillator) dial on each tuning unit is calibrated in arbitrary units; there is a rough tuning chart mounted on top of the set and more accurate calibration curves in the manual. There is no provision for crystal control and no internal calibrator; a connection is provided for the use of an 'LM' or other external frequency meter.



The ATD. Each of the four tuning units contains all coils and capacitors for the M.O. and final amplifier. As my wife Marie says, "Once you see it, you won't forget it"!

All controls are on the front panel but the ATD could be operated by the pilot from a remote control box. It requires 24-28 VDC input and draws about 19 amps when transmitting voice.

History

Like the ART-13 the ATD is a 1939-40 design. I don't know in what aircraft it was used; its low power and less flexible operation suggest non-frontline applications like shore based patrol and logistics aircraft but it may also have been a stopgap to the ART-13 in critical applications. From the serial numbers I have seen, I estimate that about 6000 ATD's were built. They became surplus rather quickly at war's end; Esse Radio Co advertised "truly as fine a piece of equipment as we have ever purchased", new with spares and accessories for $225 in 1950. (My thanks to Gerald Parker, WØGPX, for calling this ad to my attention.) Probably because the ATD was rather bulky and low-powered for ham use, few sets have survived and even fewer of the accessories such as dynamotors and control boxes – but if you do find one, it probably won't be extensively modified!

Design

Since they came from the same specs, the ATD is almost exactly the size and shape of the ART-13. The similarity ends quickly, however, when you look at the front panel and in the approach taken to providing multiple channels, the two sets could hardly be more different.

How can a multichannel set be built? One method is to use a separate transmitter for each channel as done with the command sets. At the other extreme is a transmitter with one set of tuned circuits and motor driven retuning, as first done by Collins with the ART-13. In between there are several possibilities.

Separate sets of tuned circuits can be built-in for each band as was done for the five-channel BC-653 transmitter of SCR-506 (a GE design), the Bendix TA-12 and the twenty channel Collins 18S-4 (ARC-59). Or, replaceable tuning units can be used: the Army's BC-375 and Navy GP-series hold a single unit, while the Navy/RCA ATB uses two. The ATD takes the replaceable unit approach to what was probably its limit: four tuning units.

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With multiple sets of tuned circuits, switching is a problem; the ATD handles this in a unique way. Behind each tuning unit stall is a vertical linen bakelite slide. The slides are pulled up by springs; running across the top of the set is a roller camshaft driven through gears by a small motor. The cams press one slide at a time downward; six lugs on the slide operate leaf switches on the rear of that tuning unit to connect it to the rest of the transmitter circuits. Changing the channel either locally or (with the panel switch in 'REMOTE', at the remote control unit), causes the motor to operate the camshaft and select another tuning unit.

The tuning unit for the selected channel can't be installed or removed. A flip-up tab on the camshaft (reachable through a hole in the end of the set) allows manual channel selection when power isn't applied.

The ATD is built in a 'U' around the tuning unit stalls. On the left are the power and remote control connections below the chassis and the antenna relay and modulation transformer above it. Behind the tuning units are the PA, master oscillator, modulator, driver, and voltage regulator tubes; these can be reached through a hinged lid on top of the set. On the right side, are the speech amplifier and channel switching motor.

The set is built with .060, .090, and 1/8" aluminum stampings and angle stock. The basic frame of the set is spot welded; panels and parts are held on mainly with machine screws and loose nuts.

Electronically this is a MO-PA set, but unlike U.S. Army sets of the late 30's, it uses modern beam pentodes -- a 6L6 Hartley master oscillator driving an 814 final. Added isolation between the MO and final is gained by using an ECO (electron coupled oscillator) circuit, that is, the 6L6 screen grid serves as the plate for the oscillator, with coupling to the plate mainly via the part of the electron stream which misses the screen grid. This gives some of the advantage of a separate buffer stage without an extra tube. The plate circuit is tuned to twice the oscillator frequency for even better isolation.

The final is an unneutralized 814. Output coupling is reasonably flexible with a variometer link feeding a tapped coil in series with a variometer adjustable coil. On the tuning units used above 3000 kcs, there is also a series capacitor with a shorting switch.

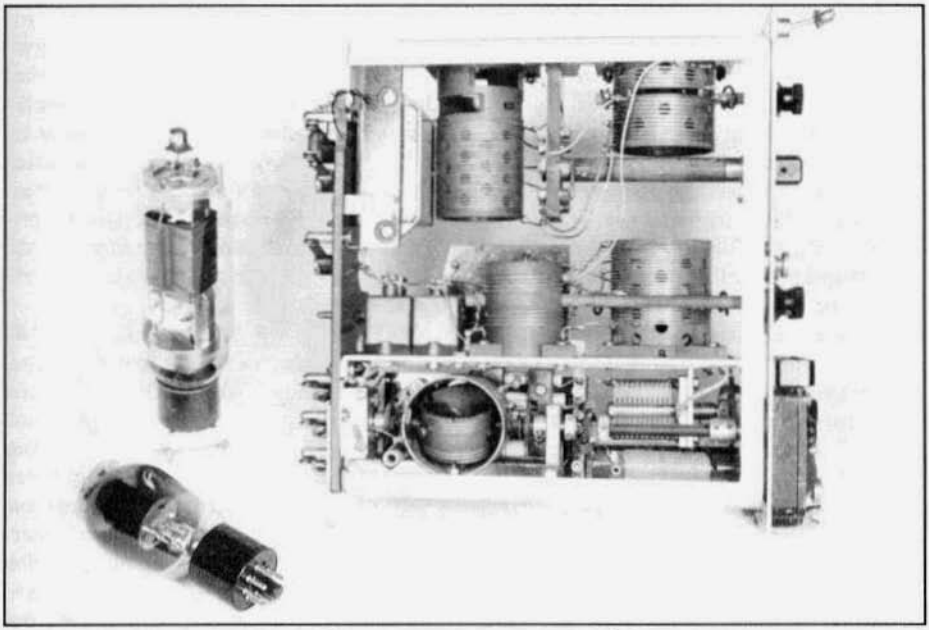
Plate modulation is supplied by a pair of 6L6's in class AB2; another 6L6 is used as a driver. An extra winding on the driver transformer supplies sidetone to the operator; 'sidetone' means you hear yourself talking in your headphones and is a feature of all military radios.

U.S. military hand microphones of the period were all carbon types but British mics and at least some of our oxygen mask mics were dynamic; a two-stage (12SL7) speech amplifier allows use of either kind by setting a switch. This option is also found in the ART-13, SCR-522 and ARC-3.

The tuning units are a study in themselves. Three tuned circuits are needed -- oscillator grid, plate and PA plate -- plus a series loading coil to allow use with the aircraft 'fixed' (short) antenna. But the only variable capacitors are in the oscillator plate circuit of the tuning units which operate above 3000 kcs. All the other circuits use fixed ceramic and mica caps, with switches to select the right combination of caps and/or coil taps for the range of frequencies to be covered. Tuning within a range is provided by variometers -- smaller coils mounted inside the oscillator grid and plate and PA plate coils -- and connected so they either reduce or increase the inductance of the coil as they rotate. Connections to the variometers are made with 'pigtails' rather than slip rings as in most other military radios.

The MO tank circuit is one of the cleverest I've seen, giving a combination of compactness, high power operation and stability with low-cost easily-made parts.

To set up a new frequency, you remove the tuning unit and select the right part of



An ATD tuning unit. The coils are (L to R on each level from the bottom): MO grid tank, MO plate tank (below tuning capacitor), PA Plate with coupling adjustment, PA Plate main coil with taps and variometer, antenna series loading coils, left with taps only, right with taps and variometer. On the left is the 814 final amplifier with a 6L6G.

its frequency range with three or four switches located on the right side. Then, (with the unit back in the set) the variometers are adjusted from the front of the tuning unit. There's a vernier dial on the oscillator tuning (MO GRID) control; the others are knobs with calibrated skirts and sturdy dial locks.

Coil forms and rotary switch wafers are paper or linen bakelite and bakelite shafts are used rather than ceramic insulating couplings; except for the tube sockets there are almost no ceramic parts in the ATD.

The oscillator grid and plate-tuned circuits are located in the bottom of the tuning unit below a shield plate. The upper part of the unit is taken up by PA plate circuit parts. The construction is 'wide open' with just about every part larger than your thumb having slots and holes to allow free air flow.

The two front panel sections to the left and right of the tuning units carry an amazing assortment of controls and meters. The TUNE-OPERATE switch is actually two switches connected by a link; one switch is the usual bat handle toggle, but the other opens the 1000 volt supply to the PA and is designed accordingly.

Also on the left is the 0 - 5 amp antenna current meter mounted about an inch behind the panel but visible through a window. This meter is connected in the antenna lead and can be at a very high RF voltage when operating on a short antenna; by treating it as a 'hot' part, the use of a coupling transformer was avoided.

The right panel section carries the PA plate meter, switches to select the mode of operation and another meter which can be switched to read either the supply voltage or PA grid current.

On The Air With The ATD

The KJ4KV ATD came along a few years back as a Christmas gift from my friend Charlie DiCecca, KA1GON; though mili-

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tary radios have gone in both directions between us, this unusual unit is a good example of why I generally feel in Charlie's debt.

Like everything over 50 (such as myself!), it had a few problems. A former owner had replaced the power connector with one from a command set; William E. Perry Co. (502-893-8724, a good source for WW II and later military connectors) supplied another with a matching plug. There were the usual dirty contact problems as well as minor paint damage where the set had been damp. I don't have an ATD dynamotor but Charlie suggested using the ART-13 unit; though the voltages are somewhat higher (1150 volts instead of 1000 and 400 instead of 380), they are not out of line with the tube ratings and the dynamotor control circuits are compatible.

The set 'fired up' right away but when tuning up with one of the two 3 - 9.05 Mcs tuning units the final could not be dipped. This turned out to be a fixed mica PA plate tank capacitor with a high-voltage-only short; a 'parts' tuning unit supplied a replacement.

Tuning up an aircraft MO-PA set for the first time can be quite a handful and the ATD was no exception. These sets are designed for short (capacitive) antennas with an effective resistance which is typically 5 to 30 ohms. Except for a few sets with extra flexible antenna tuning arrangements, you must both add capacitance and step up the transmitter output voltage to use a 50 ohm resistive ham antenna; some fumbling is usually needed.

In addition, the controls of a MO-PA set interact. Retuning the MO plate for maximum grid drive (for example) moves the oscillator frequency by one or two kcs at 3885 kcs. Even redipping the final or peaking the antenna current moves the oscillator several hundred cycles; since the set isn't neutralized, it also changes the grid drive. It took most of an hour to get full power into a dummy load and even longer to make it go up the feed line.

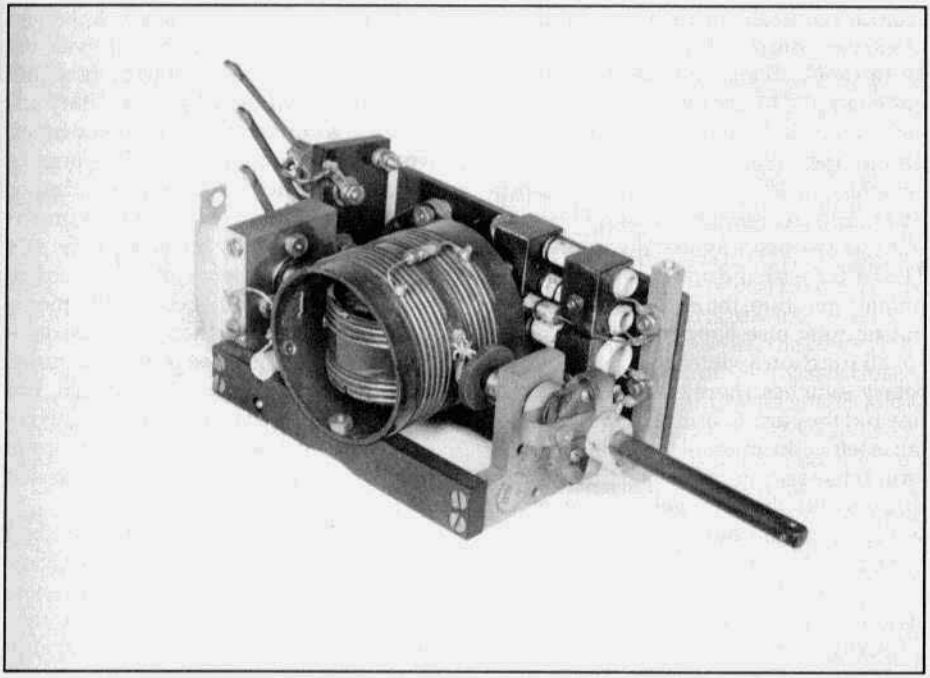
With an ART-13 on the other hand, you only have the antenna loading to figure out. The MO never operates at more than half the channel frequency and multiplier stages are added as the frequency increases. This gives lots of isolation (detuning the antenna causes no detectable frequency change!) and since everything up to the final is ganged to the MO knob, any interaction that exists is invisible.

Because of what looked like 'cheap' RF construction, I was eager to do warm-up stability testing on the ATD. The usual test sequence of four minutes warm-up followed by 30 minutes of one minute transmit/four minutes key-up cycling gave a drift of -171 cps. During 10 minutes continuous key down the drift was another -70 cps but there was really no drift after the first five minutes – an amazing performance for an oscillator with around five watts output. These numbers are comparable to those of the ART-13: -112 cps during the 30 minute cycling and -130 cps more during 10 minutes key down.

Running with the ART-13 dynamotor, I found that the modulation would reach only about 70% before the negative peaks 'hit bottom'. Since it was designed to furnish about twice the power, the dynamotor was actually delivering almost 1300 volts and the modulation transformer turns ratio just wouldn't let the 6L6's pull the PA plate all the way down to zero output. A 2500 ohm resistor, shunted by a 20 mfd cap connected in the HV lead, brought the voltage to 1000 and the modulation up to around 85% at just above 40 watts carrier. The linearity is so good that you can't tell the set is being modulated by watching the plate meter and it gets good on-the-air signal reports. Unlike most military sets, the ATD can be fully modulated with a carbon mic.

Conclusions

You've probably heard the camel described as "a horse designed by a committee" and that was my first reaction to the ATD. It works fine, but it looks klutsy. Who ever heard of a radio with an over-



The variometer tuned tank for the ATD MO has spring loaded ball bearings giving zero play. Board at right of unit holds NPO ceramic caps connected through switch (wafer can be seen toward rear) to give ranges 3.0 - 3.8 - 5.0 - 6.25 - 8.0 - 9.05 Mcs. The small part on top of the coil is a 30 mmf N750 temperature compensating capacitor and the coil is probably self-compensated by the space wound turns. Three switch contacts sticking up at the rear connect the oscillator grid, cathode and plate circuits when pushed down by a slide bar at the rear of the tuning unit stall.

head camshaft or two different types of switches on the front panel connected by a link? How 'bout a front panel with thirty-one controls? And all those 50-cent plastic coil forms and internal range switches...

As we got better acquainted however, I saw that each of the ATD's peculiar features avoided something more costly -- and not just in dollars, either. Building the beautiful Autotune assemblies which were essential to the multichannel operation of the ART-13 gave Collins Radio fits. The ATD's two-switches-with-a-link arrangement may look 'tacky' but it avoids the use of an expensive relay or special switch. The ART-13's cast, line bored and milled chassis, was not the type of work you could assign to a 'new hire' but the spot welded angle frame of the ATD could have been built from drawings by almost any metal shop in the country in 1940.

The ATD shows that 'cheap' design doesn't have to be bad design. The switch sections in the tuning units are bakelite rather than ceramic, but they have slots between the contacts to reduce the chance of arcing along surface dirt or moisture; since ceramic switch sections are notorious for breaking under severe shock, the ATD's switches were probably more dependable than ceramic ones. One can build an oscillator with low warm-up drift by using stable (expensive) parts but it can also be done by providing lots of air flow and a self-compensating coil as in the ATD.

At best, however, the ATD is an awkward set to operate. Even forgetting the

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separate controls for each tuning unit, it has seven controls doing the work of six on the ART-13 and they are less logical. For example, to operate CW you set one switch to CODE and another to CW; for phone operation you set the same two switches to VOICE and MCW respectively. Some combinations of ATD switch settings are meaningless: if you press the TEST KEY with the other switches set for phone operation, the antenna relay clicks, but nothing else happens. On the ART-13, all function switching is done by two rotary switches; there are fewer possibilities and they are all useful. If the camshaft tab is left in the manual position, the ATD won't change channels when the switch is thrown but the channel change motor will run continuously. There's no pilot light or other indication that the set is powered on; if in doubt you must press a switch to read the battery voltage. On 'human factors', the ATD earns one of our In Uniform "Turkey With Trimmings" awards.

There are big differences in performance, as well. The ART-13 can operate at altitudes well above 25,000 feet (it reduces power automatically at 25,000 feet to prevent arcing), while the ATD may flash over at high altitude and has spark gaps built-in to prevent damage when this happens. The ATD has only four channels and 40 watts output; the ART-13 has 10 channels and delivers 100 watts. It was surely no fun to set a new channel in a cramped radio compartment (in flight) on either set but it would be a lot more practical to reset the five knobs of the ART-13 than to pull an ATD tuning unit, hold it on your lap and fiddle with the switches by the light of a cockpit lamp.

In the area of multichannel operation, the competition between the ART-13 and ATD turned out to be a match between a hot young kid-motor driven retuning -- and the old pro -- multiple tuning units. As usual, only the timing of the victory was in doubt. The war got Bendix a contract for the ATD, but by 1945, 8 and 10 channel sets were common and the next few years saw 16, 20, 48 and even 100 channel equipment: multiple tuning unit sets passed into history for military aircraft use while the ART-13 showed how it would be done for the next 25 years.

Finally, in the philosophy department, the ATD reminds us of something important. Wars generally are won by the side able to provide plenty of 'good' equipment -- after a point, 'better' only means 'more expensive' and therefore, less equipment. WW-II was an example: we buried the other side in 'good' equipment, like the ATD, GP-series and BC-375, buying ART-13's (my book says $14,400 a copy in 1940!) only for the jobs which needed such gear.

As the new world order proves to be a new set of rules for the old disorder, there will still be wars. They will, however, look more like the Persian Gulf War than WW II -- short and nasty, fought against countries run by thugs or religious fanatics whose citizens may be more nearly victims than believers. The other side will not be trying to 'win', but to wound us into a favorable settlement -- a few islands here, doubling the price of oil there, paying 'reparations' -- extortion, but with a modern army instead of a hit man.

Both sides will fight with what is already in the depots and the men and women already trained to use it -- with missiles and nuclear weapons around, we won't have years to mobilize. But the cold war days of 'best possible technology and never mind the cost' are over. Let us hope that instead of buying just a few ART-13's, our planners and equipment designers of the next few decades are thinking like the Bendix team that built the ATD -make it good but make it cheap, so we can have enough of them in the Depots and Supply Centers to do whatever ugly job comes knocking on our door. ER

AUDIO MODIFICATION FOR THE NATIONAL NC-300 RECEIVER

Thomas E. Jurgens, KY8I
3920 Jim Dr.
Bridgeport, MI 48722

During the 1950's, the National NC-300 took it's place among many great receivers of the time, as a receiver of great quailty with outstanding sensitivity, selectivity and stability. It offered many of the features known only to more expensive receivers at a fraction of the cost. A true value with little compromise.

Designed as a true amateur communications receiver, (covering 160-10 meters, plus the 6 meter, 2 meter, and 1 1/4 meter bands with optional converters), the NC-300 displays a true communications type audio quality, thin, "with the audio by-products similar to those generated by clipping in a speech amplifier". It is not unlike the audio when the noise limiter is in operation, a bit fuzzy, and not really clear. With a background in music education, I have a tendency to be overly critical of receivers in general when it comes to the quality of the audio and was not really satisfied with the NC-300 performance. With this in mind, I started reading everything I could find on the NC-300 and finally found an article in April 1958 of *QST* which shows a simple modification that greatly enhances the quality of the audio in this great classic receiver.

The article entitled, "Three Modifications for the NC-300", by Eugene H. Hastings, WIVRK, explains how a simple low pass filter inserted to the grid of the final audio stage, (6AQ5), from the plate of the preceding stage, (12AT7), will improve the audio. Once you have acquired the appropriate parts, the total modification consists of mounting the 20-hy choke to the inside, back of the chassis close to the antenna and muting terminals allowing enough clearance to enable returning the chassis to the cabinet. The only connection that needs to be broken is the .01uf capacitor to pin 7 of the 6AQ5. You may have to remove the 470k ohm resistor to gain access to this connection. Once you have disconnected the capacitor, simply make the connection from one lead of the choke to the capacitor, (be sure to insulate this connection), and connect the other lead of the choke to pin 7 of the 6AQ5. Return the 470k ohm resistor to pin 7 if you removed it, and place a 500-700 uuf capacitor from pin 7 of the 6AQ5 to ground. Solder all connections on pin 7, the ground end of the 500-700 uuf capacitor, and your modification is complete.

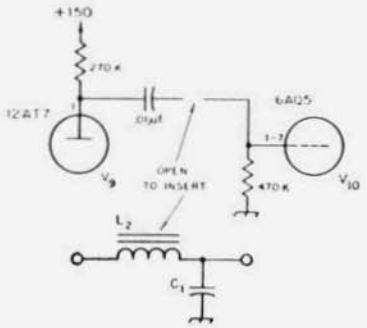


Fig. 2—A low-pass filter in the audio improves the quality.
C_1—500 to 700 $\mu\mu$f.
L_2—20-hy. 15-ma. choke (Stancor C-1515).

I highly recommend this modification. It gave my NC-300's audio a clear, clean sound with substantial fidelity to please even the most critical of ears. It's now a real pleasure to listen to the fullbodied audio quality that we strive for on an AM signal. It was definitely worth the little effort it took to complete. **ER**

Gatti-Hallicrafters:

The first grand ham DXpedition

by Mike O'Brien, NØNLQ
1031 E. University St.
Springfield, MO 65807

Operating from a remote corner of the globe -- being DX instead of chasing DX -- is an appealing daydream for many hams. Unfortunately, few dreamers can afford such adventures. And some recent DXpeditions have turned into nightmares with rowdy pileups, deliberate jamming, and commercial hype by companies which loan equipment and help finance the trips.

Blame the guilty for the rude operating. But don't assume that commercialization of DXpeditions is a new idea conjured up by Japanese makers of ham gear. In fact, it is a made-in-USA marketing technique dating back decades.

From the very beginnings of radio, manufacturers have boasted of DX achieved using their equipment. Arctic explorer Donald MacMillan took Zenith receivers with him on his 1925 North Pole expedition, and "Long Distance Radio" became Zenith's advertising slogan. A teen-aged ham in Cedar Rapids, Iowa, named Arthur Collins, kept in regular radio contact with MacMillan's crew, which included one Richard E. Byrd. Eight years later when Byrd, by then a Navy admiral, headed his own expedition to Antarctica, he specified transmitters built by Art Collins -- and the resulting publicity gave the fledgling Collins Radio Company a big push toward success.

However, modern-day underwriting of DXpeditions for the express purpose of spotlighting a company's products can be most directly traced to a 1947 trek to Africa that was largely sponsored by the Hallicrafters Co. It was a lavish production that also generated widespread publicity for the amateur radio hobby as well as thousands of exotic QSL cards for hams around the world.

The expedition actually was the brainchild of Attilio Gatti, a 50-year-old Italian adventurer who had led 10 pseudo-scientific safaris through Africa in the 1920s and '30s. In 1938-39, Gatti visited the Belgian Congo and, licensed there as OQ5ZZ, was introduced to Hallicrafters gear. After sitting out World War II in New England, Gatti yearned to return to Africa. He approached Hallicrafters chief, Bill Halligan, with a proposal for an electronic exploration expedition.

In addition to putting ham radio in the international spotlight, Gatti's plan called for measurements of atmospheric noise in equatorial regions and experiments in the 6-meter ham band to test potential range of television signals that soon would be occupying the VHF airwaves.

Gatti's pitch came at an awkward moment for Hallicrafters. The company, which did $36 million worth of business during its peak year of wartime production, had just seen sales plummet to $8 million in 1946. There seemed uncertainty about how Hallicrafters would adapt to the postwar marketplace. Hallicrafters' traditional mainstay customers, the hams, were offered a new top-line receiver, the SX-42, in 1946. However, the company also was busy developing home television receivers, hi-fi gear and simple broadcast-band radios. Some observers predicted ham receivers and transmitters soon would amount to only a minor portion of Hallicrafters' business.

However, Halligan bought into Gatti's project. A trade journal, acknowledging Gatti's flair for publicity, interpreted the decision as "an effort to make Hallicrafters a household name" and "expand its market beyond the technically-minded enthusiast." Yet, first word of the venture was aimed squarely at hams. In the March and April 1947 issues of QST, full-page ads bore the headline "Going Places (Again)" and this terse, teasing announcement:

One of the 'villages' put together by the expedition. Note the uniformed drivers standing in front of the trucks.

"Hallicrafters famous radio equipment, sold and distributed around the world before the war and used with superb effectiveness in every theater during the war, is once again on the move. Watch for latest details of the Gatti-Hallicrafters mobile radio–equipped expedition to the Mountains of the Moon in deepest Africa –a new and exciting test for the ingenuity of hams and the performance of Hallicrafters gear."

In the May and June QSTs, two-page ad spreads not only revealed promised details of the journey but announced a nationwide competition to select a lucky ham to go along as "the key figure, next to Commander Gatti, chosen to keep the expedition in touch with the outside world." Applicants were instructed to submit a 250-word letter stating qualifications (a Class A amateur ticket was required). Judges were to be Gatti, Halligan and F.E. Handy, communications manager of ARRL. It was reported that some 9,000 entries were received by the July 1 deadline.

By autumn, the contest had narrowed to a two-man race. Both finalists were summoned to Gatti's Vermont home for personal interviews.

Bob Leo was a 26-year-old Californian working as a transmitter technician for the Civilian Aviation Agency (now FAA). He'd become enamored with radio when, at age 12, he followed plans in a Hugo Gernsback magazine to build an oatmeal box receiver. "That radio changed my life," Leo recalls, and in 1937 he earned his first call, W6PBV. He'd been in the Navy for five years, working in radio intelligence, but hadn't been sent overseas; he decided to try to join the Gatti-Hallicrafters expedition to belatedly see the world.

Bill Snyder was almost 30, trying to get started as an industrial filmmaker and installing taxicab radios on the side in his hometown of Fargo, N.D. He'd been a licensed ham for half his life, first as

continued next page

Gatti-Hallicrafters from previous page
W9LHS and later as WØLHS. Snyder had spent three years in the Army Signal Corps in the Pacific, and the idea of more world travel sounded like fun. "My girl friend before the war had sent me a 'Dear John' letter, so I didn't have anything much tying me down just then," he says. "So when I saw the ad in QST I thought, 'Why not?'"

Leo and Snyder hit it off so well when they met on the way to Vermont that, although the original plan called for a single radio operator, they hatched a plot as they prepared to meet Gatti. Recalls Snyder: "I told Bob, 'Let's figure this so we both can go.'

We convinced Gatti there'd be too much work for just one guy. So instead of taking one ham, he agreed to take two."

Meanwhile, Gatti was running another contest to fill out the roster of the expedition. In cooperation with True, a popular men's adventure magazine of the day, Gatti advertised for applicants for two photographers (one still, one movie), a pilot and a camp manager. Some 20,000 entries were received.

Gatti also was promoting equipment. He convinced International Harvester to provide a fleet of eight trucks. He commissioned the Schult Trailer Co. of Elkhart, Ind., to build four special 23-foot long trailers, one of which was designated the "Shack on Wheels" and turned over to Hallicrafters for installation of radio gear. Gatti also talked Aero-Craft out of three aluminum boats, convinced Evinrude to contribute outboard motors and got Onan to weigh in with portable electric generators.

A couple of Gatti's ideas didn't work out. At the last minute it was decided to leave behind a small experimental helicopter built by Bell, dubbed the Humming Bird, after tests indicated it wouldn't perform satisfactorily in the mountain regions Gatti planned to visit. And a "Diving Eye," a man-sized metal cylinder with a window to allow a brave photographer to take underwater shots at depths of 30 feet, didn't prove very practical – nor popular.

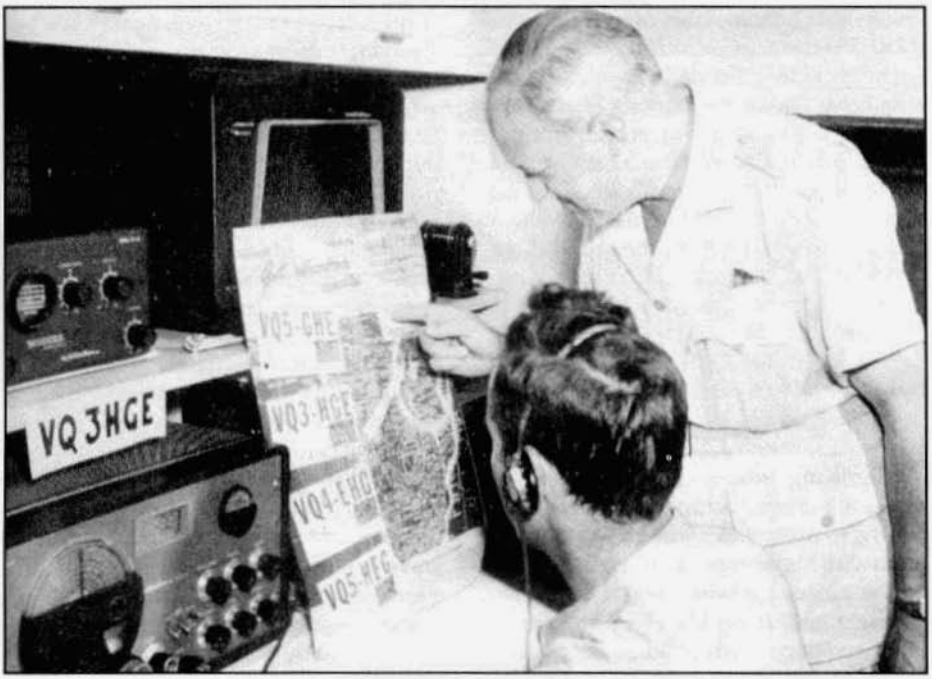
Perhaps Gatti's greatest publicity coup was convincing International News Service to lend reporter Jim Powers to the expedition. Dozens of Powers' colorful stories were distributed worldwide by INS and appeared in hundreds of newspapers during the expedition.

Hallicrafters equipped the "Shack on Wheels" with a blend of old and new technology. The company's latest receivers were installed – a SX-42, a SX-43, plus a S-40A and S-38 for backup. An SP-44 Panadaptor was connected to the SX-42 in order to provide a visual spectrum display. The HF transmitter was a HT-4E, a descendant of a rig that first was offered to hams in 1938 and won fame during World War II as the BC-610. A new HT-18 served as a VFO for the older transmitter. HT-14 maritime radio telephones with battery packs offered local communications on 160 and 80 meters. Battery-powered aircraft transceivers, Hallicrafters Sky Fone models, allowed low-band communications even though the helicopter had been abandoned. Prototype portable FM rigs, forerunners to the Little Fone series marketed by Hallicrafters in the 1950s, provided 6-meter coverage.

Rhombics were prefabricated with portable support poles. And double-extended Zepps also were packed. ("I remember with the Zepps, we ran a slider with a lightbulb up and down the feedline to adjust it," says Leo. "That lightbulb really got the attention of the natives. They couldn't figure out why it would light up and get brighter, then dimmer as we moved it along the feeders.")

The gear and crew were assembled and loaded onto a freighter, the African Pilgrim, setting sail from New York City on Nov. 23, 1947. Forty-eight days later, the entourage disembarked at Kilindini, Kenya, and began to steer toward Kwale, 30 miles inland, where the first of eight planned base camps was established.

Leo and Snyder strung up the antennas, fired up the generators and tuned up the rigs. As luck would have it, solar cycle



Cmdr. Gatti and one of his radio operators inside the radio trailer.

conditions were extraordinarily favorable that year and band conditions were consistently excellent, especially on 10 and 20 meters.

"When we first went on the air, we had the panadaptor hooked up and it was showing signals from one end of the band to the other," says Snyder. "Signals were great. We could hear guys from all over the world."

Leo recalls the first QSO was on 20-meter CW with IIKN, Fortunato Grossi, in Florence, Italy. Leo remembers this vividly because other QSOs with IIKN followed as the expedition progressed, and Leo and Grossi became such friends that, a few years later, Leo and his bride-to-be journeyed to Florence to be married, with Grossi as best man.

AM phone operations to the U.S. were most successful on 10 meters. "We'd usually set up outside the U.S. band so everybody could hear us," Snyder says. "Once they knew we were on, we could just give the receiver dial a flip, like playing roulette, and wherever it landed somebody would be there calling us. It was really fantastic."

During the nine-month stay in Africa, the "Shack on Wheels" was operated under several calls, including VQ3HGE in Tanganyika, VQ4EHG in Kenya and VQ5GHE in Uganda. The special licenses were supposed to limit output to 150 watts but, admits Snyder, "We were pumping out better than 400 watts."

Nobody seems sure how many contacts were made during the expedition. The logs have been lost. Gatti later claimed a total of 10,000 QSOs. Leo does remember that 123 countries were worked, 39 zones and all states except Montana – ironically now his own home state.

Leo does remember some special QSOs. With the aid of other hams, he was able to speak with his father, who was working in the oil fields of Saudia Arabia, and his mother in New York state. He also kept a regular sked with a friend operating Leo's home station in San Mateo, Calif. Leo was

continued next page

able to hear how his own homebrew pair of 250THs into a homemade beam sounded on the far side of the globe.

Another California contact also sticks in Leo's memory: "We were set up in a town, and a lady from a nearby hotel strolled over to the trailer to see what we were up to. When I told her it was a shortwave radio station, she asked if we could talk to Oakland, Calif. I said, 'Gee, I don't know.' But I gave a quick 'CQ Oakland' and W6TT in Oakland came right back to me. That lady went away thinking that ham radio was really something!"

The expedition's still photographer, Weldon King, whose generous recollections and personal scrapbook contributed greatly to this article, was able to keep in touch with his mother in Springfield, Mo., via the "Shack on Wheels" and cooperating hams back in the Ozarks. The Springfield newspaper published an account of an April 4, 1948, hour-long QSO while the expedition was in Tanganyika. Most of the contact was via CW, with local hams copying and sending for Mrs. King. However, at one point, Leo switched to AM and handed the microphone to King. "Hello, Mom!" came booming through the loudspeaker in the Springfield ham shack. An excited Mrs. King later told reporters her son's voice "sounded as if he were in the room with me."

Snyder and Leo also kept in regular contact with a Hallicrafters club station in Chicago. However, the operators grew uneasy over some of Gatti's self-promotional schemes.

"Gatti was a showman," explains Snyder. "He was still playing the 'Dark Continent' routine when, in fact, many of the areas where we went were quite civilized. But Gatti wanted to be seen stepping on a snake in every other photograph."

Leo agrees that, "Gatti liked to do more business over the radio than we liked doing on the ham bands." As a result, Leo confesses with a chuckle: "We could always talk to Chicago when we needed to – but for some reason, we couldn't always get through when Gatti wanted to."

Gatti had seized upon the "Mountains of the Moon" theme for the expedition because of its mysterious and romantic ring. The formal name for those remote peaks is the Ruwenzori Range. Because of weather, rough terrain and personnel problems, the main party never made it to the Ruwenzori. Instead, another mountain, Kilimanjaro, at just under 20,000 feet the tallest point in Africa, figured most prominently in the expedition's accomplishments.

A base camp was established at about the 6,000-foot level of Kilimanjaro. A five-man party was chosen to make the five-day trek to the summit in early May. Leo was among the climbers; Snyder was assigned to man the base camp station. The slopes were relatively gentle, as mountains go, but thin oxygen content at higher elevations made breathing an exhausting ordeal.

According to journalist Powers' dispatches via INS, Leo led the way and was the first to reach the top of Kilimanjaro – "The Roof of Africa," as Gatti called it. Despite all the ballyhoo about radio experimentation at high altitude, Leo says it was all he could do to complete the climb. He did check in from time to time with Snyder, but he cannot recall which of the several portable radios were used.

Snyder, meanwhile, had his hands full with Gatti down at the base camp. "He and his wife were kind of, uh, difficult, and we didn't really get along very well," Snyder explains. "We sort of got into it when we were left there at the base camp while the others were climbing, and soon thereafter we came to a parting of the ways."

Snyder says that whatever radios were used – he can't remember exactly either – there were concerns about conserving the batteries on Leo's unit. "So I told him one night on the way up, 'Why don't you shine a flashlight down here and see if we

Bob Leo, W7LR, in a recent photo.

can communicate by blinker.' And it worked. So at night I stood outside the trailer and worked Bob that way."

When told of Gatti's bylined version of the climbers' push to the top of the mountain, published in 1950 in the Toronto Star, Snyder laughs uproariously. As Gatti told it in the Canadian newspaper, the final day of the climb began thusly:

"The radio operator (Leo) wakes up. Like a somnambulist, he turns the radio pack on, mumbles some words into the mike. From the base camp 14,000 feet below, a clear voice (Snyder) answers: 'A last effort, men! Thousands of hams in Canada, in the U.S. and all over the world are following your every call. Don't let them – and yourselves – down! Call again from the very top...'"

Gatti also put words in Leo's mouth when he wrote this fanciful account of a transmission From the summit: "Yes, all here on the peak. Every job completed. Signing off and clear from the top of Africa's roof!"

Says Snyder: "That's pure Gatti. Bob checked in with us every now and then to let us know how the climb was going, but there was nothing that dramatic about it. But ol' Gatti sure knew how to make up a good story."

After splitting with the Gatti-Hallicrafters expedition, Snyder hooked up with Hollywood radio playwright Arch Oboler ("Lights Out") who was accompanying a University of California sponsored research trip to Africa. Snyder used his electronics skills to maintain the group's tape recorders and also applied his filmmaking skills in Kenya, the Belgian Congo, Rhodesia, etc., for the next several months. After he found his way back to Fargo, Snyder helped put the community's first television station on the air. On the side he was a stringer for Walt Disney Studios, filming features for "The Mickey Mouse Club" television show and outdoor segments for Disney's nature films. Eventually Snyder realized his earlier goal of establishing his own industrial filmmaking company.

Today, at age 75, Snyder remains active as WØLHS, primarily on RTTY and AMTOR. He hasn't lost his taste for DX, however, with 251 countries confirmed on RTTY.

Leo, meanwhile, continued on for another four months with Gatti after Snyder's departure. Snyder had been considered the resident expert on maintaining the HT-4, because of his experience with the

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Collecting/Repair/Restoration...Tips

How To Make A Nasty Boat Anchor Look Almost New

"How do you get all that grease, nicotine stain and 40 years of crud off your restoration work?", they always ask. "Why I just use the old garden hose", I answer. I have stopped counting the times I get asked that question and my answer always brings the response, "Are you sure that is the right thing to do?"

In all the years I have been restoring radios, I have never lost one to water. I used to go the old cotton swab, carbon tetrachloride route, however, that gets boring real fast and doesn't get all the dirt out.

Here is the way I presently clean a chassis prior to restoration:

I first pull all the tubes, crystals, mechanical filter and any other parts that pull out. If the weather is warm I take the chassis outside and place it on the picnic table. I set it down on some pieces of 2x4 lumber. I spray it with a 50-50 mixture of 409 household cleaner and common household ammonia. After a liberal spraying with this mixture I use various sizes of brushes to scrub the chassis and get into those hard to get at places. After I've finished the scrubbing, I just rinse everything off with the garden hose. I do both the top and bottom of the chassis. **NOTE: Experience has taught me not to spray the kilocycle dial or the megacycle drum of the Collins 75A receivers or the 32V transmitters. The lettering has a tendency to run.**

I repeat the scrubbing/rinsing process until I am satisfied that the chassis is as clean as I can get it. Depending on the hardness of the water there may be some residual water spots left on the metal. To preclude this, I put a cap of Photo Flo into a bucket of water and douse the work with the solution. Photo Flo is available at most photography supply stores. It is used to wash prints and makes water 'wetter' thus preventing those ugly water spots. To dry the work I use the blower position on my heavy duty shop vac. It takes about 20 minutes to get all the water off- use the smallest diameter snout on your blower; you want to get the strongest stream of air possible. In the summer I let the sun bake the chassis.

During the winter months or in the case of inclement weather, I do the washing procedure in the bath tube. Remember to use a 2x4 platform. It not only prevents the tub from getting scratched but prevents the chassis from sitting in water where it would soak up moisture. After using the blow dryer I set the chassis near a heater for several days.

I think this method is quicker and more efficient that any other. The secret is not to let the chassis soak up water.

Howard Mills, W3HM

Hum Problem

I had a National 200 transceiver with a stubborn hum problem. I discovered that the AC leads to the on/off switch on the front panel were bundled in the cable harness with everything else. There was coupling between the AC leads and some of the low level audio lines. Moving the AC leads out of the cable harness cured the problem.

Niel Wiegand, WA5VLZ

Gray Paint For Ham Gear

I tried a lot of different brands of paint searching for just the right shade of gray to repaint some of my vintage gear. I finally found it; it's ACE interior/exterior premium enamel #75577-17021, machinery gray. It's available in spray cans. The color of the cap did not impress me until I tried it. Behold it was that BLUE GRAY or battleship gray I'm sure you would like.

Bob Bricker, K4CSV

AM FREQUENCIES

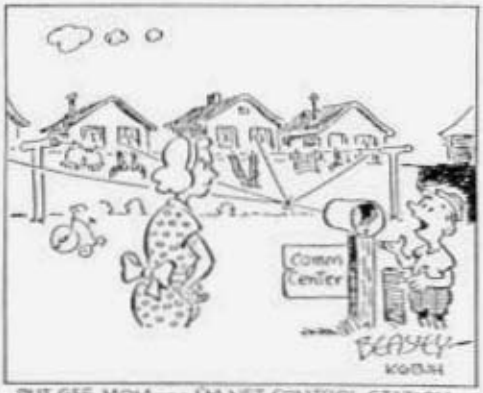
2 Meters - 144.4, calling freq., activity in most cities; **6 meters** - 50.4 calling freq. **10 meters** - 29.0-29.2 operating window; **12 meters** - 24.985 calling freq.; **15 meters** - 21.400 - 21.450; **17 meters** - 18.150 calling freq.; **20 meters** - 14.286 for the nightly SPAM net starting at 5:00 CA time; **40 meters** - 7160, 7195, 7290 are the main freqs. Westcoast SPAM net every Sunday afternoon ,4:00 PM on 7160; **80 meters** - 3870, 3880 and 3885 are the main freqs. Westcoast SPAM net Wednesdays nights, 9:00 PM on 3870. AM Swap net Thursday nights, 7:30 PM on 3885; **160 meters** - Gray Hair net every Tuesday at 8:00 PM EST on 1945. Mostly sporadic summer-time activity but during the winter signals can be heard anywhere on this band.

From the Editor:

Vintage CW Net to Change Frequency

Tracy Reese, WB6TMY, net control for the Vintage CW Net, has advised me that with the advent of daylight savings time the net will move back to 14.062. The Saturday night net starts at 9:00 Eastern. At this time it isn't planned to have a Sunday net on this frequency.

Tracy reports that although the net has not grown from the first few sessions there is a group of 'regulars' that show up every session. He and the other net participants are hoping that the change back to 20 meters will be a positive move. He'd like to invite everyone to check into the net and help him make it a success.



OUT GEE, MOM--- I'M NET CONTROL STATION FOR OUR SATURDAY MORNING CHECK-IN!

Vintage SSB Net ..... Update

The move to Sunday afternoons - 14.295 plus or minus, 3:00 PM Eastern - has worked out very well. Not only is propagation much better than our previous Saturday evening time, but we're getting a lot more check-ins. On February 23 we had 38 check-ins; that's quite an increase from previous sessions.

As time goes by the interest in vintage SSB is going to grow. Considering that some of the early gear is 40 years old now, it may be time to start giving it some consideration. Up till now most of it has lanquished in storage, unused and for the most part unwanted. The real interest amongst vintage enthusiasts has been in the older gear from the AM days.

Most of the check-ins to the SSB net are operators most often heard on AM. Although operating AM will always be their prime interest they're finding that a little vintage SSB can be fun too. It's 'new' and different and a change.

The most gratifying aspect of the Vintage SSB net so far, is that it's been entirely devoid of any bad operating or ugliness. For my part,I feel that I am in very good company. The Vintage SSB net may be around for a long time and it could have a very positive influence.

Please consider joining us some Sunday afternoon. **N6CSW/Ø**

Vintage Product Review

by Bill Kleronomos, KDØHG
POB 1456
Lyons, CO 80540

"The Hallicrafters Skyrider SX-23"

It was a dark and stormy night. Nick Archer strode into his office and tossed his grey fedora across the room with an expert sidearm throw that snared it on the oak coat rack. He draped himself into his squeaky office chair and pulled out the bottle of bourbon and grimy glass from the desk drawer - third one down, on the left. He poured his drink, took a swig, and propped his wingtips up on the desk. There was trouble brewing - Poland was invaded that week - so Nick reached over and switched on his new shortwave receiver to catch up on the latest news. The receiver was new - a gift from a grateful client. As he waited for the receiver to come to life he pondered the name Hallicrafters in bold letters..."now just what kinda name it that?"

Style and class, two things that were absent from the popular Hallicrafters line since the first. Yes, Bill Halligan built pretty good receivers all right, but with all the grace of laboratory test equipment. As with most shortwave and amateur receivers of the '30's, there was apparently a race to see who could build the most business-like, knob infested or impressive looking receiver by the standards of those who probably knew the least about style - those electrical engineers and hams!

So, the stylish SX-23 is an enigma. Introduced in March 1939, and apparently only manufactured for the remainder of that year, there were no large numbers of those receivers ever made. No reliable records exist today but after consulting Chuck Dachis- "The Hallicrafters Collector" I'd guess that perhaps 5,000 or fewer SX-23's were ever built; the serial number of mine appears to indicate it is number 3377. This leads to a question we'll look into later - why were so few built?

A general overview of the Skyrider 23 would be incomplete without giving a brief equipment description. The receiver is an eleven tube, four band, general coverage superhet with an IF of 455 Khz. General features included bandspread on 80, 40, 20 and 10 meter amateur bands; a BFO, adjustable selectivity, noise limiter, single crystal filter and amplified AGC. Coverage is from 540 Khz to 34 Mhz. The main dial calibration is every 10 Khz on band 1, every 100 Khz on band 2 and on to one mark per Mhz about 16 Mhz. Clearly, the SX-23 wasn't designed for participants of the ARRL frequency measurement tests! This leads to question two- what was the market Hallicrafters targeted for this receiver?

The advancement of radio component technology was rapid in those pre-war 1930's. New and clever circuitry designed to take advantage of those new developments were being devised at Hallicrafters and other manufacturers. My own opinion is that Hallicrafters wanted to produce an easy to use receiver with decent performance that might appeal to the ham whose shack might have been in an inhabited part of the house, the professional wanting a 'shortwave' to keep up on world affairs or even a newspaper reporter whose livelihood was impacted by those tumultuous events of the late '30's. Easy to use clearly meant no plug-in coils, a minimum number of bands and switches and mechanical/electrical stability. It is no accident, therefore, that several new features - previously un-

The Hallicrafters Skyrider SX-23 in KDØHG's 'vintage 'shack.

known to the industry - were designed into this receiver; features made possible by several new components hidden within the insides of the chassis.

Upon removing the one piece bottom and rear wraparound cover, one immediately notices that the entire front end is constructed within a heavy gauge steel box assembled with a multiplicity of hardware. This type of construction certainly contributes to the units stability. When one removes the bottom cover from this assembly the two new key developments that led to this receiver's conception are evident. The trimmer capacitors on the oscillator and RF stages are honest-to-goodness piston type capacitors. They're not the fancy glass and silver capacitors in common use in today's microwave circuitry, but distant ancestors that nevertheless shared the same virtues of vibration resistance, multi-turn micrometer type adjustability and long term stability. The next thing that catches the eye are rows and rows of negative temperature coefficient ceramic capacitors. These components became common during and after WW II and were a vast improvement over the standard mica compression trimmer technology of the '30's. If one looks over the schematic, several other design features essential to good stability are also used, such as triode connected 6SJ7s, used as the local oscillator and BFO.

The 'easy to use' part of the design criteria makes for a rather unusual means of bandspreading the amateur bands. There is no separate bandspread adjustment or dial. When the main bandswitch is rotated to one of the four 'bandspread' bands', the selected ham band (and a bit more) is tuned over the main receiver dial itself. In effect the receiver becomes 'ham band only' in operation. Quite a bit of bandspread is afforded by this arrangement and it's very easy to tune in even a modern SSB station. For example, it takes about ten turns of the main tuning to cover the 80 meter band. There is no ham band calibration on the dial. One needs to use the logging scale and a homebrew chart, but one can achieve resettability to about a Khz by this means. Unfortunately, I believe this cleverness in bandspreading

continued next page

may have been a contributing factor in this receiver's short production run.

The bandswitching and bandspreading arrangement in the SX-23 is almost unbelievably complex in implementation. In short, when a bandspread position is selected in the bandswitch, a number of temperature compensated ceramic capacitors are switched in a series and/or parallel arrangement with the antenna and the RF and oscillator coils. Many of these several dozen capacitors were selected by either the manufacturer or, more likely, the Hallicrafters assembly line to within 1/10 picofarad (uuf) value! My receiver even has paralleled capacitors that added up to the right value and a few appear to have been scraped with a sharp tool to trim their values to final test or assembly. Unfortunately, this bandspreading scheme - without the use of adjustable coils - required this sort of cutting edge precision for the bandspreading to come out right. Considering all of the circuit and component variables, it must have been quite an expensive headache to get each set through the final test. Remember that in 1939 there were no digital capacitance meters! Also, the bandswitch itself is another incredibly complex piece of hardware with innumerable isolated rotor sections. It's switching functions are highly complex and almost impossible to trace out.

Judging by the difficulty I had during my restoration of this receiver, I'd bet that few emerged from final assembly free of wiring errors and, at best, a qualified and experienced technician couldn't repair and calibrate more than a few units per day. This apparent lack of cost effectiveness in the manufacturing process may have contributed to the short production life of this receiver.

Another mystery surrounding the Skyrider 23 is it's art deco styling - virtually unique among communications receivers of that period. Who was the stylist responsible for this unit? I feel this is far too good to have come from the same 'industrial stylists' who brought us the airplane dial 5-T or S-19 Sky-Buddys! In his article in ER #9, Chuck Dachis mentions that Hallicrafters employed the services of the well known designer, Raymond Loewey sometime after 1946. I believe that the SX-23's unique styling indicates that Hallicrafters employed the services of Mr. Loewey or another talented individual before the war as well, at least for this one receiver. It is a mystery why some of this elegant design didn't continue on in other Hallicrafters receivers of that era.

After completing a thorough alignment, I ran this example of the Skyrider 23 through the KDØHG lab to get a feel for the technical side of things. AM sensitivity was not too bad measuring close to 3 uV on all bands. Temperature stability tests showed a total effective warm-up drift of about 10 Khz at 10 Mhz, measured from a cold start to two hours later. This amount of drift was somewhat disappointing considering the amount of temperature compensation Hallicrafters had engineered into this unit. Most of this drift occurred within the first 15 to 20 minutes. After one hour, drift was not readily noticeable. Mechanical stability is very good. The usual shaking of the desk had no effect on a CW signal and a sharp rap on the cabinet caused a brief chip but no permanent frequency change to the beat note. Image rejection is about as expected with a single RF stage receiver with an IF at 455 Khz; at 14 Mhz measuring 30 dB and at 30 Mhz coming in at 6 dB. Audio fidelity and distortion are very good. At full room volume (1/2 watt) audio distortion measured 4 % at 1000 Hz and increased little at higher outputs.

The single signal performance of the crystal filter is just excellent and was a real surprise; better than those in the SP-600 or the SX-28. It works extremely well peaking a CW signal or as a high selectivity notch. It is also selectable for use on one of the wide bandwidth 'phone' positions to notch out heterodynes. The 'IF sharp' po-

continued on page 28

LETTERS

Dear ER

I want you to know that I miss participating with all the AM'ers in the mode we all hold so dear. I will be home soon for a little while and look forward to working everyone from Chula Vista and Scottsdale, Arizona.

At this very moment, our tanker is pumping our JP-5 (jet fuel) cargo ashore at Diego Garcia. We will discharge all of it and make ready for our shipyard commitment at Singapore on 1 March. All hands will be paid off there and I will catch a flight to Japan where I will join my XYL for a visit to her family. We will be returning to the US on 18 March.

Your readers may be interested to learn that the only AM signal heard out here from the US was W5IPYT. Caught dear Bob making one of his usual informative 'ol buzzard transmissions on 19 October on 10 meters. He was running his usual 100 watts on the Viking I and putting in a respectable signal. I waited until his QSO with KE7KK (whom I couldn't read) ended - and then I called and called and called. Bob.... please don't pull the switch without listening a little while longer. You would have been my first AM QSO with America. Incidentally, my first and only contact with an AM operator was made with KK6BS on SSB. Jo Jo was 5/9 from San Diego and ran a phone patch with me to Ron Cole, N6OMW, of HRO, San Diego. Not too bad for a distance of 12,000 miles. It was sure good to hear Jo Jo and my dear AM friend, Ron.

David Olsen, W6PSS

Dear ER

I read with interest W6RNC's column last issue regarding the works of Tesla. At the end, Fred mentions how nice it would be if we in the radio community could come up with a unit of measure in honor of Mr. Tesla. Well, the hard work has been spared us, as there already is one! The Tesla is a unit of magnetic flux density, and is expressed in Webers per square meter. A Weber is a unit of magnetic flux. (Flux is defined as the rate of flow of a physical quantity through a reference surface.) A "nanotesla" is commonly used in geophysical research to describe changes in the earth's magnetic field which affect ionospheric propagation, where one nanotesla is equal to 1 x 10 - gauss.

On a related subject, I have recently received some new information from NOAA's SESC center in Boulder, Colo., which may be of interest to us. They have now compiled enough data concerning the current solar cycle to begin predicting the next one. (Their long-term modeling has been surprisingly good.) What they are saying is that the current cycle will bottom out in December of 1996. The bad news is that they expect that the 10-cm flux readings will not get over 100 for over 5 years, from August 1994 to October 1999! If that is not bad enough, the next cycle is expected to peak at much lower levels than this one, with a smoothed flux value just over 175.

We better enjoy frequent 10-meter openings while we can, as they may be gone for a very long time!

Ray Osterwald, NØDMS

Dear ER

Your comments in the February issue concerning the effect of our "recession", interested me a great deal. I started ham radio in the depths of the Depression in 1931-32 and got my first ticket in '32....

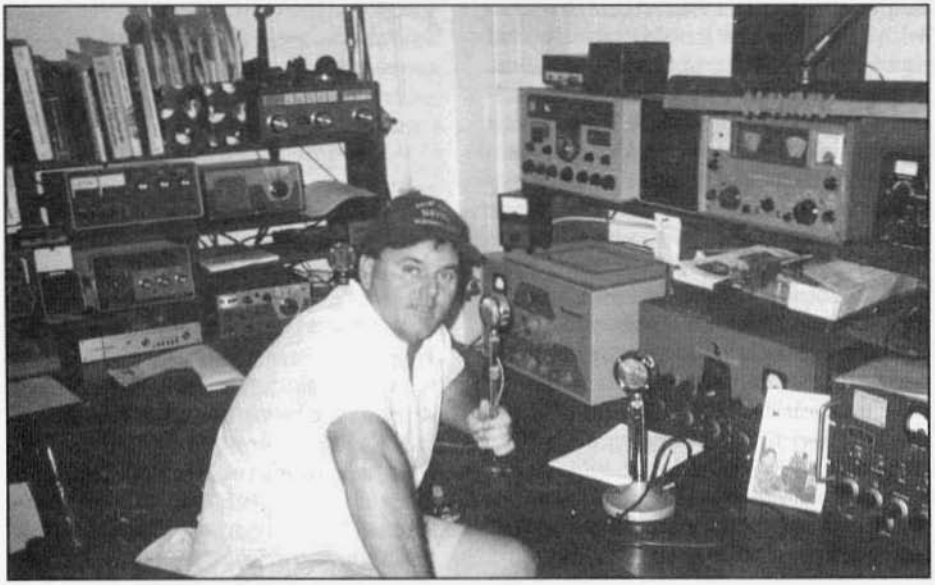
My first transmitter was a breadboard with a '10 osc. (Hartley) and the receiver was a 24 det. into a 56 audio. Everything I had was homebrew.

As we progressed, we built larger and more complex gear, traded, bought and sold and worked our way up.

Hopefully, this recession will be the impetus to start some of the fellas back to simple, repairable gear.

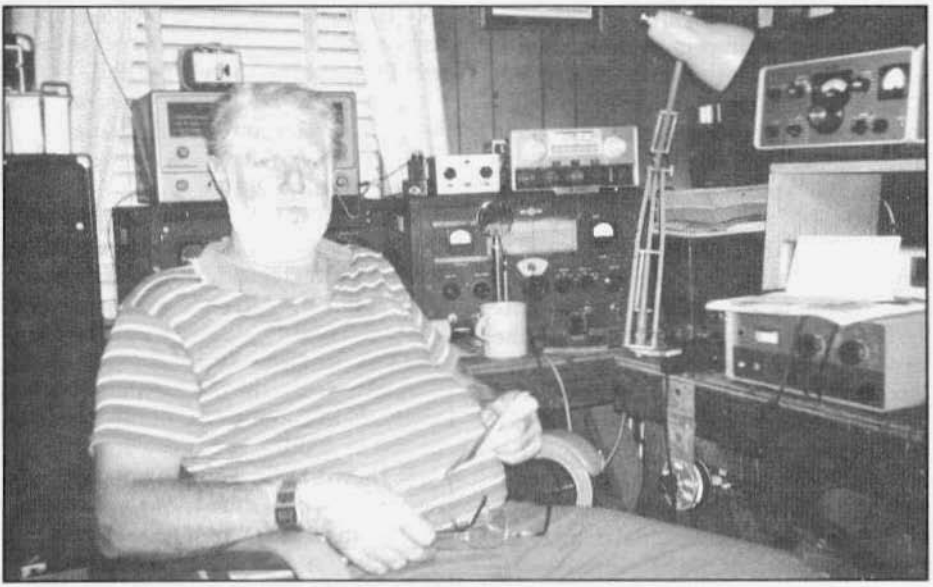
Fred A. Linn, W9NZF

Bud Enochs, KE6DN. The homebrew console is constructed from 1-inch steel tubing and is mounted on casters for easy access to the back. Being modular in design ,Bud can add 19" sections as his vintage collection grows.



Wayne Medley, N4VMV, in his vintage station. Wayne says he has operated AM since he was licensed and that he also enjoys vintage SSB.

Jim Choroszy, NG9X, with the 'classic' Morrow mobile twins. He recently worked Russia with the twins on 10 meter AM.



Jerry Buckner, WAØYSG. This photo was provided by Larry Howe, KBØHIB. He says that Jerry is "truly a ham of yesteryear" and one of his 'elmers'. Readers may remember that Jerry co-authored the article on the Johnson Avenger in ER #33.The Avenger is sitting on a Collins rig behind Jerry.

Keep it Clean!

by Dewey Angrhofer, WØZUS
P.O.Box 540
Edgemont, SD 57735

It has always been the desire of the AM operator to keep his modulation percentage up close to 100%. If we rely on a friend on the receiving end to tell us how we're doing we usually wind up backing down a little just to be on the safe side.

When conditions are good, with strong signals and little QRM or QRN, we can do okay with as little as 50% modulation but with poor conditions we usually need to be 100% modulated to get through. In an attempt to achieve 100% modulation we've all heard the stations that are over-modulating and spreading buckshot 20 Kcs up and down the band. This puts the AM fraternity in a bad light and, as we know, we don't need to supply any more ammunition to those wanting to do away with AM operations. The problem or question now becomes," How can we more accurately adjust our modulation levels to achieve 100% modulation without going over the top?"

ENTER THE OSCILLOSCOPE

By sampling the RF output and injecting it on the vertical plates, we can now see the results of modulation. This is fine for a single tone injection, but for the complex wave form of the human voice, it still is not easy to adjust our audio to run close to 100% modulation.

The trapezoidal display works great but there are some problems to be faced here too. To develop a trapazoidal display it's necessary to sample the RF output (to the vertical plates) and to sample the the audio (to the horizontal plates). This is where things get difficult and dangerous. One problem is getting the audio leads out of the cabinet, another is dealing with the DC voltage present which must be blocked with a high quality condenser before presenting it to the horizontal plates in the scope. My solution to this set of problems is a demodulator circuit which can be used with only the sampled RF, thereby eliminating the need to sample the modulator high voltage.

The demodulator circuit is simple and none of the parts are criticial, in fact my unit is constructed entirely from junk box parts, with the exception of the germanium diode and the box it is mounted in. I'm using an old Clough Brengle scope and found it necessary to mount everything inside due to lack of gain in this unit but with any of the later scopes with both vertical and horizontal amps built in, this is not necessary.

Construction Notes

1) The size of capacitors C2 and C5 depends somewhat on the scope you're using.

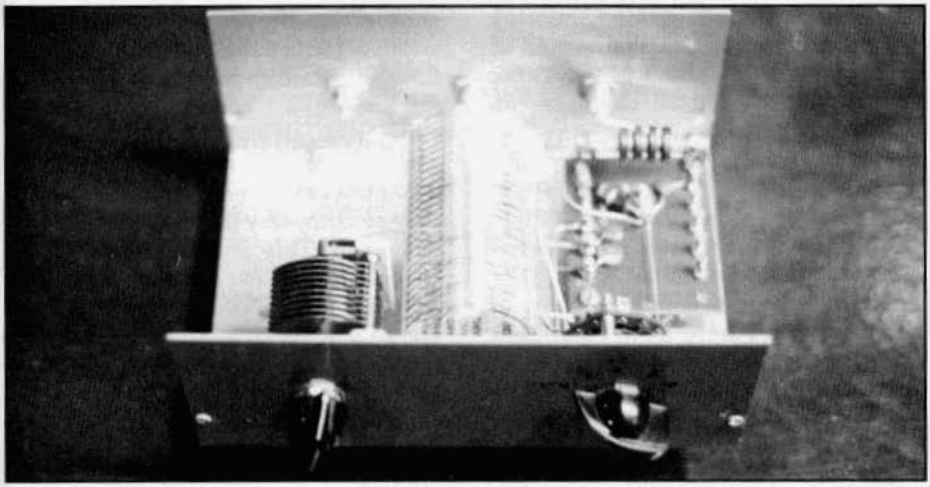
2) If you plan to use the demodulator on ten meters, the lead length from the demodulator to the scope becomes most important due to the capacity of the cable which is, in effect, across the coil.

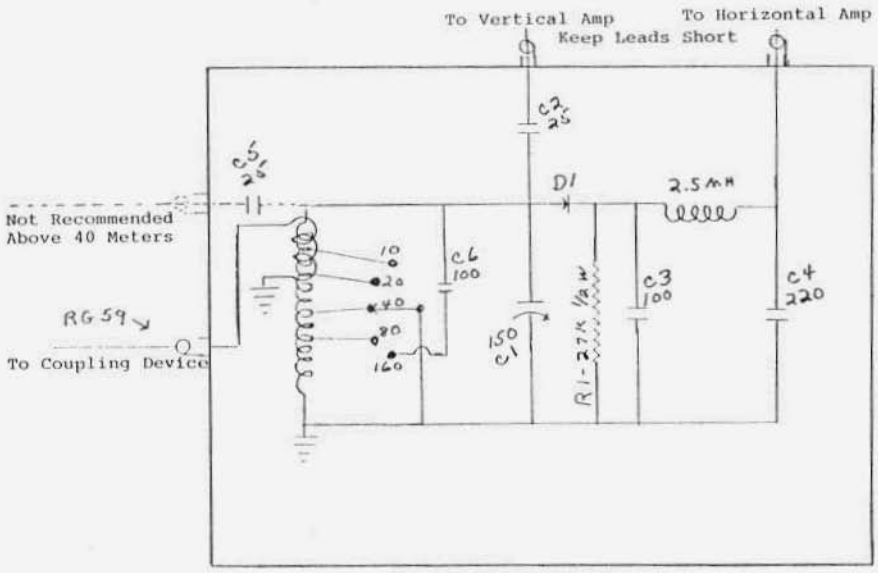
3) For 20-15-10, I strongly suggest you use link coupling on the coil, again to keep the parallel capacitance to the input cable to a minimum.

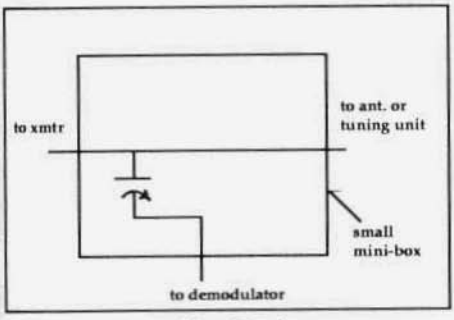
4) The taps on the coil were placed with the use of a Grid dip oscillator starting from the 10 meter end. The coil is a surplus unit made by Air Dux #0093, but any other coil of suitable size would be okay. The link used was 3 turns. I went around the coil to create the link but the any other method - to the side or at the end - would be just as good.

5) There's also a coupling devise that's necessary. This consists of a variable capacitor in another mini-box. The size of the capacitor depends on the transmitter power and the gain of the scope you're using. Start with approx. 25 puf. The cap I'm using has .030 spacing which should handle legal power.

continued on page 28







Coupling Device

Parts list

All capacitors in pico-farad
C1 - 150
C2 - 25
C3 - 100
C4 - 220
C5 - 25
C6 - 100
D1 - RCA SK3087 (or similar)
R1 - 27K 1/2 w
Air-Dux coil#0093 1 1/2" x 3 1/4"- 16 TPI
BNC coax connectors
(2) mini-boxes

Keep It Clean from page 26

6) Depending on what you have to work with in your junk box, this unit could be put together in a variety of ways. For instance, a mono-band unit would be simpler to build. Another possibility I've thought of would be to use plug-in coils.

Operation:

C1 is tuned for maximum deflection. The CRT dislay may be raised or lowered by adjusting the variable capacitor in the coupling devise. Use enough capacity in the coupling unit to ensure that sufficient RF is presented to the vertical amplifier in the scope to guarantee mid-range operating voltage. **ER**

Editor's Comments from page 1

These rigs will require many more 'transplants' of parts. Another thing is that vintage parts of any sort are going to become hard to get. We'll all have to be recycling more.

As the hamfest season approaches I hope we'll all keep an eye out for parts rigs. Usually there's a few at every hamfest and they can usually be purchased for next to nothing. If we buy these rigs (and if we don't they'll probably wind up in the dumpster) we can do our bit for vintage radio and perhaps make a couple of dollars in the process.

I know that practically everyone involved in the vintage aspect of ham radio has at least one 'parts unit'. I'd like to suggest that consideration be given to putting it in the parts unit directory. Although it's a hassle pulling parts out of a rig and packing them and shipping them, there's a lot of satisfaction and good feelings that can be gained.

Maybe we should develop a motto: "give your parts so another rig might live" or "parts today, part of a radio tomorrow".

Please call or write or FAX if you have a unit (or units!) for the directory.

N6CSW/Ø

Vintage Product Review from page 22

sition of the selectivity switch has a bandwidth of about 6 Khz and the high-Q slug tuned IF transformers have very good skirt selectivity. Listening to the shortwave broadcast bands is a pleasure due to a near elimination of that annoying 5 Khz adjacent channel heterodyne. Tuning is very smooth, easy and remarkably backlash free. This receiver might have benefitted from the addition of a tuning flywheel weight, but only for that 'feel'. The sum of all these features makes for a good general coverage receiver even by today's standards.

I guess one could say that overall the designers of the SX-23 came close to achieving the goals they set out to accomplish. Certainly there were better performing receivers built in those pre-war years but none that looked any nicer sitting in a ham shack, living room or an old gumshoe's office. **ER**

Reflections from page 2

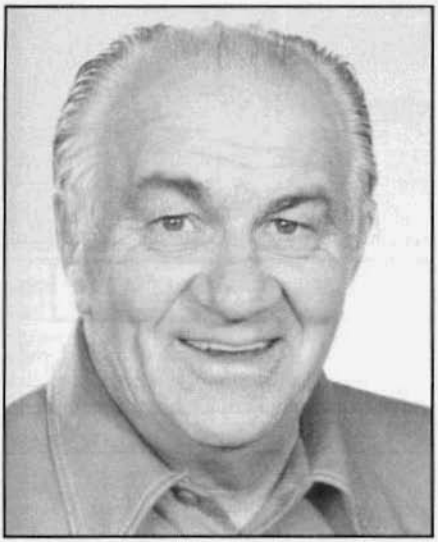
In those days, the standard low-frequency shipboard receiver was the IP-501A, which consisted of a 201A detector and a 201A audio amplifier. The unit was in a oak box and had a front panel of black hard-rubber. On the top of the front panel, all the connection came out to brass binding posts.

So, all I had to do was tap one of the brass binding posts with my finger, to key the receiver. I gave the other ship a call and he responded. We conducted a little QSO to break up the afternoon monotony. It was solid copy all the way. I am sure these kind of transceiver QSO's have occurred many times before mine and many years earlier too.

The IP-501A receiver put out such a good CW carrier that it made merchant ships sitting ducks for German Submarines. A lot of ships were sunk early in WW II off our Atlantic coast, due to their radio receivers oscillations. All the old receiver were taken off the ships in a hurry and replaced with superhets, as a protection against submarine attack. **ER**

Gatti-Hallicrafters from page 17

BC-610 during the war. Leo had never seen one of the 500 pound monsters before signing on with the expedition. He was an experienced transmitter troubleshooter, however, and armed with only a simple volt-ohm meter and a schematic, he was able to repair a faulty driver stage in the only major breakdown of the 5,000-mile land journey. "Other than that one time in Uganda, about the only maintenance I did was sweep up a few nuts and bolts every now and then," Leo jokes.



Recent photo of Bill Snyder, WØLHS

When the expedition disbanded in October 1948, Leo hopped a Norwegian tanker to Saudi Arabia and worked for ARAMCO for about two years, operating for a while as NP4BAL. Back in the states, he attended Stanford University, worked for General Electric in Arizona and eventually took a teaching job at Montana State University. In 1963-65, he took a leave for an assignment in Thailand, where he hammed as HS1L.

Now retired from teaching, Leo, at age 71, remains active as consultant and expert witness in cases involving electrical accidents. And he remains an avid DXer as W7LR from his Bozeman, Mont, QTH that has room for a 530-foot-long dipole as well as a 70-foot-tall vertical and an 80-foot tower with a tri-band beam. With 327 countries confirmed, he's the top-ranked W7 on the DXCC CW Honor Roll.

Both Snyder and Leo rely primarily on solid-state transceivers these days. However, Snyder has kept a favorite Hammarlund HQ-129X around, and both men still own treasured National SW-3 receivers from the early 1930s. And Leo has a homebrew modulator and 4-400A amplfier that, he says, he "just might have to put on AM again one of these days soon."

Gatti organized another expedition or two to Africa in the 1950s, but none with the fanfare of the joint venture with Hallicrafters. He died in the 1960s.

For its part, Hallicrafters remained in an awkward position when it came to capitalizing on the 1947-48 expedition. The HT-4 was being phased out as a ham rig as development accelerated toward smaller, more efficient and less TVI-prone transmitters. Even the still-new SX-42 was short-lived, although it continued in spirit for many years as the SX-62. About six months after the Gatti-Hallicrafters expedition was completed, Hallicrafters announced the SX-42's successor, the double-conversion SX-71.

The widespread news coverage of the Gatti-Hallicrafters expedition apparently did broaden consumer recognition of the Hallicrafters name, and sales of television sets were impressive the next few years.

Apparently Bill Halligan felt sufficiently rewarded by the association with African safari that in 1954 Hallicrafters again helped finance a DXpedition -- a voyage to Clipperton Island undertaken solely by hams with no Gatti-like promoter involved. The Clipperton venture provided Hallicrafters some solid publicity for the then-new SX-88 receiver and HT-20 transmitter used on the island. Hallicrafters also sponsored a DXpedition to Vatican City in1960. **ER**

CLASSIFIEDS

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Non-subscribers: $3 minimum for each ad (up to 20 words). Each additional word is .20. **Please call or write for display rates.**

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DEADLINE FOR THE APRIL ISSUE: APRIL 3

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: FET multimeter AN/USM-223 (ME-297/v). Ranges - AC/DC 20k ohms/V, 10K ohms/V, (measures up to 5K volts, 10 amps DC), ohms x 10,000. Completely overhauled, calibrated, fresh batteries, test leads, adapters,instructionsheets and schematic.Ideal for RF applications, military's finest multimeter. - $49.95; calibration and overhaul service available for above meters; radio rcvr R-509/ARC (R15), 105-135 Mhz, new unused, orig. box w/TM ARC type 12 manual - $49.95; IF xfmr, Collins Radio, 3.45 Mhz, 2 adj. iron cores, mfg P/N 278-0087-00 - $2; ultra min. audio xfmr, Pr. 10k ct, Sec. 1.2 K ct - 3/$1; military tech manual listings, largest stock in the world, over 50k - $5 refundable with first order. SASE for inquiries. Lee Frank, POB 10776, Harrisburg, PA 17105-0776.

WANTED: Info on National Radio Institute course 160 meter AM transmitter project: 6CL6-2E26 RF; 6AN8 driving PP 6BQ5's modulator. Circa mid '70's. Al Bernard, NI4Q, POB 690098, Orlando, FL 32869-0098. (407) 351-5536

FOR SALE: Miscellaneous odds and ends, antique radios and parts. LSASE for list. Hidyne Research, POB 3342, Williamsport, PA 17701. (717) 326-2148

FOR SALE: NC-303 - $250; DX-100 - $100. Both near mint. BC-610 E. Chuck Graves, KØRFQ, (417) 863-7415

WANTED: CE 10B/20A/458 vfo, must be in vg cond. Will pay fair price pluf UPS. Craig, KB6XV, 14 Govenors Ct., Sacramento, CA 95817. (916) 736-1133

FOR SALE: BC-348 - $125; Globe Scout Deluxe - $150; S-53A - $75; HT-40 - $75. All excellent. Al Sziriski, AI4U, 6251 Fox Hunt Trail, Orlando, FL 32808. (407) 222-0007 days

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FOR SALE: CE 20A w/458 vfo - $100; Knight R-100A - $50; KW HB rig - $200; GE 70 cm, 30 watt - $35. Mike, KFØVM, 10010 W. 59th Pl, #4, Arvada, CO 80004. (303) 431-7298

WANTED: Stoddart: information on company, personnel, products; catalogs, price lists, manuals, antennas and accessories; power supply for NM-40A. Alan Douglas, Box 225, Pocasset, MA 02559.

CLASSIFIEDS

FOR SALE: Used technical books - radio, electronics, military, test equipment, catalogs, etc. List- $1 (stamps ok). Softwave, Dept. ER, 1515 Sashabaw, Ortonville, MI 48462

FOR SALE: Johnson Courier amp., uses a pair of 811a's - $175; Johnson Ranger - $125; Hammarlund HQ-180 rcvr - $175. Charlie Vaughn, KD4AJ, 1968 Huntington Hall Court, Atlanta, GA 30338. (404) 396-0276

FOR SALE: 300 rigs, SASE for list; vintage manuals. Mike Horvat, POB 73, Stayton, OR 97383.

WANTED: Squires-Sanders - information on company or personnel; whereabouts of AN/URR-58 Coast Guard receiver prototypes; SS1V bandscanner; late SS1R. Alan Douglas, Box 225, Pocasset, MA 02559.

FOR SALE: Johnson, Heath, Gonset, Hallicrafters and other vintage equipment. Cleaning up shack. Will not ship. SASE for list. Jack, K4GYK, 2717 Hwy. 90 W., Lake City, FL 32055. (904) 755-0318

WANTED: Military radios and electronic equipment, collections, components, cables and manuals; freq. standard for GRC-109; GP-7; TU's; NIB 811A's. Charles Di Cecca, KA1CON, 501 Mystic Valley Pkwy, Medford, MA 02155. (617) 396-9354

FOR SALE: James Millen grid dip meter, 1.7-300 Mcs, model 90651 - $145; Jennings vac. type UCS 302 to 9 cap., unused - $135. WA6CAS, (916) 731-8261

WANTED: 180U-2 antenna network, part of Collins KWT-6 type 8 xcvr. Mike McDermott, 305 N. Keith St., Scammon, KS 66773. (316) 479-2756

FOR SALE: Western Electric horn type broadcast mic. **WANTED:** Pilot radios, any model, any condition. Bill Moore, 1005 Fieldstone Ct., Huntsville, AL 35803. (205) 880-1207

WANTED: AX9901, 5867 or TB3/750 tubes; any info on UTC 34528A mod. xfmr; manual for HP-412A VTVM. Geoff Fors, WB6NVH, POB 342, Monterey, CA 93942.

WANTED: Millen Vari-Arm vfo, type 90700, 90701 or 90711. Also looking for a Millen ceramic jack-bar type, 5 pin coil socket #41205 and air coils #43022 and #43042 for a 90800 exciter. Interested in Millen equipment and any information on James Millen's life and company for a future article. Thanks to all who have helped so far. Henry Rogers, WA7YBS, POB 501, Minden, NV 89423. (702) 267-2725

WANTED: HRO-60 coils type G/H/J/AA/AB. Barry Nadel, Box 29303, San Francisco, CA 94129. (415) 346-3825

FOR SALE: Lafayette radio operating and service manuals, schematics etc. If I don't have it,they never printed it. Pete Markavage, WA2CWA, 27 Walling St., Sayreville, NJ 08872. (908) 238-8964

FOR SALE: Components. Parting out 1 ea. - Collins 75A-4 and 75S1, National HRO-60 and R390 with meters. Jim Larson, KF7M, 2245 Ross Ave., Idaho Falls, ID 83406. (208) 523-6756

WANTED: Viking II w/vfo; Valiant or Valiant II. Doug Beard, KFØVF, 604 7th St., N, Springville, IA 52336. (319) 854-6312

FOR SALE: Mint rcvr from late teens or early '20s w/owners orig. log - $200. **WANTED:** KW-1; Ranger; Desk KW manuals. Gary, KE6MS, (310) 696-0177

WANTED: Squire-Sanders SS1R rcvr and SS1S noise silencer. Ted, WA2RGB, (718) 723-3894

FOR SALE: GC rcvrs: SX-110, near mint - $89; Echophone EC-1 - $29; S-38 w/BFO and RF gain mods - $29. Plus shpg. Henry Mohr, W3NCX, 1005 Wyoming, Allentown, PA 18103.

WANTED: E and F coils for HRO-5AT1. W7RBF, (602) 864-9987

WANTED: Telegraph keys. Signal Corps 'J' keys with low no. (J-2, J-5, etc.); old Navy 'SE' keys; McElroy Mac-Keys. Send description, cond. and price. Tom French, W1IMQ, 120 Great Rd., Maynard, MA 01754. (508) 897-2226

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WANTED: Manual for HP600B; 3TF7 tubes; meters for R390A; TEK 465 or 475 scope, must be in very good cond. Clark Hatch, WØBT, 2546 SE Peck Rd., Topeka, KS 66605. (913) 235-2721

WANTED: Shock mounts for R-392 and BC-342. Brian L'Huillier, POB 37, Brownville, NY 13615.

FOR SALE: KWM-2A; KWT-6 USAF manuals- $30; 32RA-9 xmtr - $25; more, list - $.50 (coins). **WANTED:** Collins 62S-1 VHF converter w/manual. J. Orgnero, VE6RST, Box 32, Site 7 SS 1, Calgary, AB T2M 4N3. Canada (403) 239-0489

WANTED: Nice 75S-3/3A or 75A-4 SN 3,000 plus; Ranger II; Viking 500 or similar quality xmtr. K5YY, (903) 832-3344

WANTED: Drake TR-44B HF xcvr in working or non-working cond. Paul Thekan, N6FEG, 335 Rutherford Ave., Redwood City, CA 94061. (415) 367-1499

WANTED: Pilot Super Wasp. Cash or trade for mint AM gear. Bob Mattson, KC2LK, 10 Jane Rd., Highland, NY 12528. (914) 691-6247

FOR SALE: Collins R390A PTO and other 390A parts; Henry 4K Ultra parts; NC-240 w/manual. Earl, K5FTE, (915) 592-9185

FOR SALE: Hallicrafters S-77A rcvr, clean - $100; Heathkit HR-10, DX-60A w/13 xtas, clean - $200. Jim Leathem, K7BTB, Box 50355, Parks, AZ 86018. (602) 635-2117

FOR SALE: Lots of tubes, many NOS, some pulls, all checked. Send SASE with wants, no list available. Steve Harmon, N9HGF, 4340 N. Congress Ave., Evansville, IN 47711.

WANTED: 8 contact female cable conn. for BC-654/SCR-284/PE103; 0-3 A round RF ammeter. Tim, N6CC, 2608 Campeche Ct., San Ramon, CA 94583. (510) 830-9474

WANTED: Buy and sell all types of electron tubes. Harold Bramstedt, C&N Electronics, 6104 Egg Lake Rd., Hugo, MN 55038. (800) 421-9397, (612) 429-9397, FAX (612)-429-0292

ELECTRON TUBES FREE 1991 Catalog, over 2,000 types in stock. **Electron Tube Enterprises,** Box 311, Essex, VT 05451. (802) 879-0611, FAX (802) 879-7764

WANTED: Radar equipment, units or complete systems. Also early WW II aircraft TV cameras. Allan H. Weiner, 14 Prospect Dr., Yonkers, NY 10705. (914) 423-6638

WANTED: WW II military sets, racks, etc. Finders fee paid on non-owned sets purchased. Sam Hevener, "The Signal Corps", W8KBF, 3583 Everett Rd., Richfield, OH 44286. (216) 659-3244

FOR SALE: Radio tubes; repair and restoration of all vintage amateur and commercial radios, 25 years experience. Herbert Stark, 321 N. Thompson St., Hemet, CA 92543. (714) 658-3444

WANTED: Pre-WW II FCC amateur license application form, a copy, blank or otherwise. James T. Schliestett, W4IMQ, POB 93, Cedartown, GA 30125. (404) 748-5968

FOR SALE: Meters: Collins KWM2/A meter, used - $25; R-390 VU meter, new - $20, used - $10; R-390 carrier level, used - $10. Jack, WA2HWJ, (201) 927-7784

WANTED: TMC GPT-750 xmtr in good wrkg cond. Joel Thurtell, K8PSV, 11803 Priscilla, Plymouth, MI 48170. (313) 453-8303

WANTED: Collins 75A-4; Zenith Trans-Oceanic rcvrs, pretty and wrkg; also any tapes by W2OY. Brian Hemmis, K3USC, 7575 Hamot Rd., Erie, PA 16509. (814) 866-2585

WANTED: Drake 1A rcvr; also CE 458 vfo alone or with 10A, 10B, 20A. Art Charlap-Hyman, W6ZNO, 18151 Rancho St., Tarzana, CA 91356. (818) 342-1170

FOR SALE: National NC-2-40D rcvr w/matching spkr and manual - $325. Charles Stinger, W8GFH, 404 Ross Ave., Hamilton, OH 45013. (513) 867-0079

CLASSIFIEDS

FOR SALE: SCS-2 and 3 technical manuals (BC-638, 639, 640, 686, 687, EE-99, RC-81, 93 and RM-18, 25). SASE or call for list of these and over 100 other 1940's and early 1950's military technical manuals. August J. Link, 2215 Faraday Ave., Suite A, Carlsbad, CA 92008. (619) 438-4420 Mon-Sat.

WANTED: Excellent 3253 and 312B-4 sought for new Collins station. Prefer late WE. Peter, VE3URO, (416) 928-6153 (d), 694-4652 (n)

WANTED: HRO-60T, KWS-1. Carter Elliott, WD4AYS, 1460 Pinedale Rd., Charlottesville, VA 22901. (804) 979-7383

FOR SALE: Hallicrafters CRX-102 rcvr - $15; new CB-3A, Citizens Littlefone - $25; Clegg 22 xcvr - $25; J. W. Miller low pass filter - $10. Ward Becht, 625 Tufts Ave., Burbank, CA 91504. (818) 842-3444

WANTED: Hallicrafters SX-111 Mk I in mint cond. Will ship. Greg Pace, POB 102, Norcross, GA 30091. (404) 447-9345 daytime M-F

FOR SALE: 75A-4 w/spkr and manual, SN 1207, excell. cond. - $300 plus shpg. Charles Graham, K6KDZ, 20335 Casa Loma Rd., Grass Valley, CA 95945. (916) 273-6847

FOR SALE: Hammarlund HXL-1 linear, pr of 572Bs, approx. 350 watts AM, 800 watts SSB output, matches HX-50/HQ-170, presently in service - $375 firm. U-ship. Rick, KN3C, Lebanon, PA (717) 272-8763

WANTED: Mint or near mint: Collins 75A-4; Drake R4B, R4C, SPR-4; HC-10 IF strip. Will pay top dollar and pu anywhere in Northeast. Bob Bell, 89 Ridgehill Dr., Toronto, Ont. M6C 2J7. (416) 783-3288

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FOR SALE: KWM2, WE, SN 10254 and PM2 ps SN 7 - $450 plus shpg. Gary Elliott, NO5H, POB 295, Epps, LA 71237. (318) 926-3343

WANTED: Drake MN-4 matching network; xtals for R-4C; SSB generator for B&W 5100. Howard Albers, WA7PDN, 3306 Horton Smith Ln., Billings, MT 59106. (406) 656-4855

FOR SALE or TRADE: Johnson Matchbox 250-23; EE-8 phones; Silver 903; Shure CR-41 mic; Gonset Conv. (2); Weston T/T 777. Ray, (314) 428-1963

WANTED: Any condition, units modules or parts for R-390, R-390A, R-392, ARR-41, PRC-47, PRC-74; to buy quantities of receiving tubes. WA5THJ, 1920 Maxwell, Alvin, TX 77511. (713) 331-2854

FOR SALE: Johnson Desk KW - $1700; Johnson Thunderbolt amp. - $400; SX-62A - $200. PU only. Ben, W6FDU, 933 Robin Lane, Campbell, CA 95008. (408) 374-0372

WANTED: Military sets, AN/ARC-52, AN/APN-2, R-550/ARR-40, ARQ-9, WWII IFequip. (aircraft). Leroy E. Sparks, W6SYC, 924 W. McFadden Ave., Santa Ana, CA 92707. (714) 540-8123

WANTED: Manuals for the following: R-553/ARR-8B and Neptun-2, HF Naval rcvr made by Johnsen Radio, Denmark. Robert Bennett, 5675 Shadowhills, Las Cruces, NM 88001.

WANTED: Meissner Signal Shifter 20 M plug-in coil set winding info, PN 18-2918. Have forms, will twist. Jim Hanlon, W8KGI, POB 581, Sandia Park, NM 87047. (505) 281-0814

FOR SALE: Sonar SRT-120 xmtr - $100. **WANTED:** Coils E & F for HRO-60. Don, W7KCK, (503) 289-2326

WANTED: Meter switch for Heathkit AT-1 xmtr. Larry, W3MNE, 1598 Brimfield Cir., Eidersburg, MD 21784.

FOR SALE or TRADE: Eico 730 modulator, excell. w/manual - $50. **WANTED:** Hallicrafters SX-28, SM-40 S meter, HA-26 vfo, SX-122. Bill Colligan, N1DJR, 35 Quail Run, Hampstead, NH 03841. (603) 329-7879

WANTED: Manual for R-392, R-648, Viking I, SX-62A; vfo for R-392; tubes, 26A6, 26C6, 26A7. Dan Harlan, N8ETQ, 3418 Stanfield Dr., Parma, OH 44134-5052. (216) 845-5442

FOR SALE: Heath SB-10 w/manual - $45. **WANTED:** Cabinets for 51J4, GPR-90, SP-600; National spkrs; med. size (lower) knobs for 75A-2/4. Bill, KE7KK, 6712 Lake Dr., Grand Forks, ND 58201. (701) 772-6531

FOR SALE: UTC mod. xfmr C-VM-5, weighs 60 lbs, 600 watts audio, 1200 w class C. **WANTED:** xmtng RF chokes. Roland Matson, K1OKO, RFD 1, Box 2943, Kennebunk, ME 04043. (207) 985-3751

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FOR SALE: Our triple output Crystal Calibrator covers broadcast to UHF. On board regulator handles rectified filament voltage or 9V battery. Great bench or pocket signal source. Very helpful at hamfests.Large SASE for complete info. Visa/MC. Two Fox Electrix, POB 721, Pawling, NY 12564. (914) 855-1829

FOR TRADE: Immaculate Collins R-391/URR Radio Set. Includes extra-clean R-391 Autotune radio rcvr, like-new matching PP-629 rack mount Autotune supply, connecting cable CX-2083/U, power cable, very clean Remote Switching Control C-973 for use when set it employed in FRR-33 configuration, and original Collins (not Signal Corps) manual. A rare and beautiful set - once in a lifetime opportunity to own the finest! All I ask is a super-clean RE 51S1 in table-top cabinet w/ manual. For the right receiver, I can even sweeten the deal with new ballast tubes and 6082's. Contact R.W. Parker, KB2DMD, 21 Blue Grass Dr., Trenton, NJ 08638. (609) 883-3255

WANTED: Intelligence museum wants German, Japanese, Italian, Russian and Chinese communication equipment and any British or U.S. spy radios. LTC William Howard, 219 Harborview Lane, Largo, FL 34640. (813) 585-7756

WANTED: Old books; magazines; handbooks; Whites Radio Log; first Callbooks; old writings on early radio; issues of Radio Magazine. Call, write or FAX. I pay shpg. Please do not throw them away. Donald R. Boland, N1FYX, 28 Faulkner St., Malden, MA 02148. (617) 324-5362, FAX (617) 322-8412

FOR SALE: Hallicrafters S-20R - $55; RT-111/TRC-20, like new - $50; CE GC-1 audio compressor - $20; LM-18, LM-21, LP-5 - $25 each. George, WA7HDL, (208) 756-4147

WANTED: Hammarlund HQ-160/HQ-200 rcvrs; HQ-205 xcvr; Heath SB-310 rcvr. Any other Hammarlund fanatics out there? Harry Helms, AA6FW, 7445 Andasol St., San Diego, CA 92126.

FOR SALE: HQ-140XA - $150; Collins 75A-1 - $225; Globe King modulator unit - $125; Globe King ps/vfo unit - $70. Cliff Fleury, AI7Y, 64174 Tumalo Rim Dr., Bend, OR 97701. (503) 382-9162

FOR SALE: New Collins parts: 30L-1 blower motors - $35; 51S-1 PTO osc., 70K-7, P/N 522-2918-000 - $200; silver plated 30S-1 tank coils - $7. Dennis Brothers, WAØCBK, HC 84, Box 1, Potter, NE 69156. (308) 879-4552

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WANTED: Collins KW-1, KWS-1, KWM-1, R389, R390a, 75A-4 with 3 filters; SX-115. F.H. Werry, DJ3OE, Saturnweg 18, D-4056 Schwalmtal, Germany. phone: 01149-2163-20528, FAX: 20552. 24 hrs., will call back.

FOR SALE: SX-100 - $140; SX-71 - $140; HT-37, very clean - $100. James Olson, N6IFO, (415) 321-3319

FOR SALE: Partial sets of Radio-Electronics, Photo-Fact Reporter, El. Tech, El. World, Pop. El., CQ, 73; manuals - BC-334/RC 26, 27 interphone sets; Marvel-Schebler MA-4-5 (AA) carburators; '65 and '66 Bell Helicopter clinics; RCA Super Car/Fleetfone repair; Also: Heath GR-91, 550 Khz - 30 Mhz rcvr - $15; AT-556B/ARN-41 search head - $10; RE-2/ARC-5 ant. current ind. - $25; ICS audio amp #792-3900 - $5; BC-229/429 coil unit #C-269 - $5; BC-334 (et. al.) control modules; ARC-5 3-4 Mhz xmtr, no tubes or cover - $20; BC-1033A rcvr - $7; Philco 4-tube bat/ac AM chassis - $10; 108-126 Mhz Lear aircraft rcvr - $35; Sperry A-2 amp - $15; AN/ARC-48 rcvr w/dynamotor - $45; BC-453B 190-550 Khz rcvr w/shockmount, dynamotor, A-B control box - $55; T-17 mike - $5; MA-1 compass controller - $5; BC-347A interphone amp - $10; commercial aircraft and radio gauges: Piper Cub airspeed, amp, volt, cyl. temp. RPM, fuel PSI, tuning; New AC-285 aircraft sparkplug - $20. **WANTED:** Portable ham sets such as: Heath HW-8, 9, (99); Co-Pilot; Swan 260. All postpaid, OBO. Eric Jones, N4TGC, Rt 11, Box 492, Florence AL 35630. (205) 764-0675

WANTED: APS-50 ps for a Harvey Wells TBS-50. R.L. Kurth, M.D., W5TRP, 403 Mantooth, Lufkin TX 75901-2800.

FOR TRADE: RME DB-23 preselector for KWM-2 cabinet. Steve, WB7BNZ, (509) 649-2913

WANTED: Drake R-4B w/FS-4. Levy, 8 Waterloo, Morris Plains, NJ 07950. (201) 285-0233

FOR SALE: Signal Sentry case - $4; DX-100, nice - B/O; Invader - B/O; Viking II - $50 or part out. **WANTED:** Diagram for ST-203A, Viking 500 owners: would appreciatte comments regarding modifications and updates. Joe Sloss, K7MKS, 4732 119th SE, Bellevue, WA 98006. (206) 747-5349

WANTED: Transistor radios (Motorola, Zenith, Regency, etc.) and small tube portables. S. Martin, 815 N. Hayden Rd., B-204, Scotts, AZ 85257.

ELECTRIC RADIO PARTS UNIT DIRECTORY

At this point the directory has 200 units in it. If you need a part for a vintage restoration send $2 and an SASE (.52 postage) for the list. If you have a parts unit, consider putting it on the list. Your dead unit can help bring others to life!

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WANTED: Machine shop work. Knobs shafts bushings, etc. made to your sample or drawing. Reasonable. Jim Dill, Box 5044, Greeley, CO 80631. (303) 353-8561 evenings.

FOR SALE: Parts by mail since 1954. Vintage parts available. Send stamp and request "Vintage Flyer". USA only. Bigelow Electronics, Box 125, Bluffton, OH 45817

FOR SALE: Several Hallicrafters S-38s, ABCDs, very good, may need alignment, includes manual copy and shpg - $50 each; Collins mech. filter F455A2 for KWM-2 - $60; 15 ARRL Handbooks, 1943 to date, plus other books - LSASE for list; parting BC-610 and B&W 5100. **WANTED:** Pre 1940 ARRL Handbooks for my collection. WA7IIN, P.O. Box 442, Aumsville, OR 97235. (503) 749-1149

WANTED: Early TV camera equipment. Also buying and selling radar equipment. Allan H. Weiner, 14 Prospect Dr., Yonkers, NY 10705. (914) 423-6638

FOR SALE: 1 set of xmtr tank coils for 80, 40, 20, and 10 meters (Bud, 300 watt); (2) Astatic D-104 mics w/stands. Bill Riley, W7EXB, 863 W. 38th Ave., Eugene OR 97405.

FOR SALE: Galaxy 300 w/spkr, ps, manual - $100; HP-202A square, sawtooth and sine-wave gen. - $50. Above in good wkg cond. Several xfmrs 120v pri., 240v sec @ 2 amps; BC-610 rf deck cabinet; antique portable Hickock RF/AF gen. in carrying case, 100 Kcs - 40 Mhz, RF or 400 cycle mod. RF, no model number; antique portable florescent fixture lamp and starter tester in carrying case, Dayton ACME Co., model #3. Rick, K8MLV/Ø, (719) 543-2459

WANTED: VT-52 tubes; WE 618; 171 xfmrs; Triad HS-1; HS-32; Kenyon T-109; T-110. Trade my 6 Kc R4C filter for 4 kc. Joe, N4WQC, Box 19302, Alexandria, VA 22320. (703) 683-2955

FOR SALE: Old technical hard back books, radio, elect. eng., TV, physics, chemistry, machinists, etc. - $2 each; also softback books - $1.50 each. Minimum of 50 books. No list. All plus UPS. S.T. Carter II, W4NHC, POB 033177, Indialantic, FL 32903-0177. (407) 727-3015

FOR SALE: Pre-40s and later xmtrs and revrs; special purpose tubes; surplus radio equipment. LSASE for list. B.V. Edmondson, Rt 1, Box 2599, Lee, FL 32059.

FOR SALE: Hallicrafters Sky Buddy - $60; SX-101 - $150,negotiate shpg; National SW-54 - $50; BC-645; BC-342. Also HV caps 100-3KV, discs and electrolytics. Frank Tamilio, WA1VNR 6 William St., Arlington, MA 02174. (617) 641-2055

WANTED: To share a lifetime of accumulated radio since 1920. What do you need? Cdr. Glenn W. Ritchey, USN Ret., W7SAB, 219 Naval Ave., Bremerton, WA (206) 373-9631

FOR SALE: National HRO-60, w/spkr, all coils, manual - $185; HT-37 - $100; HT-32 - $85; Eico 730 modulator - $40; Sencore tube tester, new - $45; 813s - $20; 805s - $20; 3B28s - $5. Levy, W5QJT, 539 McCarty, Ste. 407, San Antonio, TX 78216. (210) 366-3290

WANTED: NC-183 main tuning knob (grey with chrome insert); NC-183 spkr and Globe screen modulator. Jack Shutt, N9CT, 1820 Dawn Ave., Ft. Wayne, IN 46815. (219) 493-3901

FOR SALE: Eimac 8165/4-65A new in sealed box (3) - $30 each; General Radio model 1181B AM freq. deviation monior - $35. Ron, KC6WTG, POB 783, Santa Rosa, CA 95402. (707) 539-8319

FOR SALE: Transmitting/Receiving tubes, new and used. LSASE for list. I also collect old and unique tubes of any type. Looking for Taylor and Heintz-Kaufman types. Maybe you have something to trade? **WANTED:** Large tubes and sockets from old Eimac line; 450T through 2000T for display. John H. Walkter Jr., 16112 W. 125th St., Olathe, KS 66062. (913) 782-6455

FOR SALE: 3.1 Kc filter for S-Line.**WANTED:** CW filter for S-Line; Collins 270G, 312A-1 spkrs, SM-2, SM-3 mics. Butch, KØBS, 5361 St. Mary Dr., Rochester, MN 55901. (507) 288-0044

Please remember to count the words in your ad. If you are over 25 words, please send 15 cents for each extra word.

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WANTED: Collins 75A-4, 51S1. Trade: GE K50; AK-165; Riders I-XIV. Brian Roberts, K9VKY, 3068 Evergreen Rd., Pittsburgh, PA 15237. (412) 931-4646

FOR SALE: B&W LPA-1 dual 813 grounded grid linear amp - $250. PU only. **WANTED:** Knight Ocean Hopper w/case and plug-in coils in very good to mint condition; also manual for Hallicrafters S-107. David Ishmael, WA6VVL, 1118 Paularino Ave., Costa Mesa, CA 92626. (714) 979-5858

FOR SALE or TRADE: TBS-50A w/ps; Globe Champ 300; Collins PTO; manuals. **WANTED:** Drake B or C-Line complete; PMR-7 rcvr; 75A-4. Gene, W7MXM, 508 S. Ammon Rd., Idaho Falls, ID 83406. (208) 522-5854

WANTED: Qty of Johnson ceramic transmitting tube sockets, 4-pin bayonet type for tube display purposes. John H. Walker Jr., 16112 W. 125th St., Olathe, KS 66062. (913) 782-6455

WANTED: Original manual for Collins 32V-2; antenna relay for Collins KWS-1; original manual for Collins KWS-1 vintage 1955. Bob, K7NWB, (602) 833-7786

FOR SALE: Johnson Viking II with 122 vfo and spare Viking II for parts, works good - $100. No shipping. Dan Radcliffe, KF9BP, 8201 Plainview Pkwy., Sussex, WI 53089. (414) 255-9165

WANTED: Receivers: Squires Sanders SS-1R; 51S-1; ARR 15; R-388/388A; G1 33. Mitsugu Shigaki, JA6IBX, Jozan Kamidai Machi 2825-2, Kumamoto, Japan 860.

FOR SALE: Heath HW-16 CW xcvr with book & 6 xtals - $50; Heath HW-12 xcvr with book, hand mic, spkr, house supply - $70. U-ship. Rich Lucchesi, WA2RQY, 941 N. Park Ave., N. Massapequa, L.I. NY 11758. (516) 798-1230

WANTED: Aug. 1969 CQ magazine; CE 100/200V with 160M, will pick up within 300 miles of my QTH. Pat, WB9CKZ, 3767 Fairview Rd., Green Bay, WI 54313. (414) 434-9016

WANTED: RME DM-36 converter (matches RME-69 rcvr). Will trade RME VHF 152A conv. or buy. Bill Braden, WC7O, 2831 N. Sherry Ave., Tucson, AZ 85712. (602) 322-5601

WANTED: Good front panel and meter cover for Johnson Valiant II. Jeff, W7ID, (208) 323-9267

CLASSIFIEDS

WANTED: Hallicrafters S-85, smoking or not! Marcus Frisch, WA9IXP, Box 28803, Greenfield, WI 53220-0803. (414) 545-5237 (machine)

WANTED: Power xfmr for RCA AR-88. Fred, WD5BPP, 10981 FM 20, Kingsbury, TX 78638. (512) 639-4437

FOR SALE: R-648/ARR-41 rcvr - $200; Johnson Viking Matchbox, 250 w - $75; (2) Heath SB-10 SSB adapters - $60 each; Navy TED xmtr modulator - $60. **WANTED:** Navy RAX CG-46115 rcvr. Steve Davis, KD2NX, 705 13th Ave., Belmar, NJ 07719. (908) 280-9760

FOR SALE: WW II military equip. manuals, originals and quality reprints. Send your wish list or a check for any of the following reprints:BC-348H, BC-312J/BC-342J, BC-375-E, B-17 flight manual. $10 each plus $1 shpg. Keith Morton, 3936 E. Orchid Ln., Phoenix, AZ 85044.

WANTED: Johnson Viking II, vfo, Ranger II, 500; Heath DX-100, Apache, Warrior (all VGC to mint, please); Hallicrafters HT-32/A/B black front bezel (or non-wkg unit); knobs (all) for DX-100. Todd Zelasko, KA8CEF, 9401 Grand Division, Cleveland, OH 44125. (216) 883-5134

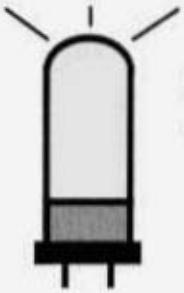
FOR SALE: URM-25D sig. gen. - $60; I-177B tube tester - $35; National HPS w/coils and ps - $125. WANTED: Pre-war and WW II HRO's, coils and National table racks for HRO's. John Orahood, 5819 Miller Valley, Houston, TX 77066. (713) 440-5598

FOR SALE: RCA AR-88 - $100; BC-639 w/RA-42 ps - $60; AN/ARN 59 radio compass (2 836 rcvrs, C2275 control box, AT-780 antenna, ID 637) - $50. **WANTED:** R389; CRV-23073 control unit and CRV-20131 ps for RAK/RAL rcvrs. Tom Brent, Box 1552, Sumas, WA 98295. (604) 826-4051

FOR SALE: Volt-ohm-meter I-166, model 3AP 415, in nice homemade wood box, has been restored - $25 + $4 shpg; Fada model 790, brown, missing 1 knob - $35 + $5 shpg; Majestic AC elect. pwr unit, no controls on box, has rectifier and plug-in ballast - $25 + $5 shpg; Hallicrafters AM-FM chassis, 10 tubes, large slide rule dial, untested - $25 + $5 shpg; 18 rolls, 1800 ft mylar, 1 mil, Soundcraft recording tape, all for - $25 + $4 shpg; CBC minimax CCTV Corp. model CTC-3010, B&W TV camera - $25 + $5 shpg. James Fred, R1, Cutler, IN 46920. (317) 268-2214

FOR SALE: Jennings vacuum var. caps,some with motor drives, 300 pfd/10K volts - $80 and up; new 4-400 w/used socket, chimney, blower and fil. xfmr - $180; new 4X150 - $40.All prices include shpg. Clyde Sakir, N7IOK, 4243 E. First St., Tucson, AZ 85711. (602) 323-1120

WANTED: National doghouse power supplies; black wrinkle spkrs; SW-4; SW-5 and good silver dial from junker Sky Buddy. Robert Enemark, W1EC, Box 1607, Duxbury, MA 02331. (617) 934-5043



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