CHRS official

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AVC

CALIFORNIA HISTORICAL RADIO SOCIETY

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THE SOCIETY

The California Historical Radio Society is a non-profit corporation chartered in 1974 to promote the preservation of early radio equipment and radio broadcasting. CHRS provides a medium for members to exchange information on the history of radio with emphasis on areas such as collecting, cataloging and restoration of equipment, literature, and programs. Regular swap meets are scheduled four times a year. For further information, write the California Historical Radio Society, P.O. Box 1147, Mountain View, CA 94042-1147.

THE JOURNAL

The official Journal of the California Historical Radio Society is published six times a year and is furnished free to all members. Articles for the Journal are solicited from all members. Appropriate subjects include information on early radio equipment, personalities, or broadcasts, restoration hints, photographs, ads, etc. Material for the Journal should be submitted to the Editor, Herb Brams, 2427 Durant #4, Berkeley, CA 94704.

MEMBERSHIP

Membership correspondence should be addressed to the Treasurer, John Eckland, 969 Addison Ave., Palo Alto, CA 94301.

AUTOMATIC VOLUME CONTROL

Until the late 1920's tuning a radio had one bothersome feature. Loudspeaker volume was greatly affected by signal strength. When tuning from one station to another, it was usually necessary to adjust the volume control, turning it up to hear weaker stations and turning it down on stronger ones to prevent "blasting." It seemed desirable to have some sort of automatic volume control that would maintain the same loudspeaker volume with signals of various strengths.

Before 1925 several circuits for automatic volume control (AVC) had been proposed, but none of these had been used in any actual receiver. Then, in 1925, Harold Alden Wheeler, working for the Hazeltine Corporation, devised a system of AVC that used a diode to rectify the incoming signal, developing a negative voltage that was proportional to the strength of the signal. This voltage was applied to the grids of the RF amplifier tubes, decreasing their amplification. With stronger signals a more negative voltage was developed, reducing the amplification still more. As a result, the same loudspeaker volume was obtained from signals of various strengths. The diode also acted as the detector, recovering the audio information from the signal.

In 1926 Wheeler built and demonstrated a battery-operated neutralized TRF receiver that incorporated this system of AVC. This was the first radio set of any kind to have a working system of automatic volume control. The first <u>commercial</u> broadcast receiver to have AVC was the Radiola 64, sold by RCA in 1928. It used a more complex triode AVC circuit, different from that of Wheeler.

Despite its obvious advantages, AVC was not immediately adopted by the radio industry. It was expensive to provide enough RF amplification for its effective use. Also, with the large degree of amplification required, prevention of oscillation due to feedback was a problem. These problems were alleviated by the development of the screen-grid tetrode tube in 1929 (type UX-224). These tubes provided much greater amplification than the older triode types without causing feedback problems.

In 1929 the Philco radio company decided to use AVC in the top model of their new line and approached the Hazeltine

Corporation for the design of an appropriate circuit. Wheeler designed a receiver for Philco that used his AVC circuit, and later that year (1929) this set was marketed as the model 95. It was an AC-operated TRF receiver, using type 24A screen-grid tubes. It used a type 27 triode connected as a diode since there were no signal-rectifying diode tubes made at this time. In 1929 the Philco model 95 was the first commercial receiver with Wheeler's diode-type AVC system to be marketed.

In 1930 RCA released the superheterodyne circuit to the radio industry. This circuit permitted greater amplification to be obtained without feedback problems. AVC could easily be incorporated into the design and superheterodyne receivers with AVC could be manufactured at relatively low cost.

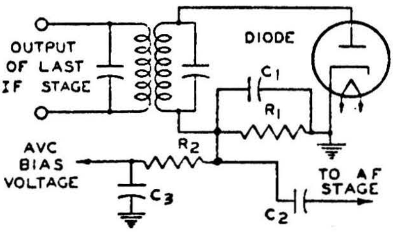
One problem remained. The screen-grid tubes in use at this time were easily "cut off" by large AVC voltages derived from strong signals, resulting in considerable distortion. It was necessary to have a "Local-Distant" switch to reduce very strong signals from the antenna. This problem was solved in 1931 by the development of tubes having a more gradual cut-off characteristic, so-called "super-control," "variable-mu," or "remote cut-off" tubes (types 35 and 51).

In the early 1930's AVC began to be used in more and more receivers. Several systems besides Wheeler's were used. These used relatively complex circuits involving triode or tetrode tubes and required complicated biasing arrangements.

In 1931-32 tubes with diodes designed specifically for signal detection and AVC rectification were developed. Tubes were also introduced that contained both a diode and a triode in a single bulb. The triode could be used as the first stage of the audio-frequency amplifier.

By 1933 development of AVC was essentially complete. The development of screen-grid tubes, the superheterodyne circuit, and diode tubes made it practical to incorporate AVC into receivers at low cost. Wheeler's design proved to be the simplest and most effective. His AVC system could easily be incorporated into superheterodyne receivers which, by now, were replacing the older TRF types. As a result, by 1933 Wheeler's diode AVC system was being incorporated into nearly all radio sets. It has continued to be a regular feature of commercial receivers even today. Wheeler's design of automatic volume control was an outstanding contribution to the development of radio. It had numerous other applications, as we shall see.

CIRCUIT ANALYSIS



Typical values

R1 - 500,000 ohms
R2 - 1.0 megohm

C1 - 250 mmfd
C2 - 0.01 mfd
C3 - 0.05 mfd

A single diode is used for both AVC and signal detection. The amplified radio-frequency signal is applied to the diode through an RF transformer, T. The diode rectifies the signal, developing a negative DC voltage across resistor R1. Capacitor C1 removes any radio-frequency variations. The negative DC voltage retains the audio modulation of the incoming signal. It is used in two parallel paths:

(1) The voltage is applied to capacitor C2 which blocks the DC component but allows the audio modulation to be sent to the volume control. The audio modulation is amplified to produce sound in the loudspeaker.

(2) The voltage is also passed through a filter consisting of resistor R2 and capacitor C3. These components remove the audio-frequency variations, leaving only the negative DC component. This voltage is the AVC control voltage. It varies only with the strength of the incoming signal.

The AVC voltage is applied to the grids of the preceding RF or IF amplifiers to control their amplification. The negative voltage decreases the amplification of the RF or IF amplifier tubes. The AVC voltage is proportional to the strength of the incoming signal. With stronger signals, a more negative AVC voltage is developed, resulting in less amplification. As a result, the strength of the signal at the diode, and therefore the resulting audio signal, are held nearly constant despite variations in the strength of the radio signals at the antenna. The automatic control responds in a fraction of a second so that its adjustment of the signal level is not detectable during tuning. The manual volume control is then used not to control the amplification of the receiver but simply to adjust the receiver to the desired volume. It is seen that although AVC results in automatic control of volume, it is more technically correct to call it "automatic gain (amplification) control." However, the term "automatic volume control" is the one most commonly used.

DISCUSSION OF AVC

Signal Requirements. The main disadvantage of Wheeler's diode AVC system is that the receiver has to provide a relatively large degree of amplification since the signal strength required to drive the diode-type detector and AVC rectifier satisfactorily and to provide adequate control voltage is on the order of ten to twenty volts. With the development of improved tubes and radio circuits, this is no longer a major problem.

Use of Diode as Detector. In Wheeler's circuit the AVC diode also functions as the signal detector. Until 1929-1930 the use of a diode for signal detection was unusual. Until this time radios used triodes or tetrodes as detectors, in grid leak or plate detector circuits. This was done to reduce costs. Tubes were expensive and had limited gain, and the amplifying capability of such detectors was desirable. Use of the diode detector was uneconomical because it could not amplify. In addition, it required relatively large signal voltages to operate effectively. The diode detector did, however, have significantly lower distortion than the other types. As the problem of providing sufficient amplification at low cost was solved by the development of screen-grid tubes and the superheterodyne circuit, the low distortion offered by the diode detector became increasingly attractive. The diode detector was first used in a commercial receiver in 1929, in the Philco model 95. By the early 1930's the diode detector was being used in more and more sets, and by 1933-34 it had supplanted all other types. It is universally used even today. Wheeler's development of the diode detector in 1925 was an outstanding contribution to the development of radio.

Use of Diode in AVC Rectification. Wheeler's use of a diode to obtain the AVC control voltage from the RF signal was also unique. Other AVC systems used triodes or tetrodes. These required complex circuits with complicated biasing arrangements. Wheeler's diode AVC system was simple and produced a voltage that could be used directly for control purposes with relatively simple circuitry. The control voltage obtained with diode-type AVC was more nearly proportional to the signal voltage, providing better control.

Single Diode for Detection and AVC. An advantage of Wheeler's AVC system is that a single diode can simultaneously carry out the dual functions of signal detection and AVC rectification, giving a more economical circuit. Moreover, the RF or IF amplifiers can serve the dual functions of amplifying the signal for both detection and AVC rectification, offering further economy.

Regulation. In the AVC system, regulation is "regressive," i.e., control is applied from the detector backwards to the RF amplifying stages of the receiver. If the control voltage were to be applied forwards, say, only to the audio-frequency amplifier following the detector, it would effectively regulate the volume of the set but it would not be able to prevent strong signals from overloading an RF amplifier stage or the detector. AVC control is usually applied to the first amplifying stage of a receiver and also usually to several stages within the receiver so that no stage in the receiver can be overloaded by strong signals.

AVC maintains the signal voltage at the detector nearly the same for incoming radio signals of various strength. Under these conditions the detector gives more uniform results. Furthermore, under these conditions the detector can be designed to give optimum performance with highest efficiency and lowest distortion.

It is easily seen that AVC constitutes a form of negative feedback, automatically reducing the average amplitude of incoming RF signals in proportion to their strength.

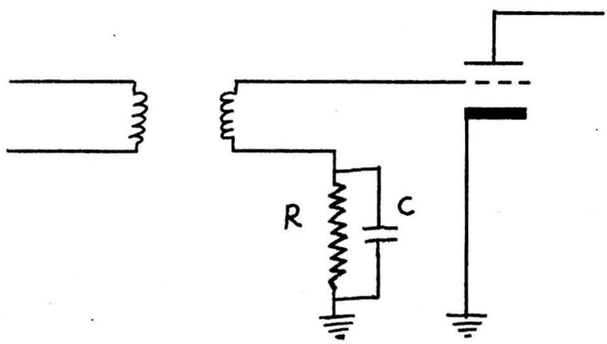
Delayed AVC. With weak signals a small AVC voltage exists, preventing the receiver from achieving its maximum amplification just when it is needed. This problem can be overcome by using a separate diode for AVC rectification, and biasing it so that it is inoperative until the signal strength is great enough to overcome the bias. In this way the receiver can attain its maximum sensitivity on weak signals but retain AVC control on stronger ones.

Amplified AVC. To provide somewhat better AVC control characteristics, a separate AVC diode may be used and the signal fed to this diode may be amplified by more tubes than used to amplify the signal for detection. This arrangement is called amplified AVC. The tubes involved in AVC amplification may include those used to amplify the signal for detection or they may be completely separate.

Problem of Flat-Top Tuning. The position of correct tuning of a receiver is usually the point at which the receiver delivers the strongest signal to the detector. In most radios this is obtained by designing the tuning circuits to have a peaked characteristic, i.e., one in which maximum signal transfer occurs at one frequency, with less transfer at frequencies above or below this.

In some cases, however, (e.g., in "high fidelity" receivers) it may be desirable to have a "flat-top" tuning characteristic, i.e., one in which maximum signal transfer occurs over a narrow range of frequencies, rather than at just one point. With this arrangement the full bandwidth of the audio signal is reproduced without the reduction of higher audio frequencies that occurs with peak-tuned circuits. With a flat-top tuning characteristic, however, the AVC voltage remains the same over the tuning range so that it gives no definite indication of the point of correct tuning. This difficulty is resolved by using a separate AVC diode that is fed by a peak-tuned transformer. The AVC voltage will then show a peak at the correct frequency, giving a sharp indication of the point of correct tuning.

Grid Leak AVC. A different form of automatic volume control is obtained by the action of a grid leak circuit. The grid of an amplifier tube is returned to ground through a large resistance bypassed by a capacitor.



With large signal voltages applied to the grid, the grid draws current, developing a negative voltage across the resistor. The resulting negative bias on the grid lowers the amplification of the tube. The voltage becomes larger or smaller depending on the strength of the signal, changing the amplification of the tube accordingly. As a result, the output of the tube is maintained nearly constant despite variations in the strength of the input signal. The negative bias may be used for other control purposes as well.

The major disadvantages of grid leak AVC is that under these conditions the tube has considerable distortion. As a result, this form of AVC was used only in the more inexpensive receivers, mainly of the early and mid-1930's. Grid-leak AVC circuits are used extensively, however, in FM receivers where they are known as "limiters." In this type of receiver the distortion caused by grid leak activity has little effect on the quality of the resulting audio signal. Grid leak AVC was first described by G. W. Pickard in 1923.

APPLICATIONS OF AVC

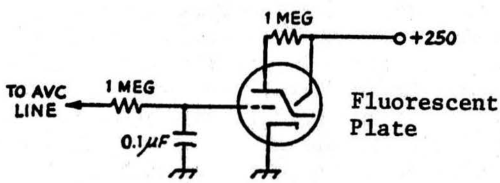
In automatic volume control a negative DC voltage proportional to the strength of the incoming radio-frequency signal is used to control the RF amplification of the set. This same control voltage can be used to perform a variety of other functions as well.

Tuning Meters. The first device used to indicate how accurately a receiver was tuned to a station was a meter. The meter was connected to indicate the plate current of an AVC-controlled tube. The tube was usually one of the RF or IF amplifiers but it could also be a separate tube. The AVC voltage was applied to the grid of the tube. When the receiver was tuned accurately to the station, the AVC voltage reached a maximum and the plate current decreased to a minimum. The needle was then furthest to one side of the scale. Off station, the AVC voltage decreased, the plate current increased, and the needle moved away from its peak position. The position of the needle indicated how accurately the receiver was tuned to the station. It also indicated the relative strength of the incoming signal and any variations in its strength (fading). A tuning meter was used in the first commercial broadcast receiver to use AVC, the RCA Radiola 64, in 1928. Tuning meters were used mainly in sets of the late 1920's and early 1930's but they continue to be used even today.

Shadowgraphs. The shadowgraph was another tuning indicator, similar to the meter. A small metal vane was suspended in a small box and held in position by permanent magnets. A lamp behind the box projected light past the vane onto a screen in front of the box. The vane cast a narrow shadow onto the screen. Around the vane was a coil of wire through which the plate current of an AVC-controlled tube passed. Current through the coil moved or rotated the vane, changing the position or width of the shadow on the screen. As one tuned the receiver, the AVC voltage varied, changing the plate current of the tube. The shadow changed accordingly, giving an indication of the accuracy of tuning. Shadowgraphs were found in Philco and Zenith sets of the early 1930's.

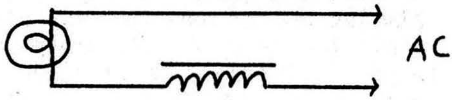
Neon Tuning Lamps. Neon tuning lamps were another form of tuning indicator. They were similar to the familiar small bulbs seen nowadays as indicator lamps but were about three inches long. They had correspondingly long wire electrodes inside them. The lamps were connected across a resistor through which passed the plate current of an AVC-controlled tube. Variations in the AVC voltage produced variations in the plate current which, in turn, developed a varying voltage across the resistor. The length of the glowing beam around the wire electrode varied with the voltage across the resistor. Accuracy of tuning was shown by the length of the glowing beam of light in the tube. Neon tuning lamps were found in Atwater Kent, Kolster, and other sets of the early 1930's.

Magic Eye Tubes. Magic Eye tubes were a popular form of tuning indicator, found in many sets from the middle 1930's until the late 1950's. They consisted of an evacuated glass bulb with a small round metal plate at the end of the tube. The plate was coated with a fluorescent material that glowed a bright green when bombarded by electrons coming from the cathode. Near the center of the plate was a small metal rod. Voltages on the rod caused the rod to repel electrons flowing from the cathode to the plate, causing a dark shadow to appear on the screen. In the most familiar eye tubes (6G5, 6U5, 6E5, 6AF6, and 6AB5) the shadow was wedge-shaped, like a piece of pie. The eye tube usually also had a triode in it, the plate of which was directly connected to the control rod. The triode plate and rod were connected to the B+ supply through a resistor. The flow of triode plate current through the resistor produced a voltage drop across the resistor which developed a voltage on the control rod. The voltage on the rod controlled the width of the shadow.



AVC voltages were applied to the triode grid. When a station was tuned in, a large negative AVC voltage was applied to the grid, the plate current of the triode decreased, the voltage drop across the resistor decreased, and the voltage on the triode plate and control rod became more positive. The rod then repelled relatively few electrons and the shadow width decreased to a minimum. Between stations little or no AVC voltage was applied to the triode grid, the triode plate current increased, the voltage drop across the resistor increased, and the voltage on the triode plate and rod became relatively low. The rod repelled many electrons and the shadow width opened out. The width of the shadow indicated the accuracy of tuning. The magic eye tube gave probably the clearest and most sensitive indication of accurate tuning of all the tuning indicators.

Dimming Lamps and Colorama Sets. Another form of tuning indicator was a lamp or set of lamps that became dimmer or brighter as the station was tuned in. These operated by the action of a saturable reactor, as follows. A lamp was connected in series with an inductor (reactor) and an AC power supply.



The inductor opposed changes of current through itself and so it lowered the current flowing through the lamp. This caused the lamp to be dim. If a separate coil of wire was wound on the core of the inductor and a DC current passed through it, the inductor became "saturated" by the magnetic field thereby created. As a result, the inductor became less effective in opposing the flow of AC current through itself and the lamp became brighter.

The DC current through the controlling coil was supplied by a tube whose current was controlled by AVC voltages applied to the grid. As a station was tuned in, the AVC voltage increased, the plate current decreased, coil saturation was relieved, and the lamp dimmed. With other circuit arrangements the lamp became brighter rather than dimmer as the station was tuned in.

In another circuit, used in General Electric "Colorama" sets of the mid-1930's, differently-colored lamps were used in an arrangement in which the saturable reactor turned off lamps of one color while simultaneously turning on a set of lamps of a different color. The translucent dial was illuminated by the lamps so that there was a spectacular change in the color of the dial as one tuned in the stations. The color changed from bright green off-station to yellow-green, yellow, orange, and finally bright-red as one tuned in the stations.

In a variation of these circuits, the saturable reactor was replaced by an AVC-controlled tube. The tube acted as a rectifier, passing current when the plate was positive with respect to the cathode. The AVC voltage controlled the amount of plate current that flowed through the tube and lamp, thereby causing changes in its brightness.

Muting. One feature of automatic volume control was potentially bothersome. When the receiver was tuned off-station or between stations, there was little or no signal reaching the detector and so no AVC voltage was developed. Under these conditions the amplification of the set increased to its maximum, resulting in a greatly increased pickup of noise, static, and other disturbances. This could be very annoying. With most sets this problem was ignored. The owner was expected to tune quickly from one station to the next, thus avoiding the problem.

Interstation noise could be overcome by using a circuit that made the receiver silent in the absence of a signal. Such circuits were called by various names such as muting, interstation noise suppression, quiet automatic volume control (QAVC), or squelch. Many circuit arrangements were possible. In a typical arrangement, an AVC-controlled tube acted as a variable resistor connected so as to affect voltages on the grid, screen, or plate of the audio amplifier stages of the receiver. In the presence of a signal the control tube changed these voltages to permit amplification to occur. With no signal, the control tube changed the voltages of the audio amplifier so as to prevent the signal from being amplified and reproduced by the loudspeaker.

Automatic Tone Control. The tone of a receiver may be automatically adjusted by the AVC voltage, depending on the strength of a signal. With strong signals the receiver has its normal tone. With weak signals the higher audio frequencies are reduced, thereby reducing the noise and static that often accompany such signals.

Tone control is carried out by a circuit that acts as a variable capacitor, connected to bypass the higher audio frequencies from the signal path to ground, preventing them from being reproduced. The variable capacitance is the input capacitance of a tube having a large, variable Miller effect. (With the Miller effect, the input capacitance of a tube is much greater than what would be expected simply from the construction of the tube because the capacitance that exists between the signal grid and plate of the tube is amplified by the tube.)

The large, variable capacitance required for tone control is obtained by connecting a small capacitor from the plate of an AVC-controlled tube to the signal grid. The tube amplifies this capacitance, giving a high input capacitance. The AVC voltage changes the amplification of the tube, thereby changing the input capacitance over a wide range. With strong signals, a large AVC voltage is applied to the control tube, amplification is low, the input capacitance is small, and the tone of the set is normal. With weak signals, a small AVC voltage is applied to the control tube, amplification is high, the input capacitance is large, and the high-frequency audio response of the set is reduced, providing automatic reduction of noise and interference.

Automatic Selectivity Control. The selectivity of a receiver can be automatically controlled by the AVC voltage. Selectivity is the ability of a receiver to pass a desired signal while rejecting other signals whose frequencies are close to that of the desired one. With high selectivity interference from adjacent stations is greatly reduced. However, the higher audio frequencies of the desired signal are also reduced, giving a poor quality of sound. If selectivity is low, the higher audio frequencies are reproduced, giving improved sound quality, but interference from adjacent stations and static may also be reproduced.

With strong signals, the amplification of the receiver may be reduced by AVC to the point where there is little pickup of noise and interference. Under these conditions the full-range response offered by a low selectivity would be desirable. With weak signals, the amplification of the set is increased and noise pickup is greater. In this case, a higher selectivity would be desirable. It would therefore seem desirable to have a circuit that automatically adjusts the selectivity of a set, giving high selectivity for weak signals to reject interference and a lower selectivity for strong signals to obtain full-fidelity reproduction.

Circuits providing automatic selectivity control have been devised. In some Atwater Kent receivers the AVC voltage is applied to the suppressor grid of the converter tube. The negative AVC voltage lowers the plate resistance and transconductance of the tube, decreasing the selectivity of the following IF transformer. Thus, strong stations producing a large AVC voltage pass through a broad bandwidth in the IF transformer, giving "Hi-Fi" response. Weak stations put a smaller AVC voltage on the suppressor grid, resulting in a sharper bandwidth, thereby reducing noise and interference.

In other arrangements selectivity is controlled by the degree of coupling between tuned circuits. The circuits are coupled together with additional coupling occurring through an AVC-controlled tube. The total coupling between the tuned circuits, and hence the selectivity of the circuit, is varied by the AVC voltage.

References: The Early Days of Wheeler and Hazeltine Corp., by H. A. Wheeler, Hazeltine Corp., N.Y. (1982).
Radiotron Designer's Handbook, ed. by F. Langford-Smith (1952).
RCA Tube Manual.
CHRS Newsletter, April 1983.
AWA Old Timer's Bulletin, March 1984.
CHRS Journal, May-June 1984.

MY PROBLEM

I recently acquired an old Emerson Mickey Mouse radio, made around 1933. I know it has some collector's value. But I don't want to keep it since I don't really like it. The problem is how to dispose of it.

(1) I could sell it at the highest price. This seems very mercenary, however. There are many other people who would like to have the set who might not be able to pay top price. Besides, is making the biggest profit really the proper way to dispose of these old sets?

(2) I could sell it to the first person who offered me a reasonable price. But what about others who may not have heard that I have such a radio? Also, shouldn't the set go to someone who will really enjoy it?

(3) I could sell it to a friend of mine who likes the set. But he could not pay as good a price for it. Is money more important than friendship?

(4) I could sell it to a collector. But which one? There are collectors of old radios, novelty sets, Emerson products, Disney memorabilia, etc., all of whom would be interested in my set. What if the collector already has such a set? Shouldn't the radio go to someone who doesn't have such a set? Who is the most deserving person to have this set?

(5) I could trade the set. But there isn't anything I'm really looking for. Besides, that means the set would go only to that person who has exactly what I'm looking for. Is this the right person to get the set?

(6) I could donate the set to a museum. They could put it on display so everyone could see it. But then again, maybe they would just put it away in storage, not being interested in showing it. Besides, would they take proper care of it?

Well, you can see I'm in quite a dilemma. What should I do? What would you do in my situation? I invite your suggestions.

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WE NEED TO EXPAND

We are looking for people to help out with the various functions of our Society. We could use assistance in such areas as treasurer, writing for the Journal, printing the Journal, setting up swap meets, judging contests, photography, correspondence, advertising and promotion, etc. If you are interested in volunteering your efforts, contact either Norm Berge, 969 Addison Avenue, Palo Alto, CA 94301, (415) 323-0101, or Herb Brams, 2427 Durant, #4, Berkeley, CA 94704, (415) 841-5396.

WRITING FOR THE CHRS JOURNAL

Most of the articles you have been reading in the CHRS Journal have been written by myself, Herb Brams. I have worked very hard to produce a quality Journal, hoping thereby to inspire others to contribute their own ideas, opinions, and information. This effort seems to have had the opposite effect, however. Very few articles written by other CHRS members have been submitted. Perhaps they think standards for the Journal are so high that their articles aren't good enough to be printed.

Let me assure you that this is not the case. I welcome any and all material. I feel that the Journal should be an expression of <u>all</u> the members of CHRS, not just those of one or two professional writers. For those who feel embarrassed about their writing abilities, let me assure you that as an editor I can help you to write your article. I can correct mistakes in spelling, grammar, or punctuation, rewrite awkward passages, bring out important points of the article, clarify obscure ideas, etc., so that any contribution will be able to stand on its own.

I don't want the CHRS publication to become the "Herb Brams Journal of Old Radio." Won't you help expand our horizons?

PHOTOGRAPHS

Do you like to look at photographs of old radios and other electronic equipment? Well, I certainly do! I repeat my request for CHRS members to submit photographs of their collections to me to be assembled in a photograph album that will be available for viewing at our swap meets and other places. If possible, include the brand name, model number, and date of manufacture of the set, and notes of any unusual feature of the set. The photographs can be anonymous for those who don't want others to know to whom the sets belong.

BING: THE EARLY YEARS

by Jerry Perchesky

It was my good fortune to be a friend of both Bing Crosby and Al Rinker. Al was Bing's boyhood friend in Spokane, Washington, and literally gave Bing his first start in show business. I knew Bing personally for some 30 years, and was informed by his manager, Basil Grillo, that to his knowledge, I was the only person given "carte blanche" by Bing to his personal collection of films, tapes, and recordings, both at his Robertson Boulevard office in Los Angeles and at his home in Hillsborough, California, south of San Francisco. Only a year before Bing's passing I did a taped interview at his home covering the very early years of his career. Between that interview and the one I did six months earlier with Al Rinker, I learned about the early years of "Der Bingle." I must preface all of this by stating I found both Bing and Al to be fine gentlemen and genuinely cooperative and friendly whenever we spoke on the telephone or spent time together.

It was in 1924 in Spokane that Al Rinker was forming a band with local young talent. At the last moment, they found that their drummer couldn't continue with the group. Al had heard about a fellow named Bing Crosby who sang a little and could play the drums, so he contacted him, and Bing got the job with "The Musicalaters." Bing, attending Gonzaga University and studying law, was the eldest of the group; the others were mostly high school students. I have in my possession (a gift from Al Rinker) an 11" x 14" black and white photograph of that group on a stage in Spokane in 1924. Al is seated at the piano, his brother with a saxophone, and a very youthful Bing Crosby at the drums. They played all over the Pacific Northwest--weddings, private parties, and theaters, until they just "ran our of places to play." Most of the group had to stay in Spokane for their education, but Bing and Al had other ideas. The early days--those of struggle and obscurity--were 1925 to 1931. Crosby found entertaining more fun than college or law, so with $50 in their pockets, they headed for Los Angeles to visit Al's sister, Mildred Bailey (later married to Red Norvo). She was then singing swing numbers in clubs and entertaining in a new medium called radio. Mildred got them a job at the Tent Cafe, then owned by Abe Lyman's brother Mike. Crosby played traps and Rinker pounded the piano. Both sang. They booked into the Boulevard Theater, toured with revues, and played movie houses as "Two Boys and a Piano." It was during this period of the movie houses that Bing told me he picked up his "timing" for lines and comedy by watching and sometimes participating in other acts on the same bill. Al told me once they played a small town in the Midwest, and Al had an affair with an usherette. He told Bing how great this chick was, and Bing also had a "fling" with her for a few days. Bing contracted a "social disease" from her, and Al related the following: "In those days, there was no penicillin. It took a B-I-G needle to do the job. Bing had to take the cure, and didn't talk to me except when we were on the stage for two months!"

Paul Whiteman saw them at the Metropolitan Theatre in Los Angeles and signed them to tour with his band in 1927. Soon they played Chicago and New York. In New York, Whiteman hired Harry Barris to accompany them; the trio was a tremendous hit as "The Rhythm Boys." They sang with Whiteman until 1930, then went to Los Angeles and worked with Gus Arnheim at the Coconut Grove. Bing first sang on the air while performing with Arnheim at the Grove in 1930. It was there that he met Dixie Lee (born Wilma Winifred Wyatt). She was already an established player. Dixie played hard to get, Bing said, and it was not until his recording of "I Surrender Dear" (which was done for her) that he won her over. If so, it won him both fame and the lady. When Crosby's brother Everett sent the recording to the networks, Crosby was asked to audition for both NBC and CBS. Offered both jobs, he opted for CBS. His radio premiere was to be late August 1931, but he was stricken with laryngitis and was unable to go on. By September 2, he had recovered, and a young Harry Von Zell introduced him on a nationwide CBS hook-up ....without a sponsor: FIFTEEN MINUTES WITH BING CROSBY. Crooning had come alive. For fifteen minutes Bing buh-buh-boohed his way through such numbers as "Just One More Chance" and "I'm Through With Love."

Everything broke at once. With his first nationwide radio hookup, his star rose as fast as any in show business, and he became almost overnight a super-hot property. Bing made "THE BIG BROADCAST OF 1932," and settled into a hectic pace of two to three films a year. He began recording for Decca, and the following year picked up Chesterfield as sponsor of a twice-a-week songfest. In 1933, the show landed in prime-time as a weekly half-hour for Woodbury Soap. His best break came in 1935 when he left CBS to host NBC's popular 60-minute KRAFT MUSIC HALL. The hour-long format suited his casual style, and his show always got the major share of Thursday night listeners.

Bing had once told me his favorite performers were Al Jolson and the great Irish tenor John McCormack. His parents used to play McCormack records on their old Victrola. I asked him if he ever worked with or met John McCormack, and he replied: "Not that I can recall." I mention this because having had the opportunity to go through and copy everything Bing had, I came upon an old unlabeled ET. Putting it on my turntable, I discovered it to be a 1937 Kraft Show with Bing and his guest.....JOHN McCORMACK! I called Bing at the house immediately. "Bing, I found something that might interest you."

"Whatcha got, Jerry?" I explained that I had found a Kraft show with him and McCormack, and he was in complete surprise. "Please put that on a cassette and send it right up here. I don't recall that show at all. I'm completely amazed!"

I probably have in my collection more of Bing's radio shows from the early beginnings than anyone else. We've traded material for many years. I was there in 1972 when Bing, Fibber McGee, and others "re-created" Command Performance on Treasure Island. Any time Bing performed I had an invitation. One of the most memorable performances was his Christmas show taped at Metromedia in Hollywood in 1976. I spent the entire day there with the family taping the show with guests Fred Astaire, Bob Hope, and Joey Bushkin, and had lengthy conversations with everyone. My most dearest possession is the pipe Kathryn Crosby sent to me after Bing's passing. "I know Bing would like you to have this, Jerry. It was lying on his desk in his den." I also have many telephone conversations on tape with Bing. I had a habit of taping them all in case Bing asked for something from me; I wanted it on tape so I wouldn't forget it. I'll never forget Bing. An individual performer of outstanding natural ability...and a lost friend.

ZENITH VOLUME CONTROLS

In many Zenith radios of the mid-1930's, if you pull off the volume control knob and look at the metal escutcheon behind it, you will see that the hole is not round but is "D"-shaped. Also, the back of the knob has a series of small holes around the part that slips on the volume control shaft.

The original instruction booklets that came with the radios explain these peculiar features. One could put a nail or screw in the small hole in back of the knob and then remount the knob back on the shaft. The nail would limit how far the volume control could be turned. This was used in hospitals or rest homes to prevent people from turning the volume up too loud.

POLISHING METAL PARTS

One way to polish metal dial escutcheons and other parts and not make them too bright is to brush them with a wire brush. You can easily control the amount of cleaning and make lettering, numbers, and insignia stand out against a darker background. This method preserves the darkened old look of the metal very well.

MODEL NUMBERS

Philco model numbers often indicate the year the set was first sold. The first two numbers indicate the model year--like cars, the sets began to be sold in the fall of the previous year. A model 37-610 would be introduced in fall of 1936, a model 40-150 would be introduced in fall of 1939, etc.

The model numbers of Zenith sets seem to indicate the number of tubes in the set. A model 5R312 would have five tubes, a 9S262 would have nine tubes, a 15S270 would have fifteen tubes, etc.

SUCKING UP FLIES

Tired of insects flying around your room that you can't catch? Try this: get a vacuum cleaner with a hose attachment and bring the end of the hose near the bug. The vacuum cleaner will suck them right in and Presto! They're gone. No muss and no fuss. Stuff an old rag in the hose to prevent the bugs from getting out.

POWER SUPPLY FOR OLD BATTERY RADIOS

Has anyone used the regulated high voltage power supplies commonly seen at swap meets, flea markets, etc., to power early battery sets? These units have a high voltage supply, a filament supply, and often a "C" bias supply, all well-regulated, adjustable, and readable on meters on the front. One would have to convert the AC filament supply to a filtered DC supply but that is relatively easy (see CHRS Journal Sept.-Oct. 1984). The supplies are compact and usually inexpensive.

METAL WHISKERS

A 1940's Sears Silvertone radio I was fixing had metal whiskers growing on the tuning condenser plates. These shorted the plates, causing much static, dead spots, and weak reception as the dial was turned. To remove the whiskers, I disconnected the wires to the condenser, attached leads from a high voltage supply (250-500v) to the rotor and stator sections, and burned them out. I used a regulated high voltage power supply but one can also use the high voltage leads from a fused power transformer.

RESISTORS

Resistors are important components of electronic equipment. Typically, they are used to drop voltages from a supply to power different parts of a set.

Resistors are made in a variety of ways. Probably the oldest is the wire-wound resistor. This consists of many turns of special kinds of fine wire wound on a supporting form. These resistors are especially useful for handling large currents. Another common type is the carbon resistor. This consists of a small rod of carbon-clay mixture, enclosed in a small bakelite case, with a wire attached to each end. In the last few years, film-type resistors have become available. These consist of special materials deposited on a supporting form. Depending on the kind of materials used and their thickness or length, different values of resistance are obtained. They look just like carbon resistors. Another form of resistor is the variable resistor, also called a potentiometer or pot. In these a wiper makes a sliding contact on the body of a resistor, tapping off more or less of the total resistance. Depending on the position of the wiper, a different value of resistance appears between the wiper and the ends of the resistor. Volume controls are an example of a variable resistor.

Resistors oppose the flow of electric current through themselves. The degree of opposition is called <u>resistance</u>, measured in <u>ohms</u>. By Ohm's law, the resistance of a component is equal to the voltage drop across the component when a known current is passed through it: $R = E/I$, where E is in volts and I is in amperes. The resistance value of a resistor is usually printed on the body of the resistor, either in numbers or in some sort of color code. The oldest resistors, made in the 1920's, were simply painted one color, a different color for each of the common values. There was no standardized code for these colors. In the early 1930's a standardized color code was adopted by the electronics industry. The resistor was marked in a special way (B.E.D. system): the colors of the body of the resistor, the end of the resistor, and a dot on the middle of the body gave the resistance value. Towards the late 1930's the markings were changed to the modern form, that of adjacent bands of color around the body of the resistor. Reading the value of resistance from the color code is given in any elementary book of electronics.

The resistance value marked on the resistor does not mean that the resistor has <u>exactly</u> that value; there is always some leeway. This is normal and does not affect the performance of the component significantly. This leeway is called "tolerance" and is usually about 10%. This means that the actual value of resistance may be as much as 10% above or below the rated value. For example, a 10,000 ohm 10% resistor may actually be between 9,000 and 11,000 ohms. Tolerance is normal in other electronic components as well. The tolerance is usually indicated on the body of the resistor.

Besides resistance another important characteristic of resistors is their power dissipation. When current flows through a resistor, heat is developed, and a resistor can withstand only a certain amount of heating without being destroyed. The power dissipation is usually indicated by writing on the resistor or by its size. Size is not an infallible method, however, so one should refer to the manufacturer's specifications to make sure.

Resistors in old sets should be tested for their resistance. In some cases the resistor can be left connected in the circuit and tested this way but the presence of other components or charges remaining in capacitors can alter the readings. If you are not sure, disconnect one end of the resistor. One can use a simple VOM or multimeter or VTVM to measure resistances. All these instruments have an internal battery that applies a small voltage to the resistor being tested. Be sure to check or replace this battery periodically or you may get false readings.

One should also determine if the resistor has adequate power dissipation. Most resistors in a set dissipate little power and so standard ½-watt units are adequate for replacement. Other resistors, especially in the power supply, require higher ratings. Power dissipation is determined indirectly. The dissipation, in watts, is given by the relationship $P = E^2/R$. That is, the dissipation is given by the square of the voltage across the resistor divided by its resistance. <u>Example</u>: a 22,000 ohm resistor is used to drop the high voltage to supply the screen grid of a tube. The voltage supply is 250 volts and the screen grid runs at 100 volts. What is the power dissipation?
<u>Ans</u>: $(250\text{-}100)^2/22{,}000$ or about one watt. Power dissipation can also be calculated in other ways. By substituting Ohm's law we obtain: $P = I^2R$ and $P = EI$, that is, dissipation is equal to the square of the current through the resistor times the resistance, or is equal to the voltage across the resistor times the current through the resistor. For resistors that dissipate more than about one-half watt, it is customary to use a resistor that is rated at about twice the required dissipation to provide a margin of safety. In the example above, one would use a 22,000 ohm <u>two</u>-watt resistor. Older resistors are usually quite large. This does not mean that they had a higher power rating. The new, smaller resistors will work just as well, as long as they have the same power rating.

Any component that passes current has resistance and a power dissipation. Besides resistors, this includes coils, chokes, power transformers, audio transformers, volume controls, tone controls, sensitivity controls, etc. One should routinely check the resistance of all of these. Unusual resistance readings often give a clue to hidden faults in a component. There may be some variation in resistance readings due to tolerance, but these should not be greater or less than about 20% of the given value.

Volume controls, tone controls, and certain other controls have a special form of resistance called "taper." As the shaft is turned, the resistance first increases slowly and then more quickly as the shaft nears the end of its rotation. The value of resistance with the shaft turned halfway up is not half the total value but less than this. Tapered resistance controls are used so that to the ear there is a gradual and uniform change in volume or tone, which would not be obtained with a linear (non-tapered) control.

ADVERTISEMENTS

Wanted: Audio frequency transformers for the following: one for Zenith model 52, two for Federal model D, one for Mohawk "One Dial Control Receiver," two for General Instrument model 6-71. Mike Frankel, 1220 Sabal Dr., San Jose, CA 95132.

Wanted: Old-style type 26 and 71 tubes. Aubrey Keets, 12345 Briones Way, Los Altos Hills, CA 94022.

Wanted: Scott Philharmonic dial glass for Beam-of-Light model. Frank Rasada, 12507 Pine Grove Ln., Cerritos, CA 90701.

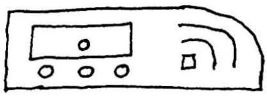
For Sale: Balkeit Console radio. Make offer. Anthony Germano, 6346 La Reina Dr., Tujunga, CA 91042.

For Sale: Silver-Marshall model 36A chassis and 32A speaker and power supply. Speaker needs reconing. $55 UPS. John Martin, 817 Cook Ave., Billings, Montana 59101.

Wanted: Atwater Kent bar radio. Jim Chanin, 1015 Ashmount Ave., Oakland, CA 94610.

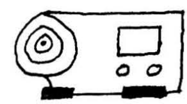
Wanted: Art Deco and mirrored glass radios. Condition unimportant. Willing to pay your price or will swap from my private collection of grandfather clock radios, crystal, and battery sets. All letters answered. Ed Sage, 1781 Helane Ct., Benicia, CA 94510, (707) 746-5659 anytime.

For Sale: White plastic Coronado radio with marbelized blue knobs, dial, and handle, model 43-8190. Cabinet is cracked and one knob is missing. $30. Old Air-King shortwave converter for sets using type 27 tubes (ca. 1928). $35. Heathkit IP-32 regulated high voltage power supply, $30. Early cathedral radio--Keller-Fuller Radiette, broken speaker grille, $30. Early battery radio made by Case with 01A tubes incl. $45. Radiokeg novelty radio, looks like a beer barrel, 1934 vintage, works, $125. Unknown small cathedral radio, good condition, works, $125. Emerson square marbelized brown and white plastic table radio, model 520, $45. Two 1950's plastic clock radios, $3 each. Philco Radio Week sign, black and yellow, $5. Lester novelty piano radio, marbelized brown plastic, broken case and missing parts but may have some parts you need. Radio looks OK. $20. Yellow celluloid Fada radio with linear dial, good condition, $150. Wood cabinet for GE model F-63 table radio (mid-1930's), $5. Wood cabinet with green inlay for Emerson AX series table radio (see Flick of Switch book), $15. Herb Brams, 2427 Durant #4, Berkeley, CA 94704 (415) 841-5396.



GE cabinet

Emerson cabinet



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It's a Sky Terrier