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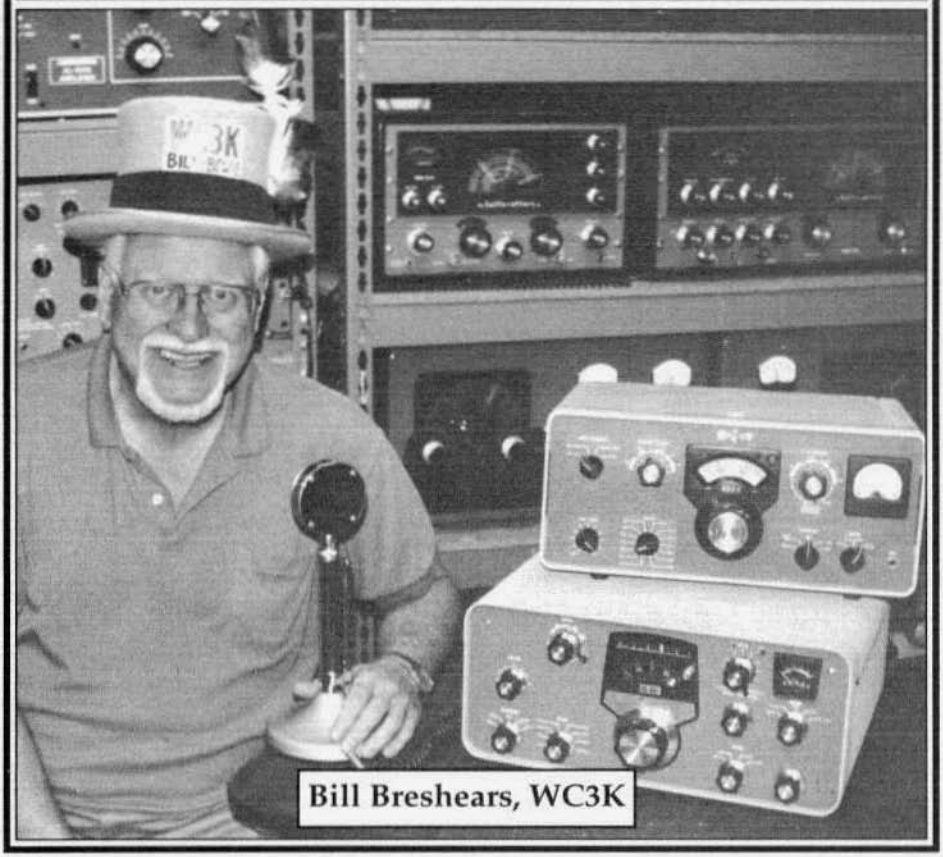
ELECTRIC RADIO

celebrating a bygone era

Number 139 December 2000



Bill Breshears, WC3K

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

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

Regular contributors include:

Walt Hutchens, KJ4KV; Bill Kleronomos, KDØHG; Ray Osterwald, NØDMS; Dave Ishmael, WA6VVL; Jim Hanlon, W8KGI; Chuck Penson, WA7ZZE; Dennis Petrich, KØEOO; Bob Dennison, W2HBE; Dale Gagnon, KW1I; Rob Brownstein, K6RB; Don Meadows, N6DM; Lew McCoy, W1ICP; Kurt Miska, N8WGW; Warren Bruene, W5OLY; Brian Harris, WA5UEK; Thomas Bonomo, K6AD and others.

Editor's Comments

Colorado Morning Group Thanksgiving Day Bash

The annual Colorado Morning Group 75M Thanksgiving Day Bash (fifth or sixth at least) was again a big success. Event organizer and net control, 'OJ' KØOJ reports that there were 55 check-ins from 8 states. Also helping as net controls were Mike, WØFD and Jim, WØNKL.

AMI Thanksgiving Weekend Jamboree

It sounded to me like there was a considerable amount of extra activity over the Thanksgiving Weekend, particularly on 10 and 20 Meters, and that the AMI Jamboree was well attended. Next month Dale, KW1I, AMI President will have a complete report.

160M QRO Jamboree, December 23

Don't miss this event as either a participant or listener. And please remember to send in your vote for the station with the best audio. I'll be counting the votes (with the help of a committee of hams from Florida) and will announce the winner in the February issue. Bill Kleronomos, KDØHG, sent in a photo of the trophy (page 17) that he has had made, and it should provide a lot of incentive for those with 'big iron' to participate. Speaking of 'big iron' Paul Courson, WA3VJB reports that the directory of BC transmitters that he is compiling now has over 40 units on it. It would seem that the interest in operating BC transmitters on the hambands is growing.

The Annual ER/N2KSZ Memorial 160M Jamboree/Contest

And also, don't miss this event that will be held this year on the weekend of December 30/31. Happy Holidays to all from Shirley and me. N6CSW

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Weird and Wonderful Radios I Have Known

by William Orr, W6SAI
48 Campbell Lane
Menlo Park, CA 94025

Radio is my vocation and advocation. I was first licensed in 1934 and was an SWL for several years before that. I remember looking down into the loud speaker of my dad's Radiola III, trying to view the little men inside. I saw no little men. Time passed quickly by and in 1941 I was working in the Electrical Department of Douglas Aircraft Company in Santa Monica, California. My section of the department tested the radio equipment that went into various Douglas planes. I quickly found out that radio was a greater concept than mere shortwave or broadcast reception. It was being used to fight the war in different and amazing forms.

Loran

Loran (Long Range Navigation) was a triangular navigation system based upon a "master" and two or more "slave" transmitters (Fig. 1). Pulses transmitted from the stations were viewed on a special receiver having an oscilloscope output. The operator visually aligned the pulses and read off his position on a special indicator. The system was in use over the Atlantic and Pacific areas and the megawatt pulses completely blanked out a 500 kHz section of the spectrum. Since ham radio was closed down for the duration, the Loran system was placed in the 160 meter band (1800—2000 kHz). After the war, the system remained in operation and much effort was expended by the ARRL and the FCC to get the military to move this nuisance out of the ham band.

After a time, Loran was improved, and moved to the 100 kHz frequency where it still operates in some regions of the world.

The APN-4 and APN-9 Loran Oscilloscopes were replaced by better receivers and plenty of the old gear showed up on the surplus market at knock-down prices. A prized component of the receiver was a high quality 100 kHz crystal, utilized by hams to build frequency markers.

"Tail-end Charlie", The APS-13 Transceiver

This compact unit was placed in aircraft. It was a small, pulsed radar transceiver which gave an audible buzz on rear approaching aircraft. This was a blind spot in most small military planes and the warning alerted the pilot of an aircraft on his tail. This device has survived to the modern day in the form of a solid-state radar warning device for automobiles.

The SCR-522 Aircraft Transmitter-Receiver

Built primarily by Bendix, in the late "thirties" the SCR-522 was an 8-watt transmitter/receiver package with a rudimentary auto-tune system. It covered the range of 100 to 156 MHz and was amplitude modulated. Power output was about 6 watts.

It was a heavy brute and it took considerable dexterity for the technician to properly tune it up to all six crystal-controlled operating channels. Once tuned and the controls locked it was ready to be placed in the aircraft.

A story floating around after the war was that hundreds of SCR-522s were removed from aircraft situated in North Africa and were replaced by British radios. The SCR-522s were piled up near the airport and eventually were covered with sand. Possibly they are still there today!

SCR-522s on the US surplus market

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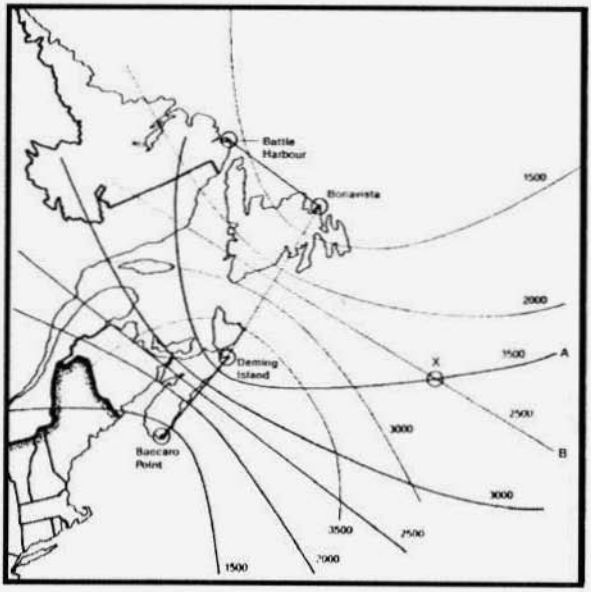

Figure 1. Loran allowed a ship or aircraft to obtain its position using the time difference between signals from two pairs of land-based stations. The position (X) is the intersection of two hyperbolas as shown on the special U.S. Navy charts.

were quickly converted for 2-meter operation. The receiver was insensitive, but the transmitter was excellent, and some hams modified it for VFO operation.

The Rebecca-Eureka Navigating System

In the preparation stages of the invasion of Europe in World War II it was quickly determined that ground-based radio beacons were necessary to guide the paratrooper-laden C-47 transport planes to a drop site.

Before the drop, low-flying observer planes dropped a VHF "Rebecca" radio beacon that sent a coded signal. This signal was picked up by a "Eureka" receiver in the plane which had two Yagi antennas, one on each side of the nose. The readout was an oscilloscope pattern that indicated distance on the Y-axis and right-left information on the X-axis. The picture provided guidance for the pilot to home on the beacon (Fig.2). Provided the beacon survived the parachute drop, and provided it was not found by the enemy and moved to a less desirable location or destroyed, it proved to be a success and saved many allied lives in the crucial days of the initial landings.

The "Identification, Friend or Foe" I.F.F. Radio

How do you keep anti-aircraft guns from shooting down friendly planes? In gloom or night, how do you tell if an approaching aircraft is friendly? A radio beacon in the aircraft could be the answer. The SCR-595 receiver/transmitter picked up an interrogating radar signal and retransmitted it, along with a code that identified the aircraft.

To prevent the enemy from recovering the IFF set in case of a crash landing, a plug-in detonator was added just before the plane took off. If the radio was subjected to a heavy-g shock the detonator would blast the radio to pieces.

Some smart-ass pilots made a game of landing, tail down, thus bumping the radio. The detonator would explode, showering the back of the plane with rivets and metal fragments. The SCR-595 was not a complete success and was soon supplanted by the SCR-695 which was relatively pilot-proof.

The BC-348 Receiver

The "star" of the postwar surplus market was the BC-348 receiver, designed to operate from a 28-volt DC supply. As these sets were used in aircraft, they are extremely compact and much smaller than an equivalent commercial communication receiver.

Many models of the receiver were made by RCA and Wells-Gardner Co.

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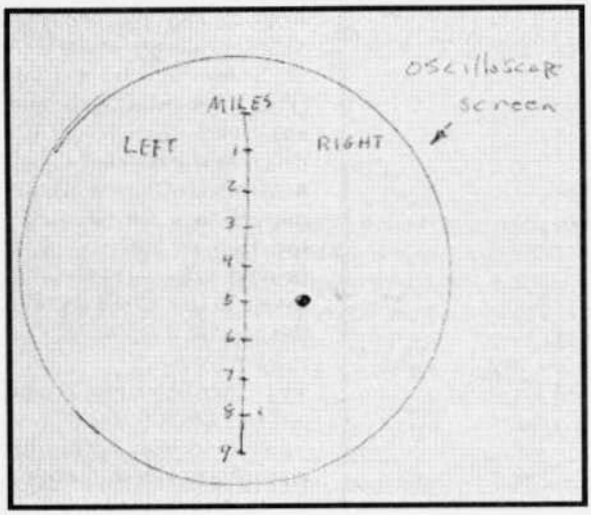

Figure 2. The "Rebecca" beacon is 5 miles ahead of the plane and to the right of it. Pilot can home-in on the beacon for a parachute drop.

The model most desired by hams was the BC-348-Q which had more up-to-date tubes in it.

The receiver had two RF stages and three IF stages. The intermediate frequency is 915 kHz. A crystal filter is included in the circuit also. Tuning range is 200 to 500 kHz and 1.5 to 18 MHz.

A brand new BC-348 could be bought for $75 and a used one for about 40 dollars. Today a BC-348 in mint condition runs over $200.

It is easy to modify the receiver for AC operation, replacing the dynamotor with a small power supply. The filaments can be rewired for 6.3 volt operation.

Many DXers used the BC-348 receiver until the Collins 75A receiver came along. The BC-348 was quickly reduced to a museum item.

The BC-221 Frequency Meter

The BC-221 (SCR-211) frequency meter was a precision instrument designed to measure or radiate a test signal between 125 kHz and 20,000 kHz. There were many models made, all varying slightly in construction.

The unit was battery operated requiring 6 volts for the filaments and 135 volts for the plate supply. A calibration book was included and the unit could be checked against a 1,000 kHz crystal oscillator.

This was a beautiful instrument and they were snapped up eagerly at about $45 by many hams. However, with the use of the VFO, the BC-221 was of little use. Many hams, in fact, converted the BC-221 to be a VFO for their transmitter.

The AN/APQ-13 Radar Set

One day in 1943 my supervisor informed me that I was selected to go to the Aircraft Radio Engineering School at Wright Field (now Wright-Patterson AFB) in Dayton, Ohio for a three week course in the theory and use of airborne radar.

I was investigated and cleared by the FBI, so off I went, along with Howard Coleman, W6SXW, who was an Air Force Inspector at Douglas Aircraft Co. He would also take this course.

I lived in a hotel in downtown Dayton and took the trolley each day to the school which was situated in a large garage, with two military guards at the door. Once inside, several APQ-13's were running with the dish antennas located on the roof.

The APQ-13 was a pulsed UHF transmitter, using a magnetron oscillator to generate several megawatts of peak power around 1 gHz. Average power was quite low. The receiver portion of the set was a sensitive crystal detector, followed by a wideband IF amplifier. It was a thrill to track an airplane with this wondrous contraption.

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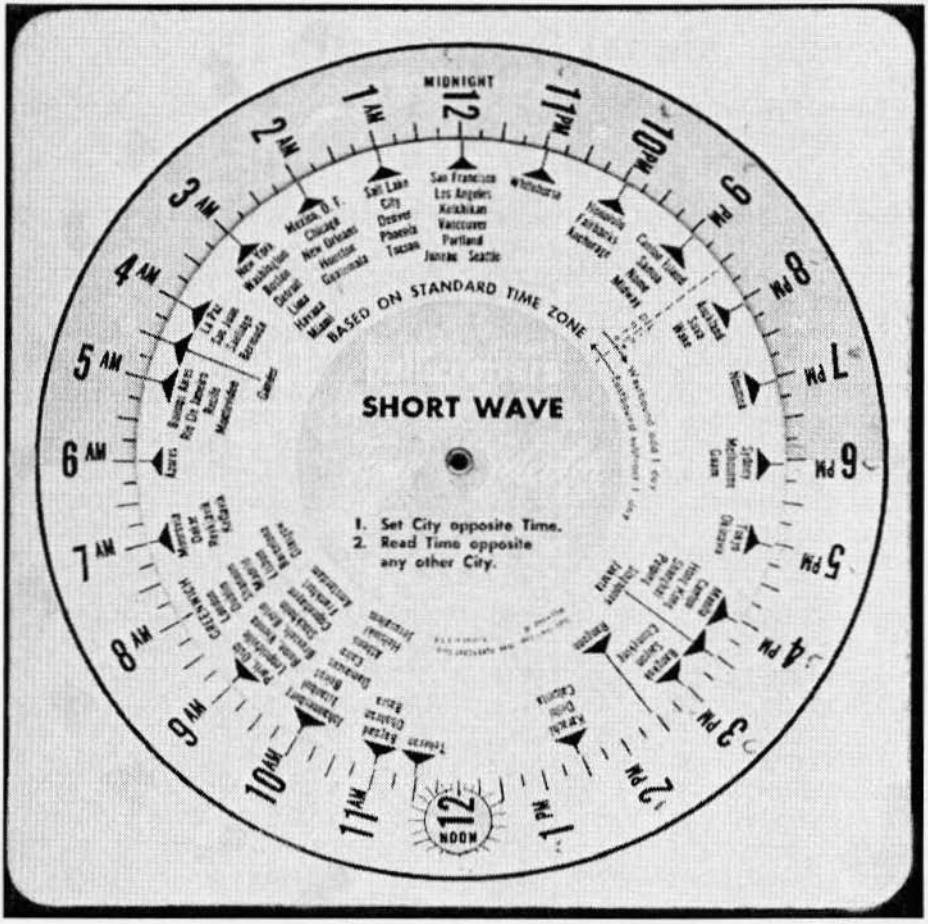

What Time is it Worldwide?

by Dennis Olmstead, WB9EMD
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Did you ever want to know the time and date in other areas of the world? About 40 years ago Hallicrafters handed out a shortwave Time Selector. You can make one yourself today. Simply make two copies of the circular guide. Cut out and paste the larger time dial to a cardboard sheet. Cut out the smaller city guide circle and fasten it to another cardboard. Punch out the center of both pieces of cardboard and place the city circle on top of the time circle with a small bolt set, with the nut on top. Done. Enjoy. ER

Signal Corps Radio 197

by Chuck Teeters, W4MEW
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Augusta, GA 30909

Some items from World War II stand out as contributing significantly to the allied success. The P-51 Mustang, the Douglas C-47, and the Jeep are well known while Signal Corps radios are known only to those who follow military communications. Among those in the know about WW II signal equipment the one radio often cited as wining the war is the SCR-299.

The SCR-299 consisted of the Hallicrafters built BC-610 transmitter and the 'built by everybody' BC-312 and BC-342 receivers in a K-51 oversized panel delivery truck. The SCR-299 is also remembered as the start of a long line of mobile high power HF radio sets that used the BC-610 transmitter. The SCR-399; SCR-499; AN/MRC-1; AN/MRC-2; and AN/GRC-26 are descendants of the 299 conceived between 1942 and 1958. But the SCR-299 was not the first of the line, but a very hastily built follow up to the first high power HF mobile, the SCR-197.

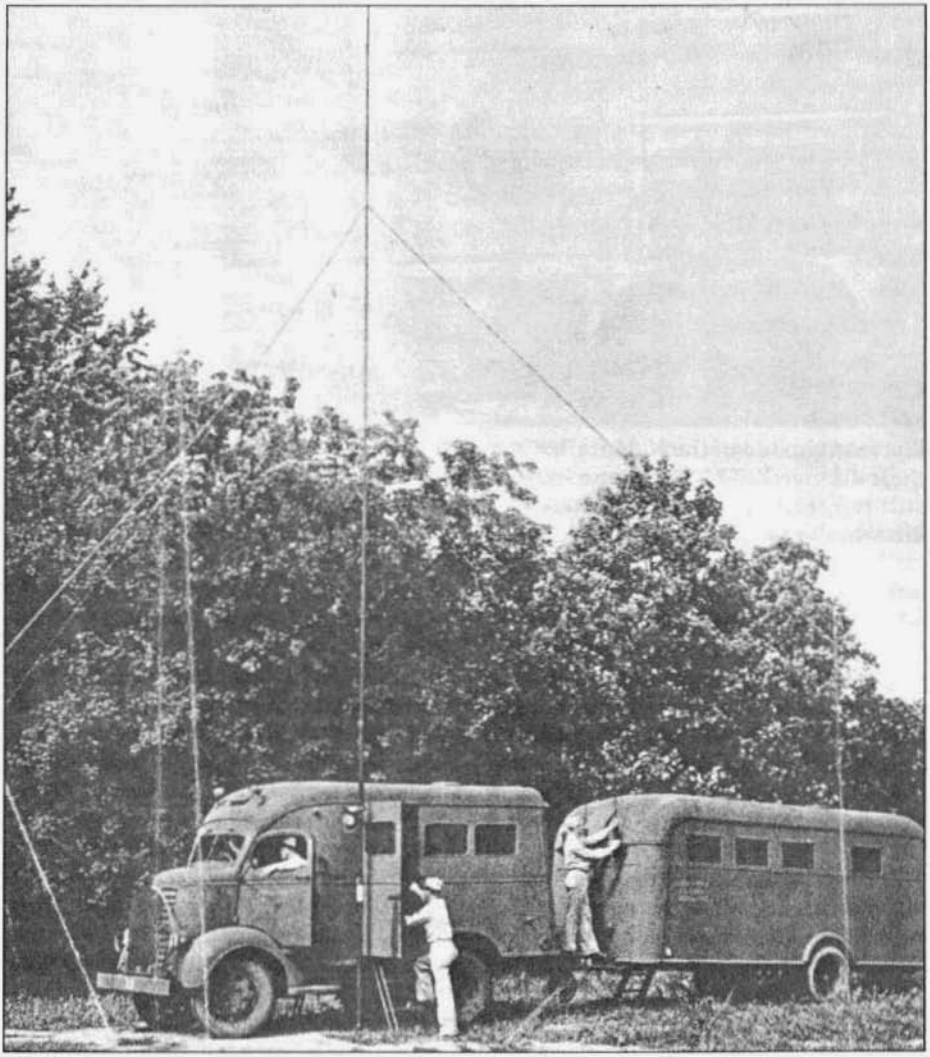
In the late thirties Signal Corps observers in Spain sent back reports on the mobility of the combined arms operations developed by the German Army. Radio communications was an essential part of the operation. They called for development of a similar integrated communication concept for the American Army. The best mobile radio in the Army inventory at the time was the SCR-193, a 75 watt set. War Department tacticians said we needed a set with a dependable range of 100 miles. With ground wave operation this translated to 400 watts of RF. A rush request was sent to the Fort Monmouth Signal Labs in September 1938 for a transportable 400 watt HF radio. Nomenclature assigned was SCR-197.

The Army operated a fixed communication service in the thirties between camps, posts and stations that used commercial transmitters. The 400-watt Western Electric, model D-151248, was one of the transmitters used by the Army and was nomenclatured as the BC-325. It covered 1.5 to 18 MHz VFO or crystal and used plug in coils. It had a 400 watt CW output and 100 watt phone output using grid modulation. It employed Western Electric tubes with a pair of WE-270As in the power amplifier. It had proved dependable in point-to-point and air ground service and was selected as the transmitter for the SCR-197.

There was no question about the receivers for the 197 as the Signal labs had just developed a new series of receivers. The BC-312 and BC-342 were identical 1.5 to 18 MHz receivers except for the internal power supply. The 312 had a 12 volt dynamotor providing high voltage while the 342 employed an AC line operated transformer rectifier.

Because of alternate frequency monitoring requirements and power, three receivers were required, two BC-342s and one 312. The BC-312 was to provide reception using a storage battery when the AC power unit was shut down for refueling.

There was also a receiving requirement of 27 to 40 MHz for air warning. In 1939 the Army used 1.5 to 18 MHz for tactical ground force AM and CW communications. Artillery and armored forces also used 43.8 to 53.8 and 52.8 to 65.8 MHz for short range communications. These small modulated oscillator sets were classified as AM voice but probably had as much FM as AM. The



Complete 197, serial number 2. The 45-foot antenna shown was supplied with all of the 197s. ***Photos are from the November, 1942 special Signal Corps issue of Radio News.***

Air Warning Service was brand new and assigned to operate AM in the 27 to 40 MHz range. To meet this requirement an off the shelf Hallicrafters S-20R Sky Champion covering .54 to 44 MHz was utilized.

Army fixed installations at camps and posts were set up with receiver-communications centers separated from the transmitters by a few miles. Remote keying of the transmitter from the receiver-com center was used. This avoided overload and cross modulation problems when using duplex frequency pairs. The same concept was thought to be necessary for the SCR-197. A K-18 shop truck was modified to hold the BC-325 transmitter, a 5 kW gasoline power unit, plug in coils and spares. A K-16 13 foot message center

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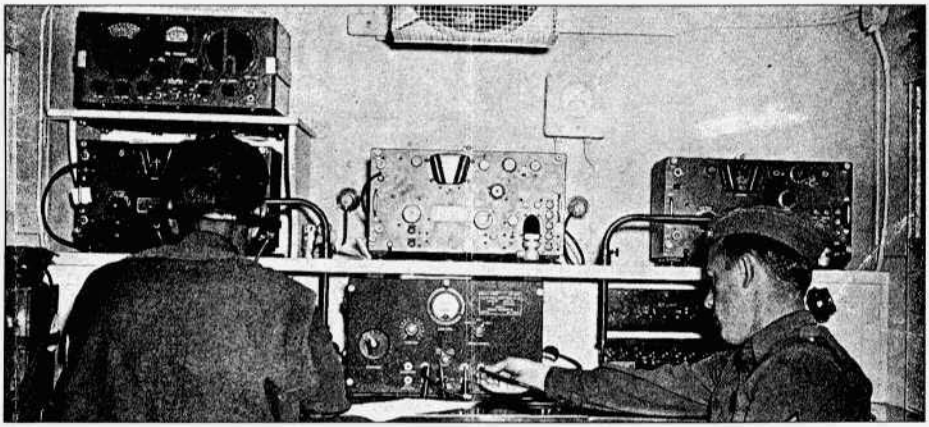

The front inside of the K-16 trailer. An S-20R receiver is at the top. On the middle shelf are two BC-342s and one BC-312. Hidden behind the operator is an MC-88 mill (upper case only typewriter). In the middle is the RM-7 and on the right is the telephone switchboard.

trailer was modified to hold the receivers along with the message center. It had a 2.5 kW gasoline generator for power. A remote control for the BC-325 was put together in Squire Lab. It consisted of two RM-7s that allowed control, keying, and modulation of the transmitter from the receiver trailer over two pairs of field wire at distances up to 7 miles.

The Army had and still does have a penchant for ground wave radio circuits. Ground or surface wave provides close to the 100% propagation reliability the Army wants. Ground wave requires vertical polarization. Whip antennas are omnidirectional vertical polarized radiators and this is in line with Army ground mobile operational requirements. The standard receiving 15 foot whip was deemed to be adequate for the SCR-197 receivers, but there was a question about a transmitting whip. With a 400 watt transmitter was there sufficient base insulation, would corona be a problem, and how could the whip be matched to the BC-325 transmitter? Since time was short, the Premax Products Company was called in. They had experience with 2 to 13 MHz marine vertical antennas. They recommended their 45 foot vertical. Squire lab rebuilt the 100 watt BC-306 antenna tuner to handle the higher power and the BC-729 antenna tuner was the result.

The first SCR-197 was assembled at the rear of the Squire Lab, building 283 at Fort Monmouth. Actual construction started with removal of equipment and partitions in September 1939 from the K-16 and 18. It was necessary to fabricate mounting hardware, operating tables, cables, junction boxes, and storage cabinets. Work progressed rapidly as the war situation in Europe became more serious each week. Procurement of parts was speeded up when for the first time Signal was able to purchase items up to $5000 without prior approval from Washington.

The 197 was ready for its first tests in February 1940. Power units, receivers, and transmitter were checked individually and as a system. Small problems were worked out and the first move and communication test was done in April. Everything was packed up and the unit moved across post to the Oceanport training area. The 197 was setup and operated with no problem. A

temporary CW circuit was used with Army radio station WAR in Washington, DC. Signal instructors from the training battalion at Monmouth were brought in to study the installation and operation of the 197. By June 1940 the 197 was a familiar sight in the Little Silver, Camp Woods, and main post areas as the troops moved, set up, communicated, and tore down.

The tests were going so well that construction was authorized on four more 197s. Work was started in the shop area behind Squire Lab in June 1940. That same month the War Department ordered the 197 and 20 enlisted men under the command of Lt. Bill Soules, W9DCM, to Louisiana to support summer maneuvers. In Louisiana the 197 performed well beyond expectations as far as communicating, but was constantly requiring support. Movement off road was impossible without a tow vehicle, fumes and heat from the gasoline generators were suffocating operators, and the guy ropes on the transmitting antenna caught on passing vehicles and personnel and snapped the antenna off many times.

The 197 operators found that by not separating the K-18 trailer from the truck, they could power the receivers from the transmitter power unit and not run the trailer power unit. All operation was simplex and break frequencies were well separated so there was no problem with transmitter receiver interference. The operator needed to get into the truck only for transmitter frequency changes. The 45 foot antenna had broken so many times that they were operating mostly with the bottom 20 foot. They eliminated guy ropes as the antenna was braced to the side of the truck. The transmitter loaded properly and communications was good with the shorter antenna. The S-20R became an entertainment radio as the air alert net was reassigned to the 4 MHz range as VHF did not provide sufficient range.

As the results of the maneuvers got back to Monmouth, the engineers reevaluated the 197 configuration. A new 4 wheel drive light cargo truck, the K-51, had come into the Army inventory and it appeared from tests at Aberdeen Proving Grounds it would be just what would be needed for a revised 197. However the truck had a vertical clearance of 51" and the BC-345 required 62". A talk with WECo did not look promising for a revision of the transmitter so inquiries were sent to five other manufacturers. A decision was made to put the transmitter and receivers together as the tactical communications was one way reversible both simplex and duplex. That would free up a trailer for a power unit and eliminate the need for the remote control units and several miles of field wire.

With the war heating up the War Department and OsigO said to leave the SCR-197 as is, and build a new 400 watt mobile radio incorporating the changes suggested. The five SCR-197s would be completed and used as emergency replacement stations for existing fixed stations. The original 197 stayed at Squire Lab and later moved to Camp Coles in Red Bank, NJ. The second 197 was assigned to the Fort Monmouth Signal School for training. Number three was sent to Fort Myer, VA. Number four went to Preceido, San Francisco. Number five went to an undisclosed location in North Carolina. Number three was the most interesting as it was eventually mounted in a small Army patrol boat and stationed at Woodbridge, VA. Its function was to sail out the Occuquan Creek, and up the Potomac to provide communications for a destroyed Washington station. Signal Corps Captain Malcom Crandal was the OIC, and had a great time passing himself off as a Navy Captain, at least on the telephone.

The revised version of the 197 ended up as the SCR-299. The Hallicrafters transmitter was chosen for the 299 as it was the only 400 watt unit that would fit in the K-

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Conversion of the R-390 IF Deck for Use in R-390A for Improved Audio
Or
Make Your Own R-725

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As many of the readers of Electric Radio know, the US Army created a modified R-390A version for direction finding known as the R-725/URR. I wrote about this modified radio in this publication a few years ago.

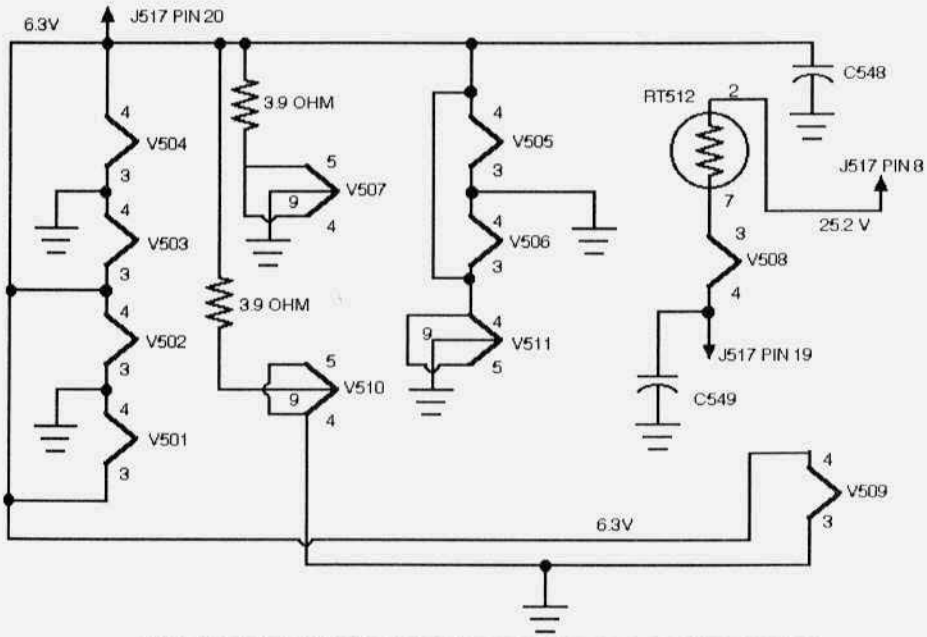
The main difference between a R-725 and the R-390A is that the R-725 utilizes a custom built IF deck that is very similar in construction to the R-390 IF deck. It has tuned circuit selectivity instead of mechanical filters, The mechanical filters created distortion when the R-390A was employed for radio direction finding use. In an internal Collins engineering report published in 1952, Lou Couillard wrote of the improved R-390A, which at that time was called the R-390(XC-3), "Although the superior shape factor of the mechanical filter IF is desirable in most applications, consideration should also be given to an alternate tuned circuit design for use in special applications. The excellent shape factor of the mechanical filters precludes the possibility of linear phase shift across the passband. Where a linear phase characteristic is desired such as in direction finding equipment, a tuned circuit IF is necessary."

Employment of the tuned circuit IF is exactly what was done in the R-725. In addition to the new IF deck, the R-725 was given a new filament transformer and a minor modification for the PTO to provide improved stability.

Motorola was awarded a contract in 1956 (476-PH-56-91) to prototype the R-725. I know of a couple of these existing today.

Packaging of modified sets for quantity DF use was handled by Arvin Industries and Servo Corporation of America. Approximately three hundred R-390A's were modified to the R-725 configuration. These sets are relatively tough to find today. New IF decks were manufactured by the modification companies (actually salvaging some of the components from the now junker R-390A IF decks) and installed in existing R-390A's. The new IF decks were named "SERIES 500 IF STRIP ASSY." They looked almost just like R-390 IF decks, (see the comparison photos), except that the IF connectors were relocated to match the cables and connectors in the R-390A chassis. The circuits were designed to plug and play in the R-390A instead of the R-390. The decks are not interchangeable (until now that is, after performing the modification described herein).

Notwithstanding DF capabilities, a side benefit of the SERIES 500 deck is that it provides a smoother sound than does the stock R-390A IF deck. Mechanical filters are said to "ring" and after a while can be fatiguing to the listener. The purpose of this article shall be to describe how one may "roll his own" SERIES 500 IF deck from a surplus R-390 IF deck. Please note that I don't advocate trashing of a good R-390 to do this mod. The IF deck I started with came from a Motorola junker. I would urge you to likewise find a junker R-390 as a source of an IF deck for this project. Make sure that the deck is in working condition prior to beginning the modification.



R-390/URR IF FILAMENTS, MODIFIED TO SERIES 500 CONFIGURATION

Figure 1

TF MARCOTTE, N5OFF
SEPT 20, 2000

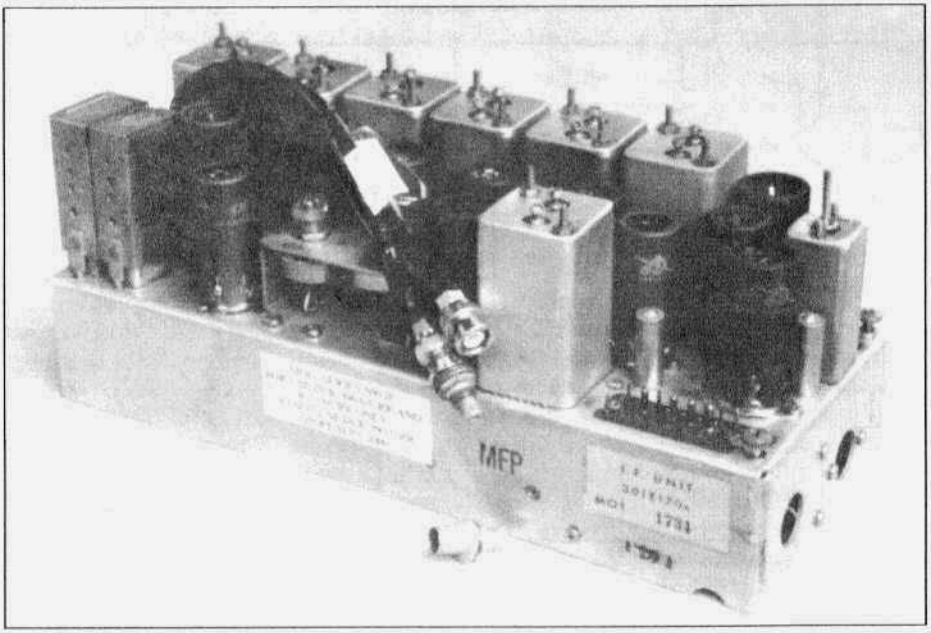
The R-390 IF deck was designed to operate with one 25V filament supply (unfortunately the 25V supply available in the R-390A is insufficient to power all of the filaments in the R-390 IF deck). The R-390A deck was designed to operate with a combination of 6.3V and 25V filament supplies. The task involved in this conversion is to rewire the R-390 filaments to comply with the voltages available in the R-390A and provided at the main IF deck connector, plug and play, without the addition of any new power transformers. Each of the twelve tubes in the R-390 IF deck must be addressed for full compliance with the voltages available from the R-390A. Refer to the schematic in Fig 1 as to the final filament wiring configuration. We will also drop the B+ a bit.

Plug P112 of the R-390A shall be plugged into the R-390 IF deck at jack J517. There is much commonality here, except for the connections mentioned herein.

In general, you will be converting 25V series connections into 6.3V (herein referred to as 6V) parallel connections for most tubes, and moving the connections of the BFO/PTO/ballast tube series to a different connection point in jack J517. The 6V filament supply shall be provided to the R-390 deck by pin 20 of P112 from the R-390A.

General instructions: Refer to the schematic for the original R-390 as the "before" schematic, and Figure 1 as the "after" schematic for filaments. Use the best soldering technique you can in this limited access space. Don't insulate or bind any wires until instructed to do so. You will be utilizing some of the new 6V supply connections more than once. Make sure you can recognize your new wires. I used black wire for the 25V supply, red wire for the 6V supplies, and green wire for new grounds.

The first task is to install a B+ dropping resistor to better match the 180V B+ that the R-390 IF deck is expecting.



Modified R-390 IF deck. Note adapter cables and BNC to MB adapters.

To do this, locate inductor L503 under the IF deck. This will be found snapped into a holder right above pin 2 of J517. Disconnect one end of the coil, and install in series with it (the equivalent of) a 470 ohm 2 watt resistor. This will tame the B+.

The first tube circuit we'll work on is the ballast tube circuit.

V508 (5749) and RT512 (3TF7). These must be supplied by the R-390A 25V filament supply. To do this, sever the connecting wire at pin 8 of jack J517 (underneath the deck) to free this slot up (hint: save access to the connector end of the wire as you will use it to wire supply to V509). Then, sever the connection at pin 2 of RT512 and wire this pin to pin 8 of J517 of the R-390 deck with a long piece of new wire. The filament return connection remains unmodified. This modification will make the BFO/PTO/ballast tube series connections identical to the R-390A 25V filament supply connections. As mentioned above, this 25V supply is insufficient to supply the remainder of the tube filaments, thus the need to employ the 6V supply for this task.

The following 6V tubes shall have filaments wired from the 6V R-390A supply. The filament pins of these tubes are pins 3 and 4. Don't sever any connections unless instructed to do so. The modification will use as much existing R-390 IF deck wiring as possible (and thus may seem a bit screwy to you until finished).

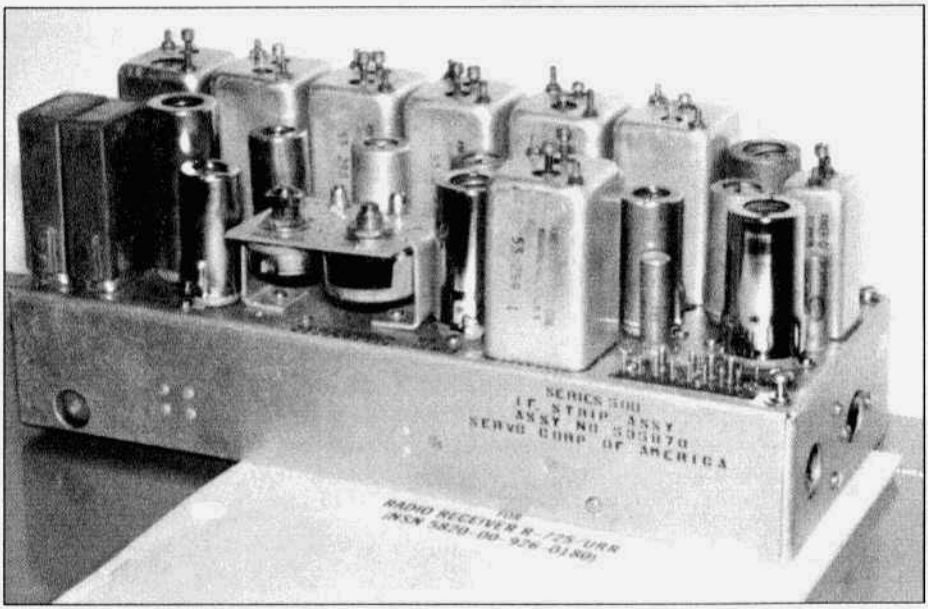
V504 (6BJ6). 6V will come from its existing connection at pin 4. Ground will come in the next step.

V503 (6BJ6). Wire pin 3 of V503 to pin 4 of V504 for 6V supply. Ground V503, pin 4.

V502 (6BJ6). 6V supply will come from an existing connection at V503, pin 3. Ground V502, pin 3.

V501 (6BJ6). Sever ground connection at V501, pin 3 and wire pin 3 to V502, pin 4.

V505 (6AK6). 6V supply will come from existing connection at pin 4. Ground will come in the next step.



Original IF deck from R-725/URR. Note connections near carrier meter adjust pot.

V506 (6AK6). Ground pin 4 of V506. Wire pin 3 of V506 to pin 4 of V505 for 6V supply.

V509 (6BJ6). Locate the free wire which was cut from underneath J517, pin 8, and connect it to the 6V filament supply at J517, pin 20.

The following tubes are 12AU7's wired in various series schemes in the R-390. They must be rewired according to their 6V option for use in the R-390A. Note two of the connections require dropping resistors on the 6V source of V507 and V510 to obtain the desired 5.3V filament voltage.

V511. Sever ground connection at pin 5. Connect pins 4 and 5 together for 6V supply, ground pin 9.

V507. Sever connections at pins 4, 5 and 9, including the two resistors (one 120 ohm and one 22 ohm). Wire 6V supply from your previous work at V505, through the deck opening for variable capacitor C525, to pins 4 and 5 through a 3.9 ohm, 1 watt resistor. Ground pin 9.

V 510. Sever connections at pins 5 and 9. Ground will come from existing pin 4 connection. Remove 120 ohm resistor between pins 4 and 9. Wire pin 5 to pin 4. Wire 6V supply from J517, pin 20 to V510 pin 9 through a 3.9 ohm, 1 watt resistor.

There are no changes to any of the other connections in the R-390 deck. Prior to installing the modified R-390 deck in your R-390A, you must check your work.

Perform filament supply and ground continuity checks as follows. Note: There will be more than one ground connectionat various tube sockets, but the filaments should have continuity exactly as shown. Filament supply is checked from J517, pin 20.

V501, filament, pin 3; ground, pin 4.
V502, filament, pin 4; ground, pin 3.
V503, filament, pin 3; ground, pin 4.
V504, filament, pin 4; ground, pin 3.
V505, filament, pin 4; ground, pin 3.
V506, filament, pin 3; ground, pin 4.
V507, filament, pins 4 & 5; ground, pin 9.
V509, filament, pin 4; ground, pin 3.
V510, filament, pin 9; ground, pins 4 and 5.

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Plate Tank Coils for the BC-610
and
AC Input Current Considerations

by Gary Willey, W4ZXS
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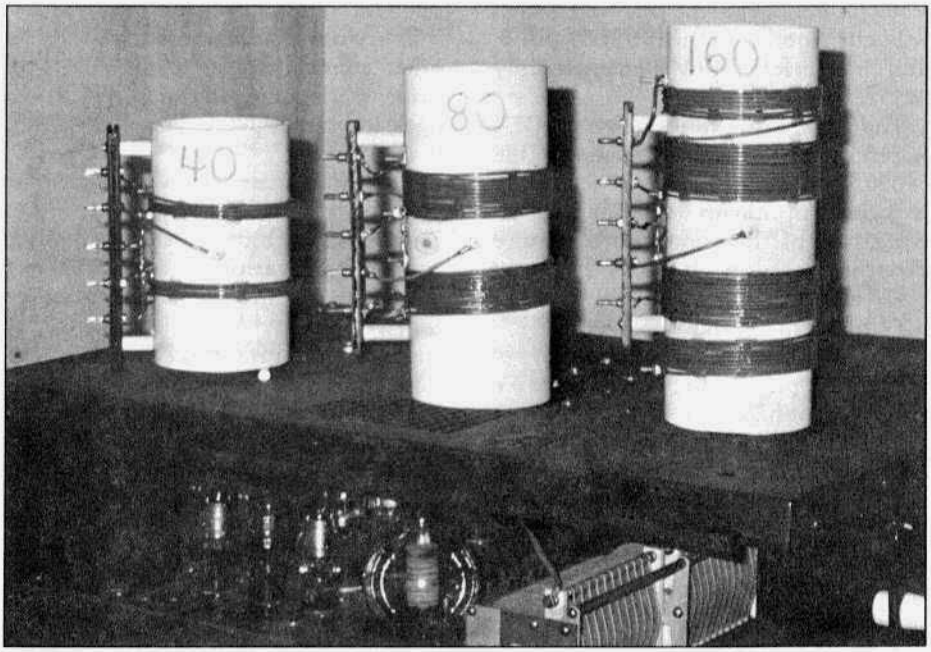
Keysville, VA 23947

The BC-610 at W4ZXS had been collecting dust for some 20 years while missing parts were being acquired. The unit had been donated to me by Jansky & Bailey, Radio Engineers. They had last used it as a test set-up for a Lynchburg, Virginia broadcast station on around 570 kc. Yes, the BC-610 can be made to work on frequencies that low. The plate tank coil for 570 kc, still in my possession, is something to see.

It was decided in early 1999 to expedite the operation of this -610 and to see just what it could do. Major parts were still missing; no coils for 160, 80, or 40 meters and I did not have the speech amplifier, antenna tuner or spare tubes.

Thanks to numerous ads in Electric Radio, a speech amplifier, antenna tuner (BC-939) and spare tubes were obtained. Nowhere could the plate tank coils for 160/80/40 meters be obtained; it was hopeless. I tried shunting variable capacitors across the 4.5 to 7 MHz coil. This got me down to 3.8 mc CW, but the variable capacitor arced over with modulation. The peak-to-peak voltage was just too great.

The only real solution was to bite the bullet and build a coil for 80 meters.



Homebrewed plate coils sitting on the author's BC-610

End view showing the inside coil.

W4ZXS is a small electronics lab with a 96-acre antenna farm. There is also a small machine shop, which made the building of the 80-meter coil possible.

The original coils of 1945 used air spacing between turns. It was decided early on not to do this and to try to keep the construction as simple as possible and to use materials that can be obtained at Home Depot or Lowe's. The original design engineers did not have the advantage of PVC pipe. It is indeed fortunate that 3" PVC pipe, 1-1/2" long will fit within 4" PVC pipe and turn 360 degrees from center. This fact is crucial in making this coil work. The results on 80 meters were so favorable that it was decided to try 160 meters also. When this tested OK too, it was further decided to try 40 meters. The 40 meter coil was also a success.

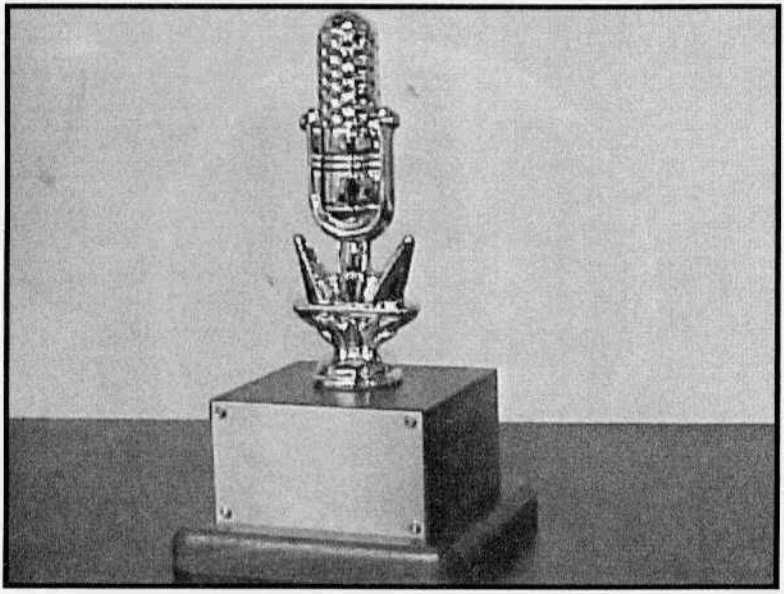
Anyone who decides to give this coil-making a try, I would strongly recommend that you have, at the very least, a small drill press. All the wire used was #12 600 volt single-strand standard electrical copper wire—leave the insulation on. Before winding any coils, run off 30-40 feet from the spool and place one end into the jaws of a large vice. At the far end, pull on the wire with pliers as hard as you can—whip it back and forth. You are trying to smooth out any kinks in the wire before winding the coils. You want the wire "as smooth as glass" before winding. During the coil winding operation, before securing the wire to the solder lugs and bolts, temporarily secure windings with duct tape.

Design Data

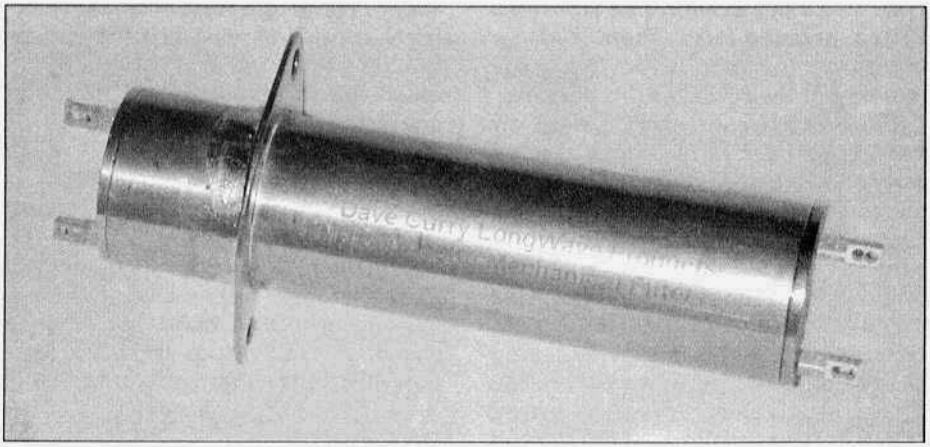
<u>Outer Coil 4" PVC Pipe</u>
Outside diameter, 4-7/16"
Inside diameter, 3-15/16"

Inside coupling coil — length of coupling coil no greater than 1-1/2" long. This is crucial. If greater than 1-1/2" it won't turn 360 degrees within the big coil. The coil rotates on 3/8" fiber wash-

continued on page 39

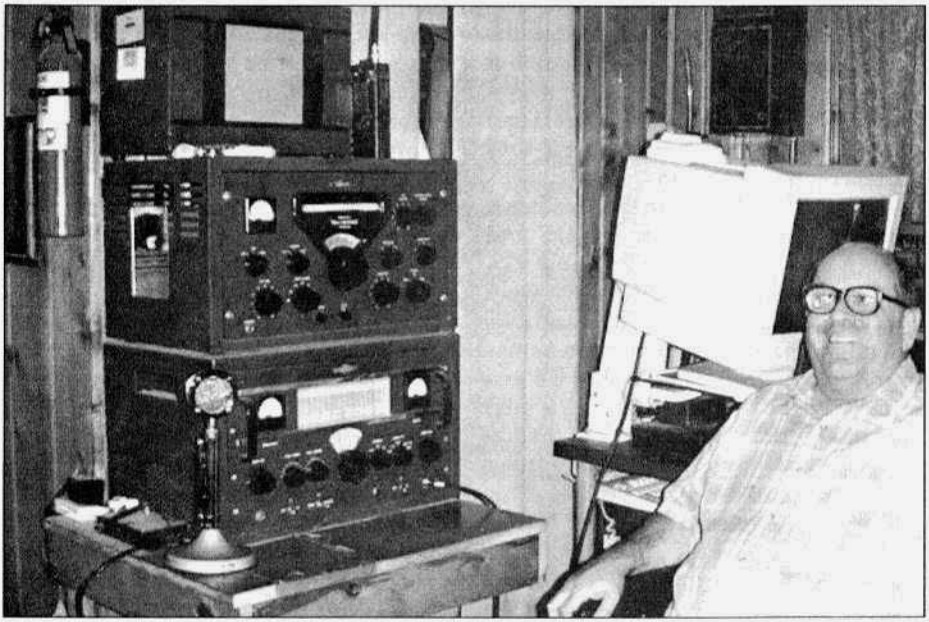


The award for the QRO Jamboree ("Heavy Metal Thunder Rally", December 23, provided by Bill Kleronomos, KDØHG. This award will be given to the AM'er with the best audio as determined by votes sent into ER by participants and listeners.



This photo shows Dave Curry's new mechanical filter for the R-390A. The actual filter used is a newly manufactured Collins unit. They will be available in January in the following bandwidths, 500 cycles, 2.5 kc and 6 kc. They filters are vastly superior to the 50-year old originals. Not only do they have lower insertion loss but they display better skirt selectivity and stopband rejection. Installation is extremely simple in that the connecting wires go directly to filters. The price of these filters will be $199 plus shpg from Electric Radio. In the January issue we'll have a comprehensive review by Ray Osterwald, NØDMS. For more info right now those interested can go to www.75A-4.com.

John, K8GJW, serenading a group of AM'ers at the Butler, PA hamfest. From left to right: John, K8GJW; Russ, WB3FAU; Ed, KO3L; Ron, K3NFS; Tony, N3HFB and Randy, N3ZVX. *Photo by Ron Myer, W8KYD.*



Orlin "OJ" Jenkins, KØOJ, our master of 'turkey day' ceremonies out here in Colorado. Every year OJ organizes a Thanksgiving Day Jamboree he calls a 'bash'. More on this year's event in the editor's comments on page 1.

AM International Update
December 2000

by Dale Gagnon, KW1I, President

Ted, W3PWW called me late in November to acquaint me with an article he had seen in a local paper, the *Carroll County Times*. It reported on November 23, 2000 that the President had signed legislation to thwart illegal CBs.

"WASHINGTON - State and local officials could crack down on unauthorized citizens band radios that interfere with consumer televisions, radios and cordless telephones, under legislation signed Wednesday by President Clinton.

The measure allows state and local governments to enact and enforce regulations that prohibit people from using unauthorized CB radio equipment, such as those that operate in excess of permitted power levels.

Existing law permits only the FCC to pursue complaints of interference on the airwaves caused by radio equipment. But the agency does not always have the resources or field agents to investigate and act on every complaint, according to supporters of the legislation."

A number of AM'ers in the Northeast discussed this article on the air, and though we agreed on the laudable motives behind such legislation, we were concerned that untrained local authorities might mistake perfectly good amateur radio operators for lawless CB'ers, especially those of us who have boat anchor equipment that looks to the naked eye like it could cause wide spread radio interference!

I e-mailed John Hennessee, N1KB, ARRL Field and Educational Services Department about this. He responded quickly with a copy of the legislation and references to the bill when it was in Congress in August 1999 QST, p15 and September 1999 QST, p15.

To make a long story short the bill was conceived years ago in Wisconsin by Senator Russell Feingold in an attempt to assist municipal authorities in the city of Beloit, Wisconsin in dealing with local CB operators who were using high power amplifiers causing significant RFI. The FCC at the time was not able to deal with this issue and the lawbreaking CB'ers were off limits for local prosecution because of federal preemption over telecommunications matters. Congressmen from other states, some prompted by amateur radio operators, also got involved and last month the bill was passed.

The key provision in the bill that will protect amateurs from harassment is: (f)(2) A station that is licensed by the Commission pursuant to section 301 in any radio service for the operation at issue shall not be subject to action by a State or local government under this subsection. A State or local government statute or ordinance enacted for purposes of this subsection shall identify the exemption available under this paragraph."

Even though this paragraph is in place, some overzealous local politician who knows nothing about amateur radio may successfully sponsor an ordinance that does not include an exemption for FCC licensed radio services. It is worth our while to monitor the development of state and local regulations authorized by this new Federal legislation, correspond with local officials, and if possible get amateur radio explicitly noted. Otherwise it will take a lawyer to get us out of hot water if we are denounced by one of our neighbors. Once proper local regulations are in place we all might want to get our FCC licenses

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VINTAGE NETS

Arizona 40M AM Group: Meets on 7293 kHz at 10:00 AM MST (1700 UTC) on Sat. and Sun.
West Coast AM Net meets Wednesdays 9PM Pacific on or about 3870kc. Net control alternates between John, W6MIT and Ken, K6CJA.
California Early Bird Net: Saturday mornings at 8 AM PST on 3870.
California Vintage SSB Net: Sunday mornings at 8 AM PST on 3860 +/-
Southeast Swap Net: Tuesday nights at 7:30 ET on 3885. Net controls are Andy, WA4KCY and Sam, KF4TXQ. This same group also has a Sunday afternoon net on 3885 at 2 PM ET.
Eastern AM Swap Net: Thursday evenings on 3885 at 7:30 ET. This net is for the exchange of AM related equipment only.
Northwest AM Net: AM activity daily 3 PM - 5 PM on 3875. This same group meets on 6 meters (50.4) Sundays and Wednesdays at 8:00 PT and on 2 meters (144.4) Tuesdays and Thursdays at 8:00 PT. The formal AM net and swap session is on 3875, Sundays at 3 PM.
K6HQI Memorial Twenty Meter AM Net: This net on 14.286 has been in continuous operation for at least the last 20 years. It starts at 5:00 PM PT, 7 days a week and usually goes for about 2 hours.
Arizona AM Net: Sundays at 3 PM MT on 3855. On 6 meters (50.4) at 8 PM MT Saturdays.
Colorado Morning Net: An informal group of AM'ers get together on 3876 Monday, Wednesday Friday, Saturday and Sunday mornings at 7AM MT.
DX-60 Net: This net meets on 3880 at 0800 AM, ET, Sundays. Net control is Jim, N8LUV, with alternates. This net is all about entry-level AM rigs like the Heath DX-60.
Eastcoast Military Net: It isn't necessary to check in with military gear but that is what this net is all about. Net control is Ted, W3PWW. Saturday mornings at 0500 ET on 3885 + or - QRM.
Westcoast Military Radio Collectors Net: Meets Saturday evenings at 2130 (PT) on 3980 + or - QRM. Net control is Dennis, W7QHO.
Gray Hair Net: The oldest (or one of the oldest - 44+ years) 160-meter AM nets. It meets on Tuesday nights on 1945 at 8:00 PM EST & 8:30 EDT. http://www.crompton.com/grayhair
Vintage SSB Net: Net control is Andy, WBØSNF. The Net meets on 14.293 at 1900Z Sunday and is followed by the New Heathkit Net at about 2030Z on the same freq. Net control is Don, WB6LRG.
Collins Collectors Association Nets: Technical and swap session each Sunday, 14.263 MHz, 2000Z, is a long-established net run by call areas. Informal ragchew nets meet on Tuesday nights on 3805 at 2100 Eastern and on Thursday nights on 3875. West Coast 75M net that takes place on 3895 at 2000 Pacific Time.
Collins Swap and Shop Net: Meets every Tuesday at 8PM EST on 3955. Net control is Ed, WA3AMJ.
Collins Collector Association Monthly AM Night: The first Wed. of each month on 3885 kHz starting at 2000 CST (0200 UTC).
Drake Users Net: This group gets together on 3865 Tuesday nights at 8 PM ET. Net controls are Criss, KB8IZX; Don, W8NS; Rob, KE3EE and Huey, KD3UI.
Swan Users Net: This group meets on 14.250 Sunday afternoons at 4 PM CT. The net control is usually Dean, WA9AZK.
Nostalgia/Hi-Fi Net: Meets on Fridays at 7 PM PT on 1930. This net was started in 1978.
K1JCL 6-Meter AM Repeater: Located in Connecticut it operates on 50.4 in and 50.5 out.
JA AM Net: 14.190 at 0100 UTC, Saturdays and Sundays. Stan Tajima, JA1DNQ is net control.
Fort Wayne Area 6-Meter AM Net: Meets nightly at 7 PM ET on 50.58 MHz. This net has been meeting since the late '50's. Most members are using vintage or homebrew gear.
Southern Calif. Sunday Morning 6 Meter AM Net: 10 AM Sundays on 50.4. NC is Will, AA6DD.
Old Buzzards Net: Meets daily at 10 AM Local time on 3945. This is an informal net in the New England area . Net hosts are George, W1GAC and Paul, W1ECO.
Canadian Boatanchor Net: Meets Saturday afternoons, 3:00 PM EST on 3745.
Midwest Classic Radio Net: Sat. mornings on 3885 at 8AM Central time. Only AM checkins allowed. Swap/sale, hamfest info and technical help are frequent topics. NC is Rob, WA9ZTY.
Boatanchors CW Group: Meets nightly at 0200Z-0300Z on 3578-80 kHz. During the day at 7050 or 7147. Listen for stations calling "CQ BA" or signing "BA" after their callsigns.
Wireless Set No. 19 Net: Meets the first Sunday of every month on 7.175 +/- 5 kHz at 2000Z (3760 +/- 5 kHz alternate). Net control is Dave, VA3ORP.
Hallicrafters Collectors Assoc. Net: Sundays, 1730-1845 UTC on 14.293. Net control varies. Midwest net on Sat. on 7280 at 1700 UTC. Net control Jim, WB8DML. Pacific Northwest net on Sundays at 22.00 UTC on 7220. Net control is Dennis, VE7DH.
Nets that are underlined are new or have changed times or frequency since the last issue.

The Universal Speaker

Bruce Stock, AB7YD
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As my collection of old radios has grown over the years, I find that I am continually looking for speakers or adapters that will match the various output impedances. It finally occurred to me that a small line transformer offered by Radio Shack might hold the answer. This transformer costs about $6 and has a large number of primary and secondary taps, allowing it to match a wide variety of impedances.

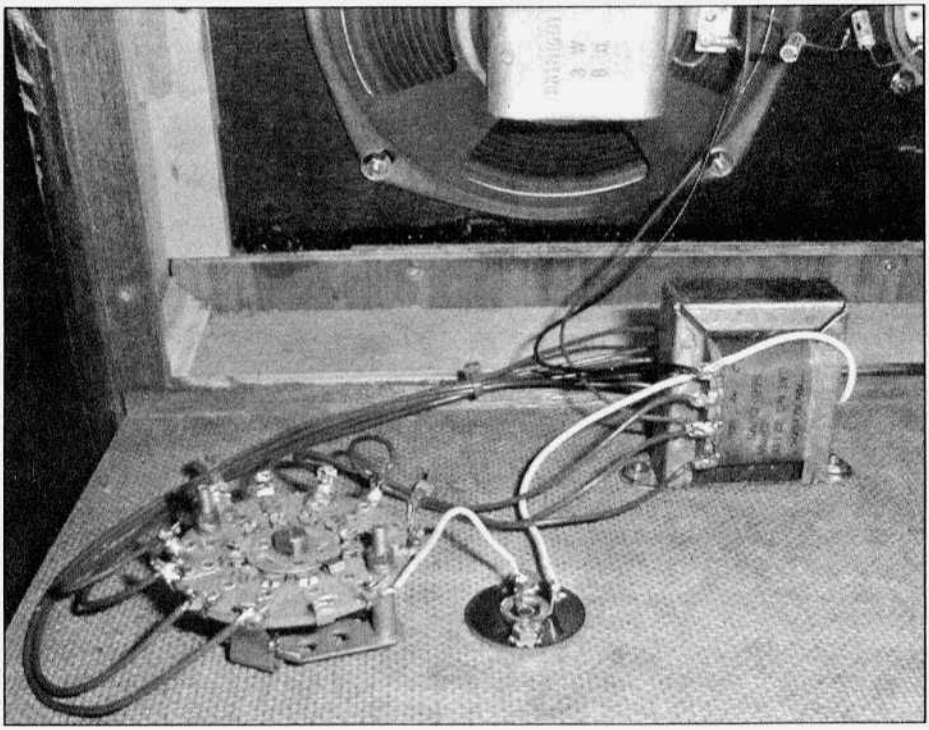
Line transformers can be a bit confusing at first, since the primary taps are marked in watts while the secondary taps are marked in ohms. In their normal service, these transformers connect to a public address distribution line having a reference voltage of 70.7 volts. You can determine the actual impedance of a particular primary tap by dividing the square of the reference voltage by the rated wattage of the tap. If you do the calculations, you will find that the primary taps range from 500 ohms to 8000 ohms.

The figure shows the schematic of the "Universal Speaker" that I built using the line transformer, a rotary switch and a common box speaker. In addition to providing the usual input impedances of 4, 8 and 16 ohms, it will also provide impedances of 500, 1000, 2000, 4000 and 8000 ohms, allowing it to be used with a wide variety of both commercial and military receivers.

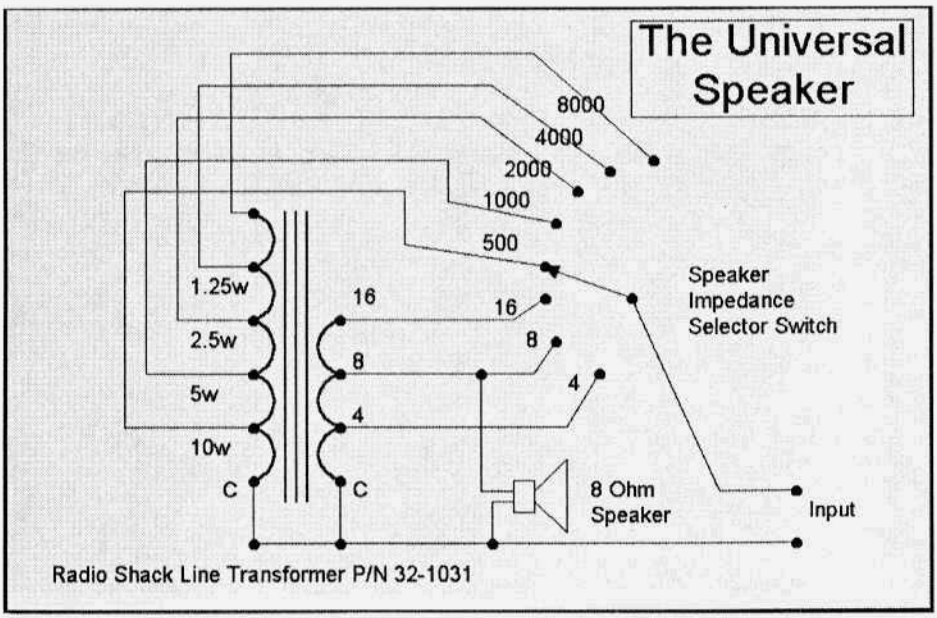
Note that the basic speaker that is used with the transformer can be rated at 4, 8 or 16 ohms. Just connect whatever speaker you have across the appropriate secondary tap and common. In order to produce the 4, 8 and 16 ohm input impedances, only the secondary winding of the transformer is active and it is configured as an impedance-matching autotransformer. For higher values, the appropriate primary tap is selected, and the transformer is used in the more normal manner. The photo shows the transformer and rotary switch installed on the back panel of a typical speaker box.

There are a number of military receivers that were intended to drive 600 ohm distribution lines rather than a directly attached low impedance speaker. Fortunately, the 500 ohm tap on the Universal Speaker is a sufficiently close match to allow it to be connected directly to these receivers. This speaker also works well with many receivers that only have an output for 2000 ohm headphones. In many cases they will have enough audio output power to drive a 2000 ohm speaker with sufficient volume.

I've found the Universal Speaker to be very useful because I have only a limited amount of space for my collection of old radios. Every speaker that I can eliminate means that I have more shelf space for some new treasure. But even if space is not a problem for you, you'll probably find that a speaker that can work with most anything is a great addition to your workbench. ER



The transformer and rotary switch are installed on the back panel of a typical speaker box.

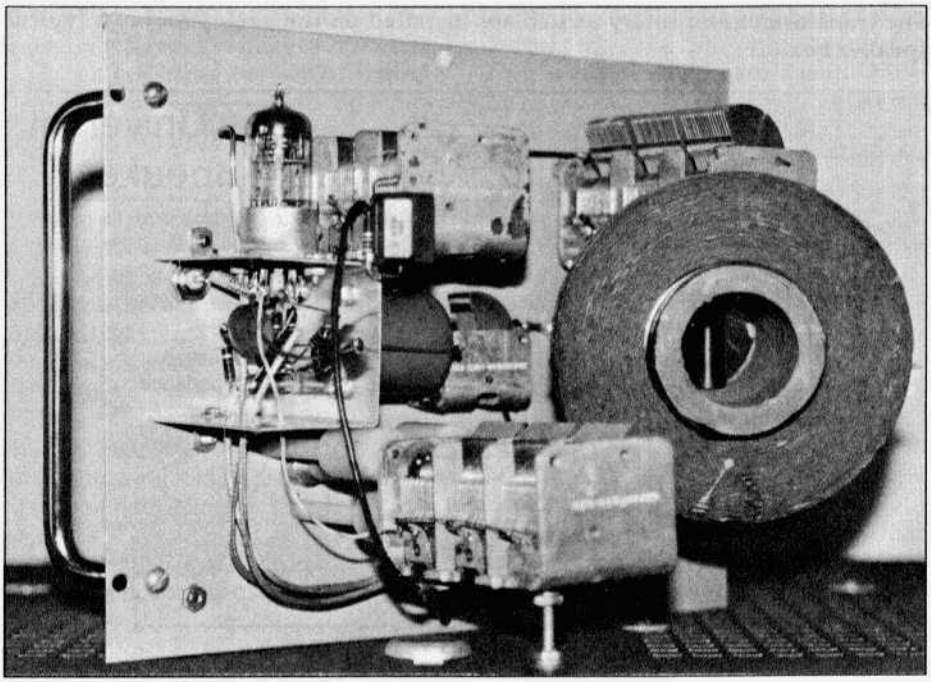


Very Low Frequency Regenerative Preselector

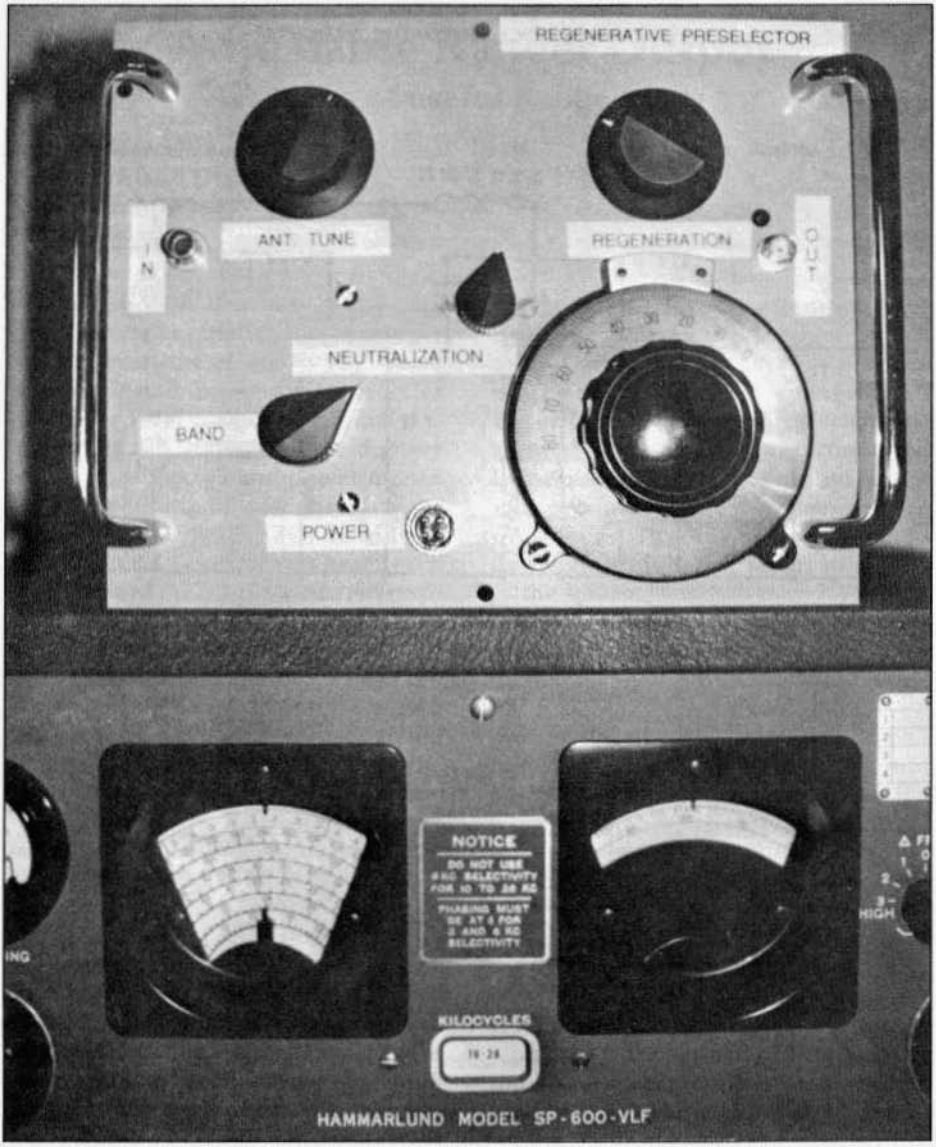
by Harry A. Weber
4845 West 107th Street
Oak Lawn, IL 60453-5252

When it comes to collecting and restoring vintage tube receivers, we are all familiar with those classic sets as manufactured by National, Hammarlund, Collins, etc. While these high frequency receivers were built by the millions, there developed a need for high quality longwave receivers that could operate from the broadcast band down to 10 kHz. With end users such as the navy, maritime industry, and certain scientific establishments, their level of production reached its height up to the mid seventies. While most of these low and very low frequency sets found their resting place at some landfill, quite a number have survived into the surplus market places of today, and are just waiting to be restored and brought back to life.

When acquiring one of these sets, it becomes readily apparent that the input termination impedance is rather low, thus hooking up a random length of antenna wire will result in poor sensitivity and performance. In order to overcome this mismatch several approaches can be taken, one being the use of active (amplified) air or ferrite loop antennas, here having the ability of directivity in orienting the loop towards the desired signal, or to null out unwanted interferences. Short active rod elements can also be used with great success, thus being able to be placed at various locations in order to minimize



Rear view of the preselector



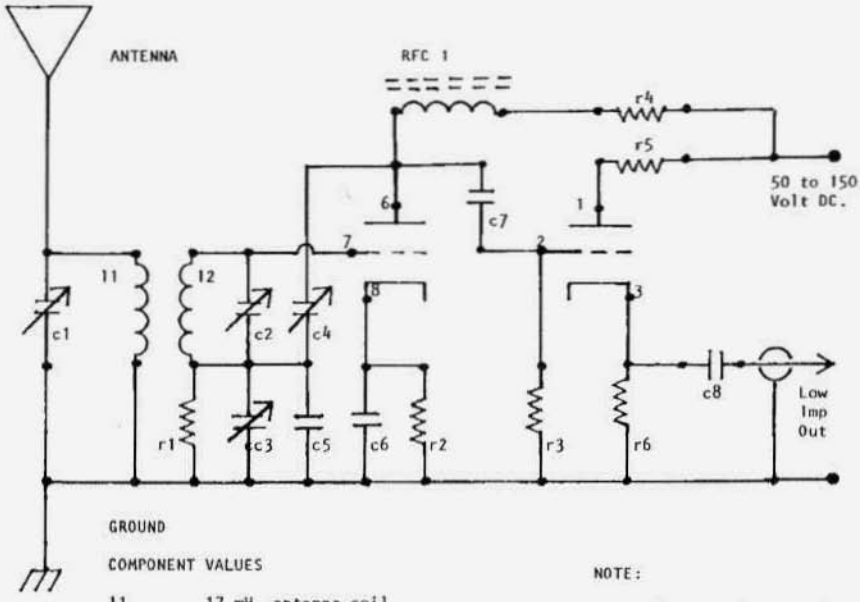
The regenerative preselector sitting on top of the author's Hammarlund SP-600-VLF receiver.

noise pickup. Another approach is in the use of passive antenna tuners or matching networks, here close attention must be placed on circuit design and proper component selection, in order to effect minimum losses while providing for proper impedance termination characteristics.

Having constructed all of the above, one of my most favorite circuits have been regenerative RF preselectors; here with a minimum amount of parts one can build a relative simple unit, exhibiting good RF selectivity and amplification characteristics. Back in 1963 the ARRL showed the elements of a high

continued next page

VERY LOW FREQUENCY REGENERATIVE PRESELECTOR



COMPONENT VALUES

l1	17 mH. antenna coil
l2	146 mH. RF. coil
c1	1,000 pF. antenna tune
c2	1,000 pF. RF. tune
c3	1,000 pF. regeneration control
c4	100 pF. neutralization control
c5	2,800 pF. in parallel with c3
c6	100 nF. cathode bypass
c7	10 nF. plate to grid coupling
c8	100 nF. cathode output
r1	470 K. grid bias
r2	470 Ohm cathode bias
r3	1 Meg. Ohm grid bias
r4+5	10 K. Ohm Plate Load
r6	100 Ohm cathode bias
RFC1	500 mH. audio choke

NOTE:

Type of tubes that may be used dual structure such as:

6CG7 or 12AT7

Power requirement:

50 to 150 volt DC. for plates
6.3 volt AC. for filaments

c1 c2 c3 are three section variable capacitors

frequency regenerative preselector; looking at it I wondered if it was possible to convert its operation to long wave. By the use of large inductance and capacitance elements, one can tune down to less than 10 kHz with very stable gain characteristics. Looking at the schematic the circuit consists of two triodes, first being the regenerative RF amplifier, with C3 as the feedback control, and C4 providing the all important neutralization. The second triode performs circuit isolation, and low impedance output by way of the cathode follower. Power requirements are rather modest, with a current draw of only 8 mA DC on the high voltage side, thus allowing an umbilical attachment to ones receiver without too much burden.

Upon completion of this preselector one will immediately recognize its selective gain characteristics along with smooth regenerative control. So as one ponders the poor band conditions on 20 meters, why not check out 20,000 meters, and copy VL3DEF twenty four hours a day... ER

For those wishing more information on longwave communications, please

continued on page 37

Adjustable Ranger Output

A series of useful Range Mods

by Tom Marcellino, W3BYM
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Rockville, MD 20853
W3BYM@arrl.net

This article had a very noisy and troublesome beginning. I'd taken my Ranger from the shack to the workbench to install the solid-state mod for the driver level control pot. After taking the rig out of the case, the dummy load was connected and power turned on. While tuning up and changing the meter function switch all of a sudden a loud GAPOW, GAPOW was heard each time I passed the PA plate current position. This was repeated several times before realizing that I should turn out the lights and find the exact location. Well it wasn't hard to locate. It was like the 4th of July at the PA contact on the wafer. The contact was arcing to the grounded shaft though the rotating wiper connection. This wafer isn't ceramic which may have prevented this failure and would have been the better choice especially in the presence of high voltage B+.

Well so much for installing the driver level control mod at this time. I had to fix this new problem. So off comes the front panel. Not a difficult task but one that does take some time and organization of all the knobs, shaft nuts, spring washers and VFO elements. I suggest if you ever do this, first rotate the VFO to one side up to the stop. Then use a piece of masking tape on the panel and mark the center of the VFO pointer. This will be a great help after reinstalling the panel and calibrating the VFO.

With the panel off, the meter function switch was readily pulled forward and inspected for damage. There was a nice carbon path from the PA contact to the center shaft. Several attempts were made at repairing the damaged switch and all failed. Then I got the bright idea of why not take the high voltage B+ off the switch. A review of the schematic showed SH4, the PA shunt, connected in the plate circuit. There was no reason why it couldn't be moved over to the PA cathode. The only difference would be a slightly higher current reading due to the screen.

That's exactly what I did and here's how I accomplished the task. In my case during all the "explosions", the original SH4 was literally blown into two parts and left hanging on the rear of SW4B. I elected to just remove the shunt by cutting the remains from the switch contacts. From SW4B there are two wires going to Pos #4 and #10 of SW5, the meter function switch. These wires were removed from SW5 and reconnected together after pulling both back though the grommet and under the chassis. A small electrical wire nut was installed to complete the job.

Next a pair of 0.82 ohm 2 watts resistors (originally purchased as meter replacement resistors for the SB-220) were connected in parallel to make up the new SH4 cathode shunt. A pictorial is shown in Figure 1 for this installation. To complete the installation, connect Pos #10 of SW5 to ground on the same wafer and connect a wire from the PA cathode pins 1,4,6 to Pos #4 of SW5. Now after cleaning (again) the original meter function switch by removing most of the carbon, it performs very well reading the PA current. The voltage

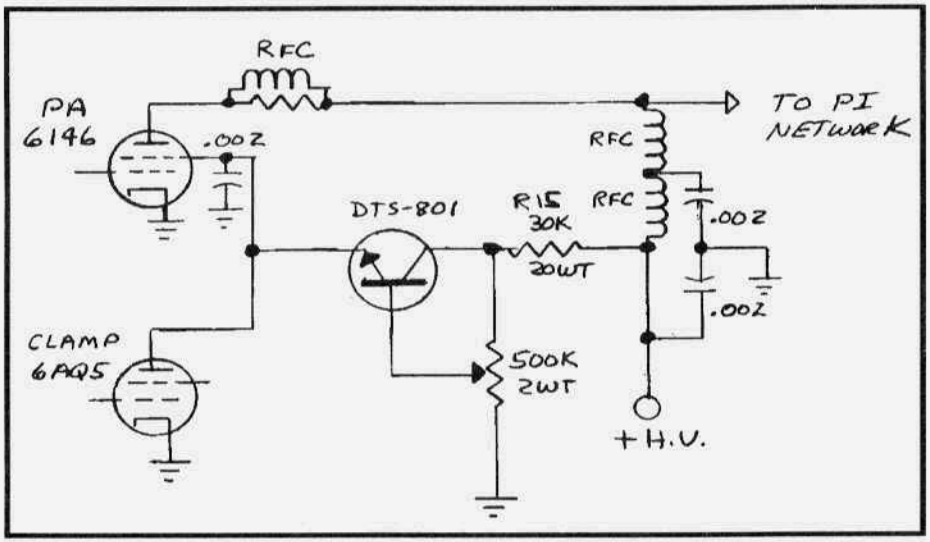


Figure 1.

The modulator tubes in the author's Ranger are KT88s

now on the switch contact is in the millivolt range. My choice of a slightly lesser shunt value compensates for the additional screen current and allows the plate current to read near the same value as with the original shunt.

This next mod is desirable if you want to use the Ranger with adjustable RF output. In my case, I like to use the rig barefoot at power levels up to 55 watts. Note, this power level is the result of several other mods to the rig including solid-stating all the supplies plus the inclusion of the Tim Smith modulator circuit using a pair of KT88s as modulators. Also I wanted to drive an amplifier thus requiring power levels in the 10 watt area.

This is another easy mod to implement as shown in Figure 2. A high voltage transistor and 500K 2 watt pot are all the parts needed.

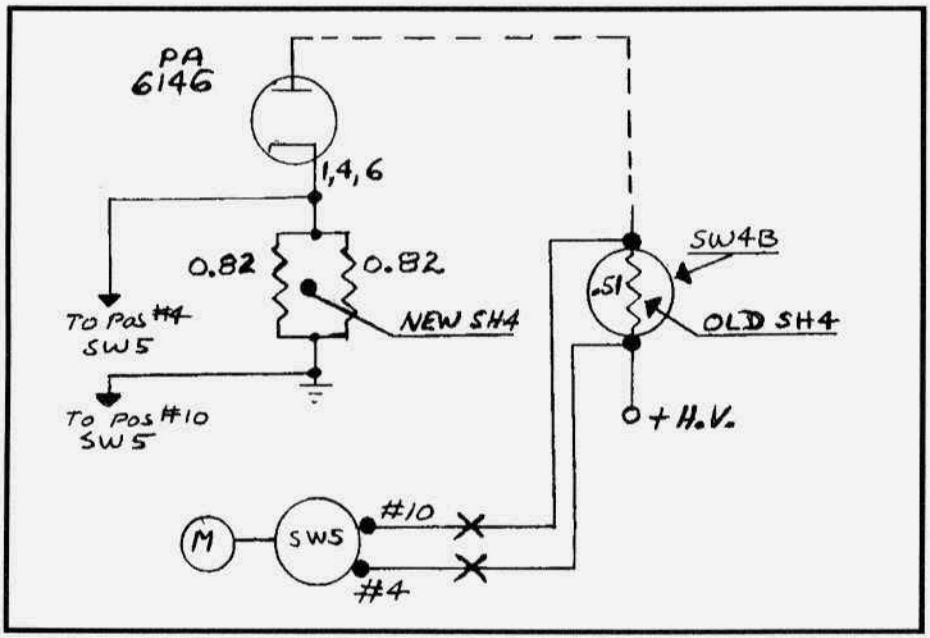


Figure 2

R15 is the original 30K 20 watt screen dropping resistor. The transistor is a TV horizontal output type rated at 1500 volts with 100 watts of dissipation. They are available at most hamfests, typically a buck a piece. It was chassis mounted using one of the rear PA chassis vent holes. Remember if you chassis mount this device it must be isolated from ground. Both the collector and emitter are sitting at B+. Mount the 500K pot to the front of the crystal socket using double sided foam tape. The crystal knob/door was disassembled and altered to accommodate the shaft by enlarging the center hole in the door slightly larger than 0.25". Discard the threaded spacer from the knob. Next drill the knob using a #30 drill on its face to accept one of those small white indicator dowels. The door can be painted with matching automotive paint to complete the job. Now I have a very easy and reliable method of controlling the RF output from a few watts to the maximum of 55 watts.

Varying the RF output in this manner actually changes the PA plate current by controlling the PA screen voltage. Thus the PA load impedance also changes. This obviously causes some impedance mismatch between the modulation transformer's secondary and the PA. On-the-air testing has detected some very small differences in the audio quality between the low vs. high power setting but not enough to get overly concerned.

The audio gain control setting has always been a concern with this rig. Full undistorted modulation is achieved with the control set at 8 o'clock. In my case this is particularly critical because a switch was installed on this control shaft for AC to the rig. Therefore I have to set the gain control each time the rig is powered up. It would be much better, and less sensitive, if the gain control were set in the 12 o'clock region. There are not many degrees between 8 o'clock and off!

There are several ways to accomplish

continued on page 37

Add AM to the Heath SB-400/401 Transmitter

(A Poor Man's Collins)

by 'Bowie' Bill Breshears, WC3K
6303 Homestake Place
Bowie, MD 20720
bbuck@ccconline.net

Heath produced a well designed and generally higher quality product in the SB-400/401 SSB/CW transmitters. The SB-400 was produced from '64 to '67 and the SB-401 from '66 to '75. The principal difference between the two is that the SB-401 has a panel mounted switch to allow easy switching between transceiver and independent transmitter operations when used in conjunction with a companion Heath SB-300, SB-303, etc receiver. The design approach and specifications, as well as the physical appearance of the package, leave little doubt that they were making a poor man's Collins similar to the 32S series. In my opinion their performance on SSB is similar, but on CW the Heath is superior to its Collins counterpart. The Heath also has a built-in power supply. Hardware quality is high. Even the gray, wrinkle finish, perforated cabinetry is much higher quality than both prior and later Heath endeavors. The panel is a rich wrinkle finish dark green with white lettering. The knobs don't have that 'Heath plastic' look, but are dark green and aluminum skirted with aluminum inserts.

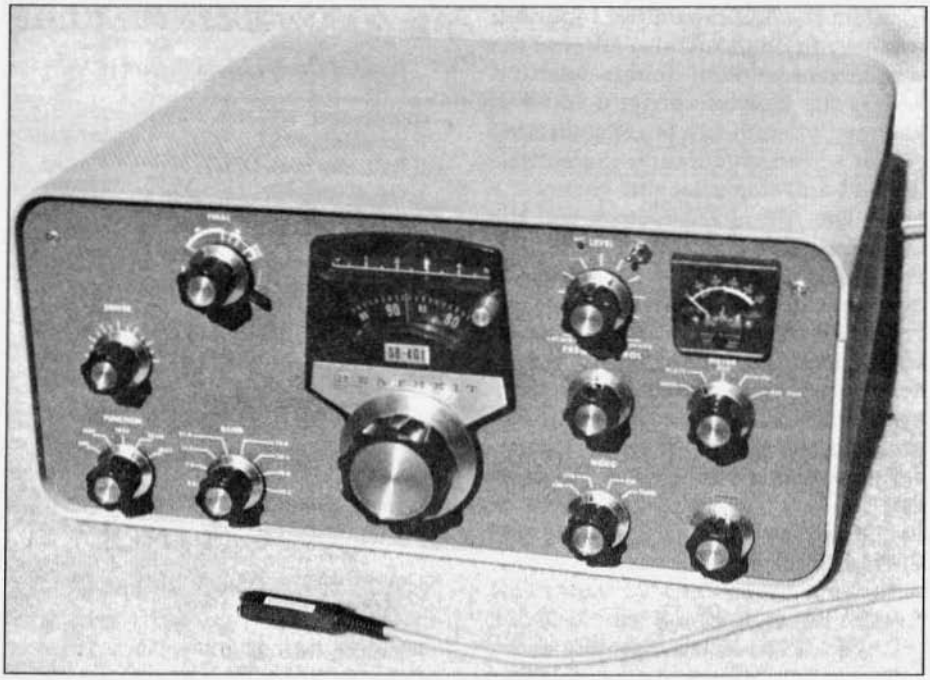
These rigs were popular in their time and a lot were sold during ten years. Few are used today on SSB although their successor, the Heath HW-101 transceiver, is occasionally heard. Being completely vacuum tube is one reason it is unattractive to many but that appeals to me. Absence of AM capability is another shortcoming. The current hamfest price is very reasonable at about $100, depending on condition. If the transmitter is to be used as a stand-alone transmitter, make sure it has the eight crystals plugged into the sockets located on the inside left front of the chassis. Just lift the hinged top of the cabinet held by two side latching screws to check.

A Station Exciter With Good AM

During the last year I have enjoyed exploring controlled carrier screen grid modulation. (See "Fun With A DX-60", Electric Radio, May 2000.) I decided a screen modulated rig was a must for the operating position to drive the linear amplifier. The humble DX-60 and its companion HG-10 VFO were working well, however the snooty Collins 51S1, sitting next to it on the operating shelf, was so irritated by its presence that its poorly designed S meter zero set circuit refused to settle down. The 'Faux Collins' aspects of the SB-401 would be more compatible. In addition the SB-400/401 had a number of very desirable characteristics for use as the station's versatile vacuum tube exciter.

Important Features

*Nice liftable weight and size, (15"x7"x14"), package that includes a built-in VFO and power supply. A very stable LMO (linear moveable oscillator) is used that tunes from 5 to 5.5 MHz. Crystal controlled heterodyne oscillators then derive specific operating frequencies. Sideband and CW are generated at 3.395 MHz and filtered with a crystal filter. The calibration, resettability, tuning ratio and 'feel' of the VFO dial are excellent. The self contained power supply is the solid state



Modified Heathkit SB-401. Two new knobs are on the right side. The 'normal AM'toggle switch and 'overmod' indicator LED are just above the 'level' control at top right.

voltage doubler circuit used on other Heath equipment (DX-60, HP-23, etc.) and is well proven and reliable. The high voltage produced is a respectable nominal 800 volts that makes those 6146s perform well.

*Most of the RF circuitry is on the primary chassis with standard point to point wiring and has ample space for servicing. Two flat mounted circuit boards are used, but still have plenty of space and access. Quality components are used.

*The final amplifier is two parallel 6146s with an output of up to 100 watts if needed. It is a bridge neutralized amp which uses a dedicated variable cap for easy adjustment. Output is a pi network circuit with a nice ceramic core coil and large, three section, variable output capacitor. Tubes and plate components are in a perforated metal shielding enclosure.

*Switchable metering of grid, plate, ALC, high voltage, and relative power output. Many of the SSB transmitters of the era only had the output metered which leaves the experimenter lacking circuit performance visibility.

*The CW generation system uses a keyed audio oscillator and produces a clean signal as well as a built-in side tone. It uses the usual, but adequate, VOX driven break-in.

*Relatively easy to modify to get AM output and the SSB and CW capability remains available.

*Well suited to drive the station linear amplifier in all modes.

*Relatively inexpensive and not so rare or collectable that it can be modified without guilt. Yes, even holes in the (GULP) panel.

The Inserted Carrier AM Modifications

Although it wasn't my original intent

continued next page

to retain the SSB capability, I found it was easy to do so and also allowed the simple generation of double sideband AM by the inserted carrier method. If you aren't as radical a fan of controlled carrier screen modulation characteristics as I am, stop after this part of the mod. The AM is satisfactory and the modification is simple to do. The second half of this article will provide an overview of the somewhat more involved additions for controlled carrier screen modulation AM fans. Components used were obtained from ham fests, junk boxes, and Radio Shack, however the nearest Radio Shack parts number equivalents are listed in the parts list.

Independent Carrier Control And Crystal Filter Bypass

This first AM modification adds a new CW LEVEL control, a 10K ohm, 1/2 watt, pot, with SPST switch assembly and a small relay to bypass the crystal filter when the switch is on. Figure 1 is a schematic that shows the CW LEVEL and crystal filter with the recommended initial modifications. Figure 2 shows the audio amplifier and balanced modulator schematic. Point 'A' is where a small positive bias is applied to unbalance the diode modulator and thus produce a carrier for CW or Tune modes. The voltage level determines the amount of carrier.

As designed the CW LEVEL (inserted carrier) control and MIC LEVEL (audio) control share a common knob, which pot is active is a function of the MODE switch position; CW/TUNE or LSB/USB. The new pot makes the CW LEVEL independent and always in the circuit. Now for USB or LSB operation the pot must be full ccw, (slider grounded), when in CW or TUNE the new pot is turned cw to provide a small bit of positive voltage to upset the balanced modulator and insert the desired amount of carrier thus controlling the transmitter output. It now also allows one to insert carrier when the MODE switch is in either LSB or USB position and produce AM output from the modulator. However the carrier and one of the sidebands of the AM will not get past the crystal bandpass filter unless it is bypassed. The switch on the new carrier control pot allows activation of a relay to bypass the bandpass filter any time the pot is advanced away from ground and allows double sideband AM while the Mode switch is in USB or LSB. The new pot also functions for CW or TUNE positions. A second set of contacts on the relay grounds the ALC line to allow the carrier to be amplified in one of the SSB switch positions without shutting down the output.

If you only plan to do this simple

SB-401 AM MODIFICATION PARTS LIST

Inserted Carrier Mods (Figure 1)

potentiometer, 10K ohm, 1/2W,	271-1715
1 pot switch, SPST	271-1740
1 RY3, mini relay, DPDT, 12v	275-249
1 cap, 100pfd, 50v	272-123
2 cap, 440ufd, 25v min	272-1030
2 diodes, 1N4005	272-1104

Audio Mods (Figure 2)

2 cap, 0.1 ufd, 250v (C101, C105)	272-1053
1 cap, 1.0 ufd, 250v (C107)	272-1055
3 cap, 0.001ufd, 500v	272-126
final screen bypass (C21, C22, C68)	

Screen Modulator (Figure 3)

1 switch, mini toggle, DPDT	275-626
1 RY4, relay, DPDT, 12v, wide contact gap	275-206
1 potentiometer, 50K, 4W	see text
1 resistor, 20M ohm, 1/2W	
2 10M ohm 1/4W in series	271-1365
1 resistor, 1M ohm, 1W	
2 2.2M ohm, 1/2W, in parallel	271-134
1 cap, 0.22ufd, 300v	
2 0.1ufd, 250v in parallel	272-1053
1 200pfd, 400v, disc or mica	--------
1 diode, 1N4005 or 1N4007	276-1104
1 Zener diode, 12v, 1W	276-563
1 Zener diode, 5.1v, 1W	276-565
1 LED diode, T-1	276-026

* Part numbers are local Radio Shack

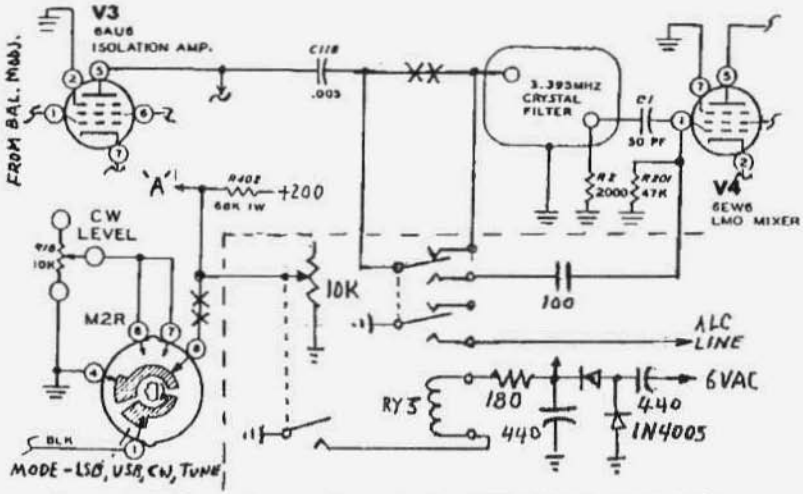


Figure 1. Independent carrier control and Xtal filter bypass mods

modification, physically install the control/switch in place of the MIC connector for a balanced look to the front panel. I use Body/Ring/Tip 1/4" phone plugs for all my push-to-talk mics and put an in-line connector on a pig-tail microphone cable out the back. A large thin hardware store washer was drilled to fit the pot panel bearing and used on the outside of the panel to make it fit the large mic connector hole.

Locate and unsolder the white-gray wire on the rear of the second wafer from the panel of the MODE switch (terminal 8). Solder an extension wire to reach the slider terminal of the new pot. Insulate the joint with a short piece of shrink tubing. Connect the ccw terminal of the pot to ground.

The crystal filter is located in the center of the chassis and the terminals are readily accessible from the underside. There is adequate space to double side foam tape or hot glue a miniature DPDT 12 volt relay upside-down near the input terminal of the filter. Wire the circuit as shown in the schematic. The voltage doubler can be made as a small direct connected module without a board and is also glued to the chassis. The 180 ohm resistor in series with the coil is selected to provide holding potential (about 11 volts) and is probably not needed, however the way I operate the relay is mostly activated and this increases its lifetime.

At this point the rig will produce AM by performing the following actions: Tune up the rig per instruction book for SSB. With the rig 'MODE' switch in either LSB or USB, and push-to-talk depressed, turn the new switch on and advance a small amount to get carrier and double sideband AM. The proper balance between the amount of audio and carrier is critical to the quality of the received signal so monitoring your own signal is important. A scope helps too. The proper ratio for maximum output can be easily set by using the REL PWR position of the METER switch. Advance the carrier pot until additional pot rotation no longer causes the REL PWR to increase. Note this meter reading. This establishes the maximum output capability of the amp and will be above 60 watts output for good final tubes. Decrease the carrier pot to just 1/2 the noted meter scale reading. (The meter scale is proportional to volts, a power meter on the transmitter output

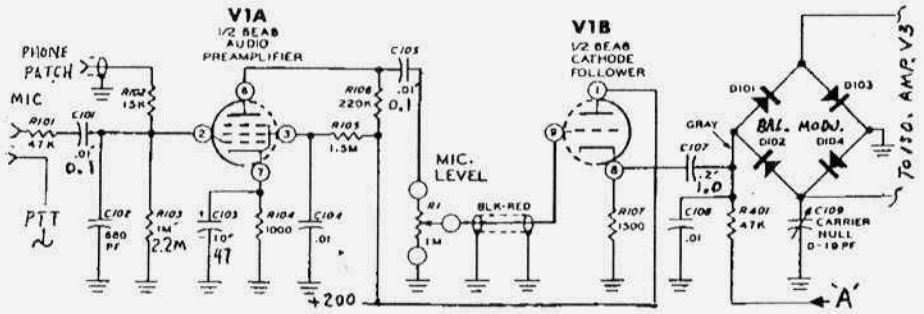


Figure 2. Audio amplifier schematic and mods

should read 1/4 the max output capability.) This max AM output will probably result in between 10 and 20 watts resting carrier. These levels are too high for most common linear amplifiers so additional downward adjustment is required to set the carrier level for a more reasonable 5 to 10 watt resting carrier condition. Audio often requires some reduction to make the monitored signal sound best. Record control settings for future use. This is the same adjustment process required to make most imported transceivers produce acceptable AM.

Audio Amplifier Improvements

The audio amplifier and cathode follower is restricted on the low end unless the four capacitors are increased in value as shown by Figure 2. The speech amplifier grid resistor was increased to 2.2 megohms and the cathode bypass increased to 47 uFd to get the best lows out of my D-104 crystal mic and the 680 pF was left in to cut some of its highs. Try it with your mic before changing these. I thought additional decoupling would be required, however my situation did not need it. The low voltage dual capacitor can (C77) was unscrewed so it could be moved enough to gain access to the printed circuit board to use solder wick and install the new value components. I later replaced the can with separate fresh caps as a part of general clean-up of a little hum in the transmitter power supply.

Adding A Controlled Carrier Screen Modulator

In my opinion this type of AM is superior to any other when used to drive a commonly available ham linear amplifier. Set to give an amplified 100 watts of resting carrier and 400 to 800 watts of PEP it sounds super and shows respect for the amplifier limitations. All this good AM from one more little 6DE7 tube without transformers has got to be the best deal around for minimum cost, hardware, and effort.

Figure 3 is a schematic of the additional modulator circuitry. The circuit is essentially the same as I modified for the DX-60 with the added convenience of an adjustable 'AM Resting Carrier' pot in the cathode of the cathode follower. This allows independent control of the resting carrier level from 0.5 watt to above 15 watts exciter output with only a little interaction with the audio modulated PEP level. The PEP level is separately controlled by the audio gain control. The modulated screen voltage is clamped to a negative value of about 17 volts to prevent negative cycle overmodulation. An LED in the clamp diode chain will flash when audio is too high and would cause distortion. These two features make setup and proper operation of the screen modulated AM mode with an amplifier easy without need for a scope.

The screen modulation circuit is composed of four principal areas/modules:

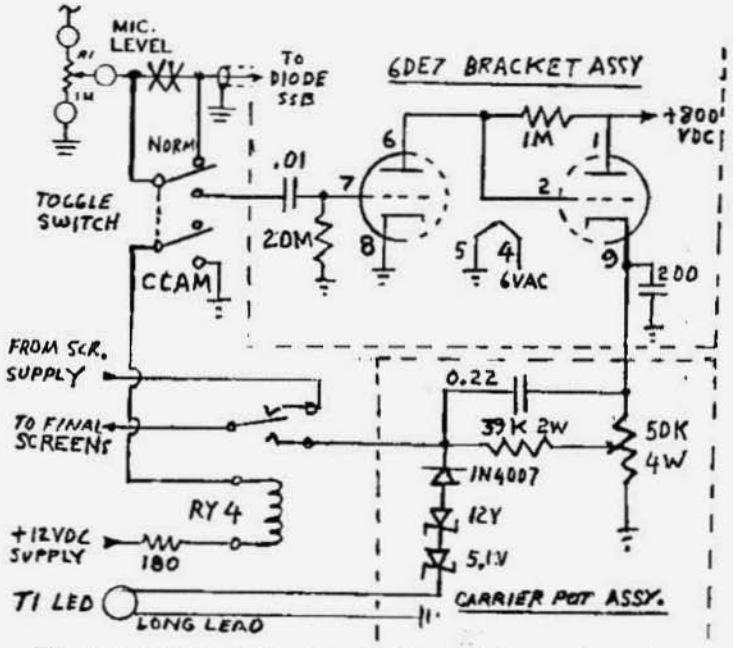
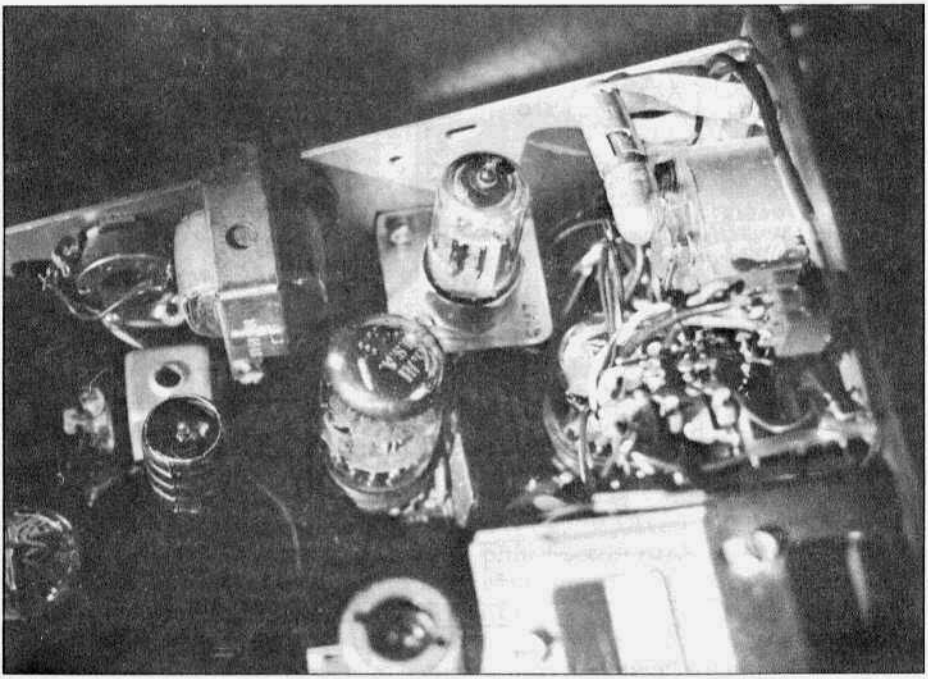


Figure 3. Controlled carrier screen modulator schematic

the toggle switch, the relay, the tube bracket assembly, and the resting carrier control pot assembly.

The miniature DPDT toggle switch positions are Normal and Controlled Carrier AM (CCAM). When in CCAM one section grounds the return of a small relay (RY4) that transfers the final screens from the normal SB-401 connection to the output of the controlled carrier modulator. The relay contact spacing should handle about 300 volts and 50 mA. The relay is glued/taped under the chassis to the amp shield near the point where the wire bundle to the finals exits. The modulating voltage from the 6DE7 is wired to the normally open relay contact with a piece of RG-174 miniature coax for shielding. The normal screen supply is a red wire attached to a terminal strip near the 6146 sockets at the juncture of R17 (680 ohms) and C68. Lift this red wire and with an extension attach it to the normally closed contact of RY4. Wire the RY4 swinger to the terminal vacated by the red wire. While in the final screen area make sure to replace the three 0.005 uFd screen bypass caps (C21, C22, C68) with 0.001 uFd to improve audio response. Twelve volts for the relay is taken from the previously described and installed voltage doubler.

The 6DE7 tube bracket assembly is a small 1-1/2 X 1-1/2 piece of aluminum with a right angle mounting tab. It has a 9 pin socket and four small components connected pin to pin. Pigtail leads are also soldered to the pins before it is installed in its final position. A small space for the bracket and tube is cleared on the right chassis support by removing one of the audio transformer support screws and rotating it to the vertical. A small two terminal board is scrapped and the connections direct wired. A small pot was removed, rotated 180 degrees, and reinstalled, to clear its terminals. The meter dial lamp bracket was removed, shortened, drilled



New 6DE7 screen modulator location. Realigned transformer and pot is to its left. Relocated meter lamp bracket is to right. New toggle switch is just visible on far right.

and bent to allow it to be supported by the right hand front panel screw. The 6.3 volts AC for the 6DE7 filaments is connected at this lamp socket.

The remaining parts are mounted on the rear of the 50K ohm, 4 watt resting carrier control pot. A 5-connection terminal strip has its support ground terminal soldered directly to the ccw pot terminal for mechanical support as well as the circuit ground point. All other components on the assembly use these terminals and the pot terminals for tie points. A long pigtail is used on the LED to allow it to be positioned in a small 1/8 inch hole in the front panel. Secure with poster putty or hot glue. Audio wires are all miniature RG-174 coax for shielding. This pot is installed in the MIC connector hole to get enough room for the circuit and the other new 10K pot must be moved to a new location below the MIC LEVEL pot. I removed the frequency dial lamp assembly on the right side to make more clearance. It isn't missed and also helps compensate for the filament current taken by the added 6DE7. See the front panel picture for my location of the added controls. In this location the toggle switch is close to its audio connection, however shielded cable will allow placement anywhere.

Controlled Carrier AM Operation

Place the toggle switch to the NORMAL POSITION. Tune up the SB-400/401 per instruction book in TUNE. Use the newly added CW LEVEL pot (10K) with switch to get a full output carrier. After tuning is complete, set the pot for two milliamps on the GRID meter and leave it there. Switch the MODE switch to USB (or LSB). Switch the toggle switch to CONTROLLED CARRIER AM. Depress the push-to-talk and advance the RESTING CARRIER POT (50K) to set to

continued on page 40

A Homebrew Mic Preamp

by Robert Burger, WB6VMI
Box 841
Keno, OR 97627

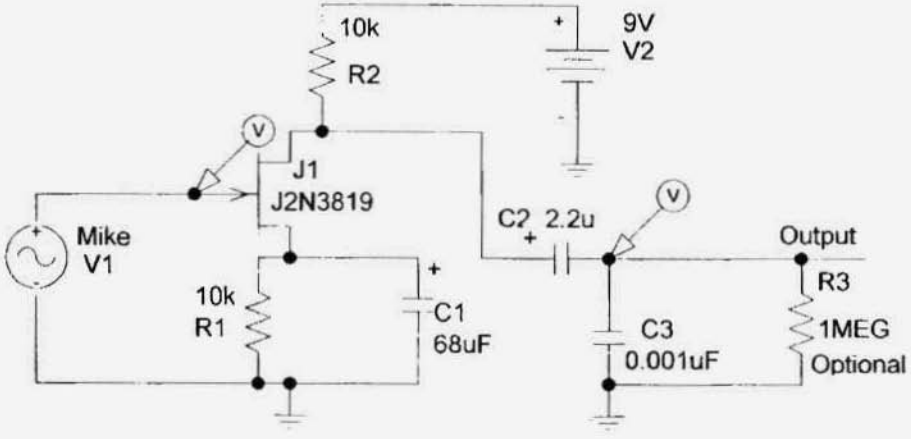
The preamp, whose schematic is below, greatly improves those odd microphones with low output levels or mismatched impedance. Also, when a speech amplifier is modified with a lot of negative feedback for linearization, as in my Viking II, the audio input from the mic must be higher. Parts for this construction are available from a Radio Shack store. I build the preamp in a small self-contained aluminum box, including a 9V battery, battery switch, mic input jack, output cable, and a push-to-talk button on top that I like to use.

This preamp has a JFET input that provides an ultra low load on the mic. R1 serves to bias the JFET properly so that there is no chance of having AC or DC current through the mic. The voltage gain is set by R2 to be about 10. C2 keeps the DC voltage off the input to your transmitter while adequately passing low frequency signals.

The value of R3 is not critical, since it merely models the transmitter's input resistance. In fact the 1 meg resistor already exists in my Viking II. Since the 1 meg is already in the circuit, I did not use it in my construction. This circuit will work correctly for R3 down to about 5k, where the preamp amplification decreases to 4.

The purpose of C3 is to attenuate the higher frequencies of audio, while the purpose of C1 is to attenuate the lower frequencies of audio. It is possible to perform first order microphone frequency compensation by adjusting C3 and C1. As shown, the range is about 10 Hz to 10 kHz as expected of AM audio. If C1 were dropped to 1 uF the lower limit is about 300 Hz; if C3 were increased to 0.01 uF, the upper limit is about 3 kHz.

After I grounded the mic directly to the Viking II chassis, RF pickup was close to nothing in my application. This was a simple project with a big payoff in audio pleasure. I heartily recommend it. ER



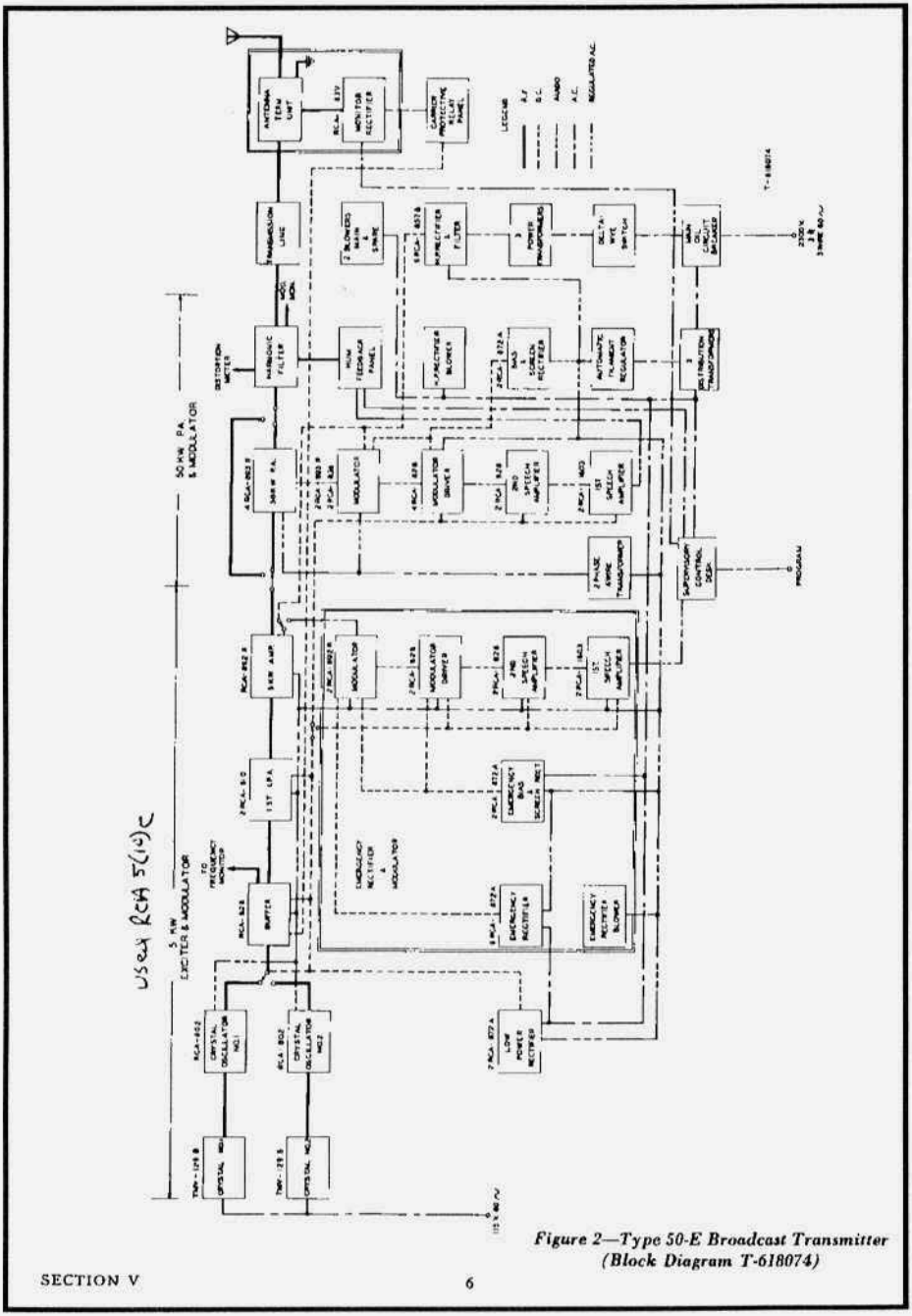


Figure 2—Type 50-E Broadcast Transmitter (Block Diagram T-618074)

SECTION V 6

Block diagram of the RCA 50-E, 50 KW BC transmitter described in last month's ER.

Ranger Output from page 27
this such as; change the mic gain pot to a lesser value and install a top resistor, change the speech amplifier from a 12AX7A to one with less gain (sugg. by W4PNT), or change the gain of the speech amp by modifying its first stage cathode components (sugg. by WC3K). Of course the easiest of the three methods was tried first. The 12AX7A was changed to a 12AU7A and the gain setting moved to the 10 o'clock area. With 5 watts of drive, a resting carrier of 90 watts is obtained from the SB-220. Increasing the drive to 10 watts yields 125 watts. Note, as the power is reduced from 55 watts to 10 watts for amplifier operation, the mic gain should be reduced to maintain the 100% modulation level.

The addition of these mods has made my trusty old Ranger more versatile. Moving the PA plate current shunt is just a better design and should have been done when the rig was first designed. With the addition of the adjustable RF output feature, operation between maximum power barefoot and low power for amplifier usage has become a real pleasure to use. The front panel control appears to be directly connected to the wattmeter! With the mic gain mod installed, the "set" repeatability has become much less sensitive and a non-problem. You can installed some or all of these in your Ranger or use the ideas in a similar transmitter. P.S. The solid-state drive pot mod never did get installed!! ER

Tip for Regen Receiver Builders

One can find a high inductance audio choke as used in regen receivers, in every BC-221/LM. The inductance is from 150 to 600 H depending on maker. **Bob, W7SC**

VLF Preselector from page 24
contact the Longwave Club of America, 45 Wildflower Rd., Levittown, PA 19057-3209.

Frequency List of active VLF transmitters as received in the US:

11.905	RUSSIA
12.649	RUSSIA
13.000	AUSTRALIA
14.881	RUSSIA
16.000	GREAT BRITAIN
18.060	RUSSIA
18.200	INDIA
19.800	AUSTRALIA
20.500	RUSSIA
20.500	CHINA
21.400	HAWAII
21.600	RUSSIA
22.200	JAPAN
23.400	GERMANY
24.000	US
24.800	US
25.200	US
37.500	ICELAND
40.000	JAPAN

Frequency is in cycles per second.

HF Receiver	**VLF Equiv.**
National NC-100	RBL-2
Hammarlund SP-600	SP-600VLF
Collins R-390	R-389
RCA AN/SSR-13	AN/SSR-11

TUBE COLLECTORS GROUP FORMED: The new tube collectors association is now in operation. This is a non-profit, non-commercial organization of collectors & history enthusiasts focusing on all phases & vintages of tube design. The founding president of the group is Al Jones, W1ITX, who is known for his award winning tube collection. For more details & complimentary copy of the association's bulletin contact Al Jones, CA, (707) 464-6470, Ludwell Sibley, OR, (541) 855-5207, or mail request to POB 1181, Medford, OR 97501.

AMI Update from page 18
encapsulated in plastic and hung by a hook by the door so we can conveniently meet the local authorities with our credentials. ER

The text of the new law follows:

One Hundred Sixth Congress of the United States of America AT THE SECOND SESSION

Begun and held at the City of Washington on Monday, the twenty-fourth day of January, two thousand

An Act

To authorize the enforcement by State and local governments of certain Federal Communications Commission regulations regarding use of citizens band radio equipment.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. STATE AND LOCAL ENFORCEMENT OF FEDERAL COMMUNICATIONS COMMISSION REGULATIONS ON USE OF CITIZENS BAND RADIO EQUIPMENT.

Section 302 of the Communications Act of 1934 (47 U.S.C. 302a) is amended by adding at the end the following:

(f)(1) Except as provided in paragraph (2), a State or local government may enact a statute or ordinance that prohibits a violation of the following regulations of the Commission under this section:

(A) A regulation that prohibits a use of citizens band radio equipment not authorized by the Commission.

(B) A regulation that prohibits the unauthorized operation of citizens band radio equipment on a frequency between 24 MHz and 35 MHz.

(2) A station that is licensed by the Commission pursuant to section 301 in any radio service for the operation at issue shall not be subject to action by a State or local government under this subsection. A State or local government statute or ordinance enacted for purposes of this subsection shall identify the exemption available under this paragraph.

(3) The Commission shall, to the extent practicable, provide technical guidance to State and local governments regarding the detection and determination of violations of the regulations specified in paragraph(1).

(4)(A) In addition to any other remedy authorized by law, a person affected by the decision of a State or local government agency enforcing a statute or ordinance under paragraph (1) may submit to the Commission an appeal of the decision on the grounds that the State or local government, as the case may be, enacted a statute or ordinance outside the authority provided in this subsection.

(B) A person shall submit an appeal on a decision of a State or local government agency to the Commission under this paragraph, if at all, not later than 30 days after the date on which the decision by the State or local government agency becomes final, but prior to seeking judicial review of such decision.

(C) The Commission shall make a determination on an appeal submitted under subparagraph (B) not later than 180 days after its submittal.

(D) If the Commission determines under subparagraph (C) that a State or local government agency has acted outside its authority in enforcing a statute or ordinance, the Commission shall preempt the decision enforcing the statute or ordinance.

(5) The enforcement of statute or ordinance that prohibits a violation of a regulation by a State or local government under paragraph(1) in a particular case shall not preclude the Commission from enforcing the regulation in that case concurrently.

(6) Nothing in this subsection shall be construed to diminish or otherwise affect the jurisdiction of the Commission under this section over devices capable of interfering with radio communications.

(7) The enforcement of a statute or ordinance by a State or local government under paragraph (1) with regard to citizens band radio equipment on board a 'commercial motor vehicle', as defined in section 31101 of title 49, United States Code, shall require probable cause to find that the commercial motor vehicle or the individual operating the vehicle is in violation of the regulations described in paragraph (1).

Speaker of the House of Representatives.
Vice President of the United States and President of the Senate.

BC-610 Coils from page 15
ers and 1" brass bolts going through the fiber washers bring the output of the coupling coil to a connection on the side of the main coil.

Solder lugs used on every connection.

40 Meter Coil
Outside Coil
4 turns X 2 = 8 total turns
Inside Coupling Coil — 5 turns

160 Meter Coil
Outside Coil
22 turns X 2 = 44 total turns
Coupling Coil - 7 turns

80 Meter Coil
Outside Coil
11 turns X 2 = 22 total turns
Coupling Coil - 7 turns

Further Design Considerations for The BC-610

The BC-610 during WW II was designed to operate as a mobile system as the SCR-299. They operated in a panel truck with perhaps some form of a gasoline or diesel generator not too far behind. No telling what kind of surges these generators produced. Probably, because of this, the fuses marked on the front panel of the BC-610 are way over rated at 25 amps.

Tests conducted at W4ZXS, in line surge measurements, show the maximum surge at 120 volts AC power line current for the BC-610 to be no greater than 12 amps. As proof during the test, three 15 amp fast blow fuses were placed in the unit and they **did not blow**. Both analog and digital meters of known accuracy were used. 50-ohm carbon load was used in the RF output/SWR 1 to 1, 450-500W output to load.

NOTE: Take the 25 amp fuses out - they are way too high. Use 20A or 15A.
Test Data:
Filament, 3.7A
HV protect on, 5.3A
Exciter plate, 6.2A
HV protect off, 6.9A
Key down no voice, 9.6A
Modulation full voice, 11.4A
CW only 500 watts output, 12.0A

There was no surge current exceeding 12 amperes, and the 15 amp fast blow fuses installed did not blow. **ER**

NOTE: If anyone has questions concerning the coil data or the current data for the BC-610, you may call me Saturday mornings between 9 AM and 12 Noon at (804) 736-9029.

A complete index of the entire 11 years of ER is available for viewing or downloading at the following website:
http://www.qsl.net/n9oo

Radios I Have known from page 4

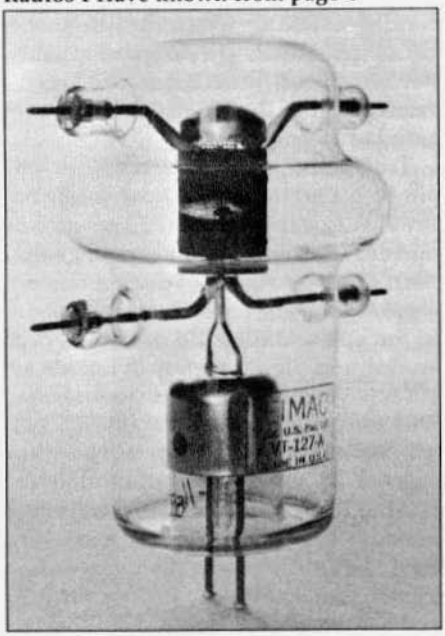


Figure 3. The VT-127A pulse oscillator tube. Two of these worked fine in a kilowatt CW transmitter.

The SCR-268 Radar Set

Shortly after the war when surplus radio gear started to come on the market, the Gilfillan company advertised SCR-268 radars for sale for about forty dollars. What a bargain! You needed a truck to haul the beast home. The ring oscillator (which operated around 100 MHz) utilized twelve VT-127A tubes (Fig. 3), electrically similar to the 100TL triode. The pulse modulator used six 304TL triodes, with two 250TH's connected as clipper diodes.

What a treasure! Enough junk to build up a kilowatt transmitter or two! Best of all, the brass fittings could be sold to a junk dealer for just about the price of the whole radio!

By the time the war started the SCR-268 was used for searchlight control, but it was quickly replaced by higher power VHF equipment. It was headed for the surplus market and eager radio hams!

That Was Then, This Is Now

Of all the surplus stuff that passed through my hands, the only item I have left is a BC-348 receiver. It is still a star performer for general shortwave reception. Every once in a while I fire it up and tune around the bands. If it were to be built today, it would cost a fortune. They don't make 'em like that anymore! **ER**

SB-400 from page 34

desired output level. (I like about 5 watts.) Advance the MIC LEVEL pot to get the desired level of modulation, taking care to always keep it below the point where the voice peaks flash the over modulation LED. The single audio amp is a little skimpy on gain. My audio gain control sets at about 2 PM with a D-104 and is enough, but that is a function of the output of your mic or audio equipment.

Conclusion

The SB-401 has been on line for a couple of months and is living up to all my expectations. The VFO is truly excellent in stability and repeatability of setting. The controls and switches are convenient and easy to use. It doesn't use up much operating position real estate and looks fine. I seldom use the inserted carrier mode of AM, primarily because I enjoy the good reports received with the controlled carrier screen modulation. At 15 watts resting carrier it does a fine job for local contacts, however the linear amplifier makes the AM signal awesome. **ER**

Make Your Own R-725 from page 13

V511, filament, pins 4 and 5; ground, pin 9.

Now insulate any bare connections, and use mini-tie wraps to secure the new wires to sturdy nearby points.

To enable final installation of the deck in your R-390A, you'll need to make two adapter cables. These cables shall consist of jumpers (RG-59 is OK, approximately eight inches in length) with BNC's on each end. You'll also need two adapters of the type found on the back of the frame of the R-390A at the IF OUT jack (AMPHENOL 47200). This will provide crossover from MB connection (R-390A standard) to BNC (R-390 standard). Connect P-218 of the R-390A to J-526 of the R-390 IF deck with one of the cables. Connect P-213 of the R-390A to J-525 of the R-390 IF deck with the other cable. It is a good idea to label these cables. See the photo for reference.

Install the deck in your R-390A. You will notice that the screw holes are the same as for the R-390A IF deck, however the screws of the R-390 deck are of larger diameter. I did not change these screws as they are captive into the deck. The BFO BANDWIDTH, and power connector of the deck will hold it in place,however I would not install it in a Jeep this way. Changing these screws is optional.

When you turn on the power, make sure your dial lamps light up normally. If they don't, you have a filament supply problem so turn off the set immediately and troubleshoot.

For great sound, instead of using the built-in audio deck, I prefer to tap the audio from the diode load jumper at the back of the set. Through a 0.1 uF or larger capacitor, feed this signal into your line audio amp of choice, and enjoy the tuned circuit audio of the new R-725, errrr, R-390A with tuned circuit IF. You'll get the smooth sound of the R-390 and R-725, but have the parts availability and support common to the R-390A for the balance of the set. I've used my modified IF deck in two different R-390A frames, and it worked equally well in both. In my opinion, it makes the longterm listening experience much more enjoyable.

If you have any questions about the mod, please feel free to write. **ER**

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TM 11-5820-358-35, FIELD AND DEPOT MAINTENANCE MANUAL, RADIO RECEIVER R-390A/URR, May, 1980.

Special thanks to Wally Chambers and George Rancourt.

Signal Corps Radio 197 from page 9

51 truck. It also was the only one that coils could be changed from the front, which allowed placing it against the cab wall of the cargo compartment. This simplified the equipment layout in the K-51. The BC-312, 342, 729, and JB-70 were the same as in the 197. Without the power unit in the truck an 1800 watt electric heater had to be added.

So the famous SCR-299 owes its heritage to the SCR-197. While the 299 went on to glory on battlefield after battlefield, the unsung 197s sat waiting to relieve radio stations that never needed relief. The last 197 waiting was #3 at Woodbridge, VA. In 1952 it was replaced by an AN/GRC-26 mounted in a Duck. **ER**

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FOR SALE: MacElroy Wheatstone tape perforator model 443-A, no pwr sply - $75 or BRO. Earl Russell, WR1Y, MA (978) 448-5822, pegruss@juno.com.

FOR SALE: MFJ G5RV antenna w/book, used - $25. Al Jenkins, WA1RWB, MA, (508) 325-7122.

FOR SALE: HQ-129X - $150; HQ140X - $200. Both VG, work, copy of manuals; Johnson Viking II, low output, fair to good, copy of manual - $150. Cliff, WA9SUE, WI, (608) 625-4527 after 6 PM

FOR SALE: Allied SX-190 rcvr w/matching spkr, exc - $125; SBE-34 (2) - BO; SB-650 (Heath) - $125. All + shpg. John B. Keil, 4618 Norwalk St., Union City, CA 94587. (510) 471-4838

FOR SALE: 1942 RCA F type AR6 rcvr - $600; Navy RBA3 rcvr 15-600 kc - $500; Wakins-Johnson 776-3 - $200. WA9IYF, IL, (847) 640-1329.

FOR SALE: Collins mechanical filter type F 500 B 14, Ser 5V2, P/N 526 9030 00 - BO. Wes, W5DPM, wesw5dpm@eatel.net

FOR SALE: Swan 410 VFO; Heath Mohican; HP-23B; TMC SBE-2; EFJ 250-35 LoPass; NowaStar AeroEar. U-ship. WA7HDL, ID, (208) 756-4147.

FOR SALE: Radar, APS-88, ex Grumman S2A Tracker, complete, antenna and mount, rcvr/xmtr, synchronizer, control amp, display, antenna control box, system control box, 65KW, X-band - $1500, no cables, manual available, extra. Carl Bloom, (714) 639-1679, 3778111@MCIMAIL.COM

FOR SALE: NOS RCA reproducer, 5 watts speech - $45; Wilson VHF 2W T1402SM w/charger - $50. Joe, W6CAS, CA, (916) 731-8261.

FOR SALE: 3 ft X 5 ft professional reprint of schematic diagram for Collins KW-1 TX - $27, shpd USA. Tom Berry, W5LTR, 1617 W. Highland, Chicago, IL 60660. (773-262-5360, 262-0016.

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FOR SALE: Jenning ant relay RB1 10 kv amps RS - $10; 115AC lge coax conn - $100. W6ATC, w6atc@aol.com

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

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WANTED: National FRR-59; Hallicrafters SX73, Scott Special Communications rcvr. EA4JL, please call, Kurt Keller, CT, (203) 431-6850

WANTED: Small 1" panel meters, especially DC ammeters. Send price info. Chris Cross, POB 94, McConnell, IL 61050

WANTED: RBB/RBC rcvrs, pwr splys, cables & RAK/RAL equip. Andy Miller, KD6TKX, CA, (831) 484-2389, amillertkx@aol.com

WANTED: QST issues: Aug. 1932; June 1933; June 1934; & Millen VFO model 90711. V. Yeich, 1700 White Hall Rd., White Hall, MD 21161. (414) 357-5112

WANTED: Millen 90800 exciter/xmtr w/as many coils as possible. Ted Bracco, WØNZW, 203 E. Main St., Teutopolis, IL 62467. (217) 857-6404 ext. 306

WANTED: Quality radio & communication collection within 250 miles of Cedar Rapids, IA, otherwise delivered. Bill Coolahan, 1450 Miami Dr., NE, Cedar Rapids, IA 52402. (319) 393-8075

WANTED: Code pratice tape MC-650 for TG-34-A keyer. Tape is 3/8" paper w/black ink markings. Full set is 15 reels but will take what I can get. Bob Lackey, W4QBE, 1252 Worley Creek Rd., Lakemont, GA 30552. (706) 782-3670

WANTED: Mics: Astatic JT 30/40; UT-48; Shure CR80/81/41; 707A; Turner VT-73; CD/BD; parts for same. Tom Ellis, Box 140093, Dallas, TX 75214. (214) 328-3225. tomsmics@flescomp.com

WANTED: BC-375/BC-191 xmtr; BC-611. Pete Hamersma, WB2JWU, POB 467, Holderness, NH 03245.

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WANTED: Military survival communications equip: radios, beacons, manuals, books, historical info/photos. Daniel Cahn, 3444 Greenwood Ave., Los Angeles, CA 90066. (310) 398-7159. danielc411@aol.com

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

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WANTED: Seeking unbuilt Heathkits, Knightkits. Gene Peroni, POB 7164, St. Davids, PA 19087. (610) 293-2421

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

WANTED: QSTs before 1936 and various years ARRL Handbook for personal collection. Gary Yantis, WØTM, 800-844-9860, gary@w0tm.com

WANTED: Drake 1A rcvr; 399C1 Collins VFO; JRC 505 twins. K5YY, AR, (501) 756-5010. k5yy@arrl.net

WANTED: Top $ for Philmore CR5A RX, international xtal 80/40 xmtr, WRL, CW7, xmtr. Gary Wagner, K3OMI, TN, work # (865) 690-4217

WANTED: Pair of good 75TH tubes for a 30K-1. Tom Lutz, WØZR, MN, (612) 931-2296. telvtz@pclink.com

WANTED: Collins 310B3, basket case OK - welcomed; & Chicago 500W CMS-2, high-level modulation xfmr; Taylor T21. Jerry, W8EGD, CO, (303) 979-2323.

WANTED: Basket case variometers w/loose or missing wiring, provided the rotor, stator & framework is in good condition. Roland V. Matson, POB 956, Lake Panasoffkee, FL 33538

WANTED: Ham Radio Magazine: May 1968, November 1968, April 1969. John Crabtree, KCØGGH, POB 24162, Minneapolis, MN 55424. Ph/fax (888) 346-8080 or crabtreejr@aol.com

WANTED: Schematic/manual copy: Racal RA-17; VLF-LF convertor. Harry A. Weber, 4845 W. 107th St., Oak Lawn, IL 60453.

WANTED: Manual, orig or copy, for BC-221-AF frequency meter. Dale Martin, W7LOG, 2021 153rd Ave., SE, Bellevue, WA 98007. (425) 746-3310

FOR SALE: Repro Nameplates, R-390A generic - $9; 51J-3 and 51J-4 exact replicas - $12. Tom Marcotte, N5OFF, 242 Chestnut Oak Dr., Mandeville, LA 70448. marcotte@iamerica.net

FOR SALE: Gates BC250-GY broadcast xmtr w/ manual, spare finals & Gates accessory equip such as modulation & frequency monitors - $500; BC-223-A xmtr w/2 spare tuner boxes - $125. **WANTED:** G coil to fit my HRO-5. Thanks. Tom Smith, N5AMA, 13034 Elmington Dr., Cypress, TX 77429. (281) 376-3436 or tsmith@hal-pc.org

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FOR SALE: Transformers, capacitors, meters, publications on radio. SASE for list. Bill Riley, W7EXB, 863 W. 38th Ave., Eugene, OR 97405

FOR SALE: WWII Merchant Marine rcvrs, Mackay 128AY, Radiomarine/RCA AR8506B, AR8510, EH Scot SLRH, SLRM, any rcvr - $250. Carl Bloom, (714) 639-1679, 377811@MCIMAIL.COM

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FOR SALE: Collins drum overlays. 75A-2, 3, 51J#. For 75A-4 & KWS-1, specify new/old - $8.50 ea. 2/$15 ppd. Correct colors. Charlie Talbott, K3ICH, 13192 Pinnacle Ln., Leesburg, VA 20176-6146. (540) 822-5643.

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WANTED: National HRO black wrinkle spkrs, oak coil boxes, coils; Western Electric horns, spkrs, amps, mics. Barry Nadel, POB 29303, San Francisco, CA 94129. bnadel@ccnet.com

WANTED: Searching for RME CT-100 or 3R9 xmtrs and info about them. David Edsall, W1TDD, 156 Sunset Ave., Amherst, MA 01002. (413) 549-0349, dedsall@crocker.com

WANTED: Mohican, SB-200; SB-220; SB-100; SB-101; SB-102; Knightkit Band Spanner II; Heath GW-12A; GW22A; GW42. Debbie, AR, (870) 857-3366.

WANTED: New or used unmodified BC459A, BC696, T18/ARC/5, T19/ARC/5, CBY52232. Louis Lytch, K2DET, 117-33 230th St., Cambria Heights, Jamaica, NY 11411-1806. (718) 528-5065

WANTED: Manuals, manuals, manuals for radio-related equipment to buy or swap. Catalog available. Pete Markavage, WA2CWA, 27 Walling St., Sayreville, NJ 08872. (732) 238-8964

WANTED: Collecting military electronics including radio, radar, RDF and test, manuals & literature. William Van Lennep, POB 211, Pepperell, MA 01463. (978) 433-6031

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

WANTED: Postcards of old wireless stations; QSL cards showing pre-WWII ham shacks/equip. George, W2KRM, NY, (631) 360-9011, george2f@aol.com

WANTED: A set of Quad II tube amps in any cond'n. Peter Stutman, POB 492, Stowe, VT, 05672. (802) 253-6022 or stutman@aol.com

WANTED: Manuals for ASB-5; OE-4/GR; TRN-25; PPS-15B; Ferris 32-D; Sienna 305A; RCA 308A. Wm Van Lennep, POB 211, Pepperell, MA 01463. (978) 433-6031, anaps46@aol.com

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

WANTED: Tektronix memorabilia & promotional literature or catalogs from 1946-1980. James True, N5ARW, POB 820, Hot Springs, AR 71902. (501) 318-1844, Fx 623-8783, james.true@ibm.net

WANTED: Cash for Collins: SM-1, 2, 3; 55G-1; 62S-1; 399C-1, 51S-1; 75S-3A, C 325-3A; any Collins equip. Leo, KJ6HI, CA, ph/fx (310) 670-6969, radioleo@earthlink.net

WANTED: 80 & 40 meter xtals in FT243 holders. Howard Weinstein, K3HW, 4041 Ridge Ave. Apt 4-405, Philadelphia, PA 19129. (215) 843-1180. k3hw@arrl.net

WANTED: Merchant ship radio memorabilia, radios, keys, parts, clocks, documentation. Tom Mackie, W2ILA, 14 Washington St., Jamestown, RI 02835. (401) 846-1200

WANTED: Collins promotional literature, catalogs and manuals for the period 1933-1993. Jim Stitzinger, WA3CEX, 23800 Via Irana, Valencia, CA 91355. (661) 259-2011. FAX (661) 259-3830

WANTED: Electric Radio; Antique Radio Classifieds; Old Timers Bulletin. Alan Mark, POB 372, Pembroke, MA 02359

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WANTED: Triplett tube tester model 3444 or 3444A. Sam Doughty, AR, (870) 772-5849, sdam.sam@gte.net

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WANTED: Westinghouse MW2 xmtr and/or pwr sply, will pick up; Heath DX-60. Gary, WA4ODY, Houston, TX, (281)-291-7701, myctpab@earthlink.net

WANTED: Test equipment & tube audio amplifiers. Mike Nowlen, WB4UKB, 2212 Burgee Ct., Reston, VA 20191. mike63dnet.com

WANTED: Hallicrafters Village/Hamlet radios TR-5/TR-20 & Gonset Civil Defense 6m radios/ accessories, manuals also. Daniel Cahn, 3444 Greenwood Ave., Los Angeles, CA 90066. Fx/msg (310) 398-7159 or danielc4116@aol.com

WANTED: Cash for Collins: SM-1, 2, 3; 312A-1, 2; 55G-1; 399C-1; 62S-1; KWM-1; 302C-3; 51S-1; 75S-3C; 32S-3A. I buy any Collins equip. Les, KJ6HI, CA, Ph/Fx (310) 670-6969. radioleo@earthlink.net

WANTED: RF & detector coils for any model National SW-3. Leland Smith, W5KL, 10 Hawthorne Dr., Harrison, AR 72601. w5kl@alltel.net

WANTED: QSL cards from old/pre WW II Ham DX countries; old regen kits. Hajime Suzuki, Nishikuniyoshi 1644-24, Ichihara-Shi, Chiba-Ken, 290-0231 Japan

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FOR SALE: Lots of old radio & related books. Eugene Rippen, WB6SZS, www.muchstuff.com

FOR SALE: Viking II & 122 VFO & ant tuner, U PU - $325. **WANTED:** Heath 2060 or 2060A ant tuner. W7RBF, AZ, (602) 864-9987

FOR SALE: Send SASE for large list of excess parts, publications, ham & test gear. K4AFW, 104 Glenwood Dr., Williamsburg, VA 23185

FOR SALE: National NCX500, good condx, good finals w/pwr sply, manual copy - $200; Kenwood TS 530S w/MC-50 mic, very good condx w/orig manual & box - $250; TMC tuning drawer 4-8 MHz FFRD-6- $15. **WANTED:** Info Taylor xmtr TSM75k, look to be 6M or 2Mts. Randy, K4RHH, VA, (804) 239-6127 or kevinc@nesbeonline.com

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FOR SALE: HRO 60 + spkr + 8 coils -$425; 75A2 + spkr - $400. Ed Sauer, 787 N.Peterman Rd., Greenwood, IN 46142. (317)-8811483.

WANTED: Ampex tube type decks, mixers, amps. George, OH, (216)-486-6489, blksub4808@yahoo.com

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WANTED: Hallicrafters SX-88 parts radio w/ complete front panel, w/knobs and gear trains. Al Royce, KE6CPS, 873 Fifth St., Norco, CA 92860. (909) 734-0623, Alan.Royce@ttrw.com

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WANTED: R-390A rcvrs, parts rigs or restorable, will restore yours at reasonable prices. Walter Wilson, KK4DF, (706) 733-8323, wewilson@knology.net, www.knology.net/~wewilson

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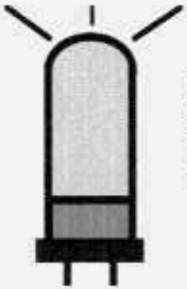

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