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ELECTRIC RADIO

celebrating a bygone era

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Bill Halligan, 1UL

ELECTRIC RADIO

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Electric Radio is dedicated to the generations of radio amateurs, experimenters, and engineers who have preceeded us, without whom many features of life, now taken for granted, would not be possible. Founded in May of 1989 by Barry Wiseman (N6CSW) the magazine continues publication primarily for those who appreciate the intrinsic value of operating vintage equipment, and the rich history of radio. It is hoped that the magazine will also 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 and operating with a primary emphasis on AM, but articles on CW, SSB, and shortwave listening are also needed. Photos of Hams in their radio shacks are always appreciated. We invite those interested in writing for ER to write, email, or call.

Regular contributors include:
Bob Dennison (W2HBE); Dale Gagnon (KWll); Chuck Teeters (W4MEW); Bruce Vaughan (NR5Q); Bob Grinder (K7AK); Jim Hanlon (W8KGI); Brian Harris (WA5UEK); Tom Marcellino (W3BYM); John Hruza (KBØOKU)

Editor's Comments

Bob Grinder (K7AK) is bringing us a series of articles starting this month that I'm very excited to present. They are the result of years of Bob's research into Bill Halligan's early years as a newspaper columnist for the Boston Telegram, and they also present a unique view of radio as it existed in the early 1920's. Information about Halligan before he started the Hallicrafters Company has always been very hard to find. I think the articles will appeal to Hallicrafters collectors and historians alike.

I've thought a lot about what life would be like if certain individuals in our history had not been able to make a contribution because of having been "qualified" one way or the other. Bill Halligan is one example of this, for he had no degree in journalism or radio engineering, but yet he was a successful writer and founded a radio company during the Great Depression that made significant contributions to the defense effort during World War Two. Thomas Edison was another who, had he needed someone's "qualification", might never have been such a prolific inventor. Also, Atwater Kent fit in with these gentlemen. Kent made many contributions that are not widely known. I offer Bruce Vaughn's article this month, "The Salesman" as an example of how easy it is to fall into the qualification trap, and of the consequences!

The reports we've been getting indicate that radio conditions for Vintage Field Day were not the best. Saturday, the 7th of June, we woke up to 4 inches of heavy, wet snow and thick fog. I decided against taking any vintage equipment out into those conditions and operated from home. Propagation was very bad, and although I made quite a few AM contacts on 20 phone into the Midwest, none of the other operators were in Vintage Field Day. Late in the day I heard Herb (K9GTB) on 40 meters, but couldn't raise him. Later, Herb and I discussed VFD on the telephone, and both agreed that conditions were not very good. I never

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Cover: A young Bill Halligan, then 1UL, as he appeared in the early 1920's while he was working as a newspaper reporter in Boston, Massachusetts. This facinating article by Bob Grinder begins on page 4.

Vintage Field Day Report

by David Jennings, WJ6W
19755 Greenbriar Dr.
Tarzana, CA 91356

I had never participated in any field day before this year. Several months ago, I occurred to me it would be fun to use my Gonset Twins (G-77A transmitter and G-66B) in the environment they were intended... the field. Vintage Field day was a natural. I planned to use the vibrator portion of the power supplies, but neither vibrator worked. I found a 300 watt power inverter on the internet for about $35, so decided that was the easiest way to go mobile without tearing into the vibrator cans with questionable results.

I built two antennas. One started as a coax fed inverted-V cut for 3870 KCs. I planned to "adjust" it by folding it back to marked points for 40 and 20 meters. Then, being lazy, I decided make it a balanced multiband antenna by replacing the coax with 300 ohm TV twin lead. I used a 300 watt MFJ tuner to balance the antenna line. I also built a vertical for comparison, but never used it as the wire antenna worked pretty well.

I arrived at my field day site before 6AM. The site was the dead end of a street about a mile from my house next to a wilderness area where there are few houses and clear all around. I cast a fishing line over the top of a street light. Then I pulled the wire antenna center section up to the light. Then secured each end on sign posts on either side of the light. Then I hooked up the antenna, ground rod, and inverter to the rig and fired it up. I was ready to go by about 6:30 AM.

About 6:50, I heard the first stations on the weekend Arizona net on 3855. During that net, my neighbor and friend KO6NM, Mike came on with his giant broadcast rig and asked if I wanted breakfast. What a treat! I only brought a few Diet Cokes with me. I told him my location, and soon there he was with a hot McDonald's breakfast. While we were there, a gentleman rode up on is bicycle and announced he was W6GY, Gary, who lived several miles away. What fun to draw so much attention early in the morning!

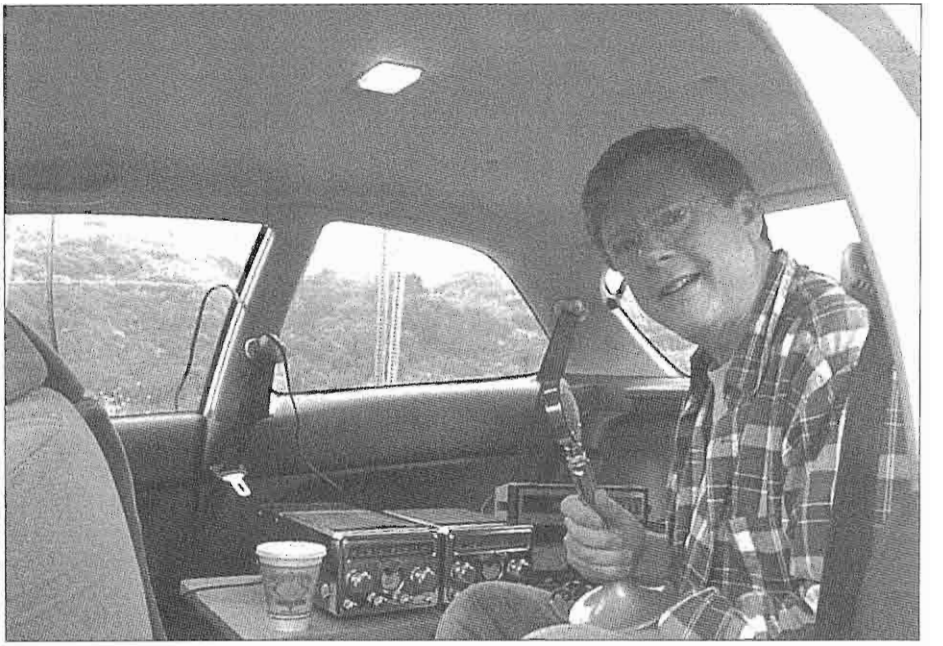
I kept busy with nets and contacts on 3855, 3870, 7293, and 14286 until about noon. Then the band either got worse or everybody got tired... so it was very quiet. I decided not to wait around all day and took the twins back home, hooked them up to shore power and worked a few more contacts later in the day when there was a little more activity.

The inverter worked but the rig could only muster about 35 of it's 50 watt capability even with the car alternator running. The inverter was very noisy on 75 and 20 meters. I was pleased that the Gonset receiver noise limiter took most of the noise out. However, I think I will either try to get the vibrators working for next year, or get a generator.

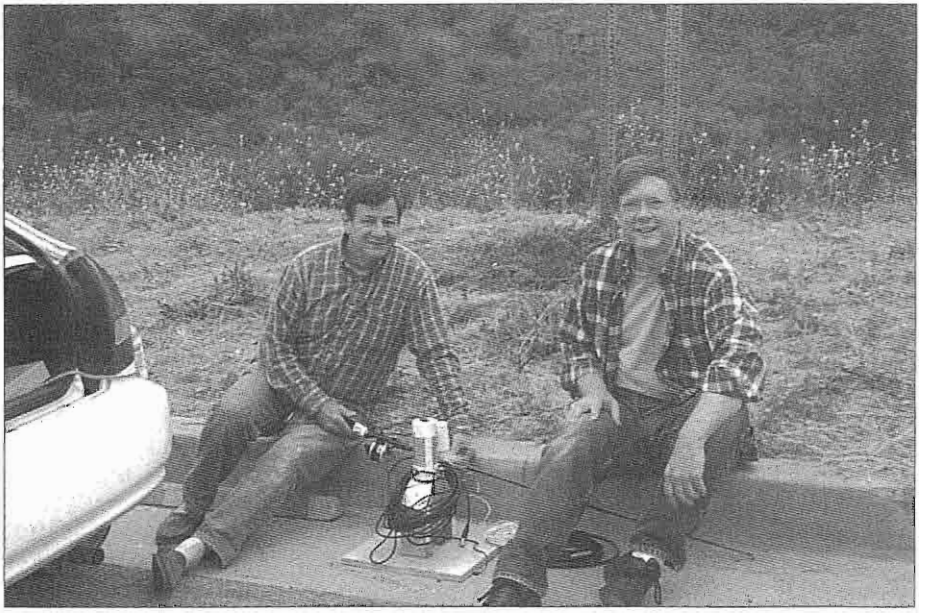
I really enjoyed the experience and definitely plan to do it next year. Vintage Field Day is a way to do field day without the pressure of maximizing contacts and competing with legions of others on the bands. I hope this serves as some inspiration to others to participate next year and get out there with the old rigs.

73's

Dave, WJ6W ER



WJ6W's Gonset Twins were "installed" in the back seat of my daughter's Honda Civic hatchback and working 3870 KCs.



After eating the breakfast provided by Mike (KO6NM) on the left, and myself on the right, we relaxed and discussedthe fishing pole and the vertical antenna base. The vertical was never used.

W. J. Halligan
Newspaper Reporter and the State of Radio
1923-1924
Preamble and Part 1, Introduction

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Preamble

We honor W. J. ("Bill") Halligan today as one of the more skilled entrepreneurs and innovative manufacturers of radio products in the twentieth-century. He founded The Hallicrafters Company in 1933 while in debt and within ten years built it into a multi-million-dollar enterprise. What do we know about this remarkable marketing genius in that his correspondence and company papers seem no longer to exist? Except for a few brief sentences quoted by his advertising staff, colleagues, and interviewers, we have had to date no conduit to his personal traits and values.

However, Bill Halligan was employed as a reporter, from March 5, 1923, to May 27, 1924, to write quasi-daily columns, which were named initially "Radio Waves," and later, simply "Waves," for the Boston Telegram. The following exhortation introduced the first eight of 227 columns: "The Telegram wishes to encourage radio fans to correspond with this department. The purpose of the column is to give publicity to the activities and the constructive opinions of local amateurs. Send your 'briefs' to the radio editor."[1]

The editorial staff at the American Radio Relay League (ARRL) stated when it reviewed in 1965 the fifty-year history of the organization: "There has probably never been a time in the history of amateur radio when so much of technical interest happened as during the period from, roughly, late 1921 to early 1924 . . .. Even if unlimited space could be allotted, it is doubtful that any chronicler could recapture the spirit of adventure that pervaded the amateur ranks at the time, . . . Truly those were great days" (American Radio Relay League, 1965, pp 46-47). Perhaps it is true that no "chronicler" of amateur radio has ever "recaptured" the "spirit" prevailing in amateur radio during the early 1920s. However, Bill Halligan was there to actually capture and record day-by-day, not only the excitement and spirit of amateur radio but also the exhilaration and anticipation as radio pervaded every sphere of society.

Bill Halligan wrote his columns for Boston-area readers living in the hear-and-now of 1923-1924. His voluminous writings in the Boston Telegram are very useful to us today in two important ways: (1) we obtain glimpses of the personal characteristics that led to his subsequent success from the social skills that he demonstrated and the aspirations and priorities that he espoused, and (2) we learn from his vivid depictions, in remarkable, insightful detail, how BCLs and amateurs coped in their individual lives in 1923-24 with the novelty of radio.

Doubtless, he never anticipated that any of his columns would ever be read again beyond the day that they were

published. However, I have retrieved them, and in cooperation with the editor of Electric Radio, they will be reprinted in forthcoming issues of the periodical, and thus, archived for future study.

Bill Halligan promoted cooperation vigorously among BCLs and amateurs. He saw the exploding BCL population as a prime source from which to draw recruits for amateur radio and, thereby, to strengthen its political clout. He publicized widely the fledgling Boston-area "Commonwealth Radio Association," and he touted "Radio Relays," its forthcoming flagship journal. He aimed to unite fraternally BCLs and amateurs in pursuit of common interests. He empathized with the tribulations of BCLs who struggled to listen to faraway broadcast stations, and he shared both the anguish and thrills of amateurs as they attempted to extend their contacts across greater and greater distances. He avoided technical discussion associated with facets of construction. However, he dealt comfortably with technological terms of the day in describing the burgeoning phenomena of radio.

Figure 1 (March 8, 1923) illustrates the literary format that Bill Halligan adopted for his columns in the Boston Telegram. Note in Figure 1 his heading, "Radio Waves" and his byline, which was comprised of his initials, "W.J.H." Each of his columns appeared usually on the same page as another column entitled, "Broadcasts Today." After December 14, 1923, Halligan's column was placed side by side with two other columns in a block, entitled "Radio Flashes," whose perimeter was designated by a black border. The first column listed broadcast schedules, the second described technological aspects of radio in lay terms, and the third presented Bill Halligan's "Waves." The Telegram never used figural material—drawings, photographs, cartoons,

Radio Waves

—By W. J. H.—

The Telegram wishes to encourage radio fans to correspond with this department. The purpose of the column is to give publicity to the activities and the constructive opinions of local amateurs. Send your "briefs" to the radio editor.

Invitations have been issued to men prominent in radio to attend Sec. Hoover's radio conference, which is to be held in Washington, March 20. The purpose of the conference is to straighten out the interference tangle, Congress having failed to act.

Fred A. Beaudoin of 84 Mountford st., Brookline, has had a new radio set in his home for two weeks, but because of the reported shortage of WD 11 tubes has not yet had the pleasure of listening in.

Friends of Henry Delaney of Stratton st., Brighton, are responsible for this one. It seems that Henry bought himself a $150 set and at the same time bought a $3 crystal set for his five-year-old son, Bob. To date the boy is getting better results than the father.

Lieut. Sadenwater, well known in Boston for his part in the trans-Atlantic flight of the N. C. planes, is now in charge of the technical department of WGY, Schenectady broadcasting station of the General Electric Co.

Apropos of the so-called tube shortage, manufacturers of vacuum tubes say demands for these products are so great that they are often unable to keep the market properly supplied. It is estimated that more than 300,000 tubes are produced each month.

Imagine a loud speaking horn 85 feet in length with an opening 12 feet square! The Magnavox Co., has such a horn at its factories. Music can be heard at distances up to five miles.

Letter received telling how a certain fan serenaded his best girl over the radio. For some reason he was unable to call at the house, so he carried on his wooing with the aid of his trusty tube transmitter.

Figure 1: Bill Halligan's first column from March 8, 1923

etc.—to augment Halligan's columns.

Figure 1 also shows that an anecdotal pattern characterized the format of Bill Halligan' s columns. Specifically, his columns constituted a compilation of brief narratives and vignettes, that is, a list of anecdotes. A column might have included two or three anecdotes or, perhaps, a dozen or so. The anecdotes in any given column were usually unrelated; however, many of his anecdotes were interrelated across columns. Indeed, he was particularly fond of using the columns to discourse interactively with amateurs whose talents and technical knowledge he respected, e.g., Irving Vermillion, 1ZE, Henry Barnacle, 1QA, John Barrett, Jr., 1VV, and Frank Maguire, 1AZN.

Halligan acquired subject matter from periodicals, news services, reader reports, personal contacts via a huge network of colleagues, friends, and acquaintances, and importantly, responses of amateurs to queries that he directed in his columns to them. Sometimes he reported incidences simply to be informative. At other times, he allowed his values to become explicit in accolades, compassionate expressions, or stern chastisements. For example, he might laud persons for praiseworthy accomplishments, proffer encouragement to others when a tube blows or an antenna collapses, or chastise those who deliberately cause interference to others or flout good practices such as calling "CQ" interminably.

A genetic propensity toward reflexive optimism propelled him; he routinely saw possibilities in situations ignored by others. His writings disclose that he was a highly sensitive individual who identified readily with persons who became confused and discouraged while dealing with the complexities of radio. Working to surmount institutional barriers and to help individuals resolve equipment intransigencies was his modus operandi. He reflected infrequently upon historical matters and seldom peered into a crystal ball. His prose accentuates instead an aura of coming "from the heart." A deeply rooted compassion filters through his descriptions of the struggles and hopes of ordinary citizens who labored to contend with the profound mysteries and awesome promises of radio.

Reading historical material like that of Bill Halligan can be engrossing. By an ethereal process, our consciousness transmutes us from our own here-and-now to another time and place. In the instance of "Radio Waves," his statements collectively enrich our take on the man and enhance our appreciation of the early stages of radio development. We are thus challenged to induce from hundreds of anecdotes, distributed across months of newspapers, the major ideologies that motivated him. The problem of discerning Bill Halligan's sources of motivation is somewhat daunting, however, because he addressed events and issues as they arose on an ad hoc basis. He did not proceed obviously with preconceived notions to deliberately establish threads among his anecdotes. Nonetheless, reading them cumulatively reveals retrospectively that many are indeed related, which suggests that some broad concerns were in the back of his mind when he wrote them.

After his sojourn as a reporter, had he been so inclined, he might have reviewed the content of his writings. He would surely have observed several noteworthy emphases that had reflected his interests, values, and priorities. But Bill Halligan probably never gave a second thought to anything that he wrote as newspaper reporter. Consequently, I have superimposed an arbitrary organization on his anecdotes. My major purpose is to provide a framework for understanding issues significant to him. I aim also to fulfill three

subsidiary purposes: (1), to delineate the contexts of the radio culture of interest to him; (2), to collate anecdotes pertaining to particular amateurs in order to enhance awareness of his interactions with them; and (3), to elucidate via epilogues technical terms, roles of prominent people, and notable events that are mentioned in the anecdotes. Such references may have been commonplace in 1923-1924 but are today often obscure and enigmatic.

My organization of Bill Halligan's anecdotes is shown below in a "Table of Contents." Part I, "Introduction," provides an overview of his young adulthood and employment as a radio editor. The material from his columns is presented in Parts II through VII. Each of the main Parts, including the Introduction, is sub-divided into Sections whose content, in turn, is sometimes further classified into smaller categories (not shown in the Table of Contents).

Bill Halligan's anecdotes from the Boston Telegram are reprinted verbatim. They are listed chronologically at either the sectional level or, wherever appropriate, at the categorical level. The date each anecdote appeared in the Boston Telegram is shown. The anecdotes encompass collectively an enormous amount of material. Thus, it will be serialized proportionately in subsequent issues of Electric Radio. Part I, Introduction, offers background information; otherwise Parts may be read in any order. Attainment of perspective and understanding is facilitated if Sections within a Part, including the Epilogue, are read as a whole.

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PART I: INTRODUCTION

Biographical Sketch of Bill Halligan

"In 1933 a salesman in Chicago representing an eastern manufacturer had ideas for improving the short-wave radios he was selling. The salesman had been a radio experimenter as a kid, earned himself a 'Ham' license, and built an early spark-gap transmitter. He later served a couple of years as a wireless operator aboard ship in the Navy, and subsequently studied at West Point. In brief, he knew short-wave radio, and he knew what the radio 'Hams' wanted . . .. Adherence to the ideas, plus unswerving determination to succeed" led amateurs throughout the country to "the new Ham sets built by a Chicago Ham who loved Ham equipment. The new company—Hallicrafters—was making itself felt. And at its helm then, as now, was a courageous (and lucky) salesman and ex-radio experimenter, William J. ('Bill') Halligan" ("Advertisement," 1952, p. 33).

When Halligan established Hallicrafters, in 1933, he was clearly distinguishable from competing entrepreneurs by such key attributes as salesmanship and "Ham" experience (*see* above). Indeed, Halligan prided himself primarily for his prowess as a master salesman. He had honed a talent for knowing the needs and wants of amateurs and for anticipating marketplace relevance. The breadth of his products thus resonated throughout the many niches of the amateur community. Hallicrafters swiftly adapted new technology, innovative designs, and cost-effectiveness, becoming a direct reflection of Bill Halligan's values. He attracted to his fledging company a loyal, competent partner/business manager in Ray Durst, and brilliant electronic designer/engineers like J. L. A. McLaughlin, Fritz Franke, Ferd Schor, and Bob Samuelson. He conveyed readily to them his enthusiasm and expectations and inspired them to extraordinary productivity (Grinder, 2000; Grinder, 2001).

Amateur radio wholly preoccupied Bill Halligan during his early, formative years. He was born December 8, 1898, and he grew up under the shadow of Bunker Hill in the Boston suburb of Charlestown. As a kid, Bill Halligan operated a spark transmitter and crystal set receiver barely ten years after Marconi's 1901 transatlantic feat (Grinder, 2002). He had learned to copy Morse code by copying the Boston Naval Shipyard station, NAD. He earned his first amateur station call letters, 1AEH, shortly after the Department of Commerce, Bureau of Navigation, instituted in 1912 its first wireless regulations. Halligan attended the Eastern Radio Institute, following high school, to obtain a commercial operator's license. The Marconi Company soon employed him as a telegraph operator on excursion boats out of Boston. He joined the United States Navy at the outset of WWI, and his first assignment was as a wireless operator on Cape Cod; later, he joined the radio crew of the U.S.S. Canonicus, a minelayer on duty in the North Sea. One of his duties on board ship was that of compiling for its officers and crew an occasional newspaper from bulletins transmitted by naval land stations

(DeHenseler, 1991).

When Bill Halligan was discharged from the Navy in 1919, at age 20, pulling signals out of noise and interference had become second nature to him. He had acquired, through arduous trial and effort, sophisticated, practical experience in evaluating receiver performance. He had attained also a modest acquaintance with newspaper reporting. However, he aspired now to a cerebrally challenging life. He delayed renewing his amateur license and restricted his work as a radioman. He chose instead to enroll in the engineering program at Tufts College, Medford, and a short distance from home. His hopes were soon dashed, however, because financial exigencies forced him to drop out of the program in the spring of 1920, following his freshman year.

Nonetheless, collegiality at Tufts impressed indelibly the sociable young man. Tufts was, in 1919-1920, at the forefront of developments in radio broadcasting. The faculty had voted in 1916 to offer courses in radio engineering, while a former Tufts student formed the American Radio & Research Corporation (AMRAD) and established an experimental amateur station on campus, 1XE. Around 1920 the station initiated daily broadcasts. 1XE became a broadcast station, WGI, and on May 20, 1921, both day and evening programming was instituted (DeLue, 1950).

A strong bond between Tufts and Bill Halligan accrued while the college evolved into a prominent university and while Halligan established a radio manufacturing company of international distinction. Tufts awarded Halligan an honorary B.S. degree in 1947, appointed him a trustee for life in 1964, and, ultimately, awarded him an honorary Doctorate in 1976. In return, Halligan donated $600,000 to Tufts in 1983 to remodel the engineering department that he had departed reluctantly sixty-three years earlier. A grateful Tufts renamed its refurbished engineering building "Halligan Hall" ("Reporter's statement," 1983).

The prospect of ever attaining any degree from Tufts was probably far from Halligan's mind in the summer of 1921. He hoped to continue his education, but he was broke. Fortunately, his father, whose life work was centered on running a bakery shop in Charlestown, had infiltrated a network of local politicians. One of them pulled strings to obtain for young Bill an appointment to West Point, where his educational expenses would be covered. His ambition to become a radio engineer eventually dissipated, nonetheless, because, first, he hated the military regimen at West Point and bucked against it to the dismay of its authorities; second, he fell in love. Marriage became his preeminent goal! But the Academy did not permit cadets to marry; so sometime in late 1922 he left West Point, thereby, abandoning his ambition to attain a college degree.

Frederick W. Enright, Editor/publisher of the Boston Telegram, rescued young Halligan from destitution in March 1923, by offering him a job as a radio reporter. Employment enabled him to get married upon receipt of his first paycheck (Connelly, 1944). But what impressed Enright about the 24 year-old college dropout, whose experience in journalism was meager indeed? Perhaps he was persuaded by a friend of Halligan's father to take a chance on him? However, the accelerating involvement in 1921-23 of general citizens in matters radio suggests a more plausible reason. The prestigious Boston papers, e.g., Boston Globe, Boston Post, and Boston American, had introduced radio columns (Halper, 2002), as broadcasting engulfed the consciousness of the popular culture like a Tsunami. The new columns recounted mostly program highlights and

program scheduling. Enright drew attention to broadcasting, too, beginning January 1923, but he appears to have had a wider purpose in mind for his columns.

Enright had boosted subscriptions to the Telegram by enticing readers with human-interest stories and vignettes. Therefore, he sought particularly a radio reporter of sufficient breadth who could: (1) describe the daily endeavors of unheralded citizens to improve reception and overcome maddening interference; (2) understand and thereby identify with the struggles of amateurs both to enjoy the thrill of wireless communication and to survive in an increasingly oppressive environment; and (3) be conversant with the ongoing efforts of federal agencies to regulate equitably among the four major constituencies associated with radio—commercial, maritime, broadcast, and amateur.

Enright believed apparently that Halligan possessed requisite skills and knowledge to interact intimately with members of every sector of society who laid claim to the radio domain. Bill Halligan, for his part, was lucky; the job afforded unusual opportunities for him to extend his awareness of the influence that radio was exerting not only upon amateurs but also on society-at-large.

B. Tensions Among Radio Spectrum Users, Circa 1923-1924

The salesmanship skills that enabled Bill Halligan to succeed in radio manufacturing against long odds in 1933 were nurtured when he joined ten years earlier the staff of the Boston Telegram. Perhaps he intended at the outset merely to report events as they occurred, but his responsibilities soon immersed him in tensions arising from the quickening onrush of developments in radio following WWI. Circumstances thus placed Bill Halligan inadvertently, in 1923, at the epicenter of the following three upheavals in the process of revolutionizing the future of radio:

First, early in the twentieth century, before the onslaught of broadcasting, commercial, military, maritime, and amateur telegraphy stations shared the known radio spectrum on a functional basis. It was believed then that the effectiveness of a radio transmission increased in direct proportion to the length of its wave. Commercial and military stations thus used the longest practical wavelengths, somewhere in the range of 20,000 (15 kHz) to 700 (428.57 kHz) meters. Since space on a ship for a resonant antenna was limited, maritime communications ranged from roughly 600 (500 kHz) to 450 (666.67 kHz) meters. Radio amateurs, to ensure that they would not interfere with the other services, were assigned the shorter, presumably worthless, wavelength of 200 meters (1,500 kHz). Accurate frequency measurement was impossible, however, and stations often drifted far from their assigned wavelengths.

The Radio Act of 1912 regulated radio communications in the United States from 1912 until 1927. The Radio Service of the Bureau of Navigation, Department of Commerce, administered the Act, and matters proceeded relatively harmoniously until the immediate post-WWI years. Commercial stations were now communicating regularly with one another throughout the world. Ships could now contact land stations from anywhere at sea. An expanding cohort of radio amateurs, operating nominally on 200 meters, were relaying messages back and forth from coast to coast. Co-existence thereby grew increasing tense among the traditional spectrum users as severe interference became commonplace.

Second, vacuum tube technology evolved swiftly after WWI and led to

an over-night revolution in receiving and transmitting equipment. Frank Conrad was a sophisticated Westinghouse radio engineer who elected in 1920 to conduct equipment tests by using phonograph records to modulate a vacuum tube radiotelephone transmitter. Conrad attracted unintentionally an enthusiastic listening audience of amateurs, who found his records an entertaining diversion from copying code signals. Conrad, in turn, asked them to send him signal reports.

A Westinghouse vice-president, alerted by the unusual activity, reasoned that systematic broadcasts might tempt the public at large to purchase receiving equipment. Westinghouse prepared subsequently to broadcast the returns of the Cox-Harding presidential election, November 2, 1920, and in order to create a sizeable audience, arranged for a local department store to market ten-dollar crystal sets for the occasion. The feat was a resounding success, and within a few months broadcast stations proliferated across the national landscape. Simultaneously, hordes of citizens, wholly untutored in the quirks of radio, sought access to broadcast programs either by building or buying receivers. The BCL contingent and the broadcast stations that arose to entertain it raised tensions regarding spectrum use to intolerable levels.

Third, none in the Bureau of Navigation foresaw initially the oncoming social significance of broadcasting. When Westinghouse applied for a station license, broadcasting was thought to become a short-lived fad; therefore, the Bureau classified it as a "limited commercial " station, assigned it call letters (KDKA), as if it were a ship at sea, and authorized it to operate on what seemed to be an optimal wavelength—the maritime wavelength of 600 meters (500 kHz). During 1921 thirty additional "limited commercial" broadcast licenses were issued. The task of regulating transmissions grew out of hand, however, as amateurs and anyone else who could build a transmitter began broadcasting programs for friends, much as Frank Conrad had done. The din and cacophony emanating from headphones and speakers of receivers tuned between 300 and 600 meters thus reached crescendo proportions.

Consequently, in January 1922, the Department of Commerce abandoned the "limited commercial" classification. It amended the radio regulations of 1912 to require that amateur radiotelephone stations cease broadcasting entirely and that all broadcasters obtain a new form of commercial license. Importantly, broadcast stations were allocated two relatively clear wavelengths: (1) 360 meters (833 kHz), for broadcasting news, lectures, sermons, and entertainment; (2) 485 meters (619 kHz) for broadcasting weather forecasts, crop bulletins, and market estimates for the Department of Agriculture.

The number of authorized stations increased from 30 to about 600 in 1922, but by early spring, 1922, too many stations already had been licensed to broadcast on 360 meters. Even though most of them were using low power, they were interfering with one another, especially at night, when their daylight range of 25 to 50 miles increased sometimes to several hundred miles. In parts of the country, by mutual but reluctant agreement, stations were forced to share broadcast time. Nonetheless, complaints continued to pour into the Department of Commerce from manufacturers, broadcasters, and the general public. The latter now was spending upwards of a million dollars a year to purchase broadcast receivers, and it demanded uninterrupted, pleasurable listening.

Hence, in the winter of 1922, Herbert Hoover, Secretary of Commerce, convened the first of a series of four National Radio Conferences. A third wavelength at 400 meters (750 kHz) was assigned to radio broadcasting. Stations with "high power," 500 to 1,000 watts, were to operate on 400 meters whereas those with less than 500 watts were to remain on 360 and 485 meters. Several of the high-power stations began to augment studio broadcasts by using telephone lines to convey audio signals from churches and auditoriums to their transmitters. Businesses, churches, and schools licensed the low-power stations for specific public and private purposes. Who knows today how The Mine and Smelter Supply Company, El Paso, intended to program WDAH? How the Bible Institute of Los Angeles aimed to use KJS? How the Ocean City Yacht Club, New Jersey, planned to use WIAD? Or what the Nushawg Poultry Farm, New Lebanon, Ohio, contemplated for WPG? The interference generated by these unique stations was particularly tumultuous in urban areas. First, because they might transmit simultaneously on the same wavelength, and second, because few early receivers could select among nearby stations even when they were assigned a different wavelength.

The inadequacies inherent in the regulations set forth by the 1922 Conference led Secretary Hoover to call a second Conference, in May 1923; about two months after Bill Halligan began writing columns. This Conference recommended that station assignments be designated by frequency in "kilocycles" instead of "wavelengths" by meters, that the band between 550 and 1350 kilocycles be allocated to broadcasting, and that stations should be separated by channels specified in kilocycles. Further, the United States was divided into five regional zones and the relatively high-power stations were to be systematically separated from one another within given zones.

The recommendations of the 1923 Conference led to enormous improvements, but two major problems persisted. On the one hand, the machinations to separate stations on the bases of power and region proved unsatisfactory. "Toll broadcasting" was becoming commonplace, and advertisers were insisting upon larger and larger audiences before they would invest sizeable funds in the new media for selling products. The largest radio audiences, of course, were in urban areas where concentrations of people were greatest. These areas thus drew a disproportionate share of the powerful stations, which competed intensely for listeners, often by boosting power output to override or swamp the signals of competitors. On the other hand, broadcasters and audiences alike in coastal areas were particular susceptible to congestion and interference because ships were still entitled to use frequencies in the broadcast band.

Eventually, in late 1924, several months after Halligan had left the Boston Telegram, and thereby, ceased dealing with the intractable problems of radio spectrum usage, Secretary of Hoover called a third conference whose major accomplishment was that of excluding maritime communications from the broadcast band. Bedlam persevered, and he convened a fourth conference, November 1925, but by this time, court rulings were seriously undermining his efforts. Finally, in 1926, courts ruled that the Secretary of Commerce lacked authority to regulate radio broadcasting. Anarchy ensued. Although five million radio receivers were in the hands of public in 1926, most listeners were unable to enjoy a single interference-free program until Congress passed the Dill-White Radio Act of 1927, from which a powerful new regulatory agency emerged—The

Federal Radio Commission (Grinder, 1995).

C. The Rise and Fall of The Boston Telegram

The Boston Telegram was the "Crown Jewel" in the publishing career of Frederick W. Enright. He worked initially as a reporter for both New York City and Boston newspapers. He accumulated in time necessary resources for publishing two relatively small, suburban Boston papers. As they prospered, he acquired finances for launching at age 37 the Boston Telegram, March 16, 1921, which he published daily except Sunday. It averaged about 20-25 pages per issue, and, in newspaper parlance, it was regarded as "broadsheet" as opposed to a "tabloid," although it resembled substantively the sensationalism of a conventional tabloid. The first two or three pages included major state and national stories, but the first several pages accentuated metropolitan reports of crime, corruption, and scandal.

On Saturday, January 27, 1924, for example, a day chosen at random, lead articles in the Telegram carried the following attention-getting headlines: "Big crooks share underworld loot," "Ancient Order of United Workmen Vets charge fraud of ten million," "Rum runners land liquor in Marshfield," "Mullowney's suspension gave grafting city polls free rein for bribe taking," "Skull broken in kidnapping [sic] attack," and "Two brothers jailed and fined for giving short weight coal." Subsequent pages offered, including, "Broadcasts Today" and "Radio Waves," sports, stock market reports, classified advertisements, obituaries, and a variety of such features as "Freckles and Friends," "In the World of Records," "Piano Rolls," "Lonely Hearts," "Advice on Love," "Uncle Wiggely's Bedtime Story," "Home Builder's Page," "Fortune Telling," "Palmistry," and "Daily Horoscope."

Telegram patrons fervently endorsed Enright's format. When Bill Halligan wrote columns for him in 1923, only two years into the life of the paper, the Boston Telegram had risen to fourth in circulation among six major Boston newspapers, e.g., Traveler (380,000), Globe (284,000), Herald (258,000), Telegram (147,000), Advertiser (82,000) and Transcript (34,000).

Surprisingly, in spite of its initial success, the Boston Telegram was published for only five and one-half years—until September 29, 1926. Enright fell victim to the same formula that fueled his success. Specifically, he began as early as 1921 to feud bitterly with James Michael Curley (1874-1958), the notoriously, flamboyant mayor of Boston in the 1920s and 1930s. Curley manipulated city politicians like pawns, built a huge power base via patronage, and in hotel dining rooms and bars around Boston engaged nightly in drunken brawls. Enright had supported Curley during his first campaign for mayor, but he began vilifying Curly early in 1922 when Curley reneged, following his election, on an alleged promise to reinstate striking Boston policemen. Enright thereafter passionately flogged Curley with unflattering publicity; he questioned the propriety of his public projects, the merits of his patronage, and the respectability of his personal behavior. Readers flocked to the paper for the latest round in the fight.

One noontime, in 1926, the two protagonists met face-to-face on a Boston street. The burley Mayor, by now thoroughly provoked, decked Enright, and kicked him while he lay hapless in a gutter. Enright retaliated by printing a cartoon entitled "Curley, the Thug," which depicted Curley in a striped uniform with a ball and chain in a prison cell, accompanied by an editorial, captioned with "Sober Up, Jim," in which he advised Curley "to get out

of town and get off the booze." Curley countered by suing Enright for publishing a libelous cartoon, and on October 4, 1926, a Judge ruled in his favor. Enright paid a $500 fine and was sent to jail for eight months. He attempted to save the Telegram from liens by changing its name on September 30 to "Boston Telegraph," but only five weeks later, November 6, 1926, he was bankrupt and he was forced to shut down his presses. The Telegram/Telegraph was finished (Beatty, 1992; Obituaries, 1964).

The antics of his editor apparently failed to faze Bill Halligan. He had to be aware of the animosity between Enright and Curly, but as radio reporter, occasions never arose in his columns for mentioning either of them. Many years later he indicated that he had left the paper because it was going broke (DeHenseler, 1991). Insolvency was not on the horizon in 1924, however, and two other reasons may have been more causal. First, he had elected during the winter of 1924 to focus his columns narrowly as instruments for communicating with fellow amateurs (see Part VI), and it is probable that Telegram readers were now more interested in the dynamics of broadcasting than in the arcane and highly personalized colloquialisms he adopted in his dialogue with amateurs. Second, Tobe Deutschmann was encouraging him to join him in a business importing radio parts and tubes from Germany. Consequently, by mid 1924, both Halligan and Enright may have decided mutually that the time had come for severing their affiliation.

D. Salvaging Bill Halligan's columns

A trip in June 2001 to the Boston Public Library, one of the premier libraries in the United States, informed me that micro photographed issues of the Boston Telegram had been available since the 1960s in its "Microtext & Newspaper" Division. My delight at learning of their availability was tempered by my awareness that micro photographic technology was fairly primitive in the 1960s (Baker, 2000). The cellulose acetate stock on which pages were photographed, whether by inert disintegration or hard use, was likely to be scratched, marred, and full of extraneous marks. Words and phrases were probably obliterated. Thousands of newspaper pages were filmed in the 1960s; the task seemed easy then, which led responsibility for the copying to be assigned to inexperienced clerical staff rather than to knowledgeable librarians. Consequently, in respect to the Boston Telegram, apparent carelessness and ineptitude caused pages to be copied at odd angles, and in turn, words near page edges to be partially cut off.

I started searching in the Boston Telegram for Bill Halligan's columns with the microfilm reel that held its first issue, March 16, 1921. The cellulose acetate stock was, as I feared, in terrible shape, which prompted me to wonder how long the reels would survive ravages imposed by the passage of time? Thus, I ventured onward with a tinge of urgency. When I reached the issue dated January 27, 1923, I encountered a new column entitled, "Broadcasts Today," which listed the programming of four stations: WNAC, Boston; WGI, Medford Hillside (AMRAD); WJZ, Newark, NJ; and WGY, Schenectady, NY. When I reached March 5, 1923, I came across the first of Halligan's "Radio Waves." A great many hours, and several days later, after winding through a few dozen reels, I had unearthed 227 columns. Publication ceased abruptly without notice after May 27, 1924. The compilation showed that Bill Halligan wrote on a quasi-daily basis. For example, the Telegram published 17 of his columns in March 1923, 15 in April, 20 in May, 3 in June, 8 in July, 5 in August, 14

in September; 23 in October, 20 in November, 15 in December, 22 in January 1924, 21 in February, 24 in March, 10 in April, and 10 in May.

I was obligated to read and copy each of Halligan's columns with a FUJI, FMRP 30AV microfilm reader/printer. The printer yielded copy produced from a roll of lightweight, thermo fax-like paper. All of the extraneous marks on the old, acetate reels transferred faithfully to the flimsy printer paper. The product proved unsuitable for scanning, so each of the columns was typed into a computer for subsequent word processing.

I had been forewarned that salvaging the columns would become a tedious, monotonous process (Baker, 2000). Baker (p. 55) describes the job of reading microfilmed newspapers as "a brain-poaching . . . ocular and neckular ordeal." I discovered that scanning the pages of a particular issue of the Telegram for a specific column, among dozens of features, meant zooming past pages at blurring speed until a promising image warranted bringing the roll to a "clanking, overshooting stop," and, then, pushing reverse and forward buttons alternately until Halligan's column came into focus. Baker (2000) likens the experience to "mowing an endless monochromatic lawn." "Visually tracking the creep and lurch of passing textscapes," sliding a film gate this way and that, and fiddling with an image rotation dial engenders, he says, a motion sickness, which I did not avoid entirely.

Suffice to say, the effort was worth it! Bill Halligan's columns comprise, in extraordinary breadth, first-hand accounts of early 1920s radio upon the lives of both citizens at large and amateurs. The columns represent, too, a contribution of significant archival value to the history of amateur radio. I hope that the readers of Electric Radio acknowledge the material to be as interesting and fascinating as much as I anticipate that they will.

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Footnote:

[1]Laymen often used in 1923 the term "amateur" inclusively to depict anyone who tinkered with radio equipment. However, radio aficionados like Bill Halligan described persons as "BCLs" [broadcast listeners] who listened chiefly to voice and music broadcasts for entertainment; he referred to those who operated radio equipment to conduct personal communications with one another as "amateurs."

ER

The Stancor 10-P Transmitter Kit

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Photography by Reggie Fraser, KG4HAD

The Standard Transformer Company of Chicago sold 13 different transmitter kits between 1938 and 1941 ranging in power from 10 to 110 watts. All were HF except one 2 1/2 meter transceiver. My intentions last year were to find a Stancor 10-P like one I had over 50 years ago, but I got sidetracked and ended up with 8 pre World War II Stancor kit transmitters. Despite my forays with these other Stancor transmitters my favorite was, and remains, the 10-P. By 1940 standards, the 10-P is an extremely compact AM phone-CW unit. It covers 1.7 to 30 MHz with crystal control and plug in coils and runs 12 watts phone and 20 watts CW.

Stancor introduced the 10-P in late 1939 and they continued selling it until the ham radio shut down December 8th 1941, the day after Pearl Harbor. Most Stancor kits were revised yearly,

The Stancor 10-P was an attractive, small transmitter that was introduced late in the year of 1939, and was in production until December, 1941. The cabinet was produced in grey and black paint with chrome trim. It's small size and cabinet colors probably contributed to the survival of several examples.

Using a rugged chassis and a reliable design, Stancor made the 10-P able to withstand 65 years years of intermittant use. Repairable with only a VOM and a soldering iron, this transmitter will be working 65 years from now.

but the 10-P remained the same through out its 2 1/2 year sales life. Since the 10-P has only 2 RF tubes and 1 audio tube there really wasn't much they could do in the way of a major revision. The 10-P appeared right after QST published a symposium of small, low powered transmitter designs. The 10-P used the best of the bunch, a circuit by W8NCM. Based on correspondence, telephone, and ham radio contacts I've had recently concerning Stancor kits the 10-P must have been the best selling of the bunch. I can account for the existence of over thirty 10-Ps. Of all the other pre war kits, I have heard of only one, two, or three each of nine models and nothing about the others. The 10-P was the cheapest phone and CW multiband transmitter kit Stancor made, which might help account for the number surviving today.

Perhaps another reason 10-Ps are still around is that the parts do not lend themselves to use in other projects. The power supply is no bigger than that in a small receiver, the RF and AF sections are not suitable for much of an upgrade, power or frequency wise. The cabinet is too small for most construction projects but is suitable for a 6" speaker, meter or accessory circuit of some type. Some of the surviving 10-Ps are less their cabinets as a result. However, to me, the main reason 10-Ps have survived in a reasonably large number is because it is an extremely attractive little transmitter. I think it falls into the

Here is the top view of the Stancor 10-P. The transmitter uses such a simple design that all of the HF bands, 160 to 10 meters, can be worked with ease. If necessary, homebrew tank coils can be wound for any desired band.

"cute" category with its gray chassis and cabinet, with a black, and chrome escutcheon. It is not the kind of thing you want to take apart. Because of its small size, 11" by 5" by 7", it doesn't take up much shelf space and it always holds out the promise of being useable some time in the future.

The 10-P circuit is as simple as they get. A Pierce crystal oscillator using a 6J5 with an untuned plate circuit drives a 6L6 beam power tetrode amplifier. The 6L6 has series plate feed and only grid leak bias, as it and the 6J5 are both keyed when operating CW. So, two grid resistors and 1 screen dropping resistor, 1 RFC, 1 coupling cap and 1 screen bypass cap makes up the entire RF circuit, if you don't count the PA tank circuit. The tank uses B&W or Bud Junior end link 5-pin plug-in coils. The low Z link on the coil is brought out to a pair of 1/2" ceramic antenna feed line terminals on the rear chassis apron. They look very impressive but are obviously overkill for the 12 to 20 watts.

The modulator used for phone is even simpler than the RF, a single 6L6. The 10-P uses a carbon mic, which is transformer-coupled to the 6L6 modulator grid. A cathode resistor is used for Class-A bias and also provides 4 volts for the mic. An 8-watt modulation transformer, a screen dropping resistor, and a bypass cap complete the audio circuit. The key jack has an extra set of contacts that are closed when a key is plugged in, which shorts out the secondary of the modulation transformer and takes care of the CW-phone

switching. The power transformer supplies 6.3 volts to the 6L6s and 6J5 filaments, 5 volts to an 80 rectifier filament and 700 volts, center tapped, to the 80 rectifier plates. A two section LC filter smoothes out the 350 volts DC from the full wave rectifier. There is a power switch in the 115-volt transformer primary and a HV on-off switch in the transformer high voltage winding center tap. It is labeled SEND-STAND BY on the front panel.

The HV winding of the power transformer is rated at 90 Ma. The 6L6 PA is normally loaded to 40-50 Ma. The modulator pulls 51 Ma. The 6J5 crystal oscillator draws 4 Ma. The transformer is overloaded, but I've never heard of one melting down. I guess when you are running 12 watts of AM you keep the transmissions short to avoid getting stepped on. However, if you are not a purest, a way to help the transformer is to cut the filament leads to the 80 and put a pair of silicon diodes under the chassis. This saves 2 amps of filament current and runs the power transformer a bit cooler. While you are under the chassis look over the wiring. All these transmitters were kits and some of the wiring is atrocious. All the original wire was push back and there is lots of room so fixing up problems is easy. If not already done, the 2 filter caps and the 2 papers will need replacing. Stancor did not include a fuse in the 115-volt input, but it is one of the many modifications you may find added to 10-Ps over the years. The 10-P draws 70 watts so a 1-amp fuse is just about right.

A very worthwhile modification is to increase the modulator power. The 6L6 can only modulate the carrier about 35-45%. The mic voltage comes from a tap on the modulator cathode resistor. The tap is not by-passed, and this puts about 200 ohms in series with the 50-ohm mic transformer primary resulting in a low input to the transformer. A 50-uF bypass from the tap to ground takes care of the problem. Changing the screen-dropping resistor on the modulator tube from 25K to I5K ups the audio power also and doesn't cook the 6L6. These two changes bring the modulation up to 100%. This is with a WECo F1 carbon mic. A surplus T-17 will not provide over 50% modulation. If you have to use a T-I7 with a 10-P, pull the insides out and put in an Fl. You can find F1s in old WECo model 500 telephone handsets. The old black rotary dial 500s are selling for $1 or $2 at most rummage sales. The F1 is a very good sounding carbon mic, and most hams will not see any difference between it and a crystal, ceramic, or dynamic. The F1s do not cake up like older carbon mics, and they do not object to heat, or banging around.

The 10-P has only one tuned circuit, so the crystal must be in the same band as the final tank. The Bud or B&W Junior coils are air wound 5-prong plug-ins with an end link. While Stancor didn't say so, the B&W Baby series works just as well, and home made seem fine also. I wound a 160 meter coil which powers up just as good as store bought. Tune up is simplicity itself: Plug in a crystal, ¾" spacing or ½" in an adapter and a tank coil, switch on the HV and dip the final. Since the end link is fixed on these coils, an antenna tuner is useful for loading, but I have worked directly into a coax fed dipole with no problem. If the 10-P will not load, check the wiring to the coil. I've got one that had reversed coil wiring which put the link on the hot end. Loading the 10-P over 50 Ma decreases the output. On 160, 80, and 40 the output on CW is about 17 or 18 watts. On phone the output runs around 12 to 15 watts. On 20 meters the output is down about 20%. On 10 meters the output is about 1/2 of the 80-meter output. The Bliley crystal I use on ten, 29.090 MHz, is a pre war third harmonic type and re-

quires more feedback. Stancor recommends changing the coupling cap between the 6J5 plate and 6L6 grid from a 250 pf to a 2000 pf and connecting one end of the crystal to the 6L6 grid instead of the 6J5 plate. If you are using a post war overtone crystal you don't have to change anything, they work fine in the original circuit.

There are two problems when changing bands with a 10-P. There are no interlocks, and with series feed to the 6L6 plate the coil has 350 volts on it if you forget to throw the high voltage switch. If the transmitter is in the cabinet, you have to work through the back to change the coil. This requires removing the 6L6 P A to reach the coil and a 6L6 is the hottest tube you will ever-put your fingers on.

Using the 10-P on CW will get you, if the other station is honest, a lousy report. Clicks are terrible. I put a choke in series with the key and bypassed it with a 1/10-uF cap to soften the keying. Don't try your electronic key with the 10-P as the keying current is about 50 Ma and the voltage goes up over 200 volts key open. A relay is a necessity. Also a few of my favorite rocks don't like the 10-P and chirp for some reason, so check your signal. Phone operation doesn't have these problems, but phone with 12 or 13 watts has its own problems with QRM except on 10 meters. When 10 is open the 10-P will run with the best of them. I've never had any luck on 20 phone, but 75 and 160 phone late at night is OK. But day or night 40 CW is where the 10-P will always get you an 1 1/2 hour QSO. And an hour and a half solid contact with a 1940 10-P has got to be as good as boat anchor hamming gets.

ER

[...Editor's Comments from page 1]
did hear any activity from either coast.

. . . . . .

Worked All States-AM Update

Hear ye, Hear ye, all amplitude modulators far and wide!

Be it known that on this day of 19 June 2003, John K. Smart, W8JKS, of Frankfort Ohio, has submitted satisfactory evidence of working all 50 states of the United States of America using AM !!

John is hereby awarded Electric Radio's WAS-AM #2 !!

Be it also known that all AM contacts were made on 6 Meters !!

Congratulations John !!

73, Mark, K3ZX
ER Awards Manager

. . . . . .

Combined AMI Discovery Weekend and Classic Exchange

Now is the time to begin planning for the next vintage operating event, which is the combined AMI Discovery Weekend and the Classic Exchange in late September. August ER wil have the full announcement, but for now, mark your calendars for the weekend of September 26 to 28 for a great operating event.

73, Keep Those Filaments Lit!
Ray, NØDMS

W6MBA, Field Day, 1938

Pickup Your RF-
Multi-Channel RF Pickups in a Box

by Tom Marcellino, W3BYM
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So how do you sense RF in your radio station? If you are like me you have tried just about everything including: resistive and capacitive dividers, probes, whips, and inductors. I've even used a common RF choke in the tank circuit area with good results. Of course that's just another inductor type.

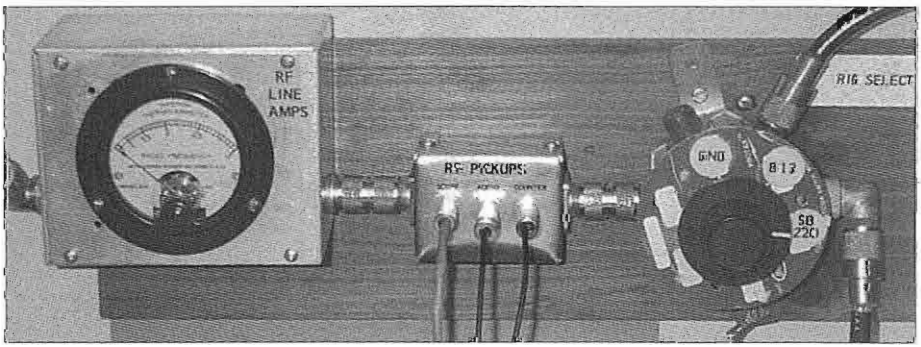
In my multi-station shack there were many different types in use and I use three all the time for each station. One for the transmitted RF envelope oscilloscope, one for the frequency counter, and one for the Tx-Rx Audio Monitor described in ER, August 2001.

Recently many wrongs have been corrected in the shack antenna switching system here so changing the RF pickups was right in line. I chose to use an all toroid system based on the Amidon T-68-2 core. This core was the right size for passing two turns of the main RF line and a multi-turn secondary. The other useful specification was its frequency range of 1—30MHz.

The system configuration in use now requires all the pickups to be on the input side of the tuner. Now the oscilloscope, counter, and Tx-Rx Monitor function with either the antenna or dummy load connected to a transmitter. Gee now how many years did it take me to get it right?

As you see in the internal photo the three toroid transformers are stacked adjacent to each other. Toroid cores perform well because they provide high permeability and good Q versus frequency characteristics. The feature I most like is that a toroid coil or transformer is self-shielding as the magnetic field is contained within the coil. Therefore if space required, they could be stacked against each other with no ill effects.

Each transformer uses 2 turns of the main RF line #18 solid insulated wire. The secondary windings use #22 solid insulated wire and enamel covered wire and each has 12 turns. These windings



This is part of the W3BYM antenna switching system, showing part of my system with the pickup box in line.

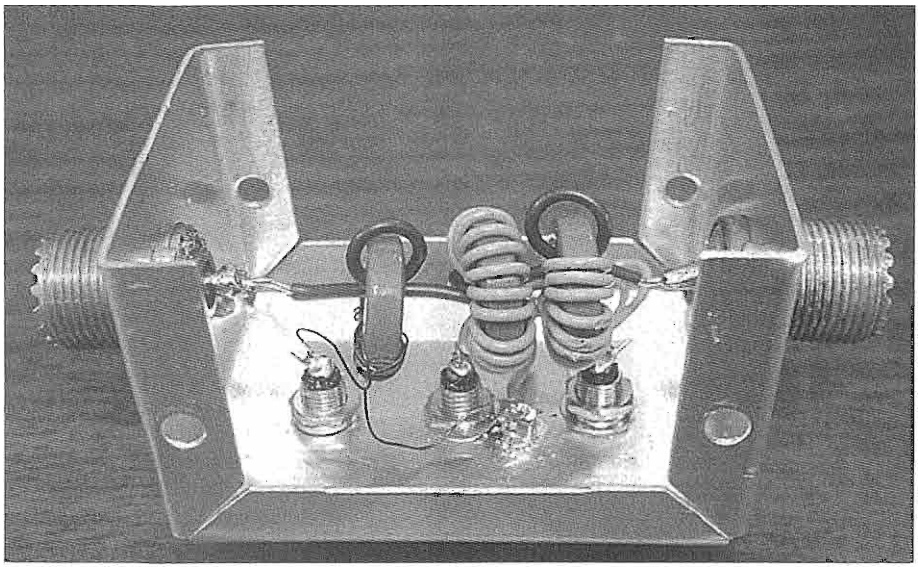
yield a ratio of 1:6 and could be done just as easily with a 1 turn primary and 6 turn secondary. I used 2 turns because it keeps the transformers from moving around. Just another Tecknо-Compulsive thing! On toroid transformers it's the number of wires going through the center of the core that count for turns and the windings don't necessarily have to fit tight to the core.

The first plot of RF power output vs. secondary output voltage was performed on one transformer's secondary. The test frequency used was 7.300MHz. Output was measured with an HP 410B voltmeter using its RF probe. As shown in the plot, the output ranged from 0.7 to 15 volts over a power range of 1 to 400 watts. The HP 410B is very suitable for this measurement since it can measure 320 volts maximum to 60 MHZ and reduced voltage to 700 MHz. From this plot it's obvious the 12T secondary will produce more than enough signal to drive external gear. Typical 100 watt class transmitters such as the Viking II, B&W 5100 or Valiant will yield 8 volts on the secondary while transmitters running full legal power using a 375 watt carrier will yield 15 volts.

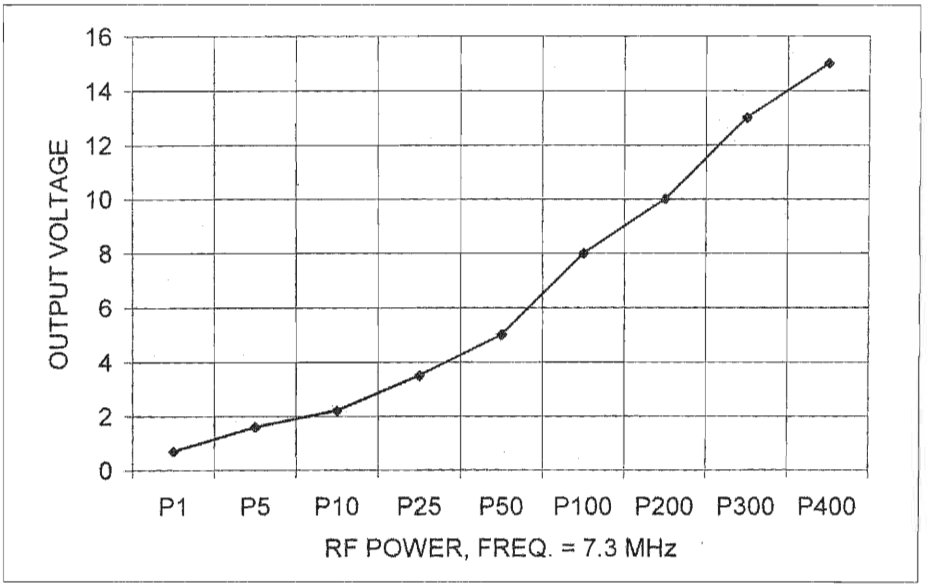
A second plot was run while varying the frequency on the X-axis and again measuring the secondary output voltage. The frequency ranged from 160 to 10 meters and two RF power levels of 10 and 80 watts were used. These curves are a bit deceiving because they were not plotted on logarithmic paper. My old version of Excel can plot a log axis, but on the Y-axis only, which confuses the presentation.

Again the data shows ample voltage is available from the secondary. At the higher frequencies it really takes off yielding 50+ volts on 10 meters with the 80-watt carrier. At the other end of the scale, 160 meters, the voltage is less than one volt with a 10-watt carrier. Even this low level is sufficient to trigger my old HP 5326C Nixie tube counter by adjusting the level control.

One exception to the toroid pickup here was recently installed into the Big

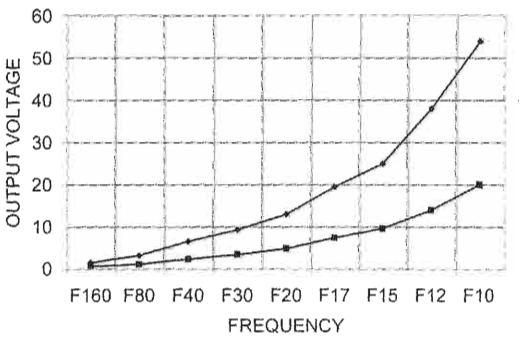


Shown here is the internal view of the pickup box with the three torroids, each using 2 turns of RF line through each core. A single turn will work, see the text.



Plot 1: This shows output voltage from one secondary plotted against transmitter output power. The frequency was held constant at 7.300 MHz.

Rig (ER Feb. 2002). This is a special case because this station is completely standalone with its separate RF Monitor scope. This was done because I'm too lazy to turn my head 180 degrees to see the other scope that's reading the same thing. This pickup uses just two carbon resistors in series. I selected a 100K and 900 ohm, both two watts, because that's what I had in stock. The 100K resistor is connected directly to the 375-watt RF line. The junction of the two resistors connects to an RCA jack and the bottom of the 900-ohm is grounded. Now all I do is set the vertical gain for the 375-watt carrier and forget it. Note: remember the scope vertical amplifier must have a bandwidth greater then the operating frequency. If not, the signal must be applied directly to the CRTs



Plot 2: The output voltage from one secondary has been plotted against transmitter frequency. Two power levels of 10 and 80 watts were used. The upper curve is 80 watts.

Physical dimensions

Core Size	Outer Diam. (in.)	Inner Diam. (in.)	Height (in.)	Cross Sect. Area cm²	Mean Length cm	Core Size	Outer Diam. (in.)	Inner Diam. (in.)	Height (in.)	Cross Sect. Area cm²	Mean Length cm
T-200	2.000	1.250	.550	1.330	12.97	T- 50	.500	.303	.190	.121	3.20
T-184	1.840	.950	.710	2.040	11.12	T- 44	.440	.229	.159	.107	2.67
T-157	1.570	.950	.570	1.140	10.05	T- 37	.375	.205	.128	.070	2.32
T-130	1.300	.780	.437	.930	8.29	T- 30	.307	.151	.128	.065	1.83
T-106	1.060	.560	.437	.706	6.47	T- 25	.255	.120	.096	.042	1.50
T- 94	.942	.560	.312	.385	6.00	T- 20	.200	.088	.067	.034	1.15
T- 80	.795	.495	.250	.242	5.15	T- 16	.160	.078	.060	.016	0.75
T- 68	.690	.370	.190	.196	4.24	T- 12	.125	.062	.050	.010	0.74

IRON POWDER TOROIDAL CORES — A_L VALUES (μh/100 turns)

Core Size	41-Mix Green $\mu=75$ 1-10 kHz	3-Mix Grey $\mu=35$ .05-.5 MHz	15-Mix Rd & Wh $\mu=25$ .1-2 MHz	1-Mix Blue $\mu=20$ .5-5 MHz	2-Mix Red $\mu=10$ 1-30 MHz	6-Mix Yellow $\mu=8$ 2-50 MHz	10-Mix Black $\mu=6$ 10-100 MHz	12-Mix Gn & Wh $\mu=3$ 20-250 MHz	0-Mix Tan $\mu=1$ 50-300 MHz
T-200 —	755	360	NA	NA	120	105	NA	NA	NA
T-184 —	1640	720	NA	NA	240	195	NA	NA	NA
T-157 —	970	420	NA	NA	140	115	NA	NA	NA
T-130 —	785	330	215	200	110	96	NA	NA	15.0
T-106 —	900	405	330	280	135	116	NA	NA	19.2
T- 94 —	590	248	NA	160	84	70	58	32	10.6
T- 80 —	450	180	170	115	55	45	34	22	8.5
T- 68 —	420	195	180	115	57	47	32	21	7.5
T- 50 —	320	175	135	100	50	40	31	18	6.4
T- 44 —	229	180	160	105	57	42	33	NA	6.5
T- 37 —	308	110	90	80	42	30	25	15	4.9
T- 30 —	375	110	93	85	43	36	25	16	6.0
T- 25 —	225	100	85	70	34	27	19	13	4.5
T- 20 —	175	90	65	52	27	22	16	10	3.5
T- 16 —	130	61	NA	44	22	19	13	8	3.0
T- 12 —	112	60	NA	48	24	19	12	7.5	3.0

NA—Not available in that size.

Turns = 100 √ desired L (μH) ÷ A_L Value (above)

Add MIX number to CORE SIZE in space provided (—) for complete part number.

NUMBER of TURNS vs. WIRE SIZE and CORE SIZE

Approximate maximum number of turns—single layer wound—tnameled wire

Wire Size	T-200	T-130	T-106	T-94	T-80	T-68	T-50	T-37	T-25	T-12
10	33	20	12	12	10	6	4	1		
12	43	25	16	16	14	9	6	3		
14	54	32	21	21	18	13	8	5	1	
16	69	41	28	28	24	17	13	7	2	
18	88	53	37	37	32	23	18	10	4	1
20	111	67	47	47	41	29	23	14	6	1
22	140	86	60	60	53	38	30	19	9	2
24	177	109	77	77	67	49	39	25	13	4
26	223	137	97	97	85	63	50	33	17	7
28	281	173	123	123	108	80	64	42	23	9
30	355	217	154	154	136	101	81	54	29	13
32	439	272	194	194	171	127	103	68	38	17
34	557	346	247	247	218	162	132	88	49	23
30	683	424	304	304	268	199	162	108	62	30
38	875	544	389	389	344	256	209	140	80	39
40	1103	687	492	492	434	324	264	178	102	51

Actual number of turns may vary slightly according to tightness of wind.

IRON - POWDER MATERIAL vs. FREQUENCY RANGE

For best 'Q', select larger cores from the lower portion of the material frequency range, and smaller cores from the upper portion of the frequency range.

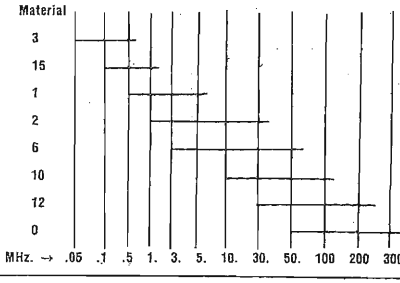


Table 1: From Bill Orr's Radio Handbook, 23rd edition, showing core types.

vertical plates. If the latter is the case, the resistor ratio must be adjusted for proper scope display. In this special case a toroid would have been used but I was out of stock.

This project was extremely simple to construct and inexpensive to build. The cores are available from several places including Amidon Associates or Palomar Engineers at a typical cost of $1.35 each. There are many variations one could use based on the toroid core. I wanted to try a single core with multiple windings but didn't have the proper size core for all the windings.

ER

Today's Kits-
An Evaluation of the Hi-Res PEP Adapter and a QSK Adapter for Classic Stations

by Steve Marquie, W8TOW
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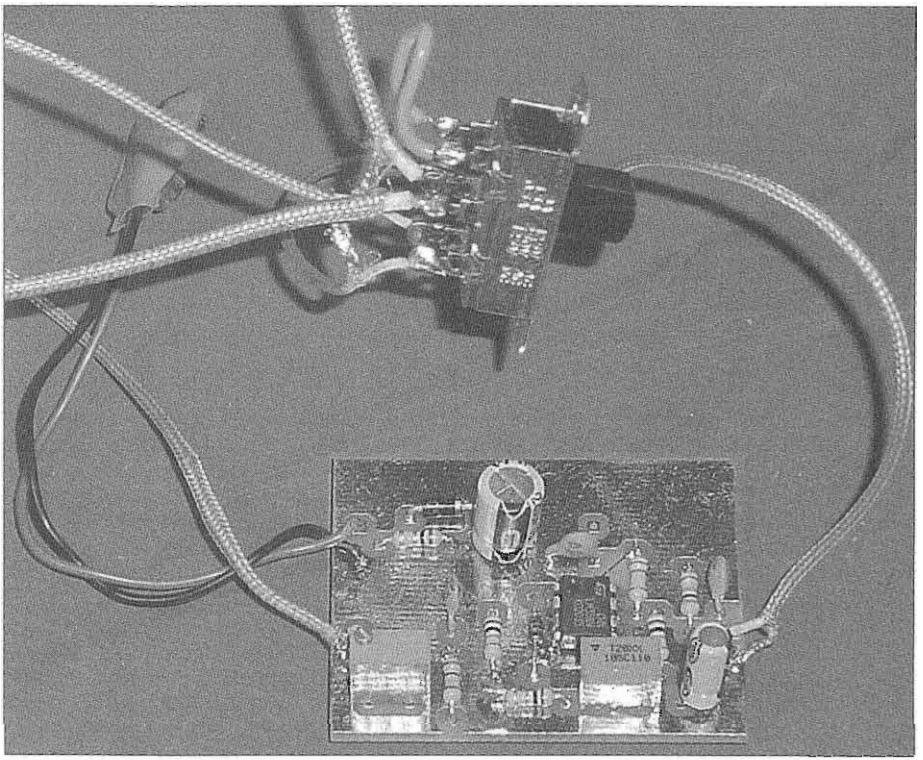
I think my wife is pretty happy that Heathkit and other kit manufacturers are no longer in business. Our house would be filled with them! Everything from a color TV to the coffee maker would be a kit. Unfortunately, kit builders today have to be satisfied with simpler less expansive kits. Never fear, many of these kits are excellent in quality, greatly needed in our shacks and fun to build! From cake pan transmitters to microphone equalizers, a small selection of kits exist, but the diversity of kits is not as vast as 1958!

The first kit Ray sent me to evaluate was a PEP interface for average reading wattmeters. I have several old wattmeters around the house and a couple of newer PEP reading wattmeters. After building the interface, I then was to compare their accuracy with various PEP wattmeters. This kit has been available for several years from HI-RES Communications right here in Michigan. I began my kit building in the usual fashion. Pop open the bag of parts, compare them to the parts list and then sort them into an egg carton. Next, I sat back with a cup of coffee and relaxed as I carefully read the instructions. Well detailed and precise, I found no conflicts or contradictions in the assembly or operation of the little adapter.

If you have never built a kit, I will make some suggestions. Since I design and build electronic interfaces and other similar systems for a living, I'll share a few of my techniques. If you are an old pro at kit building skip down to the results!

For trouble free kit building the best advise is old as Heathkit...find a place in your house you can set up a workbench and if you have to abandon the project for a couple of days, when you return, it will be as you left it. Nothing is more frustrating than coming back to your project to find someone's homework on top of it or worse, all your cute little parts shoved off to the side. For you work area, you must have plenty of light. A magnified lamp is a nice investment because our eyes aren't getting better. Various tools are nice to have but not always a necessity. A good friend of mine built a Heathkit SB100 while stationed in South Korea back in 1968. The only tools he had were a soldering iron and nail clippers! And yes, after aligning it next to a R-390, it worked the first time out for him. For your shack's workbench, you should invest in a nice pair of needle nose pliers, some wire cutters (diagonals), various screw drivers and nut drivers, plus a couple of soldering irons. A nice 120-140 watt soldering "gun" and also a 20 to 40 watt pencil iron work well. For most of the kits available today, you will find the small pencil iron the most useful but for repairs on our beloved vintage rigs, nothing beats the big iron.

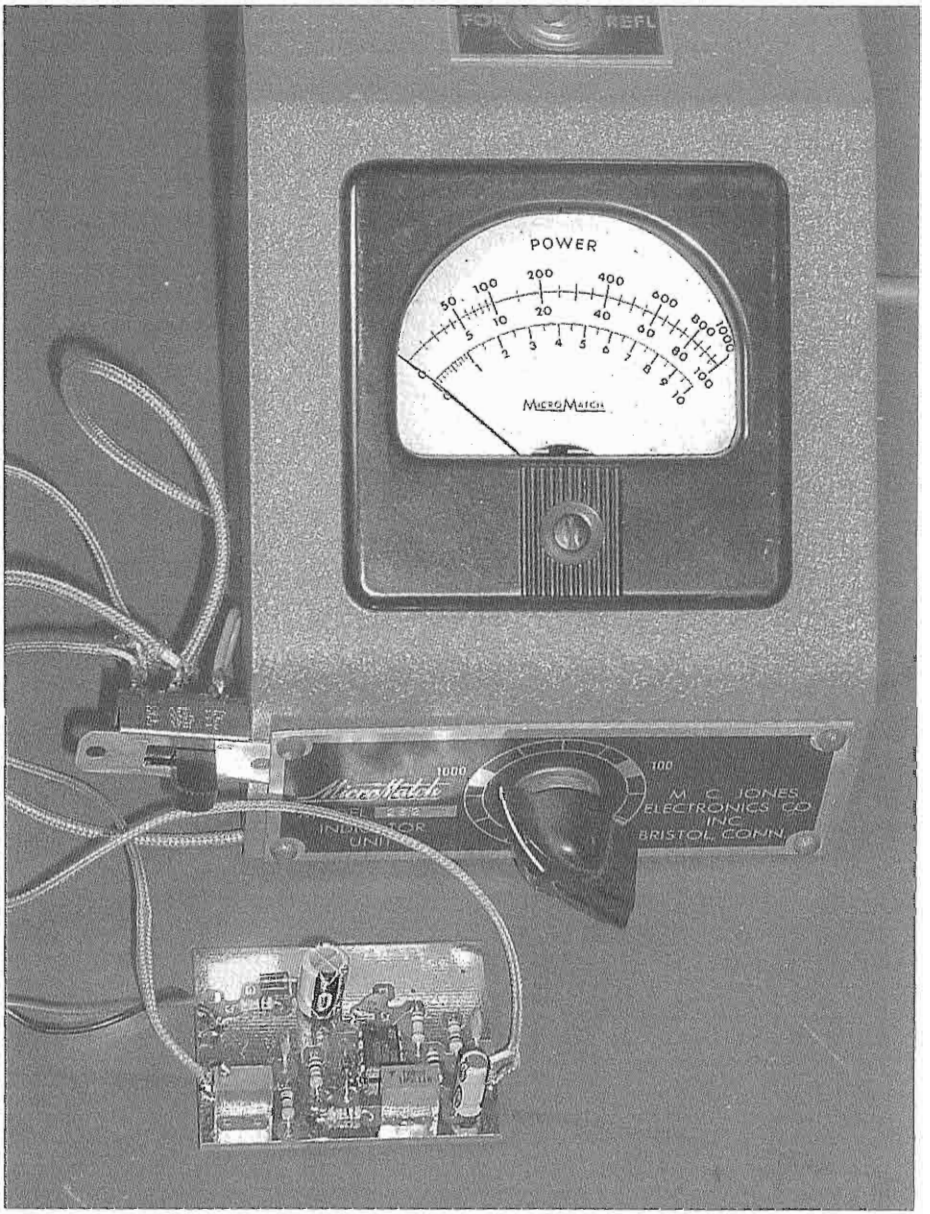
For test equipment, I would recommend a couple of items. The old reliable, Simpson 260 VOM, a moderately priced DVM, a RF signal generator and an AF signal generator. An oscilloscope is nice but not mandatory. With these tools, a couple of "handbooks" and a bit of patience, personal satisfaction and some self-education in electronics can be had.



The assembled Hi-Res PEP wattmeter adapter kit is shown assembled and connected to a slide switch that has been installed for bypass purposes. This kit is available through Hi-Res Communications, and their ad may be found in the Classified Advertising section at the back of the magazine.

After reading the instructions, and refilling my coffee cup, I ventured back to the bench and set to work on the PEP Wattmeter adapter. 20 minutes later, I was finished with assembly and ready to set up a test jig for some comparative evaluations. (See figure 1) The assembly went pretty well. I have my own opinions about what a printed circuit board designer should provide to the end user, which will cover in our end conclusions. Component options and alternatives were well covered and calibration techniques with operation results are also part of the information.

The HI-RES PEP adapter conveniently can be interfaced to any average reading wattmeter. By simply inserting between the output of the range selector and the "positive" side of the meter, it can be companioned with most commercial meters (See figure 2). I have a couple of average reading wattmeters that are great for a vintage shack so I chose to put the PEP adapter in a "Bud" box complete with connectors and battery supply. A DPDT switch was added to bypass the PEP adapter when average readings are desired. The first wattmeter I tried it with was a 1950's vintage Jones Micro-Match. Now it might not be the most accurate meter on the market, but it and the Johnson wattmeter offered during the same era have to be among the most "classic" in appearance. This interface took about 5 minutes. Shielded cables were used between the input and output of the adapter and the wattmeter as recommended in the instructions. I chose to



For testing the Hi-Res PEP adapter, I connected it to my vintage Micro-Match wattmeter from the 1950's. This is certainly a classic meter, and comparison with modern equipment can be found on the chart in Figure 1, page 28.

first make sure the meter still worked as before in "average" function. A second meter, a Mirage 2000 watt PEP reading meter was connected along with the old Micro-Match. (See figure 3) The test: with 50 watts output from a CW RF source, both meters indicated 50 watts; with 100 watts CW RF signal,

RF Output Un-modulated Watts	Meter #1 Reading Average Watts	Meter #2 Reading Average (approx.) Watts
50	47.9	49
100	99.6	100
200	201.2	205
500	503.4	505

RF Output Modulated ~100% PEP Watts Meter #1	Meter #2 Modulated ~ 100% PEP Watts	Meter #3 Modulated ~ 100% PEP Watts
197	200	195
394	400	389
596	600	605
1,197	1200	1225

Figure 1

In the top chart, meter #1 is a modern Bird digital wattmeter, and meter #2 is my vintage Micro-Match wattmeter from the 1950's.

In the bottom chart, meter #1 is the same Bird digital wattmeter, #2 is the Micro-Match with the Hi-Res PEP adapter, and #3 is a modern Mirage 2KW PEP wattmeter. See text for conclusions about these measurements.

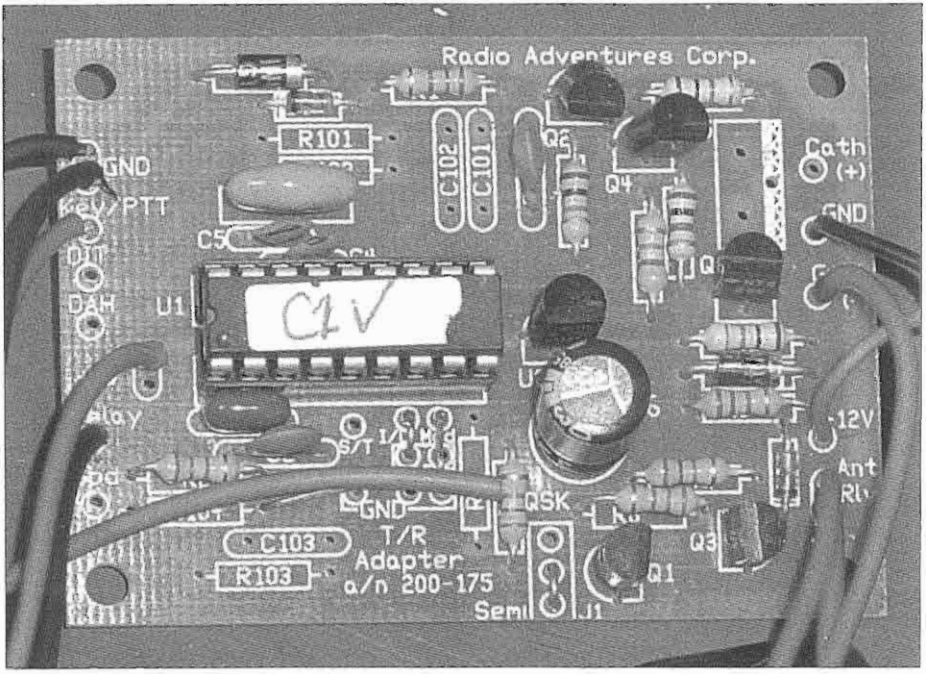
again both meters read 100 watts. I modulated the signal next with 100 % modulation from an AF signal source. Both meters read 400 watts! Well, pretty close. See the charts for the actual numbers. I also modulated the signal with voice audio. Those numbers are also included in the chart.

After comparing it with my Mirage wattmeter, I compared it to reading taken with a Swan 5000 wattmeter. Readings were once again very close. Not too shabby when you like your meter but want to add the PEP feature it without defacing it!

Radio Adventures QSK Break-In Adapter

The next kit project I evaluated is sold by Radio Adventures. Now my first rig back in 1975 was a Ten-Tec Triton. What a rig...well, maybe not compared to a 75A4 and 32V3 Collins, but for a young Novice who could only work CW, the Ten-Tec was nice rig. My only problem was getting used to full QSK. Even today, I still have problems with it. The sound of band noise between my sending is a bit of a distraction for me. Over the years, I moved to other CW stations like the Drake twins. Hearing the clatter of relays just never bothered me. When I re-entered AM in 1996, I decided to use my vintage station on CW too. The obvious problem was how to control the transmitter and receiver. The BK-175 break-in adapter by Radio Adventures was the answer.

This is a wonderful accessory for any station, which relies on a mechanical relay for T-R. The only requirement is the transmitter must have push to talk (PTT). Once this requirement is satisfied, the builder can jump right into the project of assembly! It is an easy to build kit. Power requirements are +12 VDC, about 500 mA. This accessory provides many features, which are a great benefit to CW ops. In addition to semi-break-in, side-tone, receiver muting, and even a keyer option are offered. External controls are allowed for changeover delay, but I added a side-tone "ON/OFF" switch also. The BK-175 works with either cathode keyed or grid-block keyed transmitters, such as Johnson Rangers and Valiant.



This is the assembled QSK adapter available from Radio Adventures. Their phone number is 814-437-5355, and the mailing address is RR #4, Box 240, Summit Drive, Franklin PA 16323.

After assembly, it can be incorporated within the transmitter, or mounted in its own project box. I opted for the latter, adding front panel controls for the changeover delay, sidetone, power and use a wall cube for a power supply. Rear apron connections are for key, receiver muting, control line to transmitter's PTT, and transmitter's "key" input. For simplicity, I route the mic connection through the BK-175's enclosure for easy access to the PTT line.

How does it work? It works like a dream. If you preferred the semi-break-in technology used on Collins S-line, Drake gear, and others, this is for you. Once you connect the BK-175 to the transmitter, simply touch the key. The transmitter's B+ will come up and as long as you hold down the key, the rig transmits. Release the key, and depending upon the variable delay selected, the B+ will remain "ON", and receiver muted. It doesn't get any easier that this!

OK, what do I think of the two kits? They are both great, once finished. HI-RES Communications PEP wattmeter kit could use a couple of refinements though. With little effort, to make assembly easier, I would like to see the PC board silk-screened. This would take some of the guesswork out of component placement. In addition, some pre-drilled mounting holes located at the four corners would help too. Otherwise, I wouldn't change a thing. As for the Radio Adventures Kit, the board comes silk-screened, and completely ready for mounting within a box. Both companies have well written manuals, proof to me that the author of the manuals built the kits!

Well, there you go, they are fine additions to you shack, I would recommend both of them to anyone who has some vintage gear needing some outboard accessories. Happy building!

ER

Enhanced Single Sideband- Has It Created a Threat to AM'ers?

by George Maier, K1GXT
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Background

Over the last few years, a trend has developed among a small group of HF SSB amateur operators. This group has developed something of a rivalry over the quality their transmitted audio. In order to "compete", many are using high-end studio-quality microphones, sophisticated broadcast audio processors, and modified SSB transceivers.

The modifications include wider transmit filters, and in some cases moving the carrier into the filter passband to get increased low-end audio frequency response. While these stations may sound nice, they can produce a high level of intermodulation products that cause interference to adjacent signals, in the form of splatter.

In numerous speeches given to the Amateur Radio community throughout the year, Riley Hollingsworth, Special Counsel for the FCC's Enforcement Bureau, has called attention to the issues surrounding "enhanced single sideband", and noted that the Commission has received many complaints about it. Riley is known in the amateur community as K4ZDH, and he likes to operate on AM with a totally restored Viking Valiant.

The Current Situation

After investigating the issue more thoroughly, the FCC sent out advisory notices in April and May, letting a number of amateurs know that complaints had been received about their unnecessarily wide SSB signals. One of the key paragraphs in these letters stated: "Section 97.101 applies to all amateur stations at all times. When an amateur station transmits a voice emission that occupies more bandwidth than necessary in order to achieve a 'great audio' sound, that emission occupies spectrum that could be utilized by several other amateur stations. To occupy more bandwidth (than) necessary in a heavily used amateur band is not only *extremely inconsiderate*, but is contrary to (the) requirement that amateur operators cooperate in the utilization of frequencies allocated to them, and make the most effective use of them. Such shortsightedness on the part of control operators that causes a station to transmit an 'enhanced single sideband' emission inevitably leads to ill will between operators, and likely will result in petitions for rule making requesting that the Commission establish bandwidth limitations for amateur station emissions."

In subsequent speeches, Special Counsel Hollingsworth has continued to highlight the "enhanced single sideband" situation, warning that continued lack of cooperation on the part of these operators could provoke the release of new rules limiting occupied bandwidth.

Some in the AM community have misinterpreted this as a threat against AM. If there is any threat to double sideband, full carrier AM, it is caused by the SSB operators that continue to thumb their noses at the rest of us with their disregard for rules.

In a recent conversation that I had

with Riley, he pointed out that AM operators are really quite respectful of the FCC rules, and rarely go beyond the necessary bandwidth requirements (i.e. 6 kHz "necessary" bandwidth) for that mode of operation.

Getting to the Bottom of It

To explore the technical reasons for problems caused by "enhanced SSB", I turned to my good friend, Dr. Lewis Collins, W1GXT (the call-sign is just a coincidence), for some insight. Lew earned his PhD in communications engineering at the MIT graduate school, and is a broadcast engineer with a great deal of AM and RF knowledge. Following some serious thought, he offered the following analysis:

"The SSB rigs of today are based on the use of filter technology to achieve the required bandwidth and unwanted sideband suppression. A double sideband suppressed-carrier signal is generated in a balanced modulator and then is filtered to remove the unwanted sideband. The filter also provides an additional 20 dB of carrier suppression.

Let's assume that the audio passband requirement is 300 to 3100 Hz for good communications quality, and the radio uses a 6-pole filter, with a bandwidth of 2.8 kHz to provide the desired audio response. The carrier would be positioned 300 Hz below the knee of the filter curve to provide 20 dB of carrier suppression, which is a typical industry target. The modulator balance provides 40 dB or more of additional carrier suppression.

Along comes an operator that wishes to enhance his filter type SSB radio with more low end response, or a 'big bottom' as they say in broadcast and professional audio circles. This requires an equalizer that must boost, or pre-emphasize, the low frequencies by 17 db to bring the 200 Hz audio response point up to the same level as 300 Hz. Make that 19 dB if you want to reach 100 Hz. Now, the transmit audio stages and the balanced modulator are being hit with 17 to 19 dB more voltage (7 to 9 times larger!) between 100 to 200 Hz to make up for filter attenuation, and the transmitter's low-level stages cannot handle that without distorting. This distortion shows up as increased bandwidth and off-channel splatter. Add an overdriven linear amplifier, and the signal gets pretty ugly. Some people cleverly move the carrier closer to the knee of the filter, which reduces the amount of EQ needed, but there goes the 23 to 26 dB of unwanted sideband suppression, which is considered 'good engineering practice' and of course up goes the complaints again. The same scenario results when the high-end audio frequencies are boosted, and the problem is really compounded if EQ is used at both ends of the filter curve."

In contrast, regular old AM boat anchor transmitters such as the Collins 32V and Johnson transmitters, etc. are vastly superior to a filter-type SSB transmitter in their ability to achieve a clean low end with only minor audio equalization and increased values for audio coupling and bypass capacitors. In several of his public statements, Special Counsel Hollingsworth has noted that the FCC currently has no problem with AM operators from an enforcement standpoint, and I would argue that clean AM emissions is why.

A Petition is Launched

Recently, the FCC received two petitions asking to limit the single sideband bandwidth to 2.8 kHz, and the AM bandwidth to 5.6 kHz. Although the details are not public, the petitioners evidently singled out "Enhanced SSB" as the primary offender, and went to lengths to credit AM'ers for clean operation. To date, the FCC has not accepted these petitions officially. Is DSB-AM threatened? If the enhanced

[Continued on page 44...]

Using the Collins KWM-2 on 160 Meters

by Hal Guretzky, K6DPZ
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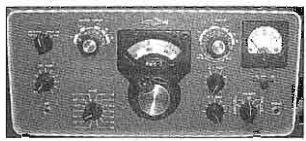
11419



The famous Collins KWM-2 transceiver normally works between 80 and 10 meters. Now that we are entering the period of low sunspot numbers the conditions on the low bands will greatly improve and there will be more activity available on 160 meters. Because there is more activity available, and because there are a lot of Hams with Collins transceivers, the very interesting conditions on 160 meters would be a lot of fun to investigate with the KWM-2. When Collins was producing the KWM-2, 160 meters was not a popular band because of LORAN navigation transmitters and other types of interference. Now that we have GPS navigation the interference is gone and we have a whole new band available now that the sunspot cycle is approaching a minimum. There will be less noise, and it will become a popular band to operate.

The main criterion for this conversion was not to disrupt the Collins KWM-2 transceiver. Many people who have Collins gear are purists, and the worst thing you can do is change a piece of gear around so that it is no longer a piece of Collins equipment. My conversion does not destroy the Collins rig at all, and it can be returned to its original configuration without knowing that there ever had been a modification made for 160 meters.

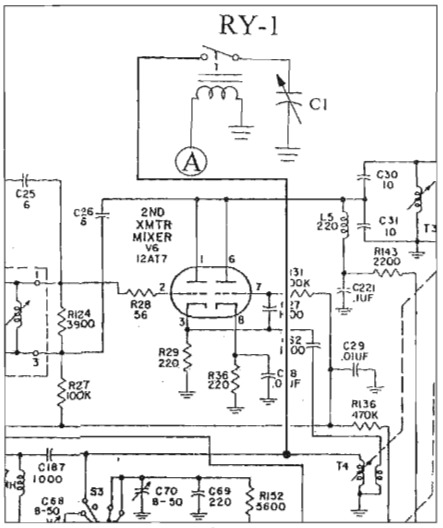
The 160-meter modification basically utilizes the 3.4-to 3.6-mc position on the bandswitch, the first position on the Collins 80 meter band. Because there are 3 positions, you can always take the crystal from the first position and use it in any of the other 80-meter positions if you don't want to loose the 3.4 to 3.6-mc segment. When the conversion is done and the rig is able to reach 160 meters, you will really be tuning 1.8 to 2 mc when the bandswitch is on the first position, which works out very well.

This conversion is done by padding different circuits and by changing out the original 6.555-mc crystal originally installed in bandswitch position 1A. By utilizing reed relays and miniature SPDT relays, the relays act to pad the inductors down when you go into the first position on the bandswitch. These are shown in the accompanying schematic circuit drawings, and pad the inductors down to 160 meters, 1.8 to 2 mc. When the relays are not energized, normal operation on the other bands is not affected.

Exact Heathkit-style conversion information is not given. The intent is for users to follow the schematic and to use the photos as a guide for installing the relays and other necessary components. Please note: *To be sure that the changes will work as designed, your KWM-2 will need to be completely checked and aligned to specification before the conversion starts.* To start the conversion, replace the Y1 crystal, originally 6.555 mc, with the new crystal, 4.955 kc. This crystal is ordered from International Crystal (ICM) and you need to ask for Collins HFO crystals. They know what that means and will supply the proper specification

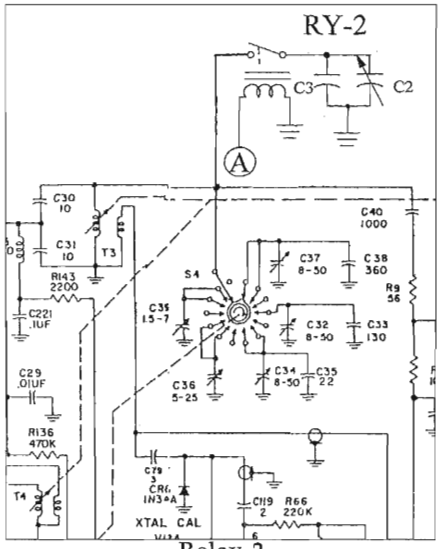
and part number when you call to place the order.

All the relays are shown in the non-energized condition. When the band switch goes into position one, all the relays operate at once.



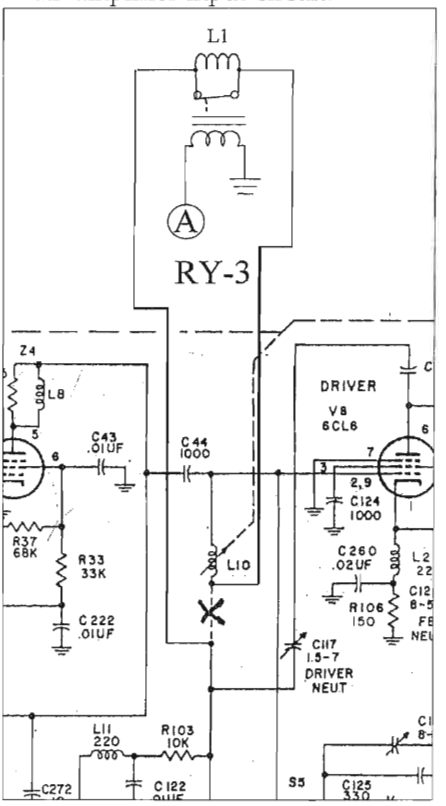
Relay 1

When relay RY-1 operates, the plate circuit of V13A is padded down to the crystal frequency.



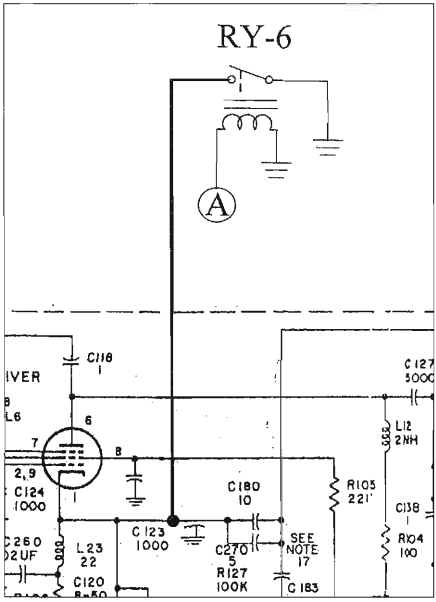
Relay 2

At the same time, relay RY-2 operates to pad down the grid circuit of the V7 6DC6 antenna input circuit and the 1st RF amplifier input circuit.



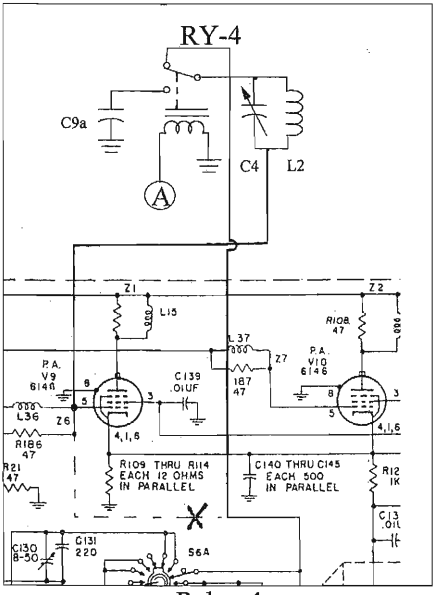
Relay 3

Relay RY-3 operates and adds inductance to L10, the grid circuit of V8, the 6CL6 driver. L10 is inside a shield cover, the only one that needs to be opened is the pre-driver mod where RY-3 is installed(See photo, page 36). Remove the cover by removing the bandswitch rod, and the slug-tuned coil is right under the cover. Lift the "cold" end of the coil and connect it to the pole of RY-3. When the relay operates, another 7.5 uH will be added to L10 to lower its frequency. When this is completed, replace the cover and the bandswitch rod. Then tune the other new padders so that everything tracks on 160 meters.



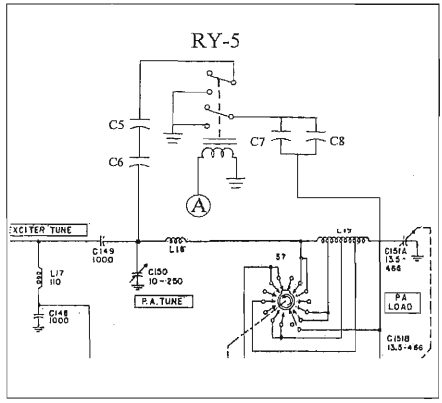
Relay 6

Relay RY-6 shorts out the cathode of V8 in the 160-meter position.



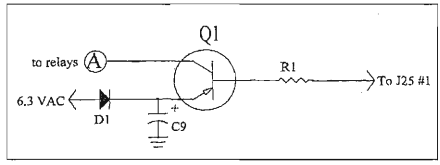
Relay 4

When relay RY-4 operates, it places L2 and C4 as a tuned circuit into the 6146 grid. All the other tuned circuits are not used when RY-4 operates; they are bypassed on the low side to ground through C9.



Relay 5

In the 6146 PA plate circuit, RY-5 operates to get 160-meter capability. When RY-5 operates, the series combination of C5 and C6 are placed in parallel with the plate side of the pi-network. C5 and C6 need to be high-voltage capacitors, at least 1000 volts because of the high circulating voltages in the tank. At the same time, C7 and C8 pad the load side of the pi-network to approximate a 50-ohm load impedance for the given power input. They can be 100 to 500 volt capacitors. There is no other modification necessary to the PA tank because it still has enough Q when modified to provide the required harmonic suppression.



Switching Transistor Q1

Finally, there is a switching transistor that is arranged in a pass configuration to drive all the relays. 6.3 VAC is taken from the accessory socket on the back of the rig, rectified through D1, filtered through C9, and applied to the emitter of Q1. This makes a switching pass transistor that is turned on when

the base is grounded by S13 as it moves into position 1. The lead to the base of Q1 is taken from pin 1 of J25, and thru R1, the base-dropping resistor. The collector of Q1 goes to the relay coils, marked as "A" on the schematics. Only one lead runs to the relays; they are common to ground. This minimizes the amount of extra wiring in the transmitter and reduces the chance of RF feedback.

When the conversion is completed, the power output on 160 meters is comparable to the power output on all the other bands. The spectrum analyzer photographs on page 38 show that the 1st harmonics are down 39 to 40 dB. Also shown is the spectrum of the transmitter operating on 80 meters for comparison.

Mike Gregory, (W5INC), took the photographs used in this article. He saw the transceiver working on 160 meters, much to his amazement and surprise. Other local Hams came by my lab to see it working and couldn't believe there was a Collins rig on 160 meters.

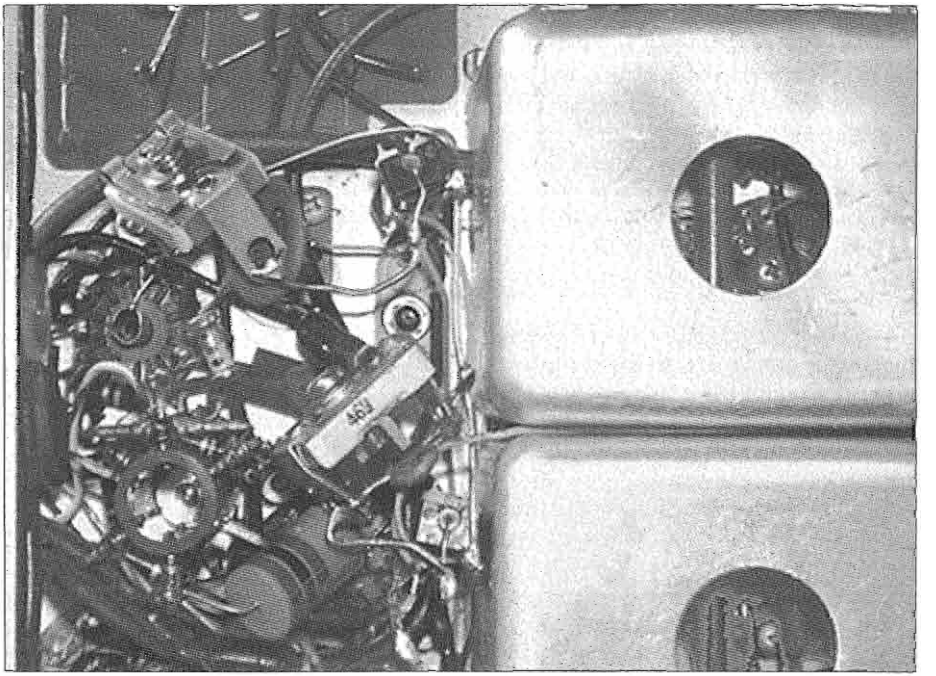
This mod is not that hard to install, and I am preparing a kit of parts for this modification that will be available shortly. Please contact me at the address in my by-line for the details.

This is a phenomenal modification that is going to serve as a prototype for 160-meter installations on other Collins rigs. I hope to work you all on top band this coming winter with your Collins equipment.

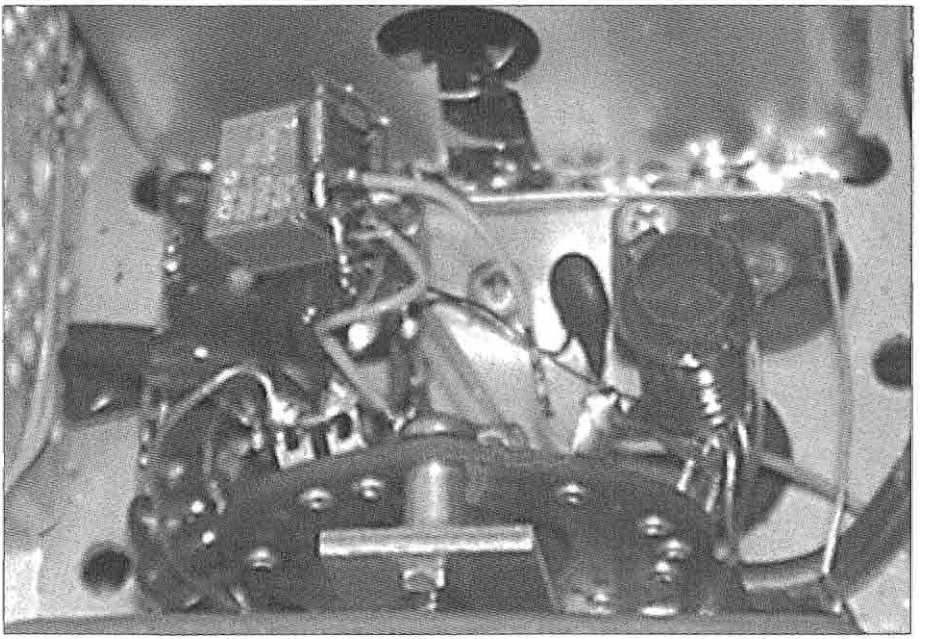
Hal is using his converted KWM-2 on the 160 meter band, to the amazement of many other operators on top band.

PARTS LIST

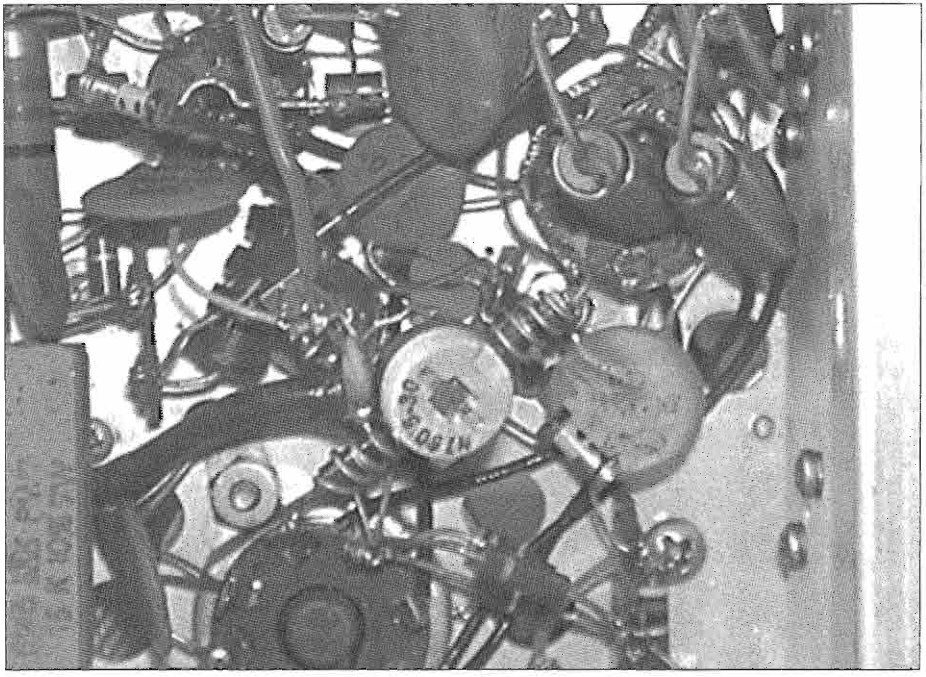
RY1, 2, 6	5V reed relay, N.O.	Radio Shack 275-232
RY3, 4	5V micromini SPDT	Radio Shack 275-240
RY5	5V open-frame DPDT	Magnecraft W88X-6
D1	1N4007 diode	Radio Shack RSU-11928397
Q1	TIP-32 PNP transistor	Radio Shack RSU-11371218
R1	1K, 1 watt	
C1, C2	215 to 790 pf mica trimmer ARCO 469	
(note: C1 and C2 are available from Surplus Sales of Nebraska)		
C3	470 pf ceramic	
C4	8/50 pf ceramic trimmer	
C5	1600 pf mica (C5 to C8 are postage-stamp mica style)	
C6	1500 pf mica	
C7	3300 pf mica	
C8	1000 pf mica	
C9	470 uF 15 VDC	Radio Shack 272-957
C9A	.001 disk ceramic 500V	Radio Shack 272-126
L1	7.5 uH choke	Miller 70F756A1
L2	100 uH choke	Miller 70F1006A1
X1	4955.0 kc crystal	International Crystal



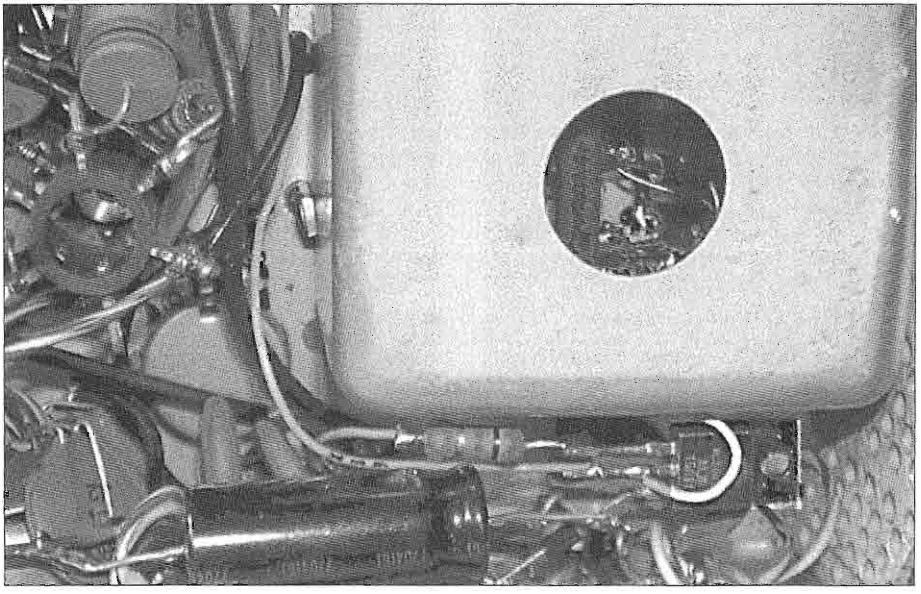
Here are the mounting locations for C-1 and C-2, which are used in connection with RY-1 and RY-2.



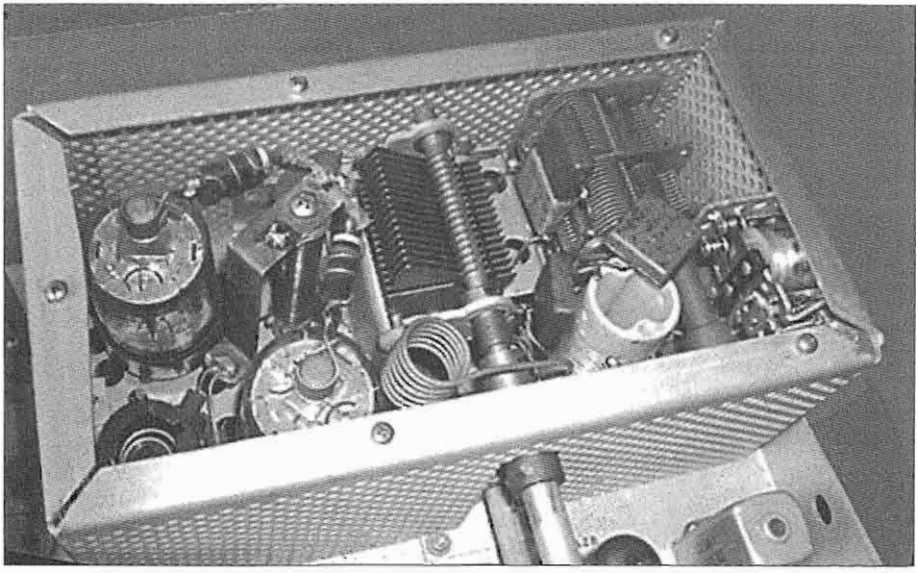
Relay RY-3 is to the upper left and L-10 is in center right. These are used in the 6CL6 grid circuit.



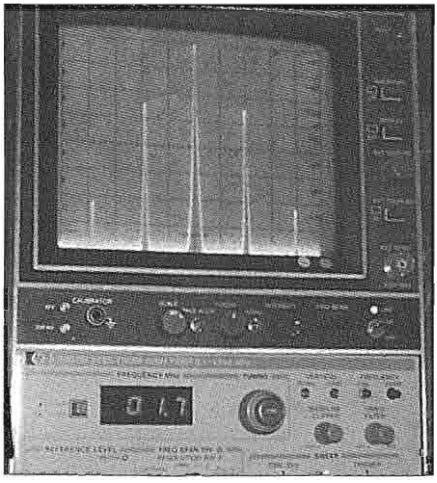
This view shows the mods which have been made to the driver and PA grid circuits.

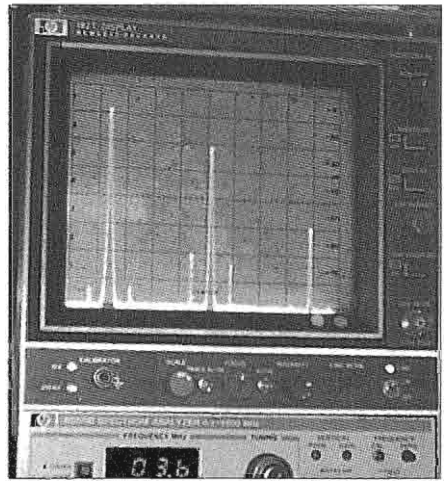


Q-1, the switching transistor, is visible to the lower right, just below the shield cover. In the lower left is the filter capacitor.



Open-frame relay RY-5 is mounted inside the PA cage, and is just visible to the far right in this photograph. The postage-stamp mica capacitors are also visible, mounted near the tank coil.





On the left is the spectrum of the modified KWM-2 operating on 160 meters, and on the right is normal operation in the 80 meter band for comparison purposes. These plots were taken in my radio lab, and they show that the modified Pi-output network still has sufficient "Q" to provide legal harmonic suppression.

ER

VINTAGE NETS

Arizona AM Nets: Sat & Sun: 160M 1885 kc at sunrise. 75M 3885 kc at 6 AM MST. 40M 7293 kc 10 AM MST. 6M 50.4 mc Sat 8PM MST. Tuesday: 2M 144.45 7:30 PM MST.

Boatanchors CW Group: QNI "CQ BA or CQ GB" 3546.5, 7050, 7147, 10120, 14050 kc. Check 80M winter nights, 40 summer nights, 20 and 30 meters day. Informal nightly net about 0200-0400Z.

California Early Bird Net: Saturday mornings at 8 AM PST on 3870 kc.

California Vintage SSB Net: Sunday mornings at 8AM PST on 3860 +/-

Colorado Morning Net: An informal group of AM'ers get together on 3875 kc Monday, Wednesday, Friday, Saturday, and Sunday at 7 AM MT.

Canadian Boatanchor Net: Meets daily on 3725 kc (+/-) at 8:00 PM ET. Hosts are AL (VE3AJM) and Ken (VE3MAW)

Collins Collectors Association Nets: Technical/swap sessions meet every Sunday on 14.263 mc at 2000Z. Informal ragchew nets meet Tuesday evening on 3805 kc at 2100 Eastern time, and Thursday on 3875 kc. West Coast 75M net is on 3895 kc 2000 Pacific time. **10M AM net starts 1800Z on 29.05 mc Sundays, QSX 1700Z.**

Collins Collector Association Monthly AM Night: Meets the first Wednesday of each month on 3880 kc starting at 2000 CST, or 0200 UTC. All AM stations are welcome.

Collins Radio Association nets: Mon. & Wed. 0100Z on 3805 kc., also Sat 1700Z on 14.250 mc.

Drake Technical Net: Meets Sundays on 7238 kc, 2000Z. Hosted by John (KB9AT), Jeff (WA8SAJ), and Mark (WBØIQK).

Drake Users Net: This group gets together on 3865 kc, Tuesday nights at 8 PM Eastern Time. Net controls are Gary (KG4D), Don (W8NS), and Dan (WA4SDE)

DX-60 Net: This net meets on 3880 Kc at 0800 AM, Eastern Time on Sundays. Net control is Jim (N8LUV), with alternates. The net is all about entry-level AM rigs like the Heath DX-60.

Eastern AM Swap Net: Thursday evenings on 3885 kc at 7:30 PM Eastern Time. Net is for exchange of AM related equipment only.

Eastcoast Military Net: Check Saturday mornings on 3885 kc +/- QRM. Net control station is W3PWW, Ted. It isn't necessary to check in with military gear, but that is what this net is all about.

Fort Wayne Area 6-Meter AM net: Meets nightly at 7 PM Eastern Time on 50.58 mc. This is another long-time net, meeting since the late '50s. Most members use vintage or homebrew gear.

Gray Hair Net: The oldest (or at least one of the oldest at 44+ years) 160 meter AM nets. Net time is Tuesday evening on 1945 kc at 8:00 PM EST and 8:30 EDT. Also check www.hamelectronics.com/ghn

Hallicrafters Collectors Association Net: Sunday on 14.293 mc, 1730-1845 UTC. Control op varies. Midwest net Sat. 7280 kc 1700Z. Control op Jim (WB8DML). Pacific Northwest net Sunday 7220 kc at 2200Z. Control op Dennis (VE7DH).

K1JCL 6-meter AM repeater: Operates 50.4 mc in, 50.4 mc out. Repeater QTH is Connecticut.

K6HQI Memorial Twenty Meter Net: This flagship 20 meter net on 14.286 mc has been in continuous operation for at least 20 years. It starts at 5:00 PM Pacific Time and goes for about 2 hours.

Midwest Classic Radio Net: Meeting Saturday morning on 3885 kc at 7:30 AM, Central Time. Only AM checkins are allowed. Swap and sale, hamfest info, and technical help are frequent topics. Control op is Rob (WA9ZTY).

MOKAM AM'ers: 1500Z Mon. thru Fri. on 3885 kc. A ragchew net open to all interested in old equipment.

Northwest AM Net: AM activity is daily 3 PM to 5 PM on 3875 kc. The same group meets on 6 meters at 50.4 mc. Times are Sundays and Wednesdays at 8:00 PM. 2 Meters Tues. and Thurs. at 8:00 PM on 144.4 mc. The formal AM net and swap session is on 3875 kc, Sundays at 3 PM.

Nostalgia/Hi-Fi Net: Started in 1978, this net meets Friday at 7 PM Pacific Time on 1930 kc.

Old Buzzards Net: Daily at 10 AM local time on 3945 kc in the New England area. Listen for net hosts George (W1GAC) and Paul (W1ECO).

Southeast Swap Net: Tuesday at 7:30 PM Eastern Time on 3885 kc. Net controls are Andy (WA4KCY) and Sam (KF4TXQ). Group also meets Sunday on 3885 kc at 2 PM Eastern Time.

Southern Calif. Sunday Morning 6 Meter AM Net: 10 AM on 50.4 mc. Net control op is Will (AA6DD).

Swan Nets: User's Group meets Sunday at 4 PM Central Time on 14.250 mc. Net control op is usually Dean (WA9AZK). Technical Net is Sat, 7235 kc, 1900Z. Net control is Stu (K4BOV)

Vintage SSB Net: Sunday 2100Z 14.293 & 0300Z Wednesday. Net control Lynn (K5LYN) and Andy (WBØSNF)

West Coast AMI Net: 3870 kc, Wed. 8PM Pacific Time (winter). Net control rotates between Skip (K6YKZ), DJ (K6RCL), Don (W6BCN), Bill (N6PY) & Vic (KF6RIP)

Westcoast Military Radio Collectors Net: Meets Saturday at 2130 Pacific Time on 3980 kc +/- QRM. Net control op is Dennis (W7QHO).

Wireless Set No. 19 Net: Meets the second Sunday of every month on 7270 kc (+/- 25 Kc) at 1800Z. Alternate frequency is 3760 kc, +/- 25 kc. Net control op is Dave (VA3ORP).

Radio's Golden Age, Episode 24

by Bruce Vaughan, NR5Q
504 Maple Drive
Springdale, AR 72764

The Salesman

Nothing much happens until somebody sells something.

The next time you step inside a retail store, pause for a few moments and look around. Lurking inside the store you will likely find one of the most important people in America. He may be dressed in suit and tie, or he may be dressed casually. However he is dressed, whatever his age, this man in all probability is costing the storeowner several times your annual salary. Unfortunately, his salary is only a small part of his cost to the business. His cost to the business in lost customers, and lost sales is staggering. He, and his associates, literally have the power to make the business a classic success story, or more likely, to run the business into bankruptcy. They call these powerful people 'Salesmen.'

Let me give you a few examples. Recently I have been involved in the job of copying, restoring, and transferring to CDs all of the surviving photographs of my old Air Force outfit, the 440th Troop Carrier Command. As the project progressed I found I needed a much better CD burner than the one built into my computer.

I started my search for an external CD burner by going to one of our larger office supply outlets, a nationally known chain with hundreds of stores. I arrived about 10:00 AM and was surprised to find that I was the only shopper in the huge, well-stocked store. I was prepared to do business; I had in my hand a file folder with a complete print out of my computer's operating system.

A well-dressed young man-perhaps in his late 20s approached and asked if he could help me. I replied in the affirmative. I explained that my computer was three years old, that it had a Pentium three processor, and that I had need of another CD burner. I told him I wanted a good external drive because I would need to upgrade my computer very soon. I asked for his suggestion. He casually waved his hand at a shelf some distance from us, and said, "They are over there on that shelf." Then he turned his back and walked off.

Why did he act in such a manner? Obviously he had qualified me as a buyer. In his opinion, a gray-headed old coot like me was either unable to afford a CD burner, or if by chance I had saved enough from my Social Security checks to buy one, I would be too stupid to use it.

I drove directly from the Office store to our Best Buy outlet. A young man, also in his 20s, came up and asked if he could help me. I replied that I needed all the help I could get. I still had the printout of my computer's operating system in the file folder. He took the papers from me and after reading them carefully, walked over to a Brand X drive and said,

"Here is exactly what you need. While it is a little more expensive, it will be usable for years to come. It has features that at the present time are not going to be of value to you because your computer is limited in several areas. However, it is backward compatible, and when you do move up to a more modern machine you will still be able to use this drive for several years."

I offered an objection. "I never heard of Brand X, why are you recommending it over several well known machines?"

"Yes, this company is not well known to casual buyers. It is not a mass merchandised drive. This drive is the choice of serious users and professionals. Now, if you prefer a more inexpensive drive, I would recommend this Brand Y CD burner. You can save about fifty bucks, and it will probably do everything you need to do at the present time."

I was impressed with his attitude. I thanked him for his help and told him I would need to think about it for a while. He thanked me for coming in and assured me he would love to make the sale when I decided what drive I wanted.

I came home and sent an email to my No.1 son Mike, asking his opinion. Mike is Dean of the business school at a large university. Mike replied instantly with "I'm forwarding your mail to our tech support team. They will get back to you as soon as possible."

Within the hour I had a letter from tech support suggesting that I consider purchasing a Brand X burner if I wanted the very best. They also gave me a more inexpensive option. I then searched the web and came up with nothing but strong support for Brand X.

Apparently the salesman at Best Buy had analyzed my needs and made a proper suggestion. I ended up buying the burner that day, along with almost $100.00 of other items.

Now, I have no idea of the markup on the items I purchased. I was in the retail business for many years, and would guess they were operating on at least a 25% markup. With so much purchasing power behind them, it is likely the markup would be more. Since the cost of doing business is about the same if you make a sale or if you lose a sale, the first store I shopped at lost about $50.00 clear profit for the day, while Best Buy ended up with a bottom line $50.00 ahead.

The first rule of a good salesman should be "never qualify a customer." Here in my hometown a classic tale of customer qualification involves the town's most influential and wealthiest businessman. Harvey Jones, starting with one vehicle, built the area's largest trucking company during the mid part of the last century. Some say he started with one wagon and a team of mules, while others say he started in business with one solid-tired Federal Knight truck. I can vouch that his truck line was modest in the beginning because I remember when he had a small sheet-iron terminal and three Federal Knight trucks.

By 1940, Jones Truck Lines had terminals in many surrounding large cities such as St. Louis, Kansas City, Tulsa, Wichita, etc. By the early 1930s, JTL's fleet consisted of almost 100% International Harvester tractors pulling Fruehauf trailers. His fleet of trucks numbered in the hundreds. Harvey was also a loyal customer. If he liked a product or service, it took a lot to make him change, and that included International tractors, Fruehauf trailers, and blue denim overalls. Soon Mr. Jones was president of the city's largest bank, and deeply involved in everything from the school system to our city hospital. He was without any doubt the best-known citizen of the entire area.

Mr. Jones drove Packard automobiles for a time, but when Packard went belly-up he switched to Cadillac. His trademark was his dress: He wore blue denim overalls practically everywhere, the noted exceptions being church services and funerals. He wore them to work, to bank meetings, school board meetings, and most social functions. His offices were strictly first class, but he had no qualms about sitting behind his large expensive desk in a pair of

$4.00 overalls. One fine day Mr. Jones decided to get in his Cadillac and drive 200 miles to Kansas City. His intention was to place an order some new Fruehauf trailers for his expanding truck line. As usual, he was dressed in blue denim overalls, with the top button on each side unbuttoned for comfort. He parked on the street some distance from the gate of the fenced-in area where Fruehauf displayed the latest in trailer design. He roamed about the lot looking at trailers for some time before a young, well-dressed salesman approached. Harvey continued looking at a reefer, or a refrigerated trailer. Finally he looked at the young man and asked, "What are trailers like this going for today?"

The young man looked him over. All he saw was a short, middle aged, somewhat chubby, smiling gentleman dressed in a pair of blue denim overalls. He qualified his customer quickly, "Hell mister, you couldn't afford to buy the tires on a rig like this."

Harvey thanked the gentleman, left his lot, and drove over to the American trailer lot where he placed an order for sixty new trailers, his first American brand trailer. The order was for almost 1.5 million dollars. By the way, his check was good!

Was I ever guilty of qualifying my customers? Oh, yes indeed I was guilty. I think everyone who ever worked a sales floor is guilty.

During the 50s TV swept the country. By 1960 a television set was considered as much of a necessity as a bathtub, more so to some of my customers. In the rush to build and sell, television sets manufacturers seemed to neglect the music end of the industry.

High fidelity was a term familiar to almost everyone, but only a few companies produced top quality sound equipment, and at prices that most customers found out of reach. When I entered the home entertainment business stereo reproduction of sound was often talked of in publications, but was far from being a reality. Manufacturers were still experimenting with record players that used two pickups in an attempt to create stereo sound. Component systems were popular only with a small percentage of the population. A number of men were attracted to component systems, but the average housewife found the units unsightly and something they did not want in the house.

For serious music lovers and true high fidelity aficionados, open reel recorders and vinyl records were considered the only way to go. Audiocassettes, when first introduced, were considered a novelty, something akin to the 45-RPM record. It was some time before they would be taken seriously.

In my opinion the leader in high fidelity, and later, stereo music systems for the home, was the Magnavox Corporation. Certainly the music systems produced by Magnavox were never intended to be equal to even a moderately priced, well-planned component system. However, their high fidelity and stereo units had much going for them. Magnavox cabinets were well designed, and a cut above average in construction. It was a time when cabinetry must have style, and a certain finish on the wood. I stocked several models of each style and finish. Prices ranged from about $200.00 up to $1000.00. Some popular styles were the Mediterranean, Early American, and the Danish Modern. Popular finishes were maple, walnut, oak, fruitwood, pine, and the nearly black finish on Mediterranean styled cabinets. Yes, stereo sets were bought more as a piece of furniture than as something reproduce music for listening.

For those who wanted sound better than the top-end Magnavox, we had the Magnavox Imperial line of stereos. Imperials started at over $1000.00 and

topped out at about $1500.00.

With all these music systems in my store, what did I use at home? I had a home-built Williamson amplifier, a Klipsch Patrician corner horn, and a Rek-O-Kut turntable with a GE variable reluctance pickup.

One morning I was working the floor while my salesman was next door having a cup of coffee. A young lady, I would guess about 14 years old, came in the door. I could not help but notice that she had on an excessive amount of makeup. She was dressed more or less in the style of 1960-just enough clothes on to be street legal. "Good morning," I said. How can I help you today?"

"I wanna look at a stereo," she replied.

I qualified my customer. "I think I have some that will please you," I replied, walking toward a display of small portable record players in the $80.00 to $125.00 range. This was still the early years of stereophonic sound, and stereo separation was more important than good sound reproduction. I proudly pointed to a mid-sized portable stereo on a cheap, brass plated, metal stand. The speakers were mounted in the doors of the imitation leather covered plywood cabinet. When the doors were opened there was about 24 inches of separation between speakers. I explained, "More sound separation can be achieved by removing one, or both, speakers and moving them some distance away. Each speaker is supplied with about 15 feet of wire for such use." I put on a record I though she might enjoy, and waited for her comment. It was not long coming.

Between pops of her chewing gun she said, "I didn't like that 'un, I want something better." I quickly moved over to my most expensive portable stereo, one with an honest 15-watt amplifier and eight inch woofers. Again the young lady was totally unimpressed. "Ain't you got anything better she asked?"

I was beginning to get a bit out of patience with her. "She is not going to buy anything no matter what I show her," I thought to myself. I decided to stop her dead in her tracks. I walked over to one of our best selling radio-phonograph combinations, a $495.00 unit with 12-inch woofers, plus a host of added features. I gave her my very best sales pitch. While a record was playing I tilted the cabinet at least 15° and showed how the turntable arm still tracked the record perfectly. I pressed down on the pickup and scraped it back and forth across the record without apparent damage. I thought I gave a darn good demonstration. I turned down the volume on the stereo and waited for her comment.

"When I buy a stereo I'm gonna get a good 'un, or none at all,"

Now I was really getting hot under the collar. "If you want the very best please step this way, and let me show you the new Magnavox Imperial I just got in," I said, as I walked her to the listening area in the rear of the showroom. I put on a record, and while the audio was not as good as that from my Klipsch Patrician, it was excellent never the less. After playing about three minutes of my demonstration record I lowered the volume, looked at her, and waited for a response.

She paused a moment, then said, "I like that 'un, I might be back later." With that she turned and left the store.

"Yeah," I thought, "She'll be back later. She probably couldn't buy a record if I gave her the Imperial."

That afternoon, about four-o'clock, a friend dropped by and invited me to go out for a cup of coffee. We had just started our drink when the waitress called me to the telephone. It was my wife (and bookkeeper) on the phone. "There's a young girl the stereo room. She said she was here this morning, and that you had showed her some

stereos. She will not talk to anyone but you. Perhaps you better skip your coffee break and see what she wants."

I told my friend I would have to go back to the store; some darn kid was waiting to talk to me. "I know she can't buy anything. I expect she is going to want to buy a stereo with nothing down, and a little each month. I've got news for her," I said, "I'm not about to sell some 14 year old girl a stereo on credit."

I walked into my store where two young teen-age girls were waiting near the big Magnavox Imperial. "You showed me this stereo this morning, and I'd like for Marie to hear it. Would you put that record back on and play part of it?"

I thought, "Oh no, not again." I had played only 30 seconds or so of the record when I heard her say,

"What do you think Marie? I like that stereo, how do you like it?"

"Oh, I think it is wonderful. I really like it"

With that comment, the young lady reaches in her pocket, pulls out a checkbook and says, "How much will that be with tax and everything?'

I was a little uneasy about taking her check until I read the name printed along the top of her checkbook. It was one of our better-known citizens, one that could well afford a Magnavox Imperial if he wanted it. I delivered the $1500.00 set late that afternoon.

I was beginning to learn: never qualify a buyer!

ER

[...Enhanced SSB from page 31]

SSB operators don't clean up their act, and continue to create ill will, it could force the FCC to take action that will affect the occupied bandwidth of SSB and possibly DSB-AM as well.

What If?

Suppose that new rules are put in effect, what happens? With a 2.8 kHz bandwidth, most SSB operation will remain unaffected, as that's a pretty typical bandwidth to begin with.

For DSB-AM, it does make a dent, but only a small one. There's no sacrifice in low end required, and the 2.8 kHz upper audio limit should not hurt too badly. For a sanity check, I asked Larry Beavers, W1GTA, who is a fellow SBE member and the chief engineer of a very well known, high power AM broadcast station in this area, what would happen should these limits be enforced. Larry said, "A 5.6 kHz, voice-only, transmission would probably sound OK, although (in broadcast terms) it would lack some brightness in the presence range, depending on the receiver you are listening on. With a well-designed audio section in the transmitter and some appropriate processing and good modulation, the resulting AM signal should sound good. Communication is communication and in this case I don't think that we have the luxury of extending our bandwidth in the interest of quality at the expense of our neighbors on the bands."

I also asked Bob Heil, K9IED, one of the most talented audio experts I can think of. This was his reaction: "Our hobby has always been one where we watch out for, and respect each other. There is no bandwidth rule in amateur radio; never has been. It was by 'gentleman's' agreement that SSB would stay under 3 kHz, with AM at 6 kHz. What has transpired over the years is that we have established our own windows for the AM guys to experiment, and SSB took the rest, leaving certain slots for SSTV, etc. It works well, but only when we respect each other, and are careful about where we operate. At Dayton this year, I did a very interesting thing. I had a TS-2000 working into a dummy load while listening to its signal through an FT-1000MP that drove a prototype 15-watt TUBE (audio) amplifier. I used various

microphones but mainly our new commercial Goldline Pro. *Everyone* was astonished at the beautiful sounding audio from the Goldline Pro and TS-2000. The interesting part was, that at no time did I ever transmit wider than 2.6 kHz. This was done purposely, to prove that you can achieve a very robust, beautiful sounding SSB signal, and only 2.6 kHz wide, as opposed to these 6, 7 8 or 10 kHz wide 'enhanced' signals."

The Measurement Problem

Most Radio Amateurs do not presently have the equipment required to measure the occupied bandwidth of their transmitting equipment. Even a used spectrum analyzer can cost more than an entire Amateur station. The spectral display incorporated in some high-end transceivers is probably adequate for the task, but again these are not in every ham shack. Many hams do own a personal computer with a sound card. With the addition of a simple down converter and the necessary spectrum analysis software, this could be used to make the necessary measurements.

A Call for Action

In conclusion, it's time to get the message out to the entire amateur community for the sake of all 'phone operators. Cool it guys!!! Keep your transmitter audio bandwidth and intermodulation products in check.

ER

A complete on-line index to the entire history of Electric Radio is now available for viewing on-line at N9oo's web site:
http://www.qsl.net/n9oo/ersearch.html

Contributor's Photo Album- Bill Wheeler, KØDEW

Bill Wheeler (KØDEW) was issued his call in November 1955. He has enjoyed the hobby for almost fifty years. Childhood in a small community (Waynesville, Missouri) has many advantages. A young person in a small town is forced to be creative in play and play led to experimentation, which, in the mid-fifties led to amateur radio. Bill has had a life long friend who shares the excitement of radio and to this day William Morgan (KØDEQ), and KØDEW share many activities in amateur radio.

KØDEW grew up in a family that encouraged his radio interest. He and his father wired a Heathkit AT-1 on the dining room table and I am sure if the old table were still with us today it would show the burn scars from a rather large soldering iron. Bill's father did not get an amateur license until after his retirement, but always had an interest in ham radio.

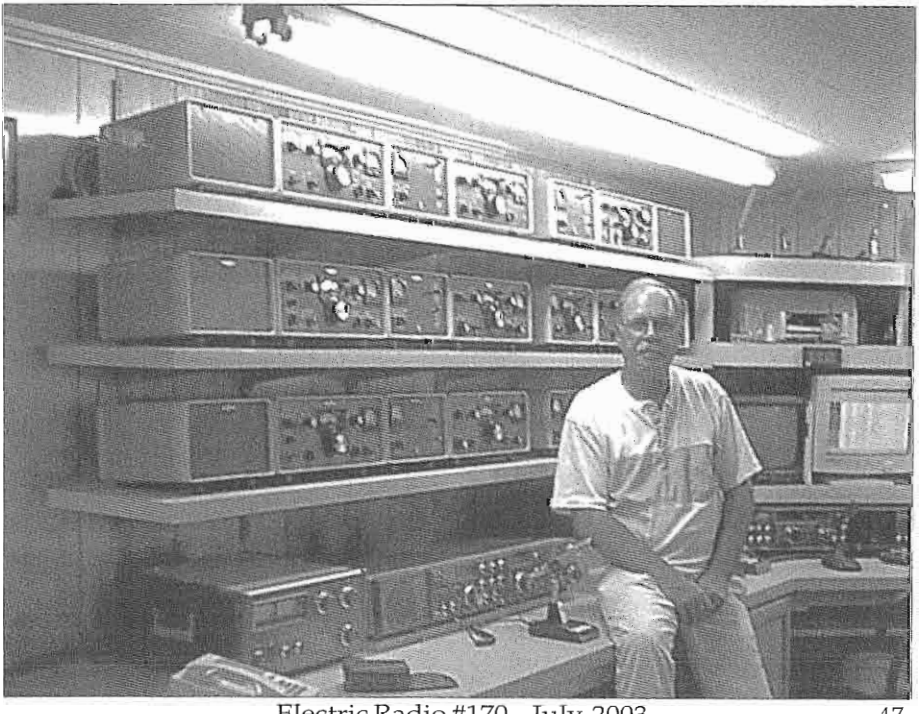
Responsibilities with college, military service, marriage, and a family have been balanced with amateur radio, but never completely put KØDEW off the air. Bill earned a Masters Degree in school administration and spent thirty years in elementary education. He retired as an elementary principal, and after a short career as a Scuba instructor, works for the City of Lebanon, Missouri in promotion and public relations. He has been chairman of the Missouri ARRL convention and the Midwest convention.

Bill has always had an interest in radio equipment, what makes it work or not work as the case may be. About twenty years ago his interest turned to Collins equipment and he soon started to collect everything Collins. To this date he has over fifty items of Collins manufactured equipment in his collection. He, and a dedicated group of collectors, started the Collins Collectors Association and Bill was honored as its first president. Bill now holds the title of President Emeritus of the CCA and remains an avid collector of this fine equipment.

To quote Bill on vintage equipment, "It is admirable to see the amount of time and money some collectors have put into the restoration of vintage equipment. Vintage equipment represents a vital part of amateur radio history and electronics history in general. It is important we preserve our history and what better way than to have actual radios that reflect the technology of a given time."

ER

These two pictures show Bill's main operating position. His older Collins A-line equipment is to the right in the photograph above, while below the more modern S-line gear is below. These two pictures reflect years of collecting and painstaking restoration efforts.



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FOR SALE: Repair and restoration on all vintage equipment; 45 years experience. Barney Wooters, W5KSO, 8303 E. Mansfield Ave., Denver, CO 80237. (303) 770-5314

FOR SALE: Military Radio manuals, origs & reprints. List for address label & $1. For specific requests, feel free to write or (best) email. Robert Downs, 2027 Mapleton Dr., Houston, TX 77043, wa5cab@cs.com

FOR SALE: Collins: 75A-4, speaker, manual. 180S-1. New S-line speaker grille. Transmitter transformers PN 672-031-010. ARC3-T67B, ARC5-T23, BC-624A, test set I-139A, TV-7. Bill Coolahan, 1450 Miami Dr. N.E. Cedar Rapids IA 52402-2933. 1-319-393-8075

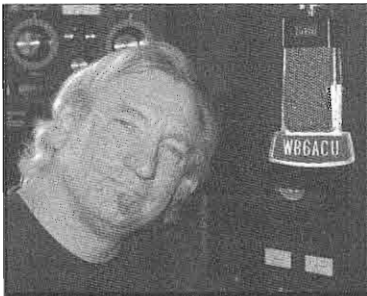
FOR SALE: Full set of '73 magazine from issue Vol 1 number 1 (early 60's) to December 2002. Great BA reading. $300 . Pickup only, Staunton Virginia. Dave Metz, dmetz@ntelos.net, (preferable) 540 886 0000 daytime

FOR SALE: Countermeasures receiving set AN/WLR-1D, 50-10750 MHz, 9 bands, simultaneous display of frequency, spectrum, and modulation info on dual displays, manual, 1200 lbs., $4,500. Carl Bloom, 714-639-1679, carl.bloom@prodigy.net

FOR SALE: Naval Receivers RAK, RAL, RAO, RBA, RBB, RBC, RBL, RBM. Some checked, pwr splys available. $75-$450 depending on condx. Many other types. Carl Bloom, 714-639-1679. carl.bloom@prodigy.net

NOTICE: NCX-1000 IF cans now available. George, 413-527-4304

FOR SALE: National HRO-60 and coils 80-6 meters, $300. Johnson Invader 2000 and pwr supply, $600 pickup only. Richard Cohen, 813-962-2460



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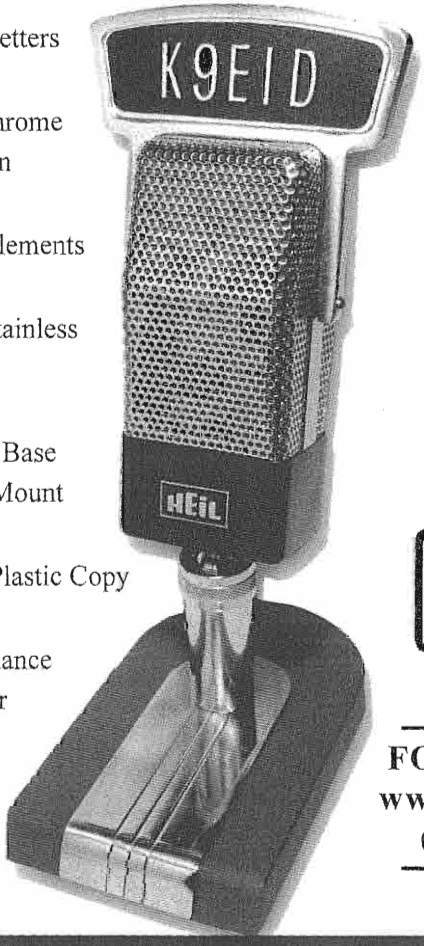

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FOR SALE: Heath Mohican, IM-18 VTVM, RCA WV-98C VTVM, RCA signal generator. Carter, WD4AYS, 434 979 7383, CElliott14@aol.com.

FOR SALE: Stoddart TS-587/U Noise Field Intensity Meter, 15-400 Mc, w/RF 37 & RF 36 tuning heads. $75. Al Jenkins, WA1RWB, 5 Daley CT. Nantucket MA. 02554. 508-325-7122

FOR SALE: URM-25 and URM-26 signal generators, working, clean, manuals. $300 pair. Stuart T. Carter, II. W4NHC, 680 Fernwood Drive, Melbourne FL 32904-1995, 321-727-3015

FOR SALE: GR 1666 Kelvin Bridge, manual copy, $325. HP USM-281 Oscilloscope, 2 probes, partial manual, $150. HP 456A AC current probe, manual copy, $50. Ross Wollrab, 229 N. Oakcrest Ave, Decatur, IL 62522-1810. 217-428-7385. rewollrab@aol.com

FOR SALE/TRADE: Original manuals: TR4CW, R4B, 32V2, SR150, SR400, Valiant, Adventurer, 6N2, HQ-145, NCX3, others. Ni4q@juno.com 407-351-5536

FOR SALE: Send #10 SASE for large list of accumulated tubes. WB5UIA, 903 Madison Ave., Minden LA, 71055-2923

FOR SALE: Antenna tuners AEA AT300 $100, Ten Tec 4229 2kw $175, Ed Sauer 787 N.Peterman Rd. Greenwood, In 46142 317-881-1483.

FOR SALE: Sunair Auto Tuner SAC69 $300. Collins VHF aircraft receiver R-540/ARN-14C, mating VHF transmitter VHF type 17L, both for $200. George Portell, 480-986-5797.

FOR SALE: ARC Type-12 parts. Two radios, mounts, control boxes and connectors. Mike, 510-732-0932

FOR SALE: ARC-5 transmitters 4-7 mc, unconverted, $50, PE-103 dynamotor $50. Ed, WN1I, 207-336-2858, Buckfield ME.

FOR SALE: Parting out kilowatt commercial AM transmitter. Heavy Stuff. Bargain prices, good condx. Includes three 833 tubes, four mercury vapor rectifiers. For 220 AC power. Request parts list & prices. Charles Graham, K2VGE, 4 Fieldwood Drive, Bedford Hills, NY. 10507. 914-666-4523

FOR SALE: Motorola and GE tube FM gear for sale, ask W2OQI@optonline.net, 631-878-1591, 17 Inwood Rd, Center Moriches, NY 11934

FOR SALE: Rohde & Schwartz type SK043/31 400-watt shortwave transmitter. This rare and unusual transmitter was made in Germany in the early 1950s. It operates 1.8 to 6 mhz. I am aware of only two of these in operational condition in the US. This transmitter is restored and on the air. Includes complete manual and documentation of problems found during restoration. Digital pictures available by email. $1000.Pickup only. Jim Jorgensen, K9RJ, 1709 Oxnard Dr., Downers Grove, IL 60516. 630-852-4704. k9rj@attbi.com

FOR SALE/TRADE: QST's 1915 to 1970's some years incomplete but dupes 20's to 40's, $1000.00 OBO or trade for communications receivers. K8CCV, Box 210, Leetonia, OH 44431-0231, 330-427-2303 Weekdays.

FOR SALE: GE mobile xmtr 40-50 mhz. 6V dynamotor 60 watts. Pair 807's. Mel, WØMLT, 970-249-1544

FOR SALE: KWM-2A plug-in relays K2 & K4 manufactured by Allied Signal, P/N T163-6C-115D and T163-4C-115D. $35.00 for a set + $3.85 priority mail. Mike Hutnick, 450 Riverview Ave., Bloomsburg PA, 17815, hutnick@epix.net

FOR SALE: Vacuum fixed and variable capacitors. Details at: http://www.isquare.com/personal_pages/forsale-vacvar.htm Bob, WØYVA, Great Falls, VA. 703-450-7049.

FOR SALE: Lafayette HA-410 10-meter AM transceiver, $135. Clegg Thor 6 six meter AM/CW transceiver, $235. Richard Prester, 131 Ridge Road, West Milford, NJ 07480. 973/728-2454. rprester@warwick.net

FOR SALE: NOS Tungsol 26Z5W as used in the R390A, $16.00 each. Electron Tube Enterprises, Box 652, Springvale ME 04083. 207-490-5870

FOR SALE: Military whip antennas NOS, handheld pilot radio beacon AN/URT-33, $40. Bruce Beckeney, 5472 Timberway Dr., Presque Isle, MI 49777, 989-595-6483

FOR SALE: World War Two vintage panel meters. Removed from vintage equipments. Excellent condition. What do you need for your projects? Bob Ryan, 1000 S. Gilbert St., Apt 132, Hemet CA 92543-7065

FOR SALE: Collins S-line and A-line repair. FCC licensed, many years of experience. Merle, lal@cyberwc.net 207-457-9257

FOR SALE: Tested good globe 201A $14, 226 $15, 227 $10 and others. Slightly weak tubes guaranteed to work in early radios ½ price shown. Write or e-mail: tubes@qwest.net for a new price list or see www.fathauer.com. George H. Fathauer & Assoc., 688 W. First St. Ste 4, Tempe, AZ 85281, 480-968-7686. Toll Free 877-307-1414

FOR SALE: Authorized repairs and sales of all types of amateur radio and communications equipment, and also test equipment. Please call us at LAND AIR COMMUNICATIONS, 718-847-3090 and visit our web site: www.landaircom.com. We have over 3,000 items in inventory and carry all types of communications parts.

FOR SALE: Repair, Restore, Sales of antique, vintage tube radios. John Hartman, NM1H, www.radioattic.com/nm1h

FOR SALE: Collins 4:1 knobs, guaranteed satisfaction. $55.00 + shipping. Dutch WB7DYW, 281-351-4953 wb7dyw@ev1.net http://users2.ev1.net/~wb7dyw/4to1knob.jpg

FOR SALE: Vintage Radio Service. We repair radios, record changers, radios home, auto, tube & transistors. 1930-1980. Ken Hubbard, KA9WRN, POB 792, Beloit, WI 53512. (608) 362-1896

FOR SALE:.Heathkit DX-60B w/VFO, HG-10B @10 $200. Books: ARRL 1930 cover bright red (7th ed.) w/1954-55 & 63 issues @8 4 for $110. Pamphlet: RCA Practical Analysis of VHF, 1943-24 pgs. $15. FW Sickles, IF Transformer design 40 pgs by Scheer $20. Right & Left Quartz-Relations to Elastic by Karl Van Dyke 1940, 20 pgs-$10. Bernie Samek, 113 Old Palmer Rd, Brimfield MA 01010, 413-245-7174 FAX 0441. NOTICE: If I don't return your call, please call again because message was garbled on my machine or I copied wrong.

FOR SALE: Radio books, magazines, catalogs, manuals (copies), radios, hi-fi, parts. Send 2 stamp, LSASE. David Crowell, KA1EDP, 40 Briarwood Rd., North Scituate, RI 02857. ka1edp@juno.com

FOR SALE: Collins Radio stock certificates, 33 avail, 10-share (green) or 100-share (blue), issued to various companies. $20.00 each, limit one per customer. Check or MO. No choice on color. William O. Dean, KC7ICH, PO Box 3105, Tonopah, NV, 89049

FOR SALE: Your old QSL card? Search by call free, buy find at $3.50 ppd. Chuck, NZ5M, NZ5M@arrl.net

FOR SALE: New Ranger 1, Valiant 1, & Navigator plastic dials, freq numbers in green, with all the holes just like orig. - $17.50 ppd. Bruce Kryder, W4LWW, 277 Mallory Station Dr., Ste. 109, Franklin, TN 37067. bak@provisiontools.com

FOR SALE: Communications Receivers, Military Communications and some test equipment. SASE, Don Jeffery, 131 North Ivy Ave., Monrovia CA, 91016, boallan@aol.com

FOR SALE: KWM2/S-line metal logo pins. Meatball or winged. Excellent replica of the original. Put one on your hat, badge, or replace a missing logo on your panel. $6.25 shipped. W6ZZ, 1362 Via Rancho Prky, Escondido, CA 92029. (760) 747-8710, w6zz@cox.net

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

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

FOR SALE: R.L. Drake repair and reconditioning, most models including TR-7's, 35 years experience. Jeff Covelli, WA8SAJ, (440)-951-6406 AFTER 4 PM, wa8saj@ncweb.com

NOTICE: Visit Radioing.com, dedicated to traditional ham radio & vintage radio resources. Let's Radio! Charlie, W5AM. http: / /www.radioing.com.

FOR SALE: Heath Nostalgia, 124 PG book contains history, pictures, many stories by longtime Heath employees. (See BOOKS inside back cover.) Terry Perdue, 18617 65th Ct., NE, Kenmore, WA 98028

FOR SALE: DX-35, DX-40 \reproduction crystal doors. $11.50 shipped. Texans add 8.25% sales tax. Glen Zook, 410 Lawndale Dr., Richardson, TX 75080 972-231-5011

FOR SALE: TX'ers, rcvrs, parts, manuals, etc. Send a large SASE. More at http:// come.to/AF4K/ Brian Carling, 117 Sterling Pine Street, Sanford, FL 32773 Brian Carling, AF4K, 117 Sterling Pine St., Sanford, FL 32773.

FOR SALE/TRADE: Transmitting/ Receiving tubes, new & used. $0.55 & LSASE for list. I collect old & unique tubes of any type. WANTED: Taylor and Heintz-Kaufman types and large tubes from the old Eimac line; 152T through 2000T for display. John H. Walker Jr., 13406 W. 128th Terr. Overland Park, KS 66213. PH: 913- 782-6455, Email: jhwalker@prodigy.net

FOR SALE: Treasurers from the closet! Go to www.cjpworld.com/micromart to

find some unique items many hams would lust for! Gus, WA, 360-699-0038 gus@wa-net.com

FOR SALE: Books, send SASE. WANTED: Anything by Fairchild or Langevin. send SASE for my want list. Richard Robinson POB 1425 Wallingford CT 06492, 203-949-0871 or richmix@erols.com

FOR SALE: Vintage equipment at the K8CX Ham Gallery Classified Ads section. Visit the largest Antique QSL Card Gallery http:/ /hamgallery.com

NOTICE: T-368 Registry. For info w2zr@aol.com Subscribe to the T-368 & BC-610 reflector at http:/ / groups.yahoo.com/group/T-368_BC-610

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

FOR SALE: Strong steatite antenna insulators. Lengths from two to fifteen inches. SASE for list. John Etter, W2ER, 16 Fairline Dr., East Quogue, NY 11942. 516-653-535

FOR SALE: Please visit RadioWorld-Online.Come to see our ham gear, parts, and more. Carl Blomstran PO Box 890473 Houston Tx. 281-660-4571.

FOR SALE: Spun Aluminum Knob Inlays for most Boatanchors. Collins Dial Drum Overlays. Dakaware Knobs. Charlie Talbott, 13192 Pinnacle Lane, Leesburg VA 20176-6146. 540-822-5643, k3ich@arrl.net

FOR SALE: Some unused obsolete Triplett tester transformers. Free List. Bigelow Electronics, POB 125, Bluffton, OH 45817-0125

FOR SALE: Build your own "Midget" bug replication by KØYQX, ca 1918, featured by K4TWJ in CQ Magazine, May '98. 10 detailed blueprints. FAX: 507- 345-8626 or e-mail bugs@mnic.net

FOR SALE: Parts, tubes, books, ECT. Send two stamp SASE or email for list. Wayne LeTourneau, POB 62, Wannaska, MN 56761 wb0cte@arrl.net

FOR SALE: Collins restoration. Everything inside & out to make it as Art Collins built it. 50 yrs experience. W9OJI / N4FZ, IL, 815-734-4255 or N4PZ@aol.com

FOR SALE: Convert any wattmeter to read PEP! Perfect for AM/SSB-$24.95 ppd for complete kit! HI-RES, 8232 Woodview, Clarkston MI 48348, 248-391-6660, info@hi-rescom.com

FOR SALE: Complete hardware set to connect Collins PM2 to KWM2 -$19.95 ppd. Warren Hall, KØZQD, FOB 282, and Ash Grove, MO 65604-0282.

FOR SALE: Repair, upgrade, performance modification of tube communications & test equip. Accepting most military, all Collins & Drake designs, & the better efforts from others. Laboratory performance documentation on request. Work guaranteed. Chuck Felton, KDØZS, Felton Electronic Design, Box 187, Wheatland, WY 82201. 307-322-5858 feltoned@coffey.com www.feltondesign.com

FOR SALE: New Release. For details send 2-stamp LSASE to: Olde Tyme Radio Co, 2445 Lyttonsville Rd. Ste 317, Silver Spring, MD 20910

FOR SALE: Military and commercial communications items. Murphy's Surplus, 401 N. Johnson Ave., El Cajon, CA 92020. 619-444-7717 www.Murphyjunk.com

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

FOR SALE: PANEL AND CABINET REFINISHING; Johnson, Hammarlund 180(a), R390(A), & others total restoration & sales; My updated web site: http:// w4pnt.8k.com Patty & Dee's Marina; Dee Almquist, 534W. Main St., Waynesboro, VA 22980. 540-249-3161 Cell: 540-480-7179, FAX 540-249-5064

FOR SALE: RIT for Collins KWM-2/2A; No modifications needed. $79.95 SASE for details. John Webb, W1ETC, Box 747, Amherst NH 03031 bigspndr@bit-net.com

FOR SALE: Aluminum heat dissipating plate and grid connectors for all 3, 4 and T series Eimac tubes including 3-500Z, 4-1000, 304T's and others. Alan Price fixr7526@cs.com

FOR SALE: Ships radio room clock repros, boatanchor mugs and t-shirts, more. http://www.cafeshops.com/amradio,amradio2

FOR SALE: Transistors (not radios) most new unused, 255 pcs, free list. L. Gardner, 458 Two Mile Creed Rd., Tonawanda, NY, 14150. radiolen@aol.com

FOR SALE: I built hot-rod receivers; R390A, SP-600, R-388/51J. NC-183D...and transmitters: Valiant, DX-100, T-4X-A-B, HT-32. 51J-4 filter replacements, R390A Hi-fi AM $245.00 ea. Chuck Felton, KDØZS, Wyoming, 307-322-5858, feltondesign@yahoo.com

FOR TRADE: Two good RCA 833A's for one Taylor 833A. Also looking for Taylor 204A, 813, TR40M. John H. Walker Jr., 13406W. 128th Terr., Overland Park, KS 66213. PH: 913-782-6455, Email:

jhwalker@prodigy.net

WANTED: Fully functional with manuals: Johnson AN/FRT505 transmitter, Swan F51 and FC76. Contact Ric at C6ANI@arrl.net

WANTED: Parts, tubes, and accessories for National NCX-5 radio. WB5UIA, 903 Madison Ave., Minden LA, 71055-2923

WANTED: Drake 2-B parts unit. Al Lemke, KB7QQW, 1115 Merea Ln., Sultan WA, 360-793-6510

WANTED: Manual for a Gates "PRODUCER" Mono Mixer board. Copy will do as well. A schematic copy will help also. Bob Lydon AB3L AB3L1@aol.com 412-429-8413

WANTED: CQ Magazine. April, May, June 1945. Lynn Stolz 614-207-2280 or n8aj@arrl.net

WANTED: Large main tuning knob for Heath SB 310. Bob WBØDMC. Phone # 507 331 5103.

WANTED: Sonar FR-104 30-50 MHz receiver, also any tube type C.B. made by Sonar or Olson for 10M conversion. Bill Smitherman, KD4AF, 336-699-8699, 9401 Hwy 67, East Bend NC, 27018.

WANTED: R9 receiver by Harvey-Wells in good condx. Richard N. Pann, W1SVJ, 2447 Yates Dr., Augusta GA, 30906-2587. 706-798-7279. RPANN@COMCAST.NET

WANTED: RCA-SRR-13A, COLLINS R-389/URR fully functional. 73 de IZ1FID federico.baldi@virgilio.it fax 390384672219

WANTED: Anything by DAVID GRIMES: radios, advertising, ephemera, stories, literature, references; please contact: Mike Grimes, K5MLG; 3805 Appomattox Cir; Plano, Texas, 75023, (972) 867-6373. Email: grimesm@flash.net

WANTED: Info/schematic on RCA Transcription Turntable Type 70-C-1 MI-4871-G.Denny Reeves, reeve06@texas.net, (512) 258-8473.

WANTED: Mint metal trim ring for the Collins S-line radios. Fred NE2E 1-732-257-0327 ne2e@ne2e.com

WANTED: Navy receiver audio filters 53090, 53091, and/or information related to their use. Louis L. D'Antuono, 8802-Ridge Blvd, Brooklyn NY 11209. 718-748-9612, AFTER 6PM.Eastern Time

WANTED: Manual/tube list for B&K model 600 Tube tester. Copy OK. Dennis Olmstead, WB9EMD, 431 Ridgewood, Glen Ellyn, IL 60137 phone/fax 630-469-0531 email wb9emd@aol.com

WANTED: Correspondence with others on military & old radios (am incarcerated). Also copies of old surplus catalogs: Meshina, Fair, Nebraska, etc. W.K. Smith, FCI Cumberland, Unit A-1 44684, POB 1000, Cumberland MD 21501.

WANTED: Manual for HP Down Converter 11710A. Richard Wieschhoff, 7 rue du Debuche, F-78120, Rambouillet France; T/Fax 0033 1 304 111 02

WANTED: Manual and/or schematic for Hewlett-Packard 1700B scope.Walt Tukkanen, box 254, Koza, Okinawa, Japan, 904-0021 billtukkanen@yahoo.com

WANTED: FRONT COVER for Tektronix model 475 oscilloscope. All Tek 270 and 460 series use same size cover. Please help me find one. Harry Grewlich, WA6IWZ, 442 S. Alpine Rd. Orange CA 92868. 714-978-3121

WANTED: I need a 0.85-800 VAC capacitor as used with Sola transformers. W7SC, 3932 S. Mesa View Ln, Boise ID, 83706-6052

WANTED: Original tuning dial knob dial lock and name plate for my Hallicrafters R-274/FRR. Walter Iacobelli, 2147 Harmon St., Ridgewood NY 11385, 1-718-456-1988

WANTED: #33A and #35 Universal SW-3 coils for cash or other coils. Hank Bredehorst 2440 Adrian St Newbury Park, CA 91320. 805 498-8907 quailhill@earthlink.net

WANTED: Coils Forms for National FB-7 and preselector. Mike Sanders 18169 Hwy 174 MT Vernon, MO 65712-9171 k0az@arrl.net

WANTED: National NC-303 in great physical condx and working, also want B&W 5100S and 51S sideband adapter. C.J. Ryan, PO Box 164, S. Plainfield NJ, 07080

WANTED: Hammarlund HQ180X crystal deck with switch. Ed Cuevas, Fort Worth, TX, 817-222-5355, ecuevas@juno.com

WANTED: National HRO-500-TS speaker for the HRO-500 and a Hallicrafters HT-32b.Bob, WØYVA. bobs@isquare.com; 703-450-7049.

WANTED: HRO 60 Xtal calibrator either original or home brew plug in. Phil, W9DVM 727-944-3226 plamarc1@tampabay.rr.com

WANTED: "H" and "J" VLF coils for my HRO-50. Jack, W8JNH, Greenville OH, 937-548-4110

WANTED: Headset, mic, key, and AC power supply for the Navy/Marine Corps TBY transceiver. Ken Kolthoff, K8AXH, POB 215, Craig, MO 64437. Work #: 913-577-8422

WANTED: 23 channel tube-type CB radios for 10-meter conversions. Also tube-type 10-meter linear amplifiers. Ed, WA7DAX, 1649 East Stratford Ave., Salt Lake City, UT., 84106. 801-484-5853

WANTED: James Millen plug-in coils: p/n 42080, 42040, 42015 43015. National NC-101X w/meter. Gary Carter, WA4IAM, 1405 Sherwood Drive, Reidsville, NC 27320. Phone: 336-349-1991. Email: gcarter01@triad.rr.com.

WANTED: W.E. Type 215-A (military VT-5) vacuum tubes. Roland V. Matson, POB 956, Lake Panasoffkee FL 33538 1-352-568-1629

WANTED: Info on Electro Tone Labs M100. Maybe a screen modulator. Has volume control & 2 slide switches, CW-phone, Tone-mic on front. 4 terminal on rear plus adjustable control that controls voltage to 2 of the terminals. Randy, 411 Woodhaven Dr., Lynchburg, VA 24502, 434-239-6127. RWC-radiocollector@worldnet.att.net

WANTED: Eldico SSB-100F linear amplifier, good condx, working. Bill, W4TXL, 336-969-2057, W4TXL@msn.com

WANTED: Manual, info on Hallicrafters SX-96A (NOT SX-96). Jim Novak, WA9FIH, 2335 S. 2nd Ave., North Riverside IL, 60546-1308, WA9FIH@arrl.net

WANTED: Looking for the emblem of National "NC". Katsu JO1GEG/ ex.N8EYH, khirai@ieee.org

FOR SALE: Johnson Desk KW with new 4-400C, $1,900. Herb, K9GTB, 6486 Bow Lane, Gillespie IL, 62033. 618-362-6539

WANTED: Meter for Hammarlund HXL-One linear. Paul, KU6T, 310-453-6631, pkcwang@ee.ucla.edu

WANTED: National HRO-500-TS and LF-10 preselector. Information on improving SSB distortion in the HRO-500. Bob, WØYVA. bobs@isquare.com; 703-450-7049.

WANTED: 111C telephone company repeat coils. Jim Alexander, KØHIP, 479-968-7270, ealexand@cswnet.com

WANTED: Poly-impedance modulation xfmr, 125 watt plus. Bill, KØRZ, 303-499-1936, billK0RZ@aol.com

WANTED: Audio transformers, with good windings, for Westinghouse RADA and Aeriola Sr amplifier. Paying $40.00 each plus shipping. Roland V. Matson, POB 956, Lake Panasoffkee FL

WANTED: Waters Q-Multiplier for Collins KWM-2. Claude Fleureau, F6GGF, 14 Sentier-Du-Buvier, 92130 Issy-Les-Moulineaux, France

WANTED: Anyone interested in forming an email discussion group on OS-8/U oscilloscopes please email Mike at: mikehardie@shaw.ca

WANTED: Power transformer for Collins 310B3 exciter—will buy junk unit if needed. Brian Roberts K9VKY, 130 Tara Dr., Fombell, PA 16123 (724)758-2688 k9vky@arrl.net

WANTED: Marantz first power amp, uses EL39 tubes. Condx unimportant. Or pay well for photo of same. For use in upcoming "History of Audio" book. Charles Graham, 914-666-4523

WANTED: WW-2 Japanese Military Radio of any kind. Yokohama WW-2 Japanese Military Radio Museum, Takashi Doi, 1-21-4,Minamidai, Seyaku, Yokohama, 246 Japan takadoi@carrot.ocn.ne.jp http://www.yokohamaradiomuseum.com/

WANTED: Collins R-389 LF receivers, parts, documentation, anecdotes, antidotes. W5OR Don Reaves, PO Box 241455, Little Rock AR, 72223 (501) 868-1287, w5or@militaryradio.com, www.r-389.com

WANTED: HELP: I need information on an E.M. Sargent Co.Model 205A 5-band radio circa late 30's (?). David Miller, 307 754-4351 or K7ALR@arrl.net.

WANTED: Any TMC Equipment or Manuals, what have you? Will buy or trade. Brent Bailey, 109 Belcourt Dr.,Greenwood, S.C. 29649 864-227-6292 brent@emeraldis.com

WANTED: Older rigs & accessories. Brian Carling, AF4K, 117 Sterling Pine St., Sanford, FL 32773. http:/ /come.to/AF4K/

WANTED: National NTE CW xmtr in working Condx. I love National. Sylvia Thompson, 33 Lawton Foster Rd., Hopkinton, RI 02833. (401) 377-4912. n1vj@arrl.net

WANTED: National Co. emblems, escutcheons, and logos from equipment, also National AN/WRR2 in working order. Don Barsema, 1458 Byron SE, Grand Rapids, MI 46606. (616) 451-9874. dbarsema@prodigy.net

WANTED: Hallicrafters SX 88 parts chassis with cabinet, power,audio output, 50khz IF and 2mhz I F transformers. Ops service manual for Eddystone EC958. Allan, Norco CA, 310-812-0188, alan.royce@trw.com

WANTED: ARC-5 rcvrs, racks, dynamotors. Jim Hebert, 1572 Newman Ave. Lakewood, 0H 44107.

WANTED: Top prices paid for globe shape radio tubes, new or used. Send for buy list or send your list for offers. Write or email: tubes@qwest.net See WWW.Fathauer.Com or send for catalog of tubes for sale. George H. Fathauer & Assoc., 688 West. First St., Ste 4, Tempe, AZ 85281. 480-968-7686, Call toll free 877-307-1414

WANTED: Old military radar displays, scopes, antennae, receivers, manuals, etc. Even half ton items! William Donzelli, 15 MacArthur Dr., Carmel, NY 10512. 847-225-2547, aw288@osfn.org

WANTED: Seeking unbuilt Heathkits, Knight kits. Gene Peroni, POB 7164, St. Davids, PA 19087. 610-293-2421

WANTED: Western Electric horns, speakers, amps, and mics. Barry Nadel, POB 29303, San Francisco, CA 94129. museumofsound@earthlink.net

The Collins Video Library

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

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

The Collins 30L-1 video (1 hour, $39.95) This is a complete guide to the 30L-1 amplifier. Topics covered are operation and safety, updates, and a discussion of the classic 811A triode. Learn the secrets to greater performance.

The Collins 30S-1 video (1 hour, $39.95) Finally, here is the one everybody has wanted! This extraordinary video describes operation and user safety, maintenance and modifications of this classic Collins powerhouse amplifier. Very informative—truly a must for all 30S-1 owners. Complete with printed documentation.

The Collins Amateur Radio Radio Eqipment Video Spotter's Guide (1 hour and 40 minutes, $24.95) Close to 90 individual pieces of Collins Radio equipment are shown in the video. Examples of some of the gear covered are: KW-1, KWS-1, 30K-1, 20V-3, 75A-4, KWM-2, S-Line, KWM-1, 30S-1, 30L-1, KWM-380 and much more. Study up before that next hamfest!

The Collins KWS-1 Video (2 hours, $39.95) This video is the perfect companion to the 75A-4 video for owners of the "Gold Dust Twins"! Butch Schartau (K0BS) shows you how to operate, maintain and repair your KWS-1. Watch as Butch goes theough the entire alignment and neutralization process, as well as showing you how to properly operate this famous transmitter.

The Collins 75A-4 Video (4 hours, $89.95) This video is four hours of great information on how to repair, maintain and restore this classic receiver. Butch Schartau (K0BS) guides you through all aspects of keeping your 75A-4 running like a top.

R-390A Video (7 hours, $109.95) At last it's available! Long awaited by serious "boatanchor" enthusiasts this is a great video all about the ultimate receiver. Now you will have the ultimate video to go along with it. R-390A expert Chuck Rippel (WA4HHG) covers an absolutely incredible array of information in this "heavy duty" video. This video looks at operation, the receiver modules, complete circuit description, front and rear panel details, complete mechanical and electrical alignment, PTO details, and performance evaluation, modifications, troubleshooting, and restoration. There is nothing like this video available today, at any price!

R390A Addendum Video ($49.95) Another 3 hours and 40 miutes of R-390A information from Chuck Rippel (WA4HHG).

SP-600JX Video (4 hours, $89.95) In this video, Chuck Rippel takes us through all aspects of SP-600-JX servicing including repairs, restoration and modifications. This video is a must for any new owner needing to work on the SP-600.

Purchase three or more videos and get 10% off of the retail price!
Add $5.95 each for the first two videos for shipping and handling in the USA, additional videos are shipped free.

Produced by Floyd Soo, W8RO (ex-KF8AT)

ER BOOKSTORE, PO BOX 242, BAILEY COLORADO, 80421-0242
Now Available on-line at WWW.ERMAG.COM

WANTED: Manuals, manuals, and 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: Postcards of old wireless stations; QSL cards showing pre-WWII ham shacks/equip. George, W2KRM, NY, (631) 360-9011, w2krm@optonline.net

WANTED: Stancor/Chicago PCC200, PCO/PSO15O, RC8150; Triad A-9-J, A-l0-J, A-1l-J, A-12-j. FOR SALE: Books, send SASE, Richard Robinson, POB 1425, Wallingford, CT 06492. 203-949-0871 richmix@erols.com

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

Announcing the Felton Electronic Services R390F High Performance HF Receiver

The Felton Update Engineered R390A comes with speaker, antenna, lab quality alignment and service, plus full guarantees. All the upgrades are hand wired with parts like original and include the following excellent upgrades:

Audio: 2 watts hi-fi audio, low-distortion Class A stages with all low-level stages reworked for lowest distortion and noise. Three new audio filters are front-panel selectable: 4 kc LP voice only 250-2700 cps or CW at 250 cps BW.

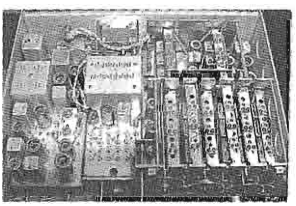
Enhanced sensitivity and large signal handling: This includes installation of a new 6BZ6 RF amplifier and a linear diode detector. Minimum discernable signal is at least -145 dbm.

All-new AGC system: No overshoot, pumping or distortion. Many advanced features, characteristics are optimized for AM and CD-SSB.

Line audio channel reworked to drive your low-impedance headphones through a stereo panel-mounted headphone jack.

Hand-selected Eminence loudspeaker for precisely defined music and voice.

The KDØZS R390A answers that nagging question in the back of your mind as you look through the ever larger and more glossy advertisments: "Are these things for real?"



For full details and pricing of this once-a-lifetime opportunity call Chuck Felton (KDØZS) at 307-322-5858, or email at: Feltondesign@yahoo.com web: FeltonDesign.com

WANTED: Info on xmtrs made by Clough-Brengle Co. Used by the CCC, in the mid to late 30's. Any help would be greatly appreciated. Ron Lawrence, KC4YOY, POB 3015, Matthews, NC 28106. (704) 289-1166 hm, kc4yoy@trellis.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

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: 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: Orig Heath manuals for ham & test equip. Please state condx & price. Warren, K1BOX, NC, (828) 688-1922, k1box@arrl.net

WANTED: WW II German, Japanese, Italian, French equipment, tubes, manuals and parts. Bob Graham, 2105 NW3Oth, Oklahoma City, OK 73112. 405-525-3376, bglcc@aol.com

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

WANTED: I wish to correspond with owners of National FB7/FBXA/AGS coil sets. Jim, KE4DSP, 108 Bayfield Dr., Brandon, FL 33511 j.c.clifford@Juno.com

WANTED: Tektronix memorabilia & promotional literature or catalogs from 1946-1980. James True, N5ARW, POB 820, Hot Springs, AR 71902. 501-318-1844, Fax 623-8783, www.boatanchor.com

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: DC ammeters, aircraft instruments, panel meters; meter books & gauge catalogs; photos of meters & control panels. Chris Cross, POB 94, McConnell, IL 61050.

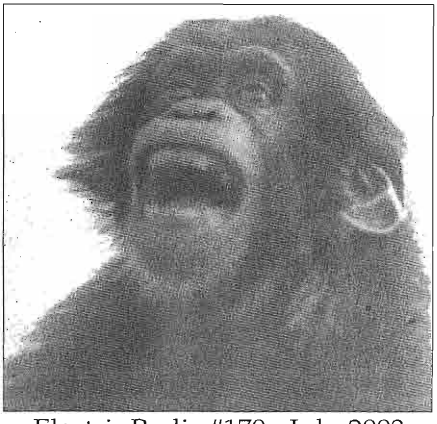
WANTED: Long wire antennas AT1O1, AT1O2, GRC-9; Bendix ATD tuning unit Type CRR 47211, 9050 to 15800 kcs; Gas engine generator UPG-12 (GRC-109) KA1ZQR, 348 N. Main St., Stonington, CT 06378.

WANTED: Manual (copy OK) for Tapetone Skysweep 345 Receiver; correspondence w/other Skysweep owners. Geoff Fors, POB 342, Monterey CA 93942 wb6nvh@mbay.net

NOTICE: Hot Springs Electronics Fest National Park Community College Hot Springs, AR Saturday, 27 Sept 03 jwhartenby@npcc.edu antqradio@juno.com

WANTED: Mailing address for Chet Glembotski, NI6I, ER subscriber. Please contact Electric Radio subscriptions.

This advertisment was seen in many Sunday papers recently. Obviously, nobody in these modern times can tell a vacuum tube from a night light!



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Collins KWS-1, 32V series, and 75A series (A1 thru A-3), 42 pages, $15.00 plus $4.00 S&H

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The front displays the logo from the cover of ER (the tube logo, Electric Radio, and "celebrating a bygone era"). The back has "Real Radios Glow in the Dark" (used with the permission of Classic Radio). The T-shirts are U.S. made by Hanes and come in Small, Large, X-Large, XX-Large. The color is slightly lighter than the cover of ER. $15.00 delivered, $16.00 for XXL.

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by Raymond S. Moore, 4th edition ---------- $19.95-10% = $17.95
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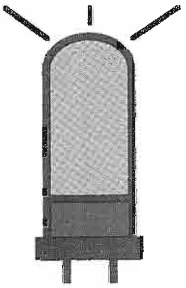

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