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GOLDEN JUBILEE ANNIVERSARY NUMBER

Address by DR. ALFRED N. GOLDSMITH

Remarks by PAUL F. GODLEY

Medals and Honor Presentations

THE RADIO CLUB OF AMERICA, INC.
11 WEST 42nd STREET ★ ★ ★ NEW YORK CITY

The Radio Club of America, Inc.

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PROCEEDINGS OF THE RADIO CLUB OF AMERICA

Volume 36, No. 2 ANNIVERSARY NUMBER FALL 1960

THE FIFTIETH ANNIVERSARY GET-TOGETHER

To celebrate the half-century of its founding, The Radio Club of America held, at the Hotel Plaza in New York, on the evening of December 4th, 1959, its greatest banquet. Covering the period "from cat whisker crystal to moon-rocket communication," (to quote pioneer President W. E. D. Stokes words for the occasion) the gathering was an outstanding event long to be remembered.

Near the hotel's 58th street entrance, a film company was shooting a night scene in the glare of strong floodlights, as guests and members arrived for the cocktail hour preliminary to the banquet. Soon several hundred persons, with ladies invited for the first time to an official Club function, were exchanging greetings and stories in the good fellowship tradition of the Club. Some, like Art Lynch, from Florida, had journeyed long distances to attend.

As small groups formed to renew their contacts, some members recognized one of the founding members, dignified and scholarly Faitoute Munn, and greeted him warmly. In an alcove, Bill Oppenhauser who was to later tape every word of the evening's proceedings on gear set up in back of the dais, was assisting a small crew in recording famous Club member interviews for world broadcasting via "Voice of America" facilities. In another group, John Bose, later that evening to receive the coveted Armstrong Medal award of the Club, was commenting upon the good fellowship here present, and the need for a Club like ours to spread this spirit among young and new members.

Meanwhile, Banquet Committeemen, with Chairman Ernest Amy, were checking over last banquet details in the Small Ballroom next to the lounge. At their signal, all filed in and took their places at the tables. A small band was playing turn-of-the-century tunes which softly faded out as President Walter Knoop officially opened the Golden Jubilee celebration meeting of The Radio Club of America.

Applause sparked as he introduced the impressive group sitting on the dais one by one. (Photo see p. 5) He said Frank Gunther, slated to M. C. the program was unexpectedly ill and could not be present, but Harry Sadenwater had volunteered to take his place. A number of messages from friends, well-wishers, and from members unable to attend were read, including telegrams from David Sarnoff, Jack Hogan, Paul Ware, and others.

W. E. D. Stokes, the Club's first President, was fittingly the first speaker. Hard working 50th Anniversary Committee chairman George Burghard was called upon to speak. He called attention to the copy of the Club's Golden Anniversary Yearbook on each table as a souvenir, and received a big hand for the year-long anniversary preparations culminating with this splendid evening.

As the program continued, M. C. Harry Sadenwater called upon Harry Houck, Medals and Awards Committee Chairman, to make first-time presentation of the Special Medal to Club Founders and Charter Members. Five surviving members in succession, Faitoute Munn, Frank King, W. E. D. Stokes, Jr., George Burghard, and Ernest Amy stepped forward to receive their gold medals. The charter medal to George J. Eltz, who died before this event, was received on his behalf by his son. A Special Medal for merit surprised Joseph Stantley, rewarding many years of faithful work as Club Treasurer. One of our beloved Fellow Members, Lloyd Espenschied, gratefully received his Honorary Membership parchment.

The honor of receiving the Armstrong Medal on the Club's Fiftieth Anniversary meeting went to John H. Bose, former President and long-time associate of Professor Armstrong, after whom the award is named. Receiving the silver medal bearing a relief bust of Major Edwin H. Armstrong, John Bose replied feelingly to the Citation in a short speech, both reported in full in this Proceedings.

The Anniversary Committee was fortunate in securing as guest speaker Dr. Alfred N. Goldsmith, consulting engineer with a long background in our field. Emphasizing that a Club such as ours is primarily "individuals," with distinctive personalities and accomplishments, he went down the Club's roster, reading his own "citations" as a salute to famous and outstanding Club members he had known through the years. His recollection of early radio days, interspersed with humorous experiences, made many present to chuckle. The full text of Dr. Goldsmith's speech appears in this issue of the Proceedings.

As the little orchestra played gay tunes of decades ago, the room went dark, and lantern slides popped on the screen for an unexpected surprise. Here for all to see flashed pictures of early Club members as they appeared in their pre-wireless dress. Youthful, handsome Frank King; mischievous-appearing Fred Klingenschmidt; serious-looking Ernest May; and carefree Frank Gunther were some that paraded on the screen amid laughter and applause. The Committee acknowledges with thanks the help received from wives and relatives who dug into family albums to provide this interesting documentation.

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ADDRESS BY DR. ALFRED N. GOLDSMITH

Before The Radio Club of America, December 4, 1959,
New York City

Introduction of Dr. Alfred N. Goldsmith as guest speaker at the 50th Anniversary Banquet of The Radio Club of America on December 4, 1959 at the Grand Ball Room of the Hotel Plaza in New York City.

Mr. Harry Sadenwater:

Ladies and gentlemen, in making the next introduction I go back to a time when as a young wireless operator in 1912 I reported back to the office of the Marconi Wireless Telegraph Company, Ltd., on Cliff Street in New York, and turned in my receipts for the trip and was paid off my $25 a month salary.

In reporting at the office, I learned that there was a meeting around the corner at Sweet's Restaurant, and somehow or other either I barged aboard or was invited, and there I met the next speaker for the first time. He was busily engaged with a few other old-timers in writing the constitution for - and the by-laws for The Institute of Radio Engineers.

Later on, as a young radio inspector for the Department of Commerce and Labor, I had the occasion to visit the City College of New York, where this same man was a professor of electrical engineering, had just recently established the first communications laboratory in any college around the world.

He has been a leader in wireless, in radio, in radio broadcasting, in television, color television, the motion picture arts, and it is an extreme pleasure for me to present our speaker of the evening, Dr. Alfred Norton Goldsmith.

(APPLAUSE)

* * * * *

(Based, with editing, on the delivered address without loss of informality)

Thank you very kindly, Harry. And now, so as to confound and out-shout any possible hecklers, I am placing the microphone at an appropriately close distance. (LAUGHTER).

Ladies and gentlemen, on this very auspicious occasion, I will introduce myself as the former builder and operator of experimental station W2XN, New York, thus establishing a close, continuous and, I hope, long future association with our good field of amateur and professional radio.

I want to begin with a few words dealing with my earlier days in amateur radio. I started out around 1901 by building a portable coherer receiving set - couplers, tuners, and all the rest of it. Its coherer had the disconcerting habit of conducting all the time because the buzzer that was supposed to decohere it also cohered it. So the coherer would keep on going indefinitely, thus producing one long dash. This signal was very hard to read because nobody knows what one long dash means, except equipment disaster. In fact, the signals were most incoherent despite the use of a coherer!

However, I finally managed partly to shield the buzzer contact terminals, and I also tried the shunted-capacity method of reducing the spark in the buzzer. And then I began to get signals from ships in the New York harbor, and vicinity. I learned how to read them. And finally I got into a very bad personal mess as a result of this.

I took this portable receiving set with me to the homes of my boy friends and pals, and set it up. I connected the ground to a steam heater, threw a wire around outside the window as an aerial, and received messages - buzzes, dots, and dashes. And the fond mothers of the youngsters with whom I was working or playing would come and say, "What on earth are you doing? Why have you got the window open?" They may have suspected I intended to commit suicide by jumping, or doing something equally dire.

In any case, the mothers objected. And when I explained that this was "wireless", they would say disdainfully, "And what is wireless?" I would answer "Well, it's a way to get messages through the air. Now this message, for example, is from a ship in the harbor planning to do so-and-so or reporting on thus and such." I aroused nothing but scornful incredulity by such talk.

So they went very indignantly to my good mother and condescendingly told her, "Your son is an evil person. He's a liar and he's misleading my young boy. He talks rubbish, and he says some ridiculous stuff about something that he calls "wireless". I don't want him to play with my boy. He's going to get him into bad habits of lying and cheating." And so I discovered that I just had to stop home demonstrations of portable receiving sets, because the very little reputation which I then had was being rapidly ruined.

All this shows that in those days, at least, broadcasting would have been regarded as the work of the devil. Some seem to think that maybe it is. At those long past times, there were no rigged programs, either.

Seating at Dais - Left to Right - W.E. D. Stokes, Jr., W. Faitoute Munn, Frank King (3 Founding Members); P.F. Godley, C.R. Runyon, Jr., John H. Bose (Armstrong Medal Recipient), Walter A. Knoop (Club President), Harry Sadenwater (Toastmaster), Dr. Alfred N. Goldsmith (Guest Speaker), Dr. Lloyd Espenschied (Recipient of Honorary Membership), Dr. R.A. Heising, Dr. John Dunning, Harry W. Houck, George H. Burghard (Chairman 50th Anniversary Committee).

There were only rigged and unfavorable material reactions.

When you go into the radio transmitting business, you start by erecting an antenna. This matter of putting up antennas was also an occupational hazard in the early days of amateur radio. Take my own experiences. It so happened that The College of the City of New York, where my laboratory and transmitter were located, had two rather tall towers. One of them was about 180 or 200 feet from the ground and the other about 120, and they were about 500 feet apart. And I wanted to stretch an antenna - a large multiple-wire antenna, if you please - between these two towers. This antenna included much heavy phosphor-bronze wire, heavy insulators, and all the other appropriate hardware. But there was no way to get to the outside of the taller of the towers. You could get to the inside of the lower tower. But you could not get inside the taller one. You had to crawl around the outside of that tower, with a very interesting and fairly ominous view of the city below and of a clear drop down to the street about 200 feet below.

And the method of staying on the outside of the tower, instead of falling to the pavement, was to hold on to some gargoyles and decorations which had been cemented into the side of the tower. These gargoyles were very handsome from the street but not so handsome from nearby nor when considered as a means of support.

And yet I had to climb outside this tower and pass some wires and insulators around the tower and the gargoyles and other projections. In the midst of this work on a rather windy day, I suddenly made a horrifying discovery; namely, that the gargoyle to which I was clinging was loose and slowly sagging. And this occurence gave me a vivid picture of the distance to the ground. Grabbing the next nearest gargoyle, I held on to that. Then I swung around and got over the edge of the parapet at the top of the tower. I then sat down shakily and rapturously contemplated some of the pleasures of amateur radio.

I need hardly tell you I did survive even this incident. What happened closely resembles the old vaudeville story of the two comedians, Massa Bones and Mister Interlocutor in the minstrel show. Massa Bones says, "You know, when I was young, I was such a puny baby that they didn't think I would live." And

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Mister Interlocutor replies, "Did you?" Whereupon Massa Bones says, "Did I? Why say - you should see me now!" (LAUGHTER)

Well, you should see me now. But if you had seen me then, you would have seen a very white-faced youngster who had no ambition for climbing outside of towers or doing any risky radio work for quite a time.

Nevertheless, there was finally established in my laboratory a long-wave tube transmitting outfit for radio-telephony, operating on approximately 180 kilocycles. And the carrier power in the antenna was 1200 watts. In those days, you put whatever power into the antenna that you could and nobody inquired about it.

Still, this transmitter got me into more trouble, because it produced almost too excellent signals. One of my "friends" up in Ossining came down to New York and was gunning for me. He said he had tuned my signal in and he happened to tune exactly on my frequency. Now, he had a very fine tube amplifier set, and he could work some rather distant stations. And when he tuned into this practically local and powerful station only a short distance from Ossining, he heard it full blast. The signals were so loud that he figured his head set had gotten grounded across the power lines. So he tore off the headset and automatically threw it away from him with full force. And I am told it went through the window, with violent breakage, frightened the cat, and generally created havoc.

As I recall, he reproached me saying, "You shouldn't produce signals that strong. Or else you ought to warn people with receivers in advance!" That was the only time I ever had that complaint, on even a short-distance reception.

Actually, I did work all the way to Grand Forks, out in North Dakota, where my correspondent Professor A. Hoyt Taylor was located at that time. Each evening I used to send him a program of speech and phonograph recordings. I also had splices, of course, to my wire telephone line. (If this fact is not reported to the Telephone Company, I shall be just as happy) So I telephoned up from downtown by wire and then out by radio. I happened to live at the time down around 11th Street and Fifth Avenue. The phone calls from downtown controlled the transmitter uptown and could send any scheduled speech, telephone messages, and music. All this was in the winter of 1915-16. And Professor Taylor would then telegraph me by Western Union from Grand Forks, so that by midnight I knew how the tests had gone.

Oddly enough, we did get through this distance of nearly 1200 miles fairly consistently on winter nights. These tests took up my evenings, and, I might add, affected my domestic felicity for a time.

I was also working that winter with W. C. White. You will all remember White of the General Electric Company; and also Dr. E. F. W. Alexanderson, the high-frequency alternator expert at Schenectady. We were trying to establish a radiophone circuit between Schenectady and New York on the stated power of about a kilowatt and on frequencies between 150 and 200 kilocycles.

Along in early December, the two-way signals came bouncing through so beautifully that we thought we had the complete answer. The signals-to-noise ratio was very large. And the signals were clear and sharp. It was real two-way telephony. And then came January. The signals became fair but not too good. In February they were worse, and by the time we got to April the signals were completely buried under the noise. So another fond hope was laid to rest.

That was typical of the dangers you ran into in those days. You thought you really had something and then you discovered you did not. But it was good fun, and we certainly did learn.

Indeed, since that time I have had lots of fun although the U. S. Patent Office Examiners (there having been some hundreds of patents issued to me) have sometimes spoken very bitterly of what I thought fun. And when I filed a new patent application, they would often and automatically reject all its claims. (Rejection of claims means they do not permit you to patent the claimed methods or devices at all. And you then sit back and devise ways of changing their minds, or changing the claims, or both.)

And on one occasion a very strange and worrisome thing happened to me. All the claims of a patent application were approved and allowed on a first reading by the Examiner. And this greatly frightened my attorney and me. We concluded either the claims had been drawn to be too narrow (and therefore they had been allowed) and I was not going to get what I was entitled to, or else the Examiner was careless or incompetent. Or else he was malicious and was allowing the patent so that it would be invalidated and worthless later.

So this business of having all claims allowed on a first action by the Patent Office is not all beer and skittles. If it happens to you, insist on getting unfavorable action. It will help you later. (LAUGHTER)

But, enough of this personal reminescing. I want to pass to a far more important matter, namely the Radio Club of America. And particularly I want to speak of its anniversary and what it implies. And now I am extremely serious.

First of all, I want to stress that, all real professionals are amateurs. For what is an amateur? One who loves his work, his trials, his triumphs. He is one who has an inquiring mind and resourceful ways. He is one who rates discovery, successes, and even failures, and the joy of exploration beyong financial return. And he is one who does not believe "it cannot be done."

Further, what is a professional? You might think he was very different from an amateur, but he is not. He is one who is particularly engrossed in his work, steady in his purpose, happy when he succeeds, and not too much discouraged when he fails. He is one who analyzes, plans, questions, and who is ingenious. He is one who places his professional standing and his opportunity of advancing his field and contributing to it beyond fees and material rewards. And he is one who also believes and insists that "it can be done."

Of course, not every so-called amateur is really an amateur in the finest sense of the word, any more than every professional lives up to the lofty standards of his profession. But so far as the true professionals and the true amateurs are concerned, they are brothers under the skin.

Present-day verbal distinctions between professionals and amateurs are arbitrary and often meaningless. All scientific and engineering work started as an amateur activity and later becomes, as we say, "professional". And its best followers have remained advanced amateurs to the end of their days.

Consider, for example, Sir Charles Herschel, who made the first great telescope at his own expense; Lieuwenhoek, the Dutch optician, who made the early microscope in his spectacle shop; Faraday, who dabbled in everything electrical; and founded our modern electrical arts (including motors and transformers); and Lodge and Marconi, who were super-amateurs in radio. And in America, the "gentlemen scientists" have included Rowland, Alfred Loomis, and John Hays Hammond, Jr.

And so it was with a myriad of others. Here in America the history of radio and electronics is inextricably interwoven with the history of the amateur. Even many years ago the American amateur was an active and valued contributor to the advancement of the radio art. And yet, he was attacked. He was attacked in this country of freedom and threatened with curtailment or destruction of his privileges.

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Presentation of Honorary Membership to Club Fellow Dr. Lloyd Espenschied, (center), by Club President Walter A. Knoop. (left), as Harry Sadenwater, who substituted as Master of Ceremonies for Frank Gunther because of Frank's illness, looks on with approval.

A high point in the distribution of honors: Bestowal of the Radio Club's distinguished Armstrong Medal to John H. Bose, former Club President, and associate professor of Engineering at Columbia University, by Walter A. Knoop, Club President.

GOLDEN JUBILEE MEDALS AND AWARDS

Presentation of Armstrong Medal, first Special Medals to Club Founders and Charter Members, and an Honorary Membership

When Club President Walter Knoop read the following citation, and presented the silver Armstrong Medal to John H. Bose during the Club's Golden Anniversary dinner on December 4, 1959 at the Plaza in New York, he became the eleventh person to receive this award since its institution by the Club in 1935:

"This award of the Armstrong Medal of The Radio Club of America to you is in recognition of your pioneering work in the art of radio communications, and particularly frequency modulation. You have been closely associated with Edwin Howard Armstrong and have contributed especially to the development of FM multiplexing systems phase shift frequency modulation, and CW Radar.

"An inventor, teacher, and true scientist, much is still expected from you, John Bose, in the continuing advance of radio communications techniques. You are a comparatively young man with years of productive and creative work ahead. You are an outstanding first of radio's second generation."

Responding to President Knoop's presentation, Professor Bose answered as follows:

"I am deeply conscious of the very great honor which the bestowal of the Armstrong Medal of The Radio Club of America represents. And in expressing my heartfelt thanks, I can only say that I will try to live up to the generous evaluation your Awards Committee has made of my work.

"This award is specially meaningful to me because it was my good fortune and privilege to have been associated for nearly twenty years with the great inventor and teacher whose likeness is reproduced on this medal. Working with Major Armstrong it was very easy to uncover new things, since the well-plowed field held very little interest for him. Because the Radio Club was close to Major Armstrong's heart, many members have had the opportunity to know him and to gain in knowledge and inspiration from his teaching.

"In communicating his findings about our art, he had few equals. His disclosures were masterpieces of exposition, demonstrating great physical insight and never failing to recognize the contributions of others. He liked to keep the record straight. In a membership as vigorous as ours, many individual contributions remain to be recognized. As the Radio Club enters its next fifty years and

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REMARKS BY PAUL F. GODLEY

before the RADIO CLUB OF AMERICA, on the occasion of its 50th Anniversary Banquet, Hotel Plaza, New York

Mr. Toastmaster, Distinguished Guests and Fellow Members, Ladies and Gentlemen:

It is, indeed, a privilege and deep pleasure to be with you here this evening on this momentous and impressive occasion. The Radio Club of America has been, and is a club of unique significance. As such, it has had - and it will continue to have - great impact upon the lives and fruitfulness of its members. The uninhibited, individualistic and sometimes "free-wheeling" exchanges here across half a century have often proven to be catalytic in their effects; and as we look about us here this evening, and think upon the roster of its members, this cannot be gainsaid.

Moreover, the associations here fostered will, surely, further contribute to the leavening of understanding on this planet the size of which, in effect, these associations have served to so greatly shrink.

It has been asked that I say something about what this club has meant to me. Please bear with me. For I must briefly scan the salients of the story across more than 60 years.

In my 7th year, I lived in a small college community in Central Iowa. Our home faced the Old National Road along which there had passed - within the vivid memory of the elders - those Oregon-bound wagon trains. By now, the railroad and the telegraph, so essential to the binding of the continental nation, had, of course, come; but that storied golden spike had been driven on the high plains but 27 years before.

My only brother, and oftimes mentor, had, together with a college classmate, built a telegraph line between our homes - a mysterious affair which I was admonished to leave alone. But child perversity kept saying: "What brother can do I can do better."

Then, right past our door - with its mysteries - came the first westward-bound tentacles of the telephone; and, shortly, the exciting story (if it could be believed) of that boy in Italy who had a telegraph without wires!

Our home atmosphere was, I am happy to say, a somewhat scholarly one. We had no telephone; no phonograph; none of the gadgets of the present day; and, for that matter, no daily newspaper. Only The Books; plus the long and treasured letters from the families in the east. But there were endless discussions amongst the grown-ups of the philosophies, the sciences, the languages - and of the disparate civilizations across the world - plus frequent speculation as to the fate of humanity in the light of the seemingly impassable communication gulfs.

And, thus it was, I there came to dream that, perhaps, my own existence could be justified by taking some small part in the improvement of world communications means.

In those days things were not so easy; sometimes hard; discouragements along the way many. And there came that, for me, great let-down when, in 1909 as operator and engineer on the Great Lakes, I found that 150 miles was about the extreme limit of dependable ship-shore communications.

Yet, in that same year, there was stimulation, too, when - after being bodily thrown out of his laboratory a-top the Majestic Theatre Building in Chicago - I was able to acquire a couple of De Forest's "Audions"; and some further enticement when, from the middle of Lake Michigan one night, I "worked" station "DF", Manhattan Beach, New York.

However - and later - what cause for deep reflection the earnest counsel of Dr. Berg, Dean of Engineering, University of Illinois - close associate of the great Steinmetz. My session with him in his study through the evening twilight and into complete darkness within the room left deep impression. And I can hear him now as he summarized: "Wireless has no possibility of fruitful future." And this was something to ponder! - as I worked and studied and fought the discomforts within the great rain forests of the Amazon; and the static, the static! - circuits dependable for but 6 or 7 hours of the 24.

But how about much shorter waves. No good! Or so everyone said. Did anyone really know! Certainly I needed to know more. And thus it was that, from the Amazon, I wrote that colorful and lucid speaker of this evening, Dr. Goldsmith, at the College of the City of New York, asking if study with him in his new courses could enhance my understanding. And his reply? "With your background the cost in time and money could scarcely be justified."

And so, upon return to the States in 1914 there was but to have a, perhaps final, go at wireless on the shorter waves and with the amateurs. I would set myself up to play around there. Something might, or might not, come of it.

At the then principal source of radio supplies in New York City I asked a clerk for a number of things, some of which were not to be had. His curiosity aroused, he asked me what I was up to; introduced himself; took me to dinner - and on to a meeting of some radio club "way up town.

I am unable to remember the paper read before the Radio Club of America that evening, or too many of those who were there. But I

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The fifty-year old spark gap of this wireless transmitter, pounds out the introductory message of the Golden Jubilee LP Record. Harry Houck, owner and builder of the equipment, is the operator.

GOLDEN JUBILEE COMMEMORATIVE ANNIVERSARY RECORD

Historical sounds of radio preserved on
unique Anniversary souvenir recording.

A unique historical memento, a golden-jacketed Golden Jubilee phonograph record of sounds of radio history was distributed as a souvenir of the occasion to guests and members attending the Radio Club's fiftieth Anniversary Banquet in New York.

Work on this commemorative LP record began a year before the Anniversary, by Jerry Minter, who conceived the idea. Searching for material through the Club's archives, he found recorded sounds of many of the Radio Club's famous members and events. Some of the material, such as the important IBCG tape, unfortunately could not be located. But outstanding and historically valuable remarks by Edwin H. Armstrong (said to be the last ones he made before the Club), Capt. H.J. Rounds, and others are now preserved for posterity on the Golden Jubilee record.

The making of the final product involved interesting techniques. The occasion of the award of the 1952 Armstrong Medal yielded interesting material spoken by Edwin H. Armstrong, and H.J. Rounds who discloses a little-known World War 1 radio secret. First President W.E.D. Stokes' introductory remarks were made in New York in October, 1959, and those of Paul Godley were taped in his living room the following month. Club President Walter Knoop's remarks were recorded at the Denville studio.

When all the voices were on tape, they were edited, condensed in content where required, and combined into a final tape. From this tape was cut the master record, a special hydrofeed(r) precision master recording machine designed and built by Jerry Minter being used in the process. From this master record, the presentation records were pressed.

The code messages, keyed in 1909-style by operator Harry Houck himself on his original fifty-year old spark rig, were recorded in the Fall of 1909 in a screen-shielded room to minimize radio interference. The authentic sound of wireless, circa 1909, was picked up by a microphone placed near the ham-made spark gap. To cross-mix and fade the code sounds into the spoken sequences, three tape machines were used, the mixed outputs of two machines feeding a third recorder. Anyone who can read code at five words per minute will easily catch Harry's staccato fist.

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REMARKS BY PAUL F. GODLEY (Continued)

clearly remember my surprise when, unexpectedly, my host, Louis Pacent, rose to ask that I speak of Amazon experiences; and when I had sat down, my astonishment when some chap at the rear got up and said he had been regularly hearing my Amazon stations at his home in Yonkers, N.Y.

This, I was loth to believe. And on adjournment, I collared him. Asked to see his "rig". Demurely, he said this might not be possible. He would have to ask his patent attorneys. And as I pressed him further I was thinking: - Well, you can guess what I was thinking.

But Howard Armstrong didn't forget. Within a few days I was with him in Yonkers. And I was thrilled!

Finally, I asked what he had been able to do on the short waves. He said that he had been unable to get performance below about 900 meters due, he thought, to the characteristics of the vacuum tubes which he had been able to get and that, in any case, he was only interested in the longer waves where possibilities for commercial exploitation lay. The challenge thus presented silenced me!

And so it was, that out of those following, pajama-clad days and nights in Leonia, N.J. came the first short-wave regenerative receiver. And from that travail, too, came a very long, not very good, yet, I like to think, timely and popular paper read before this club, "Applications of the Audion" - plus the effective application of knowledge and know-how gained to the urgent needs of the great world war which, all too soon, came along.

After some delay following the war, came a great resurgence of amateur activities; reorganization of the national amateur's League; definite plans for the publication of an authentic and badly needed Radio Amateur's Handbook. And of my part in this during that critical period I am deeply proud.

Then - quite out of the "blue" - came a long telegram. Would I go to Europe and serve as Official Operator for the imminent trans-Atlantic Tests of the American Radio Relay League in December, 1921! This called for some soul searching - and some sacrifice, both then and later on. Yet, I asked myself, could this be, perhaps, "right up the alley" of those boyhood dreams?

But the story is well known to you. The great burst of interest, seemingly everywhere. Success! - as spark-plugged by station IBCG, last-minute-built by knowledgeable, enthusiastic and energetic members of this Club. The fevered interest of the commercial entities. The quickly expanding work, trans-Atlantic,

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GOLDSMITH (Continued)

Indeed, there was some talk at the time of his abolition, as you have heard this eveing.

It was my great privilege, indeed, to speak energetically and publicly at that time and in the newspapers against these unwise and unjust proposals which would have been so injurious to our own field, not only in the amateur sense but also in the professional sense. I well remember writing indignant letters to the papers and finding that my good colleagues in some cases wondered why I was so "hot under the collar." I was worried and angry not only for the amateur, but also for the professionals and for the art itself, because I foresaw that if scientific freedom of experimentation were curtailed for young and enthusiastic people, there would be no end to travel along an evil path. And, fortunately, such proposals were completely defeated.

Now I come to the welcome opportunity of mentioning some of the great figures of the Radio Club of America. Their standing will sufficiently indicate its high character. I have selected a number of these names from your membership list. I apologize to whose whom I have not known well enough to describe in detail. I realize that each and every one of you might with equal justice have been mentioned or even rightly eulogized. But I had to select a limited number in alphabetical order, since time presses, and these are men whom I happened to know best. And perhaps you will pardon therefore the incompleteness and informality of the so-called citations. I shall now go through them.

One name, out of contect and alphabetic order - is of course our own Major Edwin Howard Armstrong. Brilliant, inventive, tenacious of purpose, tragically devoted to the pursuit of truth and to the determined justification of his life aims. Let us have a moment of silence in his memory.

And now I shall not dwell on the individual accomplishments of each of the gentlemen I mention, but only briefly mention their names and something of their activities.

Ernest V. Amy, who needs as much introduction to you as the United States itself. You know him full well as a gentleman and scholar, in the finest sense of the words.

George W. Bailey, leader, executive, professional, and amateur. Dr. W.R.G. Baker, eminent industrial and technical leader, who, though presently in Syracuse, I know is with you in spirit tonight. Ralph R. Batcher, a most capable engineer and valued author. Dr. Harold H. Beverage, a leading research worker and a thoroughly inspired pioneer. John R. Binns, deceased, literally an historical landmark and executive. Pierre Boucheron, commercial engineer, advertising expert, publicist, and amateur. George Burghard - of him, I need say only, "Our very own George".

And I want to tell you something about George and his loyalties. (I simply cannot restrain myself from telling you this story.) Years ago, it was my very good fortune to be the director of a Naval school of which George was the officer in charge. And at that time his sidekick and pal was, as he still is, Runyon. Now, George was an ensign; but Runyon was what they then called a "radio gunner". And a radio gunner is a lower grade than an ensign. So, Burghard set out to remedy this inequity, and he decided that Runyon should become an ensign.

So he went to the District Communications Superintendent, an occasionally difficult gentleman by the name of Lieutenant-Commander Latham. He was a Southerner with a real drawl. And Burghard explained, very respectfully, to Latham that he thought his friend - Runyon - should become an ensign. Latham wanted to know why. So George Burghard explained that Runyon knew more about tactics and strategy than Napoleon ever had; he was a greater soldier than Caesar and Alexander the Great rolled into one; and that the Navy would go down directly to hopeless defeat if Runyon were not made an ensign. The conversation went on for about fifteen minutes, with Latham looking at him quizzically. And when it was all over, Latham said in that drawl of his, "Burghard, I can't do anything about this. This man couldn't be anything less than an admiral, and there are no such openings just now." (LAUGHTER)

So the Commander was mischievous enough to keep the promotion in abeyance for a month or two, if I remember correctly, before he did approve the Runyon ensigncy. But it does show that loyalty going too far can be dangerous.

Going back to our membership roll, John L. Callahan, leading professional and enthusiastic amateur. Louis M. Clement, noted contributor over the years to engineering advancement. Murray G. Crosby, a most resourceful and inventive engineer and experimenter. John S. DiBlasi, another of our great historical figures. Edward T. Dickey, stimulator and guide of much of the professional literature of our own field. William Dubilier, world-renowned engineer, inventor, and industrial leader. Allan B. Dumont, major contributor to many of the most important aspects of our field. Melville Eastham, rare combination of industrial planner and engineering leader, as well as a thorough gentleman. Lloyd Espenschied, brillant and prolific inventor and indefatigable worker. Edgar Felix, thoughtful, analytic and most helpful

(Continued on page 13)

GOLDSMITH (Continued)

to our field. Donald G. Fink, blending in rare combination great engineering originality and the art of clearest exposition. Harry G. Gawler, pioneer engineer and friend to so many of us. Paul Godley, leading experimenter and most careful and dependable analyst. Dr. Thomas T. Goldsmith, Jr., combined research worker and organization manager. Virgil Graham, ever dependable and ultra-competent planner for the whole electronics industry. A.H. Grebe, deceased, pioneer manufacturer and engineer, and John G. Grinan, deceased, untiring and ingenious experimenter.

Let us again pause for a moment in memory of these two illustrious gentlemen. And let me take the moment to point out that this preliminary sample of our membership sufficiently indicates the Gold Medal nature of the membership, its high selectivity.

Frank A. Gunther. But why paint the lily? Only his absence this evening prevents my embarrassing him by great praise. Raymond Guy, leader in broadcast engineering and recipient of a shower of well-deserved honors and offices. Ralph A. Hackbusch, engineering leader under two flags, those of Canada and the United States. Daniel E. Harnett, one of our best known and most valuable engineers. Professor Louis A. Hazeltine who I know is sorry not to be here this evening, because of poor health, and who taught all of us so much during his brilliant career. Dr. Raymond Heising, experimenter, inventor, planner and leader in research. Keith Henney, whose prodigious memory and outstanding literary skill have made the complex seem very simple. Frank A. Hinners, ever devoted to his field and a dependable contributor to its advancement. Dr. Charles J. Hirsch, recognized organization executive and most resourceful engineer. John V.L. Hogan, another truly historic figure who has retained all his major ingenuity, inventiveness, and skill over the years. Harry W. Houck, greatly respected worker and contributor over the decades to the welfare of our art. Charles W. Horn, who, again under two flags - that of the United States (where he is a naval Captain, retired) and of Mexico - has been and is an industrial and military leader. Dr. Louis M. Hull, another of our great engineers. Kenneth Jarvis, distinguished by practical, thoughtful and authoritative contributions throughout his work. Frank King, another highly respected member of the old guard. Fred Klingenschmitt, whom we all know and greatly admire. Ralph H. Langley, untiring worker, pioneer and experimenter. James L. Lamb, effective engineer as well as enthusiastic amateur and legal expert. Clarence J. Le Bel, a rare combination of a highly experienced radio engineer and a leading acoustic expert, inventor, and engineering organizer.

(Continued in the next Proceedings"

FIFIETH ANNIVERSARY
GOLDEN YEARBOOK

A Brief Review by Carl Dreher

GOLDEN JUBILEE

Only less fascinating than the future of an art is its past --and we know more about it. The history of what was "wireless," became radio (which includes TV), and is now electronics, is practically summed up in the history of the Radio Club of America, which issued its Golden Jubilee Yearbook on its fiftieth anniversary. The founders of the Club in 1909 were a group of wireless amateurs: W.E.D. Stokes, Jr., George Eltz, Frederick Seymour, Frank King, and Faitoute Munn. Since then most of the eminent radio engineers, innovators and administrators have been members. The most illustrious of them was Edwin Howard Armstrong, the inventor of regeneration, and superheterodyne, and the system of FM broadcasting which is now coming into its own, unhappily after Armstrong's tragic death. "Howard tried to do it all himself and it was too much even for his great intellect and personality," is the way H.J. Round, Britan's leading radio engineer, sums it up.

The Golden Jubilee Yearbook is a compound of humor, nostalgia and the great technological achievements which have given us radio as we know it today--a major factor in the world's communications, military activities, and entertainment, and indispensable as man prepares to step off into space. The boys who founded the Club in 1909 had some provision of what was to come. On page 18 there is a picture of young Stokes, the 14-year-old president in 1910, at the key of his wireless station on the roof of the Hotel Ansonia. (His father owned the hotel.) Appearing before a Congressional committee that same year, Stokes assured the lawmakers that "within ten years, a man in his automobile meeting with an accident twenty-five miles from home will be able to signal on a specific wave length, call up his own home by ringing a bell there, bring his butler to the telephone and tell him the cause of his delay, and that he will not be home for dinner." In his boyish innocense, he assumed that everybody had a butler. Another photograph (page 53) of a member with quite different origins, shows David Sarnoff, at the Siasconset, Mass. Marconi station in 1908, aged 19, with three other brother operators. On page 204 you can read Sarnoff's biography, the longest in the book (5-1/4 inches), even though he forebore to list his 21 honory degrees. On page 134 there are the famous photographs of Armstrong, standing 400 feet above Forty-Second Street atop of the iron ball which surmounted the tower of RCA broadcasting station WJZ, the first in New York City. And much else in a handsome 8-1/2 by 11 volume of 216 pages. No one interested in any aspect of radio can afford to miss it.

GOLDEN JUBILEE MEDALS AND AWARDS (Continued)

meets this happy challenge, I am sure that future recipients of this award will feel as I do the tremendous debt we owe this great pioneer. Thank you very much."

Professor Bose is a founding member and a director of the Armstrong Memorial Research Foundation, and a former President of The Radio Club of America.

FOUNDERS' AND CHARTER AWARDS

To mark the Fiftieth Anniversary of the founding of the Club, the Board of Directors, through its Medals and Awards Committee, of which Harry Houck is Chairman, decided to recognize in a suitable way those members who established the Club, and saw it through its pioneer stages. Accordingly, Special Medals to Club Founders and Charter Members were designed, and struck off, and presented to five surviving charter members at the Anniversary Banquet. In addition, this Medal was awarded posthumously to George J. Eltz, Jr., who had died before the event; and to our genial perennial Treasurer, Joseph Stantley went a surprise Special Medal, for merit for long and faithful service to the Club.

Presentation of Honorary Membership was made to Dr. Lloyd Espenschied, a Fellow of the Club, and a former Director, whose interest in radio antedates the founding of the Club by several years. In a characteristically modest way, he acknowledged the award thusly:

"I appreciate the kindness of the Club in making me an Honorary Member. One's fellow beings represent a substantial part of life itself, and the Club does bring together a goodly representation of radio human beings hereabouts. Again, my thanks."

With the award of the Special Medals for the first time in the Club's history, at this historic gathering, another form of honoring distinguished and outstanding members was created. Other awards of the Radio Club include the prized Edwin H. Armstrong Medal, the IBCG Armstrong Medallion recognizing an extraordinary amateur radio achievement, and the certificate of Honorary Membership.

The Club's Special Medal to Club Founders and Charter Members.

PAUL GODLEY (Continued)

of the amateurs. Marconi's experiments and his discovery of the so-called "daylight wave." The revolution in world communication means!

As a child I was once told a story. I think it carries a moral. It was of the fellow who bought a badly-run-down farm overgrown with weeds and scrub, its buildings tumbling down. And after he had worked it diligently across a couple of seasons, the pastor of the local church came by one day and said: "My goodness gracious me! What wonderful things the Lord and you have done here." To which, as he chuckled, the farmer replied: "Thank you, Dominie; and I'm glad you included me, because when the Lord was running this place by Himself it sure was one Helluva mess!"

In conclusion: As I sat last evening, together with countless others, intent, and face-to-face with President Eisenhower as he made his farewell address to the nation at take-off on a monumental journey and a great mission, I found myself, on behalf of all of those who have worked and played in our beloved field, engulfed in a deep sense of satisfaction. For, lacking those facilities which, across these 50 years of ours, have been wrought, those countless confrontations, that farewell address, that unique journey, that hope-filled mission could not have been.

I thank you.

50th ANNIVERSARY RECORD (Continued)

During the editing, unwanted background noises, repetitions, and awkward speech were eliminated where possible. To increase intelligibility to a high degree, J.A. Matthews who developed a novel editing technique, did unusual tape surgery by substituting well-enunciated words of a speaker taken out of other parts of his speech, for poorly spoken words of the same talk.

The jacket labels, which displays a photograph of the original fifty-year old spark gap equipment that served for the transmission of the coded sequences, with Harry Houck its builder, at the key, were contributed through the generosity of C.R. Runyon III.

Because of the limited edition of this historical LP record, it becomes a valuable piece of memorabilia for every person fortunate enough to possess a copy.

INDEX

(Continued from page 13)

Walter S. Lemmon, rare combination of an idealist in aims and an intensely practical worker in execution. Austin C. Lescarboura, who always writes so clearly and so well, and whom I greatly respect as a close associate in years past. Louis M. Miller, an engineering contributor and also a highly respected technical worker. Arthur V. Loughren, successful in research, development, and applications. Arthur H. Lynch, who for so many years has been one of our radio leaders and beacons. William A. MacDonald, greatly respected as an engineer, a planner and an executive. Jerry B. Minter, one of our most original thinkers and a prolific contributor to electronics and to radio.

William H. Offenhauser, our own Bill, one of our finest idealists, most practiced of practitioners, and a thorough gentleman. Dr. Greenleaf W. Pickard, deceased, an experimenter and inventor known to and respected by all of us. We again paus a moment in his memory.

C. J. Popkin, ever more active in the TV and radio arts. Jack Poppele, pioneer broadcasting engineer and inventor. Haraden Pratt, one who has exemplified the finest and most fruitful attributes of the engineer. John F. Rider, editor, writer, publisher, unselfish and devoted servant of our country. Henry J. Round, pioneer inventor, of major industrial standing. Ensign C. A. Runyon, Jr. - and you see I do insist on the ensigncy here - another of our own old guard. And Ensign Harry Sadenwater. Harry, were you not finally a Lieutenant (J. G.)?

MR. SADENWATER

Finally, yes.

DR. GOLDSMITH

I thought so.

MR. SADENWATER

And Runyon became a Commander.

DR. GOLDSMITH

So Runyon became a Commander, And you did spark the advancement, I am glad to say.

And now as to Lieutenant (J. G.) Harry Sadenwater. He is one man who is not only a great engineer but inherently, and by his very nature, personality and contacts and behavior, that rare thing, the friend of all of us. General David Sarnoff, who has shown that under our precious American democracy the born leader may rise to solid fame from simple beginnings. Dr. B. E. Shackelford, another man with the strictest professional aims and ideals. Frank H. Shepard, Jr., who blends knowledge and particular ingenuity in his work. Milton Sleeper, editor and indefatigable worker. Lieutenant-Commander William E. D. Stokes, Jr., who from boyhood has stimulated and expanded the radio field and whom we admire for his initiative, for his enthusiasm, and for the spark which he generated, and which has culminated in this great meeting this evening. Harry Tunick, deceased, an unusual combination of the best to be found in the legal and scientific minds and viewpoints.

And so, in conclusion, let me hail the great Radio Club of America. I see it as the home and inspiration of the gentleman scientists of this day and of tomorrow. It numbers in its membership that sturdy breed ranging from the youthful amateur to the skilled ultra-professional, from both of whom, brothers beneath the skin, progress springs. Its members are spiritually and humanly akin to Volta, to Ampere, to Herschel, to Faraday, to Maxwell, to Lodge, to Loomis, to Armstrong, and to Pupin. Its workers have always glowed with enthusiasm and been free from all but a burning desire to probe the universe and to weld humanity together through their chosen implements.

I pay sincere and enthusiastic tribute to this most worthy enterprise, destined to carry the light of truth over the years. And so, a respectful and hearty salute to the Radio Club of America.

50th ANNIVERSARY GET-TOGETHER

(Continued from page 3)

In a genial mood, Paul Godley, "gentleman of ham radio," who holds a special niche in the Club's first half-century historical accomplishment through his IBCG association, concluded the shortened speaking program of the evening. His remarks appear in full in this Proceedings.

The hour came all too soon for President Knoop to officially adjourn the Fiftieth Anniversary celebration of The Radio Club of America. The gay, happy crowd filed out, carrying each his Golden Jubilee LP record as a souvenir of the evening, and a Golden Anniversary Yearbook, reminders of a wonderful time spent in good fellowship. - L.J.

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1943 MODEL 84 STANDARD SIGNAL GENERATOR—A precision instrument in the frequency range from 300 Mc. to 1000 Mc. The first UHF signal generator to include a self-contained pulse modulator.

1944 MODEL 80 STANDARD SIGNAL GENERATOR—With an output metering system that was an innovation in the field of measuring equipment. This signal generator, with a frequency range of 2 Mc. to 400 Mc. replaced the Model 75 and has become a standard test instrument for many manufacturers of electronic equipment.

1945 MODEL 78-FM STANDARD SIGNAL GENERATOR—The first instrument to meet the demand for a moderately priced frequency modulated signal generator to cover the range of 86 Mc. to 108 Mc.

1946 MODEL 67 PEAK VOLTMETER—The first electronic peak voltmeter to be produced commercially. This new voltmeter overcame the limitations of copper oxide meters and electronic voltmeters of the r.m.s. type.

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1949 MODEL 82 STANDARD SIGNAL GENERATOR—Providing the extremely wide frequency coverage of 20 cycles to 50 megacycles. An improved mutual inductance type attenuator used in conjunction with the 80 Kc. to 50 Mc. oscillator is one of the many new features.

1950 MODEL 111 CRYSTAL CALIBRATOR—A calibrator that not only provides a test signal of crystal-controlled frequency but also has a self-contained receiver of 2 microwatts sensitivity.

1951 MODEL 31 INTERMODULATION METER—With completely self-contained test signal generator, analyzer, voltmeter and power supply. Model 31 aids in obtaining peak performance from audio systems, AM and FM receivers and transmitters.

1952 MODEL 84 TV STANDARD SIGNAL GENERATOR—With a frequency range of 300-1000 Mc., this versatile new instrument is the first of its kind designed for the UHF television field.

1953 MODEL 59-UHF MEGACYCLE METER—With a frequency range of 420 to 940 megacycles, the first grid-dip meter to cover this range in a single band and to provide laboratory instrument performance.

1954 FM STANDARD SIGNAL GENERATOR. Designed originally for Military service, the commercial Model 95 is engineered to meet the rigid test requirements imposed on modern high quality electronic instruments. It provides frequency coverage between 50 Mc. and 400 Mc.

1955

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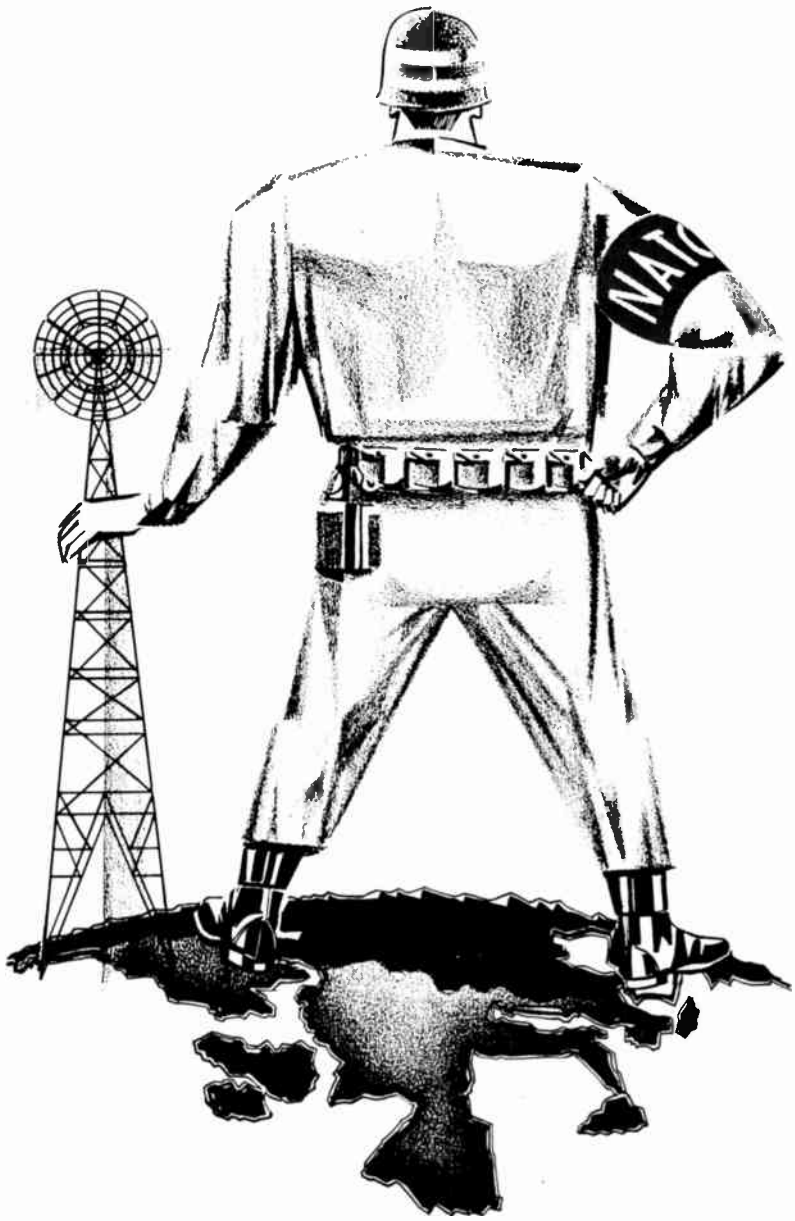

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The pre-eminence of Radio Engineering Laboratories, Inc., in specialized radio communications is again underscored by the selection of its equipment for the gigantic tropospheric scatter network being constructed by NATO.

This network, with more than a continental span, will stretch from Norway to Turkey. It is larger by far than any other tropo communications complex yet conceived. REL has designed and is constructing one hundred fifty-three transmitter modulators, one hundred nine 10-kilowatt amplifiers, and seventy-seven quadruple diversity receivers with combiners.

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Proceedings of

The Radio Club of America, Inc.

Volume 44, No. 1 First Quarter 1968

Founded 1909

FROM DRUMS TO MOBILE RADIO

WIRE TO RADIO AND BACK TO WIRE

CAPT. J. H. ROUND, 1881-1966

THE RADIO CLUB OF AMERICA, INC.

250 Park Avenue, Room 604, New York City

Founded 1909, New York, U.S.A.

The Radio Club of America, Inc.

250 Park Avenue, Room 604, New York City 10017

Organized for the interchange of knowledge of the radio art, the promotion of good fellowship among the members thereof, and the advancement of public interest in radio.

1968
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PROCEEDINGS OF THE RADIO CLUB OF AMERICA

Volume 44 First Quarter 1968 No. 1

FROM DRUMS TO MOBILE RADIO

The following is a history of Mobile Radio Communications reprinted from a brochure published by Link Radio Corporation with the permission of Fred M. Link, founder of the company and its president and sole owner for 20 years. When reading this remember that it was written and first published in 1940.

In darkest Africa the black man developed one of the earliest forms of Wireless Communication, the Drum, how long ago no man knows. He needed it for in the heart of his vast country, which was one unbroken forest without roads, traversed only by footpaths, it became necessary to communicate messages to his fellow man.

War, hunting, fishing, sickness, death, were all of prime importance to the savage.

Men went away out into the jungle forests to hunt. Women traveled to cultivate far distant garden clearings. Word came to town that enemy tribes were on the warpath; or perhaps some important member of the tribe had met death, his funeral was of major importance; a man's wife ran away, messages must be sent along her pathway of escape to catch and hold her.

The practical answer to all these important needs was the Drum which, by relay, sent messages from one town to another covering great distances. Messages are sent by "tone" rather than by words spelled out. Certain tone-rhythms convey certain understood sentences.

FIRE

The torch appearing between the flags on the insignia of the Signal Corps is one of the oldest forms of communication known to man—Fire . . .

Beacons kindled on high elevations to communicate vital messages are referred to in early classical literature:

> "Set up a sign of Fire in Beth-haccerem, for evil appeareth out of the north."
>
> Jeremiah 6-1

From Jerusalem to Babylonia the early Jews had a system of fire signals along a chain of hilltops.

The ancient Greeks flashed home the news of the fall of Troy by a sequence of prepared beacon fires built at strategic points on the Aegean Islands and on the mountain tops.

Down through the centuries fire was a most important form of communication. As late as 1775 Paul Revere still used the light of his lantern to carry his message of warning through the night.

SMOKE

Before the Christian era, when the Romans sent expeditionary legions to Britian, it was discovered that the aboriginal Picts had developed a very complete set of communications through the use of smoke puffs produced by blanketing a fire.

Later, when our covered wagons trekked their weary way westward, those hardy Pioneers, looking for new homes in the wilderness, found that the Indians used these same smoke signals to announce well in advance the coming of the pale-faces. In many cases this made possible the annihilation of wagon convoys crossing the western prairies.

At that time no white man had perfected any system of signals so effective.

GALILEO

Early in the seventeenth century, the Italian astronomer, Galileo, invented the Telescope, making it possible to magnify a visual signal from a source too far away to be seen with the naked eye. This was a vital step forward in the realm of communication.

Galileo was greatly honored for the telescope's application to signalling. A device that would bring advanced tidings of the arrival of 'treasure laden' ships was highly appreciated by commercial men.

SEMAPHORE and TELESCOPE

In the eighteenth and early nineteenth centuries the word, 'telegraph', was applied to long visual signalling lines.

The prefix, 'tele', means, 'far off'. The words, telescope, telegraph, telephone, teletype, and television, all bearing this prefix, show the sign of a new phase in signal communication.

A telegraph station consisted of an observer with a telescope to pick up signals and a semaphore to relay them to the next station. This system of semaphore lines was constructed from Cape Cod to Boston and from Coney Island to New York City; still another such system was located on San Francisco's Telegraph Hill, all to report in advance the arrival of some important clipper ship.

Samuel F. B. Morse was by profession a portrait painter. In 1832, returning to America from England on the sailing ship, Sully, he conceived the idea of a magnetic telegraph—and at the same time worked out a code of dots and dashes to carry the message over wires. Three years passed—Morse was penniless—nothing happened.

In 1835, Morse was appointed instructor of Art at New York University. He rented a garret room where he ate and slept; every spare minute he could find he worked on his discovery. He finally obtained the help of a brilliant young student, Alfred Vail, and, in a factory loft in Morristown, N. J., the Electro-Magnetic Telegraph was finally born.

On March 3rd, 1843, after eight years of heartbreaking difficulties, Morse was granted an appropriation of $3,000 by Congress, to build a telegraph line from Washington to Baltimore. The first message sent was:

"What Hath God Wrought."

Now many millions of miles of wires carry messages to all parts of the world.

BELL

Alexander Bell in an attic room and his assistant. Thomas A. Watson, in an adjoining room experimented with tuned harmonic reeds. We quote Watson's statement of what happened on June 2nd, 1875:

> "I was plucking a stuck reed, when a sound shaped electric current passed through the wire from my work-room to Bell's; he heard for the first time the tones and overtones of a sound transmitted by electricity."

There followed nine months of ceaseless effort before Bell's "brain child" uttered its first sentence.

Bell had moved to 5 Exeter St., Boston, where he rented two rooms, a shop and bedroom, for $4.00 per week. A wire ran from one room to the other. On March 10th, 1876, Bell was in his shop and Watson was in the bedroom with a receiver to his ear. Bell accidentally upset a jar of battery acid over his clothing. Excitedly he called: "Mr. Watson, come here, I want you." The instruments were so adjusted that Bell's voice carried distinctly over the wire to Watson. Bell's vision had become a reality—it talked.

1876 was the year of the Philadelphia Centennial Celebration. Bell reserved an exhibition space but his funds were so low that he had to borrow money for train fare from Boston to Philadelphia. His small display table was lost in the vast expanses of the hall. No one paid any attention to his fantastic story.

Towards the close of a hot, muggy summer day about the time Bell had given up hope of obtaining any financial help, he saw a group of influential looking men approaching. Suddenly the leader stopped and extended his hand. "Professor Bell, I'm delighted to see you again!" It was Dom Pedro, Emperor of Brazil, whom Bell had met in former years. The Emperor said, "What have we here?" Bell demonstrated his instrument. Dom Pedro placed the receiver to his ear, listened a moment and sprang to his feet exclaiming, "God save us, it talks!"

Lord Kelvin, of Atlantic Cable fame, next listened, saying, "It does speak, gentlemen! This invention is the most wonderful thing in America!"

The next morning, the newspapers blazoned the story, bringing great attention to Bell and his invention.

Once upon a time

The latest

WIRELESS COMMUNICATION

Near the beginning of the twentieth century, a new unit of energy was being investigated by many leading scientists. It was the 'electron', which was destined to advance the science of communication to undreamed-of horizons. The phenomena of our modern radio have resulted largely from the mental feats of an English mathematical physicist, **James Clerk Maxwell.**

Maxwell correlated the theories and surmises of **Faraday** and other electrical pioneers and through intricate mathematics established on paper the fundamentals of radio. He also discovered the speed of light to be 186,000 miles per second. **Einstein** later found this to be the general speed limit of the universe. Maxwell concluded that the light by which we see is a form of electro-magnetic radiation, a conclusion which stands confirmed by modern science.

Heinrich Hertz, a German scientist, put Maxwell's theories to work at Karlsruhe, Germany, in 1888. Hertz first demonstrated in his laboratory the superswift transmission of electro-magnetic oscillations, using two large metal balls and a loop of wire with a gap in the center, across which live sparks jumped through space. Hertz never realized the importance of his vast discoveries, since he died soon after this at the early age of thirty-seven.

Guglielmo Marconi, a brilliant young student of the theories of Maxwell and the accomplishments of Hertz, had the intuition that these waves might furnish mankind with a new and powerful means of communication. At his father's estate in Italy, at the age of twenty-one, Marconi began making his own tests. After several years of hard work he developed sensitive instruments and was able to send 'The Message' for a distance of

two miles. Hertz had used two metal balls for his oscillator; Marconi's conception was different. He used the earth, itself a metal ball, as one of his terminals and a great length of wire reaching upward into the heavens as the other. Then and there the Radio Antenna came into being.

One hundred and fifty years after **Benjamin Franklin** sent his kite aloft to learn the secret of electricity, another inquiring mind was sending a kite into the heavens along the coast of Newfoundland to bring out of the ether a message carried by electric emanations from far across the sea.

Guglielmo Marconi had, in 1899, sent wireless communications across the English Channel and in 1901 we find him and his assistants on the bleak coast of Newfoundland. Marconi sat for an hour with his ear glued to a receiver attached to a kite antenna. He knew **Fleming** was at his sending instruments in Cornwall, England, tapping out **Morse's** code letter "S" which is three dots. Finally, just after noon faint clicks were heard. He listened intently—then with a never-to-be-forgotten thrill he heard distinctly the first wireless communication across the broad Atlantic.

STEPPING STONES TO WIRELESS

Theory. JAMES CLERK MAXWELL was born in Edinburgh, Scotland, in 1831. He entered the University of Edinburgh and later went to Cambridge. From 1860 to 1865 he was professor of physics at Kings College in London. There he met Faraday whose theories and surmises on the subjects of 'Time' and 'Space' intrigued him greatly.

Science. HEINRICH HERTZ was born in Hamburg, Germany, in 1857, the son of a lawyer. He became a student of technical science but soon decided to devote himself entirely to physics. After three years of study in Munich and Berlin he became assistant to Helmholtz and later entered Kiel University. He taught at Karlsruhe Technical High School in 1888 and there the Hertzian or Radio Wave was born.

Invention. GUGLIELMO MARCONI was born in Bologna, Italy, in the year 1874. His father, Giuseppe Marconi, was an able business man and a gentleman of means. His mother, history tells us, was a keen-witted blue-eyed Irish girl. Their son was destined to bring everlasting glory to Italy. Marconi grew up to be a clever electrical engineer with a keen mind for business.

STEPPING STONES TO ELECTRONICS

THOMAS A. EDISON, in 1884, unintentionally built the first Vacuum Tube. While developing the electric light he noticed the effect of the play of electrons in the semi-vacuum of an incandescent lamp. To confirm his suspicions that something new was happening, Edison set up a metallic plate in such a position that he was definitely conscious of the flow of electric current through 'space' in the tube. He thus established the basis of the modern Electronic Tube. However, two decades passed before this Edison Effect was utilized.

JOHN AMBROSE FLEMING, Marconi's chief engineer, found, through experimentation, that this Edison Effect placed between the antenna and the ground connection of a receiver could be used as a 'valve', offering means of detecting radio signals. Thus, early in the twentieth century, the Fleming valve theory added to the Edison Effect created the Diode Tube Detector, which marked a new milestone in the advancement of electric communication.

LEE DeFOREST at this time saw great possibilities in this electronic 'Tube-in-the-making'. He realized that means must be found to further direct the electrons' course through space. Fleming's valve had acted as a 'do not enter' sign on a one way street; DeForest added a grid to the diode tube which established 'stop' and 'go' signs. This grid also acted as a speed control system for the regulation of electronic traffic. DeForest's 'Triode' tube became the Electronic Amplifier which ushered in a new day in radio communication.

RADIO ENTERS

In 1907, Lee DeForest had produced and patented the triode or audion Tube; later **Dr. H. D. Arnold** of Bell Telephone Laboratories and **Dr. Irving Langmuir** of General Electric Research Laboratories added their contribution of "high vacuum" to the DeForest tube and radio started on a dramatic career destined to revolutionize the scope and trend of all modern living.

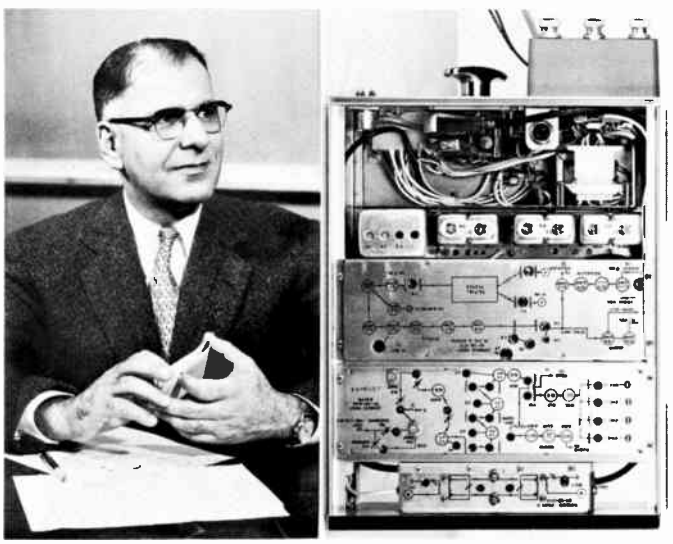
What a thrill to watch "Junior" in the basement with a table full of contraptions, earphones glued to his head, trying to make his crystal set work! Later another thrill to switch on your first set, turn the dial and pick up **KDKA** or some station nearer home. Quality of reception did not matter, the important thing was to brag next day at luncheon that you "got Davenport, Iowa", or that just after midnight you "almost had Los Angeles".

Broadcasting and reception were in a very formative state. On July 23, 1909, the steamer, **Republic**, flashed an S.O.S. by means of its new wireless equipment. The message brought nearby ships to the scene of the disaster and many lives were saved. April 14, 1912, the **Titanic** went down but not before its radio signalled for help. This greatest sea tragedy of all time proved the value of radio as seven hundred lives were saved. Wireless was becoming an absolute necessity for ocean traffic . . .

World War I again brought radio dramatically to the front as modern science and unlimited sums of money were made available for its development. Scientific investigation for war purposes had done much to improve radios. They could now be found in an increasing number of homes. The demand came for radios in automobiles; these were soon developed and operated

successfully. At this juncture an urgent need was felt for police communication to aid in crime detection and the enforcement of law and order in our communities.

THE WHOLE BROAD SUBJECT OF RADIO NOW BRANCHED INTO TWO MAJOR DIVISIONS, BROADCASTING AND COMMUNICATIONS. Broadcasting confined itself to the fields of education and entertainment while communications devoted itself to man's information and protection on sea and land. At this point we stress the accomplishments of man's ingenuity in the field of **Mobile Radio Communication**, which has assumed tremendous proportions in the past few years. Following is the story of the achievements in this field of a small group of earnest radio engineers headed by **Fred M. Link**



In the early days of civilization, man fought for his very existence in order to live in competition with the animal world around him. Finally God gave him dominion over the lower orders of life; he developed a civilization in which the forces of law and order predominated over the forces of evil. Never in the history of the human race has there been a time when man could relax for a moment his effort to uphold that balance of power for good.

Now in the advanced twentieth century we find organized crime flourishing throughout the entire world. Man carries on a ceaseless fight against such crime and also to protect his fellow man from the ravages of the elements, from flood and fire, from disease and famine. Through man's ignorance and stupidity, unnecessary accidents take a staggering toll in all walks of life.

Mobile radio is playing a great role in the world today, doing its part in upholding these important forces of law and order. Statewide Police Radio now covers the greater portion of the United States with the Eastern Seaboard almost solidly protected by modern Link FM equipment. Public Utilities all over this broad land are realizing that the cost of radio equipment, its installation and maintenance, is paid for many times over through the "speed up" of all their activities. Railroads and highways will soon be radio controlled. Our government uses mobile radio communications systems in the U.S. Armored Forces, Field Artillery, Signal Corps, Navy, Marine Corps, Coast Guard, Secret Service, Civil Aeronautics Administration, FCC, FBI, and many others.

As the motor car speeds over super-highways which have replaced the old wagon trails, as palatial steamers plow across the ocean where slow sailing ships fought the waves only a short time ago, and as the modern clipper ship wings its way into the heavens, annihilating time and space, so has come into being a method of radio transmission known as FM (Frequency Modulation) which is revolutionizing the entire field of emergency radio communications.

AM (Amplitude Modulation) is the most generally used method of broadcasting over certain prescribed air lanes. By this method you hear the programs coming from your home radio; but it is not entirely free from interference. Man-made and nature-made static overrides the AM carrier wave and often raises havoc with some favorite program to which you are listening. One could overlook this disturbance on his home radio, but emergency radio communication, especially in war time, was a different thing. Interference was an obstacle that had to be eliminated if possible.

Major Edwin H. Armstrong, internationally prominent radio expert and unquestionably one of the foremost inventors in the field of communication of all time, worked out a successful method of radio transmission and reception; this he called **Frequency Modulation** simply because the radio signal was varied in frequency rather than in amplitude in order to get variations in volume and tone. This relatively new method of radio inherently reduced the interfering effect of both nature-made and man-made static thereby greatly improving the art of communication.

YOUR NEW MEMBERSHIP COMMITTEE CHAIRMAN

Bill Offenhouser, our new president, has appointed Julian Sienkiewicz chairman of the Club membership committee for 1968. In addition, Julian has been named banquet chairman.

In our drive for 68 new members in '68, give Julian a hand. Get application forms from him and send completed application forms addressed to Julian Sienkiewicz, c/o Davis Publications, 505 Park Avenue, New York, N.Y. 10002. His phone number is (212) PL 2-6200.

John P. Taylor has been named vice president-market programs of the RCA Commercial Electronic Systems Division whose product lines include communications, broadcast and instructional equipment and systems. He joined RCA in 1930 upon graduation from Harvard.

EDITORIAL

The advances in radio since the Club was founded 59 years ago are so numerous and significant that it is physically impossible for any one person to be fully informed on all its facets. At one time, almost everyone in the field knew or had at least heard of each other. Now it is such a big industry that only some of the top executives and prolific writers have ever been heard of by newcomers to the field.

Today, the engineering personnel recruiter wants to know of an applicant what degree he holds and from what college it was awarded, and what is his specific area of "specialization." He doesn't ask the applicant if he can actually design equipment or attempt to determine if he has imagination. The prospective employer often requires job applicants to take psychological tests to determine if he is emotionally fit to work with other engineers.

Somehow, the system doesn't really work as well as the industrial psychologists think. Many times, the man with unusual drive and great creativity is turned down. The giant electronics firms point with pride to the "numbers" of engineers they employ, not to their capabilities.

On the other hand, recent graduates have been exposed to much more information than the old timers because so much more information is available. Even so, it takes a "team" of engineers months, sometimes years, to develop a product or system which could have been conceived and put into production in a much shorter time by far fewer (perhaps even one) "practical," experienced engineers.

We are now in the age of "specialization." As **Dr. Raymond Villers** put it "not so long ago, a shoemaker was an *engineer* (designed shoes), a *purchasing agent* (bought material), *craftsman* (made shoes), *salesman* (sold shoes), and an *accountant* (handled money and calculated his profit or loss). But today, a typical shoe factory has 1000 employees, none of whom knows how to make a pair of shoes."

Very few members of this club are actually specialists. Most are well-rounded, capable of inventing, designing, fabricating, selling and calculating costs.

Many of the younger engineers are brilliant and are especially competent in very narrow areas. But, how many of them can single-handedly design an SSB ham rig or even a superheterodyne receiver and then assemble it and make it work?

For these "specialists," there are scientific societies whose meetings they can attend to get "specialized" information on "specialized" subjects. The specialists are part of a machine, sometimes a very important part. But, in general, they do not fraternize with each other, even other parts of their machine.

Fortunately, there are still some "individualists" in the industry who want to get together with other "individualists" — self-made men, including those without formal education and even those with doctorates.

The Radio Club of America consists of a group of "individualists," most of whom have made significant contributions to radio and electronics. The Club members fraternize and exchange ideas.

Fortunately, there are still many "individualists" who should be encouraged to join the Club and *attend its meetings.* The Club's meetings offer diversification and thought stimulation. Thanks to the meetings and papers chairman, each meeting covers a new area—often a new one which most specialists have never heard of. The papers published in the Proceedings, listed elsewhere in the previous issue, clearly illustrate the diversity of the subject matter.

Our former editor, **Edgar H. Felix**, summed up the position of the Club quite aptly when he reported *"the technical organizations in our field have hewed very strictly to engineering while the industry trade organizations have looked upon their function to be one of maintaining the status quo and profit standards of the industry. Yet, current technological developments will continue to upset the status quo as new means of distributing programming and communications, making the old audio network organizations even more obsolete and inadequate than they now are."*

The Radio Club of America, *which is somewhat broader cut than the technical or trade associations, is in a position to take leadership in industry discussions and forums looking toward higher public service standards and maximum cultural and educational benefits to those who support the industry."*

HAPPENINGS

Bell Labs commemorates 20th anniversary of the **transistor**—1966 banquet master of ceremonies **W. Walter "Wally" Watts** promoted by RCA to senior group executive vice president—**Walter Lyons** is back from Singapore—**Gonset** amateur radio product line acquired by **Aerotron** — former Stromberg-Carlson president and Philco vice president **James D. McLean** appointed director of international industrial cooperation for U. S. Department of Transportation—**John Ashton,** radio pioneer, remarries and moves to Santa Cruz, California from Palo Alto—**William H. Forster,** formerly with **Philco,** now technical director for **ITT-Europe,**—**Dave Talley** now with **Ebasco** — **Julian Sienkiewicz** elected president of Electronics Press Club—**Lionel Rodgers** upped to vice president of **Automatic Signal** division of **LFE**—**Cap't. W. G. H. "Bill" Finch** back from Tucson —**Ivan Loucks,** former chief of **FCC** amateur and citizens radio division, retiring in March from post as signal and communications engineer, Association of American Railroads.

WIRE TO RADIO AND BACK TO WIRE

by

LEO G. SANDS

Radio is entering another stage—back to wire transmission because of the lack of radio spectrum space for mobile communications. Within the meaning of **radio** is television.

As of the end of 1967, there were 1933 CATV (Community Antenna Television) systems in operation serving 2798 communities. There were 1867 systems under construction and 2330 applications for permission to operate CATV systems in 1330 cities were pending. Millions of homes now receive television programs through cable, both those picked up off the air and those originated by CATV system operators.

In fact, television is going back in a sense to the format of radio back in the 1920's. In addition to programs broadcast by network, independent and educational television stations, many CATV systems operators originate programs for closed circuit transmission to their subscribers. These programs are generally of interest mainly to the communities served and to certain segments of the public.

In addition to television programs, CATV systems distribute off-the-air and locally originated radio programs which can be tuned in with an FM broadcast-band receiver. Some systems also transmit background music and other program material for reception by special subscribers on other than FM band frequencies, requiring the use of special receivers and, sometimes, the use of an unscrambler.

CATV started in Pennsylvania about 20 years ago. Facilities were installed which would enable the residents of a community, which was beyond the useful range of TV stations, to share a distant, common antenna system located at a point where TV signals could be received. Since then, the CATV industry has grown rapidly, system operators now reportedly buying $100-million worth of equipment annually.

It has been suggested that all TV broadcasting be through cable, making the 492 MHz of radio spectrum space, now allocated to TV broadcasting, available for other purposes. This space could accommodate almost 25,000 FM, 50,000 AM or 100,000 SSB radiotelephone communications channels.

The use of CATV is not limited to communities where there are no or too few TV broadcasting stations. CATV systems are being installed in large cities, even in New York City, in order to provide better reception, particularly of color programs.

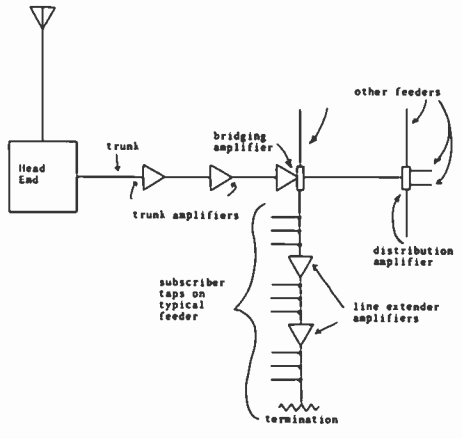
A CATV system consists of an antenna system at a good receiving location, a **head end,** a trunk line and a distribution system employing coaxial cable as the transmission medium.

The head end is equipped with RF amplifiers or frequency translators, one for each TV channel to be distributed plus an amplifier for the FM broadcast band. Some are also equipped with TV modulators and FM modulators for transmission of locally originated TV and radio programs. Frequency translators are used for receiving UHF television stations and transmitting their signals on a VHF channel. They are also used for translating VHF channels from one to another for the purpose of eliminating picture ghosts resulting from direct pick up of a local station's signals by the receiver's front end wiring and delayed receipt of the signal through the cable system.

All of the signals (as many as 12 TV plus FM radio) are combined and fed into a **trunk** line coaxial cable which runs into the communities served. These signals lie between 54 MHz and 216 MHz, with the 72-76 MHz and 108-174 MHz spaces usually unoccupied.

Since the attenuation loss of 0.75-inch diameter aluminum sheath trunk line coaxial cable at 216 MHz (Channel 13) is almost 1.0 db per 100 feet, in-line amplifiers are required at intervals of approximately 2,000 feet. These amplifiers must pass all signals within the 54-216 MHz range. The trunk line is tapped through **bridging** amplifiers whose outputs are applied to **feeder** cables. Signals are conveyed to TV and FM receivers through a **subscriber drop** connected to a feeder cable through a resistive, capacitive or inductive **tap** or a **directional** coupler. To make up for tap and attenuation losses, **line extender** amplifiers are inserted into feeder cables.

The entire system from the antenna baluns to individual CATV subscriber outlets, employs 75-ohm coaxial cable as the transmission medium. Considering the high transmission losses at VHF, present CATV techniques are not ideal, but they are compatible with existing TV and FM receivers.



TYPICAL CATV SYSTEM

Not all CATV systems are limited to transmission of signals in the 54-216 MHz range. Some are capable of transmission of 20 TV channels within the 120-240 MHz range. All subscriber receivers are equipped with a converter with which the 20 channels are selected and which feeds the signals to a TV receiver set to a specified VHF channel. Some systems transmit some of the signals through the trunk line over sub-VHF channels (5.75-45.75 MHz), translating them back to VHF television channels at the point where distribution begins.

"Elementary, my dear Watson." The cable transmission show is only beginning. Since coaxial cable can be used for transmission of signals from DC through VHF, only 30% of its capability is being utilized by so-called "fully-loaded" CATV systems (12 TV plus FM). Transmission need not be unidirectional. By providing appropriate filters, splitters, mixers and couplers, a CATV system can be designed to enable bidirectional transmission, within the 54-216 MHz (or higher) in one direction and below 50 MHz in the other direction. It's already being done and several sophisticated bidirectional CATV systems are in the planning stage.

A bidirectional CATV system can be used for unidirectional transmission of TV and radio programs to the public as well as for bidirectional transmission of CCTV, data, facsimile, telegraphy, telephone and telemetry. The capabilities of CATV are limited mainly by lack of imagination.

Dr. Pierce of Bell Labs said last year "the revolutionary possibility in mass communications lies in the full utilization of the capabilities of CATV." W. Walter (Wally) Watts, a distinguished member of The Radio Club of America and a senior group executive vice president of RCA, also pointed out that CATV has tremendous potential. He cited, as an example, that people could vote for political candidates without leaving their homes, indicate their reactions to TV programs, etc.

CATV, which is becoming to mean much more than "community antenna television," has almost unlimited potential. Imagine the capabilities for transmission of bidirectional intelligence when the entire nation is linked through coaxial cable. The trend has started and will continue. It's still radio, but the transmission medium is wire.

Orestes Caldwell
1888-1967

The man who coined the term *"electronics"* died in Greenwich, Conn. on August 27. Dr. Caldwell attended Purdue University where he earned his B.S. degree in 1908, his E.E. degree in 1931 and his doctorate in engineering in 1933.

He served on the Federal Radio Commission from 1927 to 1929. He was a member of the National Television System Committee from 1951 to 1954. He was a Fellow of the IEEE.

Dr. Caldwell is best remembered as an editor, starting his career in 1907 as an assistant editor of *Electrical Review* and later serving as an editor of *Electrical World* and *Electrical Merchandising*. He was editor of *Radio Retailing, RadioToday, Electrical Week, TeleTech, Electronic Industries, Television Retailing,* and *Electronics* of which he was also co-founder.

George Washington, Jr.
1899-1966

George Washington, Jr., a former vice president of the Club, died December 26, 1966, after a long illness, in Morristown, New Jersey. He was the son of the inventor of instant coffee. And, he was the developer of a revolutionary new photo-engraving method, now in wide use. Mr. Washington was born on Staten Island and attended Brooklyn Poly Prep and Milford Academy.

C. W. Hansell
1898-1967

Clarence Weston Hansell, a famous radio pioneer died October 20 at the age of 69 on Merritt Island, Florida. He retired in 1963 from his post as a *research fellow* at the David Sarnoff Research Center (RCA) in Princeton, New Jersey.

Dr. Hansell was born in Medaryville, Indiana and was an alumnus of Purdue University.

He started his long career with General Electric and joined RCA in 1920, and was issued more than 300 U.S. patents.

Dr. Hansell pioneered in trans-Atlantic radio telegraphy and contributed greatly to the development of shortwave radio, infrared technology, microwave, FM radio, color television, radar, aircraft radio and air ionization.

George C. Hees
1899-1966

George Charles Hees, a life member of the Club died on June 1, 1966 in Mineola, New York. The radio pioneer was graduated from Pratt Institute and was associated with Sperry Gyroscope Company until he retired in 1962.

Hugo Gernsback
1884-1967

One of the most well known men in radio, Hugo Gernsback died on August 19 at the age of 83.

Once in a while, a man comes along with such talents of intellect and imagination that he can anticipate the wonders of the future. H. G. Wells was such a man; Hugo Gernsback was another. Unlike Wells, however, Mr. Gernsback not only wrote about "Things to Come," but contributed concretely to the world in which we live. He was a writer, inventor, and publisher.

Born in 1884 in Luxembourg, Mr. Gernsback came to the U.S. in 1904, and at the age of 24, was already the owner of the Electro Importing Company, publisher of *Modern Electrics,* the first radio magazine (later to be incorporated with Popular Science), and had written *"The Wireless Telephone,"* the first book on radio broadcasting ever written. He was indeed a remarkable man. In later years he published other technical magazines, *Electrical Experimenter* (1913), *Radio News* (1919), and *Radio Electronics* (1929). He also published the first science fiction magazines, *Amazing Stories* (1926), and *Wonder Stories* (1929). In fact, Mr. Gernsback is known as the father of Science fiction. In his book *RALPH 12YC4+*, published in 1925, he presented the world of the future—a world of fluorescent lights, automatic packaging machines, plastics, radio direction finders, juke boxes, tape recorders, rustproof iron (steel), and television. His was an inventive mind. He predicted, diagrammed and explained the principles of radar, long before radar became a reality. He was a man of "FIRSTS." He designed and manufactured the first home radio set in the U.S., called *Telimco* wireless.

He built the first radio battery. He owned and operated the first radio store in New York. He pioneered the first TV station, WRNY, in 1928, and operated it. In fact, he coined the word "television." He founded the Wireless Association of America, the Radio League of America, and the Short Wave league. Mr. Gernsback's role as editor and publisher was only one aspect of a prodigious set of accomplishments. He was the recipient of many honors and awards, including the Marconi Memorial Wireless Pioneer Medal, the Gold Medal of Luxembourg, and the Veteran Wireless Operators Award.

Hugo Gernsback will not soon be forgotten.

Capt. H. J. Round 1881-1966

by

Wm. H. Offenhauser, Jr.

Capt. Henry Joseph Round, "H.J." to his friends, a most distinguished *Honorary Member* of the Radio Club and warm friend of Major Armstrong and of the Club pioneers, passed away on August 17, 1966 at his home in Bognor Regis, Sussex, England, after suffering a slight stroke at the beginning of the year. He was 85. He was known throughout the world as "the father of British broadcasting."

He was a brilliant, prolific, creative, ingenious and witty individualist with 117 inventions to his credit, and an informal list of ideas of perhaps several thousand more. He had a boundless love for his old and trusted friends in wireless, and a love of life and living that was ever generous, never selfish. He was ever anxious to advance the wireless art, and was always in the forefront of that which he encouraged. He never showed any interest in finance in connection with his inventions; he just wasn't interested in money. He was a sparkling conversationalist and philosopher, with an ever-present cigar. He liked and breathed his favorite work and pasttime almost every waking hour of every day. He was indeed one of that rare breed—the gentleman scientist par excellence — a true peer of his friends and idols, Marconi and Armstrong.

H. J. was born on June 2, 1881 at Kingswinford, Staffordshire, England. His early schooling was at Cheltenham, and from 1889 to 1902 he studied at the Royal College of Science in London, gaining first class honors. While tutoring during this period, a pupil demonstrated to him some of the principles of Hertz and told him of Marconi, the man who provided the intellectual center of his entire later life.

In 1902 he joined the British Marconi Company and was sent to the USA as an instructor at the

Capt. Henry J. Round of England (right) received the prized Armstrong Medal from John Bose, president of the Radio Club of America, at the Club's 43rd annual banquet. The Medal was awarded to Capt. Round in recognition of his pioneering work in radio, especially in the fields of radio direction and position finding and the amplification of short-wave signals. During World War I the direction-finding apparatus he designed and operated made it possible to trace the movements of the German Fleet, making possible interception by the British Fleet in the Battle of Jutland.

American Marconi Company's training school at Babylon, Long Island. In his spare time he studied powdered iron core inductances, for which he made the cores by mixing iron powder with paraffin wax. In 1906, because of a Marconi recession, he applied for a job with Thomas A. Edison, but turned it down because he felt that he could not live on $12.00 per week in New York.

For the next two years he worked for the New York Telephone Company at the Dey Street annex of the Cortland Street building, working evenings without pay, and often sleeping overnight in the Marconi office on Front Street. Here, at night, he did much of his study of frame (loop) antennas, and learned of the similarities between the workings of two loops at right angles, and the combination of a loop with a conventional single wire antenna. Here, too, Round's first wireless telephone was born.

Too often, perhaps, while at work during the day at the telephone company, the buoyancy of Round and two fellow engineers annoyed a quiet man next door. In 1908, that man, Theodore N. Vail, was elected president of the New York Telephone Company, and all three engineers left, quietly.

Round then returned to the Marconi Company in England where he made further studies of antennas and of oscillating vacuum tubes and put his findings to work promptly in the commercial operations of the company, the only one in the world to offer commercial transatlantic communication service from 1907 to 1912.

In 1912, H.J. went to the Upper Amazon where he accomplished 700-mile transmission with Marconi equipment. By on-the-spot rebuilding, he was able to transmit on 4,000 meters by day and on 2,000

meters at night to achieve the contract guarantee—with virtually no spare parts on hand at all. Earlier, he had greatly improved the performance of the Marconi transatlantic transmitter at Clifden, Ireland and had studied long distance signal propagation and its peculiarities.

After returning from Brazil, he began an intensive study of the vacuum tube and was one of the first to discover that it could generate continuous waves. By this time he was in the forefront of oscillating vacuum tube development. Soon, he had changed over the Clifden transmitter to vacuum tube operation with 10 kilovolts on the plates, something unknown elsewhere in the world for several years. In 1913-14 he demonstrated vacuum tube radiotelephony and patented important improvements, including the indirectly heated cathode.

At the outbreak of World War I, he was assigned by British military intelligence to build a network of direction-finding stations to cover the entire western front. These tube-equipped stations were so successful in pinpointing enemy transmitters and reading them that he was recalled to England to construct a second network there. In May 1916, he detected a seven-mile change of position of the German fleet through the Kiel Canal at Wilhelmshaven, 300 miles away. He reported to the Admiralty that the German fleet was about to put to sea. This was the forerunner of the Battle of Jutland. For his services, he was awarded the Military Cross.

In October 1917, Major Armstrong, enroute to France, decided to stop off in England and meet the man who had written such excellent articles in *Electrical World* and in the *London Electrician.* In the words of Armstrong, "An Englishman knows how to use the English language. When Round got through with one of his articles, you knew exactly what he meant, you understood it, and, H.J., you cleared up a great bit of my early thinking—and I'm proud to admit it." Here perhaps lies the secret for our hidden weapon today to keep under control "Today's Knowledge Explosion"—clear exposition. May H.J.'s tribe increase!

Round told Armstrong about his direction-finding work; Armstrong told Round about the makings of his superheterodyne. Round had already appreciated the need of the screening grid. He was a little chagrined to learn that Schottky, a German, had published about it in 1916.

The exchanges caused each man to listen raptly in wonder and admiration for the ingenuity and skill of the other. This was the real beginning of a deep and all-pervading friendship that lasted their entire lifetime.

Each man was so clear, so logical, so human, and so admirable to the other that it made an indelible impression, not only on the two men, but upon the entire world in which they lived. Far into the night they discussed ways and means of working their receivers in the short wave range from 500 KHz to 3 MHz, where Round had found German radio working, supposedly unknown to the British. Round had managed to get to 1.2 MHz, and Armstrong's Superheterodyne held the key for reaching to 3 MHz and beyond. It was dawn before the two great men could break away from one another.

In 1919, H.J. developed new types of transmitting tubes, and in March, directed the installation for Marconi of the radiotelephone transmitter at Ballybunion, Ireland which was the first European station to span the Atlantic by telephone. Further work led to broadcasts from Marconi station 2MT at Writtle, and to the establishment of the original Broadcasting House, 2LO, at Marconi House, for which Round designed the transmitting equipment.

In 1921 he was appointed chief of the newly formed Marconi - Research Group where his inventive genius became full-blown. He developed broadcast receivers, electrical phonographs, public address systems, reverberation systems for broadcasting, new types of microphones, tubes, pickups, amplifiers, sound recording systems including sound film, and a host of other devices and circuits. In 1931 he resigned to set up private practice as a consultant.

In 1937 he returned to Marconi again as a consultant on echo sounding and underwater sound. During World War II he worked on ASDIC and continued that work until 1950.

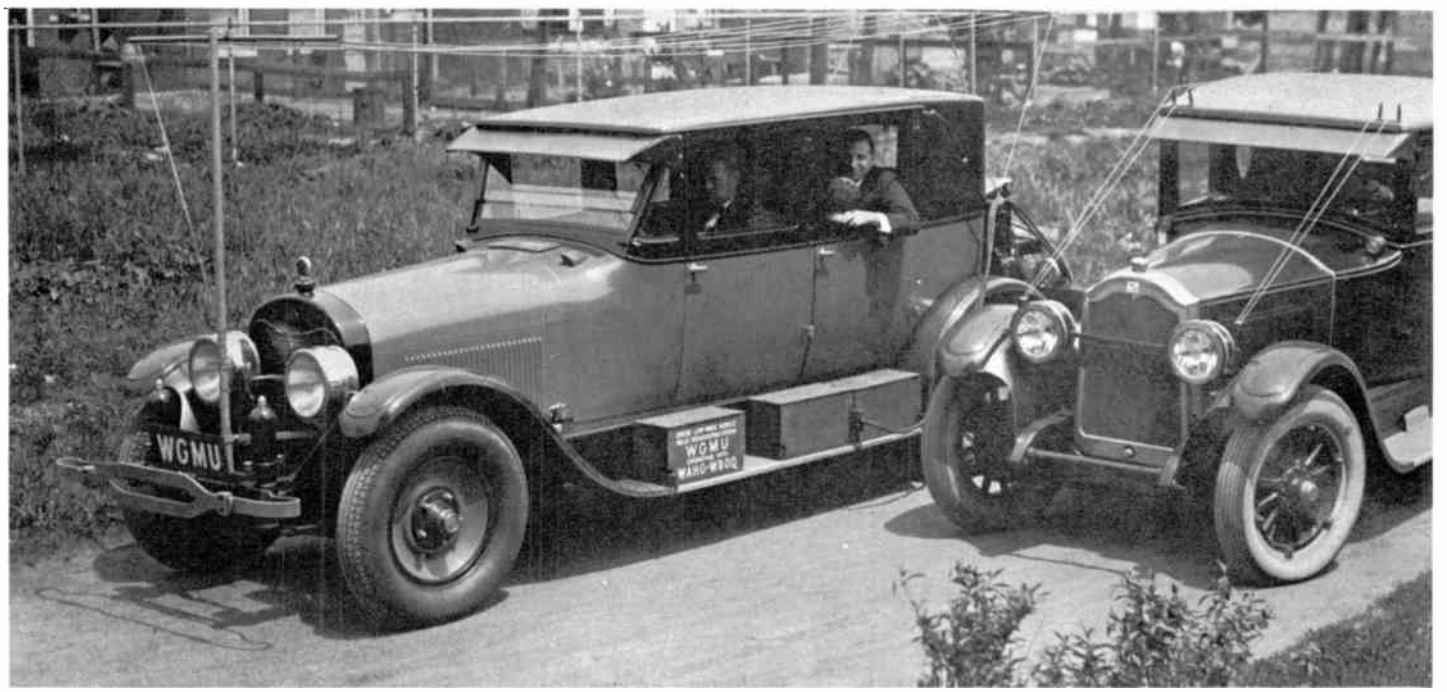
In 1952 he was presented with the Armstrong Medal of **The Radio Club of America,** and came to New York to accept the honor and to renew the many friendships he had made in his scientific home-away-from-home, the USA. The occasion was truly memorable; H.J. gave us at first hand much of the data in this short review. A portion of this in his own inimitable voice and breezy style, admirably British, is preserved in a disk recording given to every person who attended the **Radio Club Golden Jubilee Banquet** in 1959.

The world can produce only one **Henry Joseph Round;** his memory will live forever in our hearts and in our thoughts. We salute you, H.J., and wish you God speed to Valhalla with all our love and admiration, not only for your wireless, but also for your humanity as a fellow-man. *"Well done, thou good and faithful servant." May your spirit live forever.* 73 OM

RARE PHOTO WANTED

Anyone possessing a photograph of DeForest's Audion flame detector is urged to contact Julian Sienkiewicz, care of Davis Publications, 505 Park Avenue, New York, N. Y. 10022 (telephone 212-PL 2-6200). He wants to make a copy of the photograph and will return the original to its owner.

ARE YOU IN THIS PICTURE? These are the members and guests who attended the 58th Anniversary Banquet on December 1, 1967. Jack Poppele was the master of ceremonies and Fred Feldman of WOR put on a great audio-visual show.



MOBILE COMMUNICATIONS 1924

This mobile radio station was used as a part of Alfred Grebe's station WAHG during the early days of broadcasting. The LINCOLN carried a 50 watt transmitter, WGMU (the G for Grebe and the MU for Dr. Mu). The receiver installed in the BUICK coupe was owned by Ralph R. Batcher, design engineer for the Grebe Company at that time. The receiver is a three stage TRF type with a front end "tickler" to increase sensitivity, and operated from a four turn loop that surrounded the whole car.

This combination figured in many public events programs of WAHG—such as racing at Belmont and Jamaica tracks, polo matches, elections, and many of the fantastic stunts dreamed up by imaginative promoters of the time to help fill up the weekly Saturday radio supplements carried by metropolitan newspapers of that era to promote public interest in this "new" radio art. These included such items as the first-hand reporting of the siezure of rum-running boats, parades, fires, etc.

Dr. John Bertrand Johnson, discoverer of thermal (Johnson) noise, receiving the Armstrong Medal at the 58th anniversary celebration banquet of the Club on December 1, 1957. The presentation was made by Club President Harry Houck. At the far right is Jack Poppele, club vice president, who served as master of ceremonies.

GUNTHER NEW ARMSTRONG FOUNDATION HEAD

Mr. Frank A Gunther, president of Radio Engineering Laboratories Division (REL) and executive vice president of the parent company, Dynamics Corporation of America (DCA) was recently elected president of the Armstrong Memorial Research Foundation which honors the memory of Major Edwin H. Armstrong. In addition to honoring his memory, the Foundation has the following purposes: to help perpetuate the principles that guided Major Armstrong in a life devoted to basic research in electronics; to aid the engineers and scientists capable of performing basic research in electronics and related fields of science.

To accomplish the above aims, the charter of the Foundation provides that it may: make grants of funds and property to Columbia University, particularly to the School of Engineering; award scholarships and fellowships to graduate and undergraduate students found worthy of assistance. The Foundation may also allocate funds or property to institutions, groups or persons not affiliated with Columbia University for educational and scientific purposes, including the preservation and commemoration of the inventions and research of Major Armstrong. Awards of these types are made yearly by the non-profit organization.

RADIO OLD TIMERS COCKTAIL PARTY SET

On the evening of Thursday, June 13, a Radio Old Timers Cocktail Party will be held at the New York Hilton Hotel as part of the program of National Electronics Week.

NEW SARNOFF BOOK

McGraw-Hill has just announced the publication of "Looking Ahead: The Papers of David Sarnoff" which is priced at $9.95.

LETTERS TO THE EDITOR

Editor:

Your inclusion of George Clark's "A Christmas Story of Years, Towers and Oscillations" brought back a nostalgic flood of memories of a long, family friendship with George which began back in 1909. He was then the Navy's "Sub-inspector of Wireless Telegraphy" and I was first a wireless operator then operator in charge (at 20) at QL, later NAL, Washington Navy Yard. There I assisted in his tests of all new wireless equipment and eagerly absorbed his very helpful teachings of advanced theory and measurements, which were not given at the Navy's Brooklyn Yard Electrical School.

It was George who, with S. C. Harper, chief of Naval Communications, offered me the job of "Expert Radio Aide for Aeronautics" (Civil Service) when I left Purdue University to develop aircraft radio at Pensacola, Florida in 1916.

In later years when he was with RCA in New York City and I with my wife and two pre-teen daughters lived in Short Hills, New Jersey, he built a week-end retreat in near-by Flanders. This close proximity developed a strong family friendship.

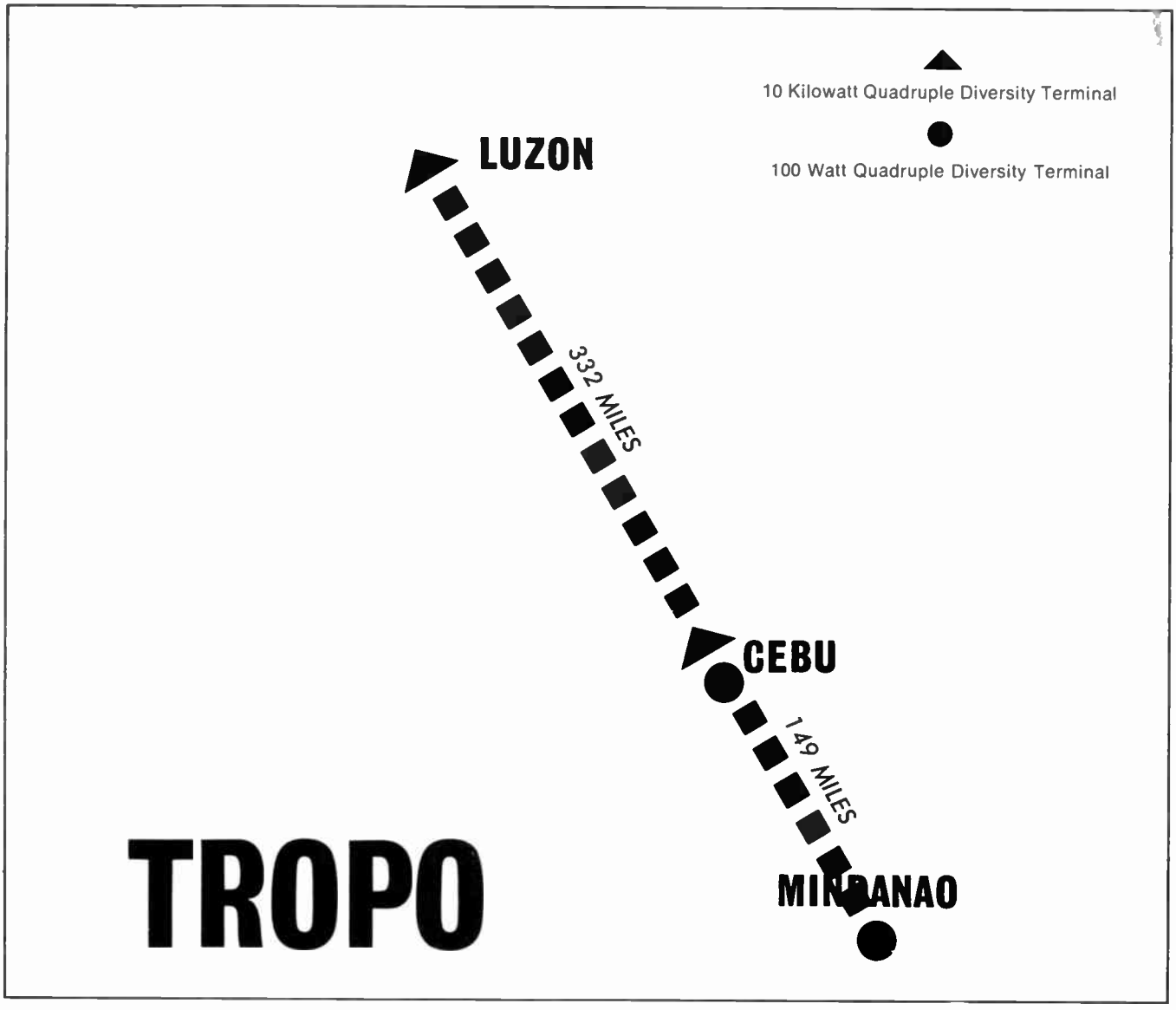
Any one who really knew George felt a strong kinship with a many sided genius, technical, literate, philosophical. We never destroyed a single one of his letters, all gems of whimsical cleverness worthy of the "New Yorker", many too personal for public display.

I've just, out of curiousity, put a fat manila envelope on our kitchen scale: one and a half pounds of distilled George H. Clark. Many a time I've been tempted to induce someone to publish them for the benefit of all of those who knew him.

Although, at this distance from New York City we still get Christmas cards from his dear Alice. If ever you get down this way come and see George's jewels, maybe you'd like to use some.

73

Ben Miessner



...in the Philippines

Added communications capability for the Philippines, again provided by Radio Engineering Laboratories (REL).

For over a decade, in fact, REL has played a major role in providing improved commercial and military communications for the Philippines.

Now, The Clavecilla Telecommunications Corporation has selected REL tropo scatter equipment for a nationwide quadruple diversity system linking the Islands of Luzon, Cebu, and Mindanao. Spanning some 481 miles in two giant over-the-water leaps, the system will operate in the 1700 to 2400 MHz range, with an immediate 60 channel capacity.

When installation is completed with technical assistance from REL, terminals for the new commercial system will be located at Tagaytay, Luzon; at Cagayan De Oro, Mindanao; and at the repeater site on the Island of Cebu.

Yes, REL means experience *and* performance that gives an added measure of assurance for every assignment . . . *every time.*

REL will welcome an opportunity to discuss your present and potential multichannel requirements. We will also be pleased to send you technical data plus the current issue of REL's "Credentials in Tropo Scatter". Please write:

RADIO ENGINEERING LABORATORIES DIVISION
Dynamics Corporation of America
Long Island City, New York, 11101

DCA

Proceedings of The Radio Club of America

Volume 35 No. 1 Oct. 1959

Founded 1909

GENERAL REVIEW OF MISSILE TELEMETRY

by DALE SAMUELSON

Sales Manager, Instrumentation Division

Applied Science Corporation of Princeton

—o—

AN ACCOUNT OF THE DISCOVERY OF JUPITER AS A RADIO SOURCE

by K. L. FRANKLIN, Associate Astronomer

American Museum—Hayden Planetarium

—o—

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from LLOYD JACQUET

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PROCEEDINGS

OF THE

RADIO CLUB OF AMERICA

Volume 35 October 1959 No. 1

GENERAL REVIEW OF MISSILE TELEMETRY

by DALE SAMUELSON

Sales Manager, Instrumentation Division

Applied Science Corporation of Princeton

1. INTRODUCTION

In reading your morning paper it sometimes may appear that the only reason for firing a missile is just to see whether it will leave the pad or not. Very seldom is there any mention of what the engineers, who have spent many weeks, months and years in preparation for this moment are actually trying to determine.

So far in the history of American missile building, the only reason for firing has been generally to gather data to determine the actual operating characteristics of the missile as it is launched and moves on its directed course through space.

As you know, during a complete schedule of firings, the goal is to determine what happens to every component, structure, and section of the missile frame, its power plant, and the guidance system, computers and other electronic elements that go to make up the overall missile. The gathering of all this information, which in some cases may encompass hundreds of different pressures, temperatures, vibrations, stresses, strains and other physical and electrical phenomena, and the transmission of this composite of data, followed by its reconversion to a logical and usable form on the ground, is covered by the general phrase "missile telemetry."

In the complexity and great quantities of telemetry equipment required for such a firing, even the instrumentation engineer finds it difficult to keep in mind his prime purpose. This purpose is to provide to the missile design engineer in his laboratory back in the engineering department the new empirically determined facts and statistics he needs to carry on his assignment of producing as fully qualified missile as possible.

2. TELEMETRY HISTORY

Missile telemetry is an outgrowth of telemetry that was initially developed for piloted aircraft use. In the earliest days of flight testing of manned aircraft--those days when manned aircraft was in model T form--it was the job of the pilot to take notes of his instrument readings as he went through his predetermined tests. Later as the aircraft became more complex the pilot had a full time job just flying the airplane. Sometimes a second man went along to make notes on what was happening, and later a system of photo panels was introduced by which a movie camera was placed in the cockpit with the pilot to take photographs of the instrument panel readings. The system of photo panel is still used to some extent by small aircraft firms.

The introduction of the jet plane brought about requirements nearly as stringent as those found in today's missile.

3. NEED FOR TELEMETRY

Actually, today telemetry is used for two purposes. The prime one, of course, is to provide a complete documentation of the actions and reactions of a missile or aircraft under all flight conditions to aid in the efforts to either prove or improve its design and construction.

A second important use of telemetry in manned aircraft is to provide an increased level of safety for the pilot.

In the case of modern manned aircraft where the pilot does not have control over what may be going on in various parts of his plane, telemetry is used as a safety precaution. (Illustration #1.) This is something of a posed picture showing a man on the ground watching changes in the plane's parameters while the pilot puts it through its tests. On various monitor scopes and strip charts he is able to see what is happening to temperatures, pressures, stresses and strains that are taking place in the aircraft when the pilot puts the plans through maneuvers where these parameters are stretched to their maximum, and when the situation may be getting dangerous he can warn the pilot either by requesting

Illustration # 1

that he not put the plane through a certain maneuver again, or that the pilot return to the ground before he finds himself in a situation he cannot get out of. (Illustration #2.) Here is seen on a 17" scope what is happening in real time to 45 channels of information from a plane or missile.

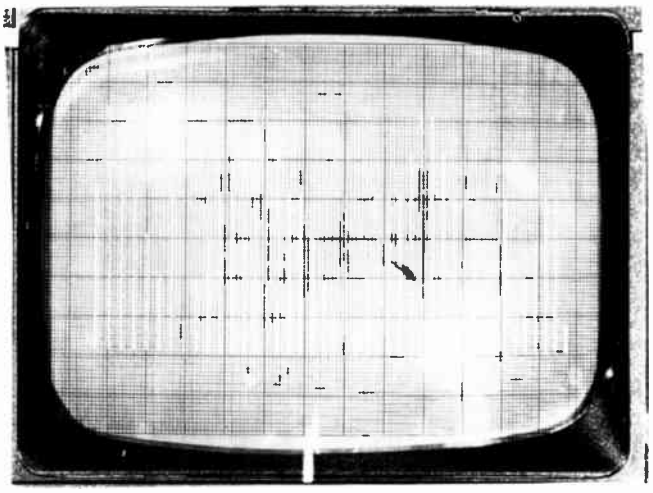


Illustration # 2

So, on the ground, while a flight is taking place, actual reduction of the information can be obtained. It is possible to actually follow the changes taking place in the missile during real flight time and simultaneously record the data for later play-back.

4. TELEMETRY STANDARDS

Shortly after World War II, when it became apparent that the only practical way of handling the data being gathered for a study from aircraft and missile flights, would be by transmitting it over a radio link, the Research Development Board set up basic standards for use of an FCC allocated frequency range from 216 to 235 mc. This board, in order to maintain some basic consistency within the industry, and based on a concensus of the industry at that time, developed a set of basic telemetry standards commonly known as RDB (Research Development Board). These standards still exist today although they are now under control of the IRIG or Inter-Range Instrumentation Group made up of the heads of flight test at the various flight test centers, such as Patrick Air Force Base, Holloman Air Force Base, Kirtland, White Sands, China Lake, Pt. Mugu, and the other missile and aircraft flight centers. They are now known as IRIG standards.

As a result, the development of telemetry equipment based on these standards has been held within fairly strict limits. Certainly there are many advantages to having such a standard set up for the industry. There also has been considerable criticism aimed at such standards because it can be argued that in some cases it actually has stifled new developments. The industry has lived with them and as a result there is a high degree of interchangeability and flexibility of the available equipment. Any airborne equipment built to these standards, for example, is compatible with ground based equipment at almost any U.S. flight test center.

Before we go further, however, we'll review some of the fundamentals of a telemetry system.

5. TRANSDUCERS

Before data can be transmitted or telemetered to the ground it must be "prepared" or converted to a standardized form which can be handled by the telemetry system. The general term used to describe these elements for the transformation is "pick-up" or "transducer." The standards of the industry have been designed so that the output of a transducer is a voltage ranging normally from 0 to 5 volts or between +2 1/2 volts, representing, percentagewise, the range of the physical input to the transducer.

For example, the parameter being measured may be a pressure that has been predetermined to range somewhere from 0 to 100 pounds. The required transducer is an element that will convert proportionately the measured pressure to a voltage output ranging from 0 to 5 volts or from -2 1/2 to +2 1/2 volts. There are literally thousands of different types of pick-ups on the market today to handle every conceivable type of physical and electrical condition. Of each type there are units to handle many different ranges under various conditions. It is the job of the instrumentation engineer working on the mis-

sile to determine exactly which transducers on the market best fulfill his requirements.

As a result, all inputs to any type of telemetry set are voltages in a standard range, or at least are all adjusted up or down before any frequency mixing or coding takes place.

In addition to these "high level" transducers, those ranging generally in the voltage area from 0 to 5 volts, there are also many requirements for handling what is called low level data. This data is primarily from thermocouples for measuring temperatures and from strain gages where the outputs are in the microvolt and millivolt range, the maximum usual output voltage being around 15 to 50 millivolts. In the past it has been necessary to install an individual amplifier for each one of these low level probes or transducers, but systems are now becoming available which make it possible for them to be handled as low level data directly.

Now let us take a look at the basic standards set up for the most commonly used telemetry system--the FM/FM system which basically is a frequency division system, a method of FM modulating an FM carrier. (Illustration #3.) First, here are the basic RF carrier and Modulation Standards as set up for the telemetry links.

R-F Carrier and Modulation Standards

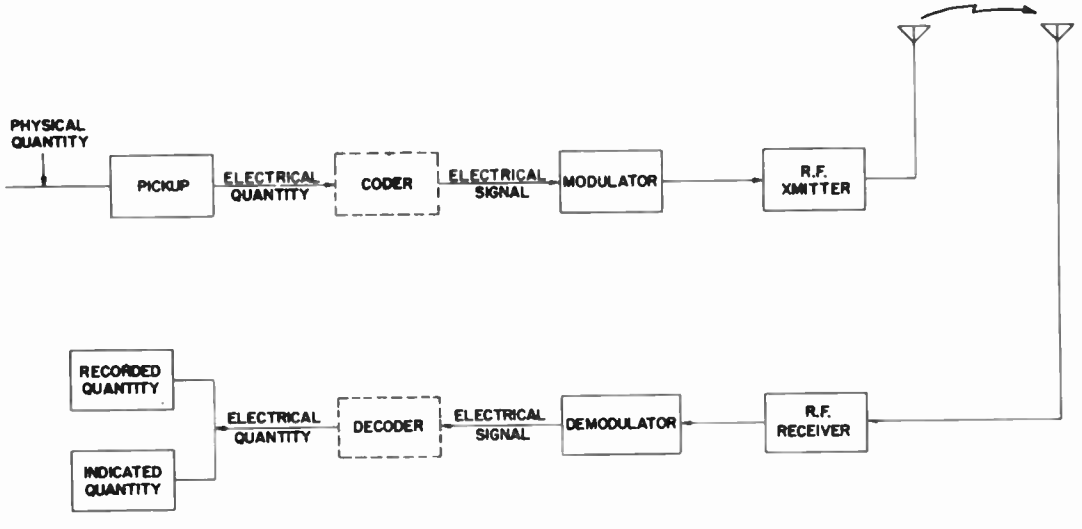
	System Type	
	f-m/f-m or f-m/p-m	pdm/f-m
R-f carrier freq	216 to 235 mc	216 to 235 mc
Carrier stability, percent	±0.01	±0.01
Type of modulation	frequency or phase	frequency
Carrier deviation	±125 kc, max	±25 to ±45 kc
Power	100 w, max	100 w, max
Spurious radiation	>60 db below carrier power	>60 db below carrier power

Illustration #3

6. FM/FM TELEMETRY

In the FM/FM system, each transducer voltage output is used to deviate proportionally the frequency of a FM subcarrier oscillator. (Illustration #4.) This next slide shows the basic block diagram for a radio telemetry system. The various subcarriers then are mixed and this composite is used to modulate the FM transmitter.

(Illustration #5.) As can be seen by this chart, there is considerable wastage of RF spectrum. Of the total 80 Kc available, little more than 3% of the total spectrum is available for use in transmitting data. With this amount of spectrum available, it is of primary concern to the flight test instrumentation engineers to make maximum economic use of what is available.



BASIC SCHEME OF RADIO TELEMETRY

Illustration #4

Subcarrier Bands

Band	Center Frequency (cps)	Max Deviation (percent)	Freq Response (cps)
1	400	± 7.5	6
2	560	"	8.1
3	730	"	11
4	960	"	14
5	1,300	"	20
6	1,700	"	25
7	2,300	"	35
8	3,000	"	45
9	3,900	"	59
10	5,400	"	81
11	7,350	"	110
12	10,500	"	160
13	14,500	"	220
14	22,000	"	330
15	30,000	"	450
16	40,000	"	600
17	52,500	"	790
18	70,000	"	1,050
A	22,000	± 15	660
B	30,000	"	900
C	40,000	"	1,200
D	52,500	"	1,600
E	70,000	"	2,100

Bands A through E are optional and may be used by omitting adjacent bands as follows:

Band Used	Omit Bands
A	15 and B
B	14, 16, A, and C
C	15, 17, B, and D
D	16, 18, C, and E
E	17 and D

Illustration #5

Under this system the maximum frequency response of any single channel is 2100 cycles which can be transmitted on the 70 Kc subcarrier channel when using a deviation of plus or minus 15%. When using plus or minus 7 1/2% deviation the maximum frequency response is just a little over 1,000 cycles.

It was determined when the IRIG specifications were originally set up that a modulation index of 5 would be used in order to provide a good signal to noise ratio. As an example of what this means, the 70 Kc channel, the highest frequency channel available, with a deviation of 7 1/2%, provides an actual deviation of approximately 5 Kc. Dividing this 5 Kc by the modulation index of 5 gives us the maximum frequency of the data that can be transmitted over that channel, in this case 1,000 cycles. A thousand cycle channel of data normally is used for handling vibration data. This, in manned aircraft, was about as high as any vibration that existed. Today, in such planes as the B-58, which is a relatively small plane with 4 powerful engines, vibration and accoustical noises must be studied that range up to 15 to 20,000 cycles. With the IRIG standards there is basically no way of transmitting this type of data to the ground.

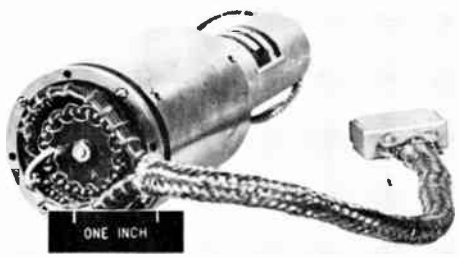
As the overall business of transmission of data has developed, it has been found that approximately 90% of the required information actually has the frequency response of around 2 to 3 cycles, that is that the maximum frequency of the channel of data is 2 or 3 cycles. The lowest subcarrier is the 400 cycle channel which will handle one channel of data which could range as high as 6 cycles. Obviously, other means had to be developed for handling large quantities of low frequency data. Conversely, in most flight tests about 10% of the data--the vibration and other high frequency data requires 90% of the spectrum available.

As a result of this situation, sampling systems were developed.

7. SAMPLING SYSTEMS

The earliest sampling system was that in which the RF carrier was modulated directly by what is commonly called commutated pulse amplitude data (Illustration #6.) A commutator basically is a high speed mechanical wiper which sweeps over a relatively large number of contacts which are connected to transducer outputs. This commutator's wiper moves from point to point producing a pulse amplitude output in serial form modulating the carrier.

IRIG standards were also set up for handling this low frequency data by commutation. A generally used standard for pulse amplitude, which was used to directly modulate a subcarrier oscillator, was a 30 point switch on which the wiper rotated 10 times in a second. This produced a wave train of 300



VIEW OF MINIATURE
COMUTATOR
MODEL DSS-I
PROTOTYPE

Illustration #6

samples per second, the pulses all being of constant width and with amplitude varying according to the transducer output voltage level. Normally this 300 samples per second output was used on the 22 Kc subcarrier. (Illustration #7.) Here is seen the IRIG standard for Pulse Amplitude commutation on FM subcarriers.

Commutation Specifications

No. of Samples Per Frame	Frame Rate (Frames per second)	Commutation Rate (Samples per second)	Lowest Recommended Subcarrier Bands cps
18	5	90	11,500
18	10	180	22,000 (± 15 percent) or 30,000 (± 7.5 percent)
18	25	450	30,000 (± 15 percent) or 70,000 (± 7.5 percent)
30	2.5	75	10,500
30	5	150	22,000 (± 7.5 percent)
30	10	300	22,000 (± 15 percent) or 10,000 (± 7.5 percent)
30	20	600	40,000 (± 15 percent)
30	30	900	70,000 (± 15 percent)

Illustration #7

The accuracy of this pulse amplitude data, because of the general state of the art, has not generally been good up until the last year or so. In order to overcome the difficulties of handling pulse amplitude data with its inherent problems of drift and its susceptibility to noise, a system of pulse width or pulse duration modulation was developed, which has been used as a standard by most aircraft and missile manufacturers for the past 5 to 6 years.

PULSE WIDTH

In this system of PDM a number of improvements became possible: In the first place, it was possible to increase either the number of channels that the system was capable of handling up to as high as 90; or conversely to increase the number of samples made per second of each channel. In this system the varying amplitude pulses were converted to constant amplitude pulses of varying width. The basic device used for this conversion is called a "keyer" which is so designed that zero amplitudes are converted to widths of approximately 100 microseconds, and the full scale, normally 5 volts amplitudes, are converted to widths of approximately 650 microseconds, with 900 total samples per second set up by the IRIG standards as the basic standard for pulse width. IRIG standards therefore indicated that for pulse width, 30 channels could be handled, each being sampled 30 times per second, for a total of 900, or 45 channels could be handled, each one being sampled 20 times per second for a total of 900, or 90 channels could be handled, each one being sampled 10 times per second, for a total of 900. (Illustration #8.) Here is illustrated the PDM/FM standards as they are set up by IRIG.

PDM/FM Standards

No. samples/frame	30	45	60	90
Frame rate, frames/sec	30	20	15	10
Commutation rate, samples/sec	900	900	900	900
Min pulse duration, T_{min}	90 ± 30 μsecs			
Max pulse duration, T_{max}	700 ± 50 μsecs			
Pulse rise and decay times	10 to 20 μsecs (constant to ± 3 μsecs)			

Illustration #8

Nine hundred samples per second provides approximately 1100 microseconds for each sample, and as we said before, the width of each sample in pulse width form after conversion was from 100 to 650 microseconds.

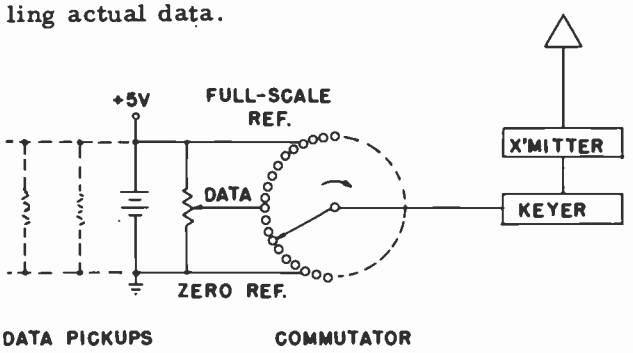
SAMPLING THEORY

The basic question of how many times you must sample data in a given period of time, such as a second, in order to reproduce the data to a high accuracy on the ground, is one that has been debated since the conception of sampling techniques. Theoretically, it has been determined by the experts such as Dr. Lawrence Rauck of the University of Michigan, that a perfect sine wave should be reproduced to within 1% accuracy when sampling it only about twice. In hardware form, however, it has been found that 5 to 6 samples per cycle of the data must be sampled to assure the instrumentation engineer that he is reproducing the information on the ground to an accuracy of 1% or less of the actual data as it occurred in flight.

If, under maximum standard conditions, therefore, you sample a channel of data 30 times in one second, and assume that you want to sample 5 times per cycle, you therefore know you can handle data with a frequency response of up to 6 cycles.

CHANNEL USAGE

Let us consider what we call a 45x20 system, twenty samples of each channel of 45 channels of data per second. In order that the automatic decommutation equipment located on the ground follow accurately the samples of data without getting them mixed up, confused, and otherwise eliminating the reason for telemetering information, two channels are held in abeyance for synchronization. The real success of pulse width came about by using two additional samples for providing information on the zero and full scale limits, leaving a total of 41 channels for handling actual data.



ELEMENTS OF PW DATA TRANSMITTING SYSTEM

Illustration #9

(Illustration #9.) Normally, the transducers are all powered from a central power supply. By actually transmitting both the ground and the high side of this supply, as shown in this slide, and having an automatic system in the ground station which could look at the zero and full scale input, the drifts that might occur in the system can be automatically compensated for. (Illustration #10.) This slide shows the pulses after they pass through the keyer and how the zero and full scale pulses appear, as well as those for synchronization. The ground station equipment recognizes the zero and full scale values, knows what they should be, compares this information with each of the individual data channels, and corrects for any changes that have taken place. If there is a drift in power supply level, this is even compensated for. As a result the pulse width system was the only one percent accuracy system available for the past few years, and just recently it has been improved to the extent that it is a 0.5% accurate system.

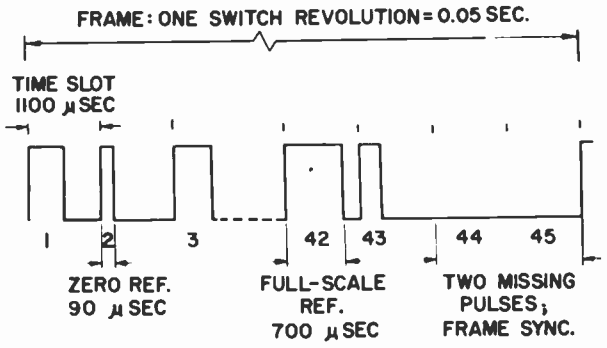


Illustration #10

9. PDM/FM/FM

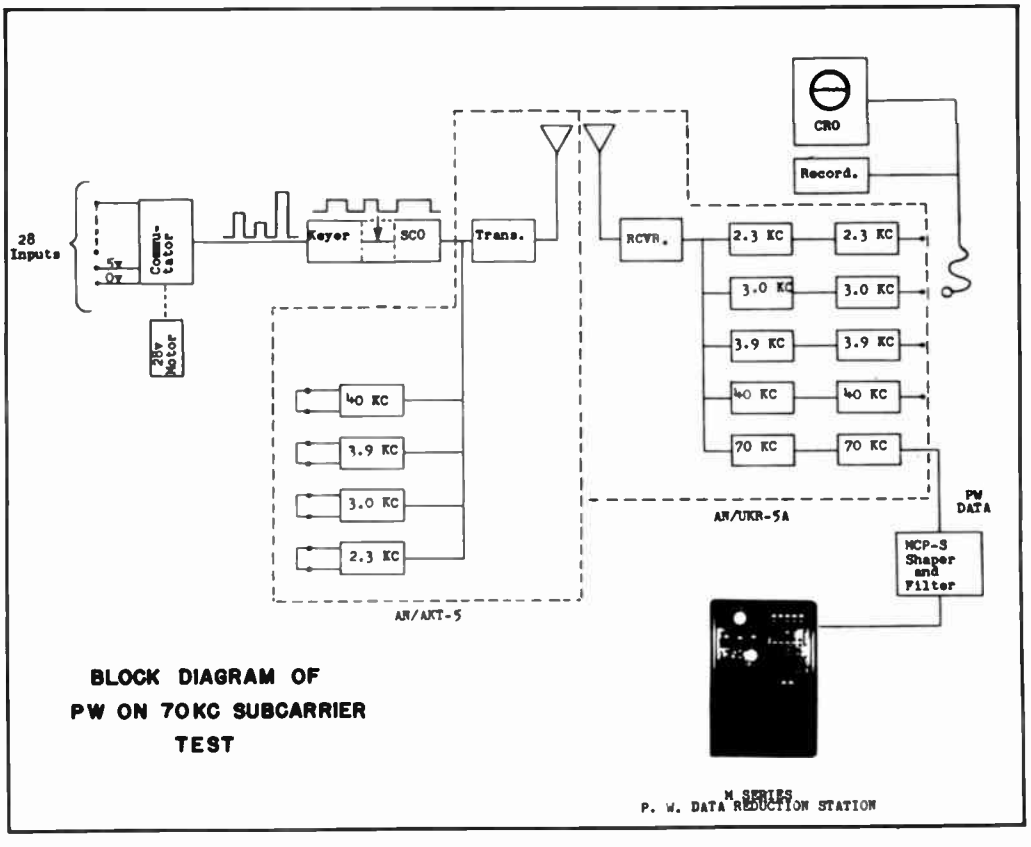
As systems became more complex it was necessary to transmit both higher frequency data, and large quantities of low frequency data, so a marriage was performed between the FM/FM and PDM/FM system. A 900 sample per second pulse width train is very easily transmitted over the 70 Kc subcarrier, and a few people have been transmitting it quite successfully over the 40 Kc channel. So, in addition to being able to transmit 10 to 15 channels of fairly high frequency data, it is possible to transmit up to 180 or more additional channels of low frequency data over a single RF link. We refer to these systems as PDM/FM/FM systems and the overall signals as a composite signal. (Illustration #11.) How this type of system works out in block diagram form is shown in this slide. The transmitter normally used is a FM crystal-controlled transmitter, of 2 to 5 watts followed by power amplifiers delivering 100 or more watts to the antenna, usually a flush-mounted cavity type. (Illustration #12.) This picture shows a complete PDM/FM/FM package as used in the Corporal missile.

GROUND EQUIPMENT

Up to this time we've talked entirely about the equipment that goes into the missile or aircraft itself. Obviously the equipment in the aircraft by itself does not make up a total system. It is, and must be designed to operate with equipment on the ground.

Basically, on the ground, the data is received through an extremely high gain antenna system, ranging from tri-helix antennas with 10 db or more gain to 60 foot diameter automatic tracking antennas with up to 28 db gain. The receiver is usually crystal-controlled with switchable IF Bandwidths. In almost all cases the received data today is recorded on magnetic tape for later analysis. Simultaneously, however, it may be automatically reduced and played out on strip charts or converted to digital form.

The reduction, demodulation or decommutation process, as it is variously called depending on the specific system being considered, reconverts the original signal to a form that can be monitored or put through further analysis.



BLOCK DIAGRAM OF PW ON 70KC SUBCARRIER TEST

Illustration #11

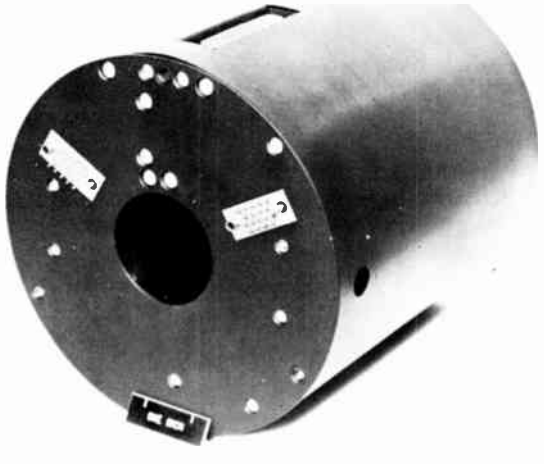


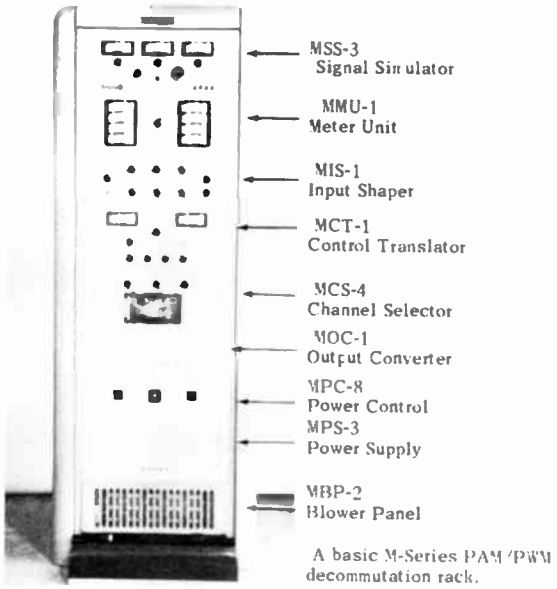
Illustration #12

In FM/FM systems, the composite signal from the receiver is demodulated when put through corresponding discriminators.

If it is a composite PDM/FM/FM or PAM/FM/FM signal the discriminator output representing the commutated or sampled data is put through a further decommutation processing, or possibly directly digitized using the computer to handle the automatic zero and full scale correction.

(Illustration #13.) This view is of a completely new combined PDM and PAM ground station recently introduced by ASCOP. Not only does it handle all IRIG rates, but also all sampling rates from 27 to 3600 sps, and converts to analog form.

(Illustration #14.) Here is seen a typical Pulse Width decommutation system as installed at Edwards Air Force Base.



A basic M-Series PAM/PWM decommutation rack.

Illustration #13

Decommutation stations for PDM or PAM accept the data, reshape the pulses, correct for any transmission changes using the zero and full scale channels, and put the pulses into a unit generally called a channel selector. This channel selector, working off the synchronizing pulses, distributes the individual pulses into parallel form to gates or storage units. The outputs of these storage units then are fed directly to strip chart recorders, oscillographs, XY plotters, or whatever is required.

The composite pulse width or PAM train may be fed directly after reshaping to a digital converter where they are put into a format compatible with the digital computer which may be available and stored on digital magnetic taps. The higher frequency data from the discriminators can in turn be fed to oscillographs directly, strip charts or digitized for later use in a computer for making mathematical calculations and solving equations.

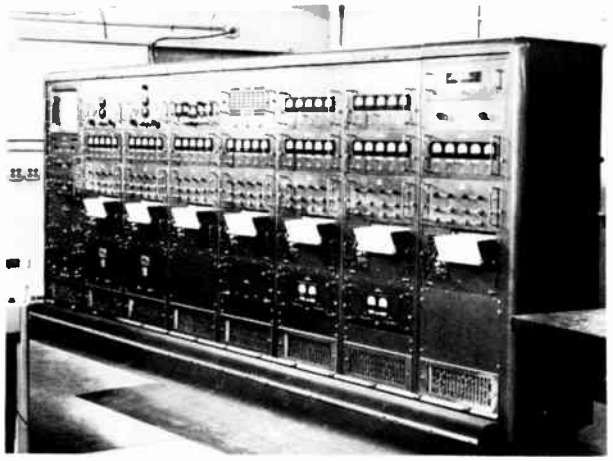


Illustration #14

The tape recorder has come into almost universal usage in the flight test operations. These are highly precisioned pieces of equipment. Once the data is stored it can be played back at any time to completely simulate the flight as it originally took place. (Illustration #15.) This slide shows one of the Ampex Corporation's most recently introduced instrumentation tape recorders. It will handle up to 14 tracks of composite telemetry data.

Nearly every data reduction station today has both analog and digital equipment. Analog equipment is required for quick look and real time editing of the data in order that only those items or those portions of the flight that are valid are put through the computer, which is an extremely expensive piece of equipment

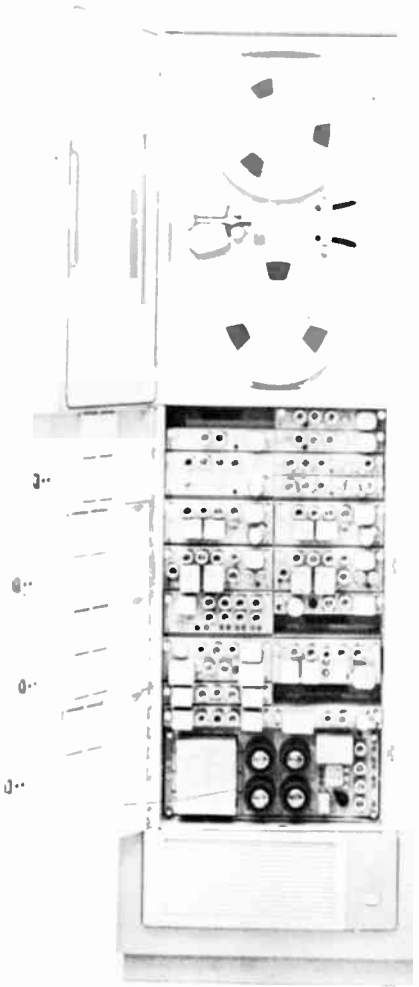


Illustration #15

to use. Some of the data then is digitized to carry out the necessary mathematical calculations and to check the basic parameters of the missile.

So far we have just discussed some of the means and ways that have been developed in order to handle this overall complex problem of obtaining information on the ground as to what's going on up above. Obviously with today's ICBM's, earth satellites, and the forthcoming interplanetary space exploration, the industry is faced with many problems.

10. TELEMETRY PROBLEMS

One of our first problems is that of bandwidth conservation. The FCC originally allocated a spectrum range from 216 to 235 Mc. Today this range has been completely outgrown. The number of flights has greatly increased, and with the increasing complexity of the missiles, each one of them is carrying much more equipment, sometimes 5 or 6 transmitters each. The allocated frequency range has now been expanded up to 265 Mc, leaving considerably more room. Also, new frequency ranges in both the 1500 megacycle and 2200 megacycle areas are being allocated. Even then the complete swamping of the spectrum is taking place by the masses of data that the engineers are finding necessary to transmit back on the newer, more sophisticated equipment. And as we mentioned before, there is the problem of handling new high vibration, accoustical type data where there has actually been no frequency made available.

A second requirement has been the ability to improve the accuracy of some of the measurements. Altitudes and total distance away are examples of parameters where it was found important that measurements of approximately 0.1% accuracy is necessary. Simultaneously a great amount of the data does not require an accuracy greater than 5%. (Illustration #16.) Here are the accuracy needs for one typical missile: The overall schedule called for transmission of 100 channels of 3 cycle data each with an accuracy of better than 5%. It called for transmission of 90 channels of 100 cycle data of which most of the channels need not be better than 5%, and few were necessary to be better than 2%, a few better than 1%, and 6 of the 90 required an accuracy of less than 0.1% or better. It was also necessary to transmit 8 channels of 8 Kc data and one channel of 10,000 cycles per second data. These channels also could be transmitted within 5% accuracy.

	Number of Channels	Frequency Response per Channel	Accuracy Needed
1.	100	5 cycle	5%
2.	90	100 cycle	"Most" at 5% "a few" at 2% "a few" at 1% 6 at 0.1%
3.	10	3 Kc	5%
4.	1	20 Kc	5%

TYPICAL MISSILE REQUIREMENTS

Illustration #16

Reliability and life of the equipment has always been an important aspect. In almost every case the only reason for firing any missile has been to provide data. If it should happen, and it has from time to time, that telemetry equipment failed to work, the whole point of the firing is lost, along with the hundreds of thousands if not millions of dollars, invested in building the missile. The life of the equipment must be long enough to carry it through all the preflight checkouts and then the actual missile test. Individually, this does not sound like a difficult order. Statistically, however, the equipment must be designed to have a life many times longer than it actually will even be run to make sure every package of telemetering equipment will last as long as necessary, and that every single component operate properly.

Environmental conditions are an area where considerable new thought has had to be placed. With increasing high G levels, higher temperatures, extreme vibration, the actual telemetry equipment itself has had to be as rugged as the missile.

Size and weight has continued to be a battle as the manufacturer is forced to put more and more sophisticated gear in less and less space. In our long range missiles every pound added decreases its firing range as much as 5 miles. As a result, miniaturization and transistorization has been a continuous goal.

The overall telemetry package must also be designed to take a very minimum of power and here again transistorization has come into play.

As we pointed out before from a little different approach one of the major present day problems has been that of handling higher frequency data.

The requirements of the newer missiles and aircraft are such that there has been no facility available for the transmission of high vibration and accoustical type of information.

Certainly, as a result of all these efforts in conserving bandwidth, improving accuracy, improving reliability and life, upping the environmental capabilities, decreasing the size

and weight, decreasing the power consumption, we are led to one general conclusion. This is that within the past year telemetry equipment prices have generally increased considerably. In my own company our most recently introduced line of equipment is selling for approximately twice the cost of equipment of a similar type a year ago. But is designed with all silicone transistors, in miniaturized, modular form for long life, high G capability, great vibration and for temperatures to 100°C and up, and it costs more money to build it that way.

11. SOLVING THE PROBLEMS

For the past few minutes we discussed the major problems which we are facing in the telemetry industry. Now I would like to point out some of the newer methods that are being adopted to overcome these problems.

12. STATISTICAL EQUIPMENT

At our company we took up the problem of bandwidth conservation approximately a year and a half ago as one of the major problems that needed a solution. We have approached this old subject in a completely unique manner, one which has never really been given serious consideration before.

Taking our lead from the knowledge resulting from information theory and statistical analysis we are now just beginning the marketing of equipment which makes it possible to analyse the high frequency data outputs in the air, and to transmit their result to the ground as low frequency data. The information that is being transmitted to the ground is the information which is normally sought out from this high frequency vibration after it is on the ground. However, by handling a 10,000 cycle frequency vibration, for example, in this manner, the output can be transmitted as a channel of 3 or 4 cycle data. This not only relieves the instrumentation engineers of the tremendous job of analyzing the vast amounts of data on the ground, but gives them immediate answers to the questions they are seeking. It was, for example, determined that from vibration data only two factors are really important. This is the proper spectrum of the data, which is actually a measurement of the amount of power at each frequency interval, and the probability of the existence of any frequency vibration in a given random signal. (Illustration #17.) Here is a slide showing a prototype model of ASCOP's spectrum analyses and amplitude probability analyzer which is presently being evaluated by the Army Balistic Missile Agency in Huntsville, Alabama.

Another item in the statistical analysis equipment is that of a time of occurrence de-

Illustration #17

vice. It was found that in many of these missiles where perhaps five or six transmitters were necessary to handle the data, that some subcarrier oscillators were being used only a very small percentage of the time. For example, it was found that a subcarrier might exist solely to transmit a single transient. Actually, it wasn't the amplidute of the transient that was important, but merely the time that it occurred. By various small transistorized devices these times can now be accurately calculated and transmitted to the ground as very low frequency data, usually on a single pin of a PAM or PDM commutator. (Illustration #18.) The next slide is of a prototype of such a Time of Occurrence Device.

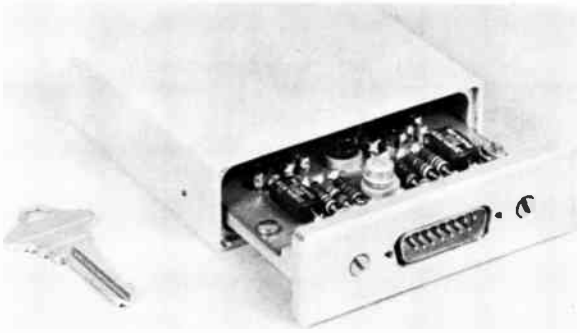


Illustration #18

13. HIGHER ACCURACIES

In order to receive higher accuracies for those few channels where it is necessary, a number of companies are introducing pulse code modulation equipment making use of digital techniques. These systems are based upon sampling at extremely high rates, perhaps 25 to 50,000 samples per second. Each sample is converted to a digital code and transmitted to the ground at extremely high bit rates ranging up to 500,000 bits per second.

As an example, such a system might be

a 100 channel system sampled at 24,000 samples per second or 240 samples per channel per second. Divided out in this way it can be seen that each of these 100 channels can handle data up to approximately 50 cycles, rather than 3 to 5 cycles as in some of the other systems. By putting the data through more than one channel this frequency response can be doubled or tripled. There are numerous advantages to such a system. One of the primary ones claimed by the various manufacturers is that once data is put into a digital code, it retains its accuracy. The basic fact here is that there actually are only a very few channels where such accuracy is required and usually not too many channels carrying 50-200 cps information. Furthermore, the major problem in obtaining a high accuracy is in the transducer itself. Mathematically there is not much gain in taking the output from a transducer, which itself is only 5% accurate, and transmitting it on a 0.1% accuracy system. These new systems generally provide quite easy access to a digital computer. It is necessary, however, for analog display, to go through a conversion system on the ground. Furthermore, they eat up spectrum space at a tremendous rate and generate masses of data which are never needed. They are, however, today in their glamour stage and are undoubtedly going to be used to a considerable extent on some of the newer missiles.

14. MINIATURIZATION

As we mentioned before the packages are becoming much more dense and much more miniature in order to fit the small crevises and corners that remain in a missile for telemetering purposes. (Illustration #19.) Here

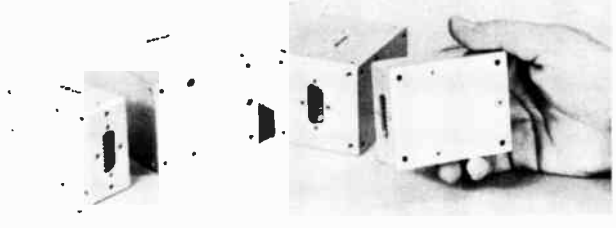


Illustration #19

are shown a completely new modular concept. From these individual, interchangeable units complete packages of various sizes and combination can be made up. (Illustration #20.) This slide shows how such a package can be put together.

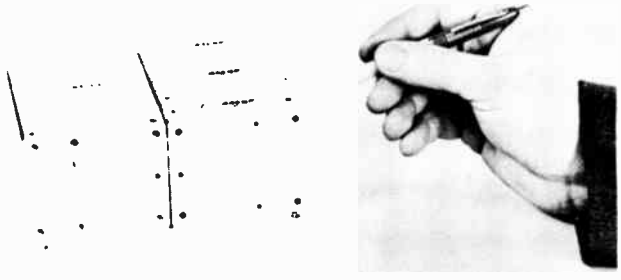


Illustration #20

15. HIGHER R.F. FREQUENCIES

One of the brightest new fields for the telemetry industry will be in the 1500 megacycle and the 2200 megacycle ranges. It is going to be a tremendously costly proposition to the Government to convert to the new frequencies as needed over the next 5 to 10 years, but fortunately, although it appeared for awhile that the telemetry industry would lose the 200 megacycle range altogether, this does not seem to be the situation at present and the millions of dollars worth of equipment at the flight test ranges and the aircraft and missile manufacturers can be used for many years to come.

16. MODERN PAM SYSTEMS

Among some of the newer systems on the market are pulse amplitude type systems which sample at very high rates, some of them up to 40,000 samples per second. I mentioned earlier that pulse width became the adopted standard because of drift and other problems in pulse amplitude systems. Within the past year or so pulse amplitude has finally come into its own and there are highly reliable and accurate pulse amplitude systems on the market now.

In order to save and conserve even more spectrum space, one pulse amplitude system is now out which is known as a non-return to zero system. In this one, even the spaces which would normally exist between two pulses are used for additional information transmission.

17. MODERN PDM SYSTEMS

Pulse width systems are now available up to 3600 samples per second, and there is some talk of systems under study that will handle up to 28,000 samples per second.

18. COMMUTATORS

Probably one of the greatest weaknesses in telemetry systems has been that of the mechanical commutator. Since 90% of all the data to be gathered has been very low frequency data, the mechanical commutator has been one of the key elements in nearly every telemetry system. Because it was mechanical, however, and operated generally at a very high rate of speed, this commutator often became the weakest link in a telemetry system. I do not want to imply by this that the state of the art of commutator development did not keep up with the rest of the equipment, since my company was the original developer of the mechanical commutator. I would be the last to admit this. Tremendous strides have been made in the development of this equipment, but because of the very fact it was a mechanical gadget it remains one of the weaker areas in the system.

Within the past year there has been introduced on the market a line of all transistorized solid state commutators which have proven themselves to be fully reliable. These items, although costly, will undoubtedly become widely used in our missile programs. (Illustration #21.) Here is a view of a typical all electronic Pulse Width Multicoder. This is

Illustration #21

all silicon transistorized, including the commutator. It operates continuously up to 100°C and withstands very high vibration and shock.

OTHER PROGRAMS

There is some talk within the industry of going to other techniques such as pulse position and pulse time systems. So far no company has actually used either of these in a modern form.

19. NEW FM/FM TECHNIQUES

As we pointed out before, the IRIG specifications have been something of a strait jacket, particularly to the adoption of any new FM/FM techniques. One of the methods that seems to have promise is the breaking down of each RF carrier into narrower, equal frequency divisions, perhaps each 100 cycles wide. These then can be used individually to handle relatively low frequency data, or two or more can be replaced by a wider band filter for handling higher frequency data.

20. FLEXIBLE PDM/FM/FM

As we discussed before, the standard for pulse width on FM/FM has been primarily for use on the 70 Kc channel. A major breakthrough also has been on this area, and it is now possible to provide pulse width on any of these standard IRIG, subcarrier oscillator frequencies.

As the subcarrier frequency decreases, the number of samples per second that can be transmitted through it also decreases proportionately, of course.

21. TRANSMITTING EQUIPMENT

By reducing the power and weight of the airborne transmitting equipment and adding greater complexity to the ground-based receiver equipment through the adoption of phase-lock techniques, considerable progress has been made. This not only reduces the weight of the equipment to be carried but also increases the distance over which effective transmission can be successfully carried on. A phase-locked receiver developed by the Jet Propulsion Lab made it possible to receive signals from the Army's Explorer at levels of -150 db. Phase-locked subcarrier discriminators further aid data recovery.

(Illustration #22.) This is a picture of the ASCOP beacon transmitter which is in the Atlas Satellite now in orbit.

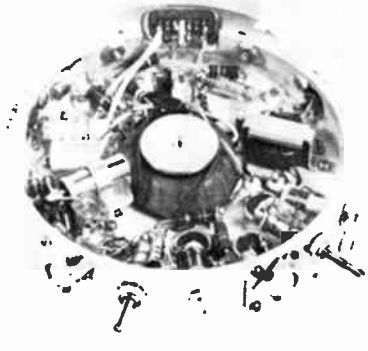


Illustration #22

22. SYSTEMS CONCEPT

As has been developing in the whole armament industry, the systems concept has caught up fully with the telemetering business. As a result, each company in this industry not only sells its own equipment, but has the opportunity and finds the necessity, to sell complete integrated telemetry systems, where they include other companies' equipment, often competitors, in with their own.

These systems may be either airborne systems or ground based systems.

As an example of this type of system, ASCOP, within the last 30 days has signed a contract with the ITT Laboratories, for the ground based equipment required for telemetry over the entire Eglin Gulf Missile Test Range, which is now being just developed. In this system we not only include our own pulse

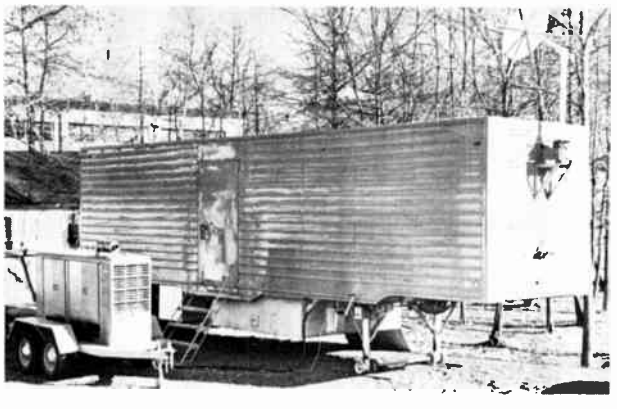


Illustration #23

width decommutators but also include FM discriminators, radio receivers, test equipment and the other items that go to make up an entire system, purchased from other companies. The industry has developed to such a point that unless you sell the complete system, in many cases you will not sell your own equipment at all. (Illustration #23.) Here is illustrated an external view of a complete ground based telemetry system we shipped the first of this month to Patuxent Naval Base, Maryland. (Illustration #24.) This cutaway view of the Patuxent Van Model shows the installation of the FM/FM equipment, the PDM equipment, tape recorder and strip chart recorders. Because this unit is on wheels it can be particularly flexible in its placement and movements. (Illustration #25.) Inside the finished van we can see here the actual equipment and its placement.

23. SPECIAL FORMS OF TELEMETRY

So far we have discussed telemetry in general, how it was developed, some of the present day problems and some of the newer techniques used to solve these problems. There are also special forms of telemetry which, while they do not exactly fall within the definition of transmitting data from one point to another, the industry as a whole, generally categorizes them as such. (Illustration #26.) Shown on this slide is a typical airborne tape recorder, the Ampex 800 which will record up to 14 tracks of information. This is equivalent to up to 1400 channels of telemetering data. The magnetic tape recorder is actually located in the aircraft or missile. This, of course, is not generally possible in large missiles, but in small missiles which can be parachuted to the ground after

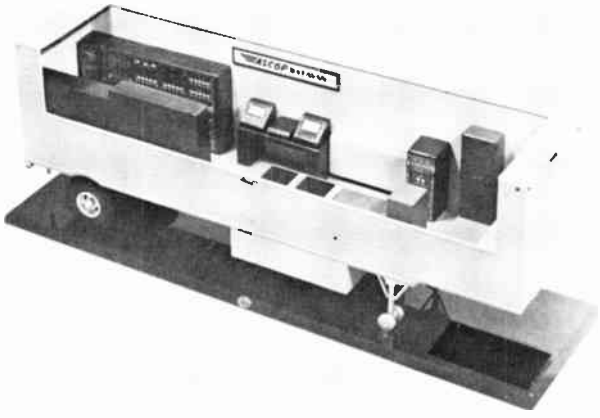


Illustration #24

Illustration #25

Illustration #26

firing, they are being included. In this case the radio link is eliminated, but all other aspects of the system remain the same.

The data from the coding devices and the subcarrier oscillators are mixed and fed into a single track of the tape recorder rather than into a transmitter. This magnetic tape then is returned to the ground where it is played back through the data reduction station just as it would have been had it been transmitted to the ground.

24. CONCLUSION

In the typical data reduction station in today's missile instrumentation center there is so much equipment involved and its complexity is so great that at times there seems to be a tendency to forget the real purpose for its existence. Basically, the only reason that it exists is to provide as automatically, and quickly as possible, answers to the designers of the missile. This is the only reason for its existence. Under ideal conditions, after a missile is fired, the data will be successfully gathered, transmitted to the ground, reduced through the data reduction equipment, and answers fed immediately back to the designers, so that any changes necessary, can be made before the next firing of the missile. Unfortunately, even today the amounts of data that are gathered are so massive, and the reduction process is so tedious, that the design engineers often do not get their needed data until it is too late to use.

As a result it is our aim in the telemetry industry to furnish airborne coding equipment, transmitting equipment, and data reduction equipment that is so automatic and so straightforward that as the missile rises from its pad, the final answers that the design engineer is looking for will start flowing from the equipment on the ground. When this can be achieved, the number of flights necessary to fully develop a missile can be greatly reduced, and the burden that all of us as tax payers must pay for these programs can be greatly lessened.

COMMUNICATION RECEIVED

The Board of Directors of the Radio Club of America feel that the letter reprinted below is worth the reading time of all members.

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December 8, 1958

MEMO: Re RADIO CLUB OF AMERICA'S 50th ANNIVERSARY

1. President Walter Knoop's Nov. 19, 1958 letter to Club members stated:

> "The greatest problem facing this Club today is the influx of "young blood". As a young man in his twenties, your President remembers with great admiration and respect the opportunity of eating in the same dining room with Armstrong, Adm. Hooper, Beverage, Hazeltine, Heising and others... "

This remark emphasizes the intensely personal attribute of the Radio Club of America, and the strong appeal that this has for those affiliated with it. The Radio Club's unique personality is directly due to this appeal -- it is the individual's club, the researcher's, the pioneer's, the inventor's "home". It is the place -- in a conformist-ridden industry dominated by a "big business" complex -- for the independent thinker, businessman, and professional, be he small business owner or manager, or independent inventor.

The conserving of the pioneer spirit in independent investigation and achievement (especially in this tense era), and of the stressing of the value of the individual personality as against the mass-thinking is not only of pre-eminent importance to us as a nation, but more especially so in the field of science and engineering. The Radio Club of America is the indicated place and forum for the small, dedicated number of independent persons whose continued existence under a free exercise of intellectual effort is a pre-requisite for the progress of the electronic arts.

2. With its strongly individualistic appeal, the Radio Club of America can therefore continue to grow and prosper, if it will:

a. Offer a youthful, invigorating atmosphere for the free expression of independent effort and thinking.
b. Continue its policy committed to the value of the individual and his worth.
c. Give greater recognition to individual achievement in fields of unorthodox investigations, especially among the younger members, as well as non-members.
d. Help to point out to youth the expanded opportunities for individual achievement in all fields of electronics.
f. Provide the younger members with sound guidance and assistance through the accumulated experience of its senior membership.

The above can serve as the Radio Club's POLICY and cornerstone to justify the beginning of its second half-century of existence.

3. In accentuating this typical American pioneer spirit which seems to be subject to considerable attack by the pressure of various ideologies and groups today, the Radio Club would be performing a most useful duty of paramount importance to every individual American, as well as for the security of the country.

(Original Signed by)
Lloyd Jacquet

RADIO CLUB

1909–1959

50th Anniversary Banquet

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Plaza Hotel, New York City

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Voltage Range ..... 100 µv — 1000 v
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5% elsewhere
Input Impedance ..... 2 meg shunted by 10 µµf*
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For Measuring DC Voltages when combined with any AC Voltmeter

Voltage Range ..... 1 µv — 100 v DC
Ratios DC Input to RMS Output ..... 1:100 & 10:1
Accuracy ..... 1% 100 µv — 100 v
Input Resistance ..... >10 meg for 1:100
50 meg for 10:1

PEAK-to-PEAK — MODEL 305

Voltage Range ..... 1 mv — 1000 v pk-to-pk
Frequency Range ..... 10 cps — 100 kc (sine wave)
Pulse Width ..... 3 µsec — 250 µsec
Min Rep Rate ..... 20 pulses per sec
Accuracy ..... 5% for pulses
Input Impedance ..... 2 meg shunted by 8 µµf*
*Shunt capacitance, 15 µµf on two most sensitive ranges

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For Increasing the Sensitivity of any AC Voltmeter by 10 or 100 times

Voltage Range ..... 20 µv — 50 mv
Frequency Range ..... 10 cps — 150 kc
Accuracy ..... 2% ENTIRE RANGE
Input Impedance ..... 5 meg shunted by 15 µµf

AUDIO to 2 mc — MODEL 310A

Voltage Range ..... 100 µv — 100 v
Down to 40 µv at reduced accuracy
Frequency Range ..... 10 cps — 2 mc
As null detector 5 cps. — 4 mc
Accuracy ..... 3% 15 cps — 1 mc
5% elsewhere
Input Impedance ..... 2 meg shunted by 9 µµf*
*Shunt capacitance, 19 µµf on two most sensitive ranges

DIRECT READING CAPACITANCE METER — MODEL 520

Capacitance Range ..... 0.01 µµf to 12 µf
in 9 decade ranges covering over a billion to 1
Accuracy ..... 2% above 0.1 µµf
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Capacitor Power Factor 0.15
Test Frequency ..... 1 kc

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Voltage Range ..... 1 mv — 1000 v
(100 µv — 1 mv without probe)
Frequency Range ..... 15 cps — 6 mc
Accuracy ..... 3% 15 cps — 3 mc
5% elsewhere
Input Impedance ..... 11 meg shunted by 8 µµf
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SPEECH BY MR. W. R. HUTCHINS BEFORE THE ANNUAL BANQUET OF THE RADIO CLUB OF AMERICA, FRIDAY, DECEMBER 5, 1958

Thank you for inviting me to tell you something about the Advanced Research Projects Agency, and the problems of ballistic missile defense on which we are working.

ARPA was established by law on February 7th of this year and charged with the responsibility for planning and directing advanced research projects assigned by the Secretary of Defense. Also, until establishment of the NASA, ARPA was charged with the advanced space projects of a non-military nature as designated by the President. Because of their unclassified, purely scientific character, it is these non-military space projects which have been associated most closely with ARPA in the public press, but the specific assignments which have been made by the Secretary of Defense include military satellites and other vehicles, research in the chemistry of propellants and the entire responsibility for advanced programs in defense against ballistic missiles. This includes the NIKE-ZEUS program which is a responsibility of the Director of Guided Missiles and is under contract to the Department of the Army.

The directive under which ARPA operates does not limit it to these assignments and the Secretary of Defense has stated that he does not intend our task to be so limited. Ordinarily the projects assigned to ARPA will fall into one or more of three categories: (1) those which by virtue of their advanced nature cannot be identified within the stated military mission of an individual military department, (2) those for which military missions can be identified as being of interest to more than one of the military departments, and (3) those which for various reasons must be pursued by an agency not subordinate to one or more of the military departments.

The Director of ARPA defends its budget before Congress in the same manner as the Secretaries of the three services. He is not hampered by any requirement that funds be used for some immediately definable weapon system; he has but to show that they will be used for useful advanced projects which can be judged to have probable military applications.

As I indicated before, ARPA has been assigned the task of working out an advanced ballistic missile defense system to improve upon or to succeed the NIKE-ZEUS and BMEWS systems which are currently under construction.

What I hope to do is to give a picture of the problems involved in ballistic missile defense and to illustrate the tremendous part electronics must certainly play in their solution. Most of us have a pretty good idea of the basic problem posed by the intercontinental ballistic missile.

In Figure 1 are indicated three of the trajectories which are possible to a missile which has a maximum range of 6,000 nautical miles. By calculations which are little more than elementary physics, it is possible to show that using the same total energy as is necessary to go 6,000 miles, an ICBM can go shorter distances and go either higher or lower than the optimum trajectory. A little consideration about your own experience with baseball will serve to remind you that this is so. Over a plane earth, you can throw a baseball a maximum distance if you throw it at a 45° angle. Or, if you use the same amount of energy, you can either throw a very high ball which lands nearer or you can throw a flatter trajectory and have a "fast" ball which lands nearer and sooner. Because of the curvature of the earth and the fact that 6,000 miles is about a quarter way around, the optimum angle for minimun energy is about 23° rather than 45°. There is nothing fundamental about a 6,000 mile capability and there is every reason to believe, on the basis of the size of their Sputniks, that the Russians can probably send a fairly heavy warhead greater distances or, at their discretion, have them arrive at the target at angles other than 23°. This, of

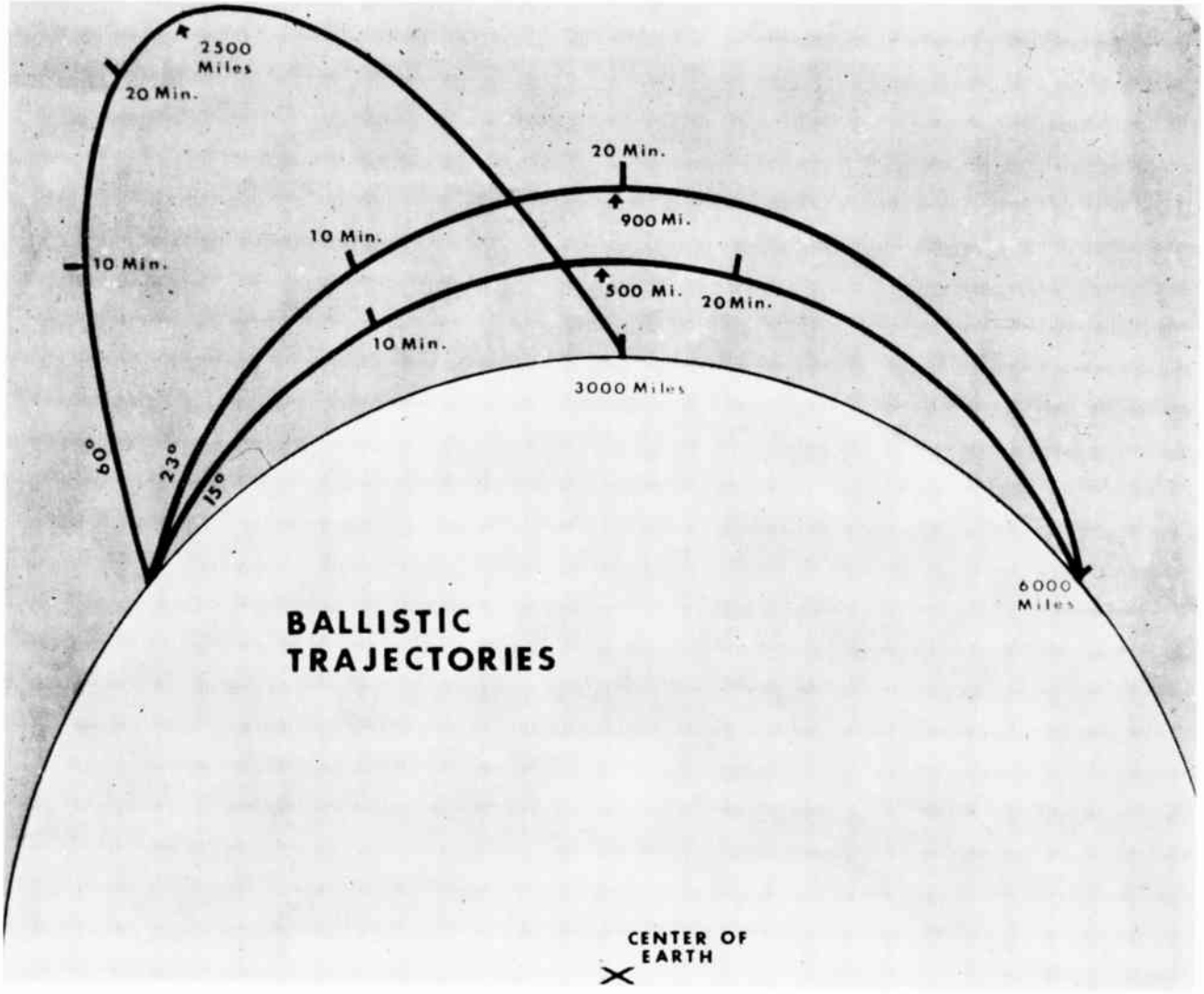

FIGURE 1
Three possible trajectories for a ballistic missile having 6,000 miles range capability.

course, increases the amount of sky that must be scanned by the defense in looking for enemy missiles.

Figure 2 is a map centered on North America. The lines drawn here illustrate the angles which the United States subtends at the boundaries of the Soviet Union and its satellites. Since ballistic missiles must fly in ellipses, the ground tracks of which must be great circles, it is not possible to have a ballistic missile fired from Soviet territory which flies outside of these lines and arrives in U.S. territory. With appreciably more energy it is possible to fire around the long way and approach in the opposite direction, but only at the expense of much greater flight time and considerable reduction in accuracy. Also launch points other than inside the Soviet Union cannot be completely ruled out. Ships and submarines, of course, can launch missiles of less range which will arrive from almost any direction on the North American continent. This is the basic problem.

As has been well publicized in the public press, the time of flight of intercontinental range missiles varies from 20 to 40 minutes or so for most of the likely trajectories. It is obvious then that in order to operate any sort of defensive system, or even to dive into holes, it is necessary to detect the enemy missile as soon after launching as possible.

Figure 1 shows that the apogee or mid-point of the flight of the ballistic missiles is many hundreds of miles above the earth. At such altitudes there is very little air indeed and consequently there is very little drag on objects. Under such conditions, the shape and size of an object has no effect on its flight path. Because of this, it is possible to blow

up the booster rocket after it has done its job or to launch numbers of balloon-like or rod-like objects from the reentry body and to find that, except for their small velocity of separation, all of these objects can fly along the ballistic path together with the warhead. Such objects are classed as decoys. The defense is forced to identify the "ducks" from these decoys and so not waste firepower on a large amount of harmless trash.

It is very important to point out here that the ballistic missile is merely a method of throwing a warhead at the target by use of a rocket. As far as the rocket and trajectory are concerned, it is just as easy to throw anything else at the same target so long as the total weight of this "anything else" is the same. Therefore, instead of using a very large warhead, it is possible for the ballistic missile designer to use a smaller warhead and a large number of decoys, or, if he desires, to use several very small warheads instead of one big one. Now we see that while we might be able to tell the decoys from the warhead, we have the further problem of telling how many warheads there are. Having solved this problem at a distance of many hundreds of miles, we must then compute the trajectory of the true warhead and work out the means of intercepting it before it arrives at its target only a few short minutes later.

In order to give an idea of the nature of the defense problem against ballistic missiles, I am going to use some illustrative examples which bear no particular relation to defensive systems actually under design or consideration.

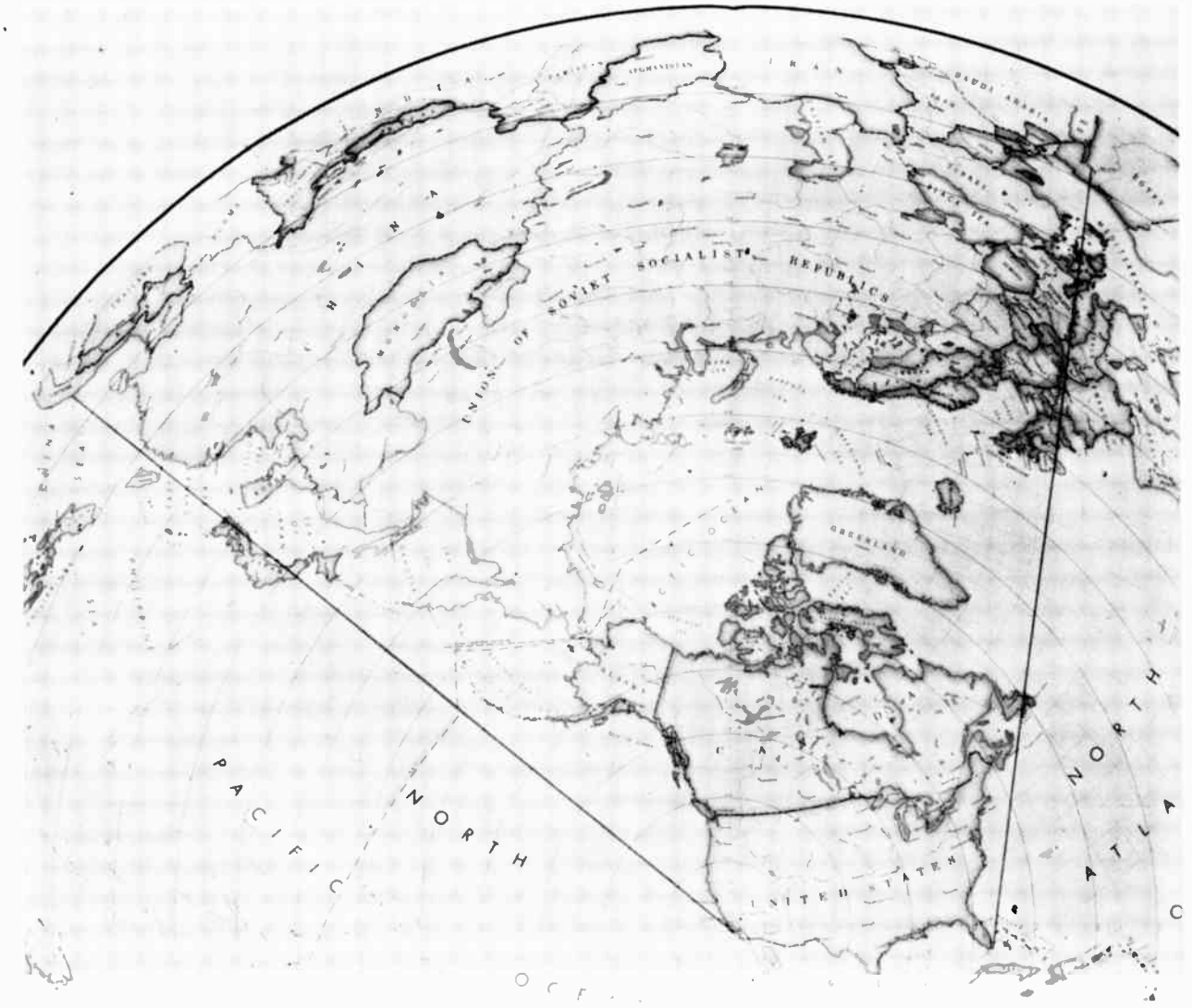

FIGURE 2
The straight lines are the outside limiting great circles which enclose all paths between Soviet territory and the U. S. A.

These simplified examples will permit you to understand a bit better the interplay of design considerations which make this problem so difficult.

For the sake of illustration I am going to consider an interceptor system which consists of early warning by radar, tracking by another radar, computation by equipment located on the ground, and a ground-to-air interceptor missile. This is only one of a great many systems of which we can conceive which have a capability of destroying ballistic missiles, and I am going to assume that the radar early warning is located so that it detects the ballistic missile before apogee. As can be seen by looking again at Figure 1, apogee occurs at something less than 20 minutes before impact. We therefore have about 20 minutes after early warning to solve our interception problem. Now let's assume that we have located a tracking radar of a many hundreds of miles range in the general area which is to be defended -- let us say somewhere on Long Island. This radar will then have to pick up the missile about 8 to 10 minutes before impact as it is approaching somewhere near the Arctic Circle. The tracking radar then examines the target upon which it is locked and decides whether it is one target or a number of objects, some of which are doubtlessly decoys. It has the problem of figuring out, perhaps by jumping from one object to another and examining it, which are genuine and which are decoys.

The computer then calculates the trajectories of the real objects from the tracking data, assigns suitable interceptor missiles, tells them when to launch, and in which direction to fly so that they may make an interception (hopefully still some considerable distance away from the ballistic missiles' impact point). We see therefore that the total time of the engagement is of the order of five minutes.

It is only by use of electronics, and very advanced sophisticated electronics at that, that we can possibly hope to perform all of these functions in so short a time. Let us look now at the requirements on some of these components -- for instance, the long range mile tracking radar that was mentioned above. Figure 3 shows a comparison of the radar we are talking about with a hypothetical S-band anti-aircraft radar having a 100 mile range on a typical bomber target of 50 sq. ft. radar cross-section. We see that with a 10 ft. diameter antenna such a radar would need to have a one megawatt peak power. In comparison, a long range anti-missile radar which must see a 1/2 sq. ft. target at 1,000 miles, say, even with a 100 ft. antenna, would need to have a peak power of 250 megawatts.

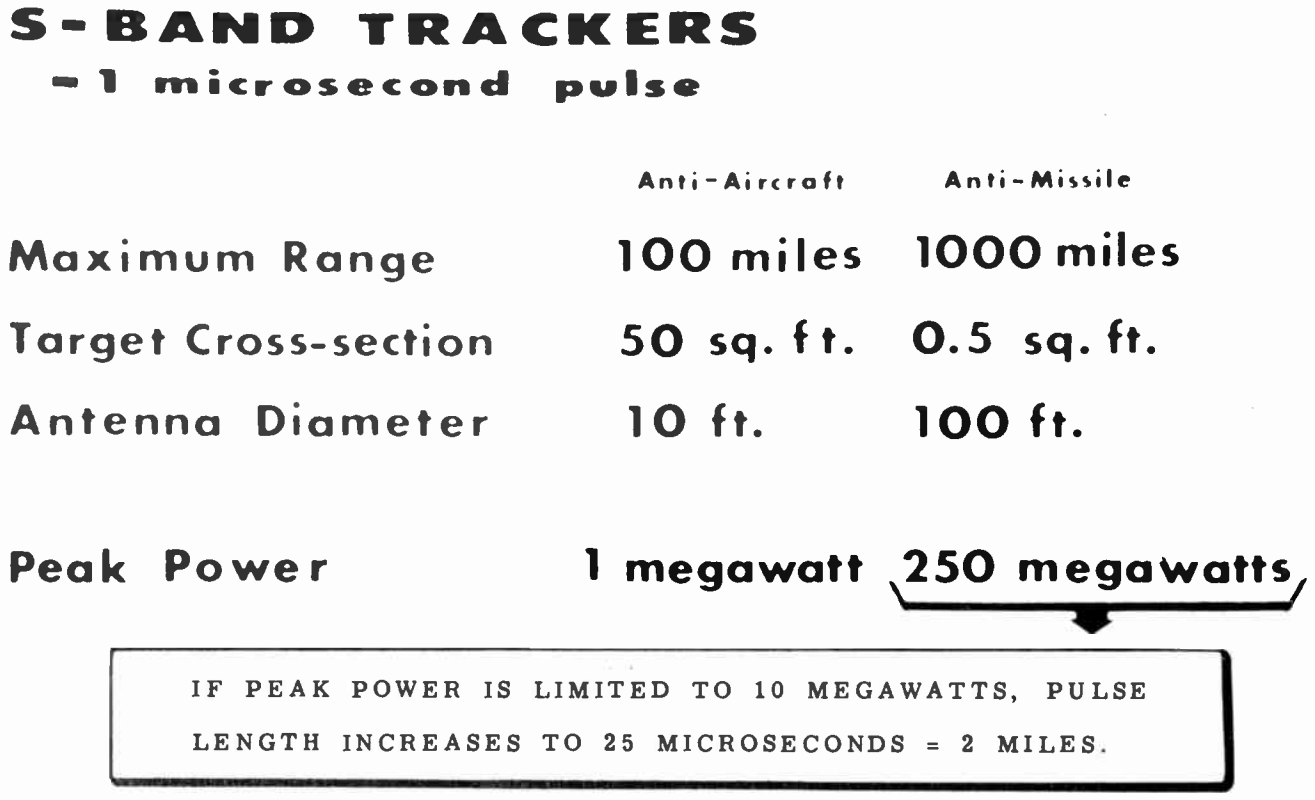

FIGURE 3
Comparison of Radars for Anti-aircraft and Anti-missile use.

At the present time, peak powers of 250 megawatts are considered impracticable. If we decide to reduce the peak power to 10 megawatts, in order to keep the same range, it is necessary to widen the pulse to 25 microseconds. Such a pulse is two miles wide and therefore will have difficulties resolving different targets in the cloud of warheads and decoys that is being examined. It is apparent that with such a radar which comes up against true physical limitations in its design, it is necessary to use tricks in order to get sufficient performance. A straight-forward approach is not sufficient. When tricks are resorted to, the complexity of the radar gets greater and the radar becomes more expensive. More expensive than the air defense radar we mentioned before by a factor of ten to a hundred times.

Until recently, the anti-aircraft radar's output was connected to scopes that were observed by human operators. Recently, in going to the SAGE and Missile Master Systems, electronic data processors have started to take the place of humans. In the ballistic missile defense era, humans may not even be able to comprehend the information on monitor scopes. Electronic machinery will do all the operation on the radar data. This means a complex electronic computer problem in addition to the already complex radar. Not only must the electronic data processor track single objects, as has been done for years with tracking radars, but it must track and maintain detailed data on the characteristics of a large number of objects, perhaps several hundred. Once it has decided which object is a true target, the computer must calculate the trajectory and predict an interception point. It must then communicate with the interceptor missile (which has already been launched in the proper direction and which is now approaching intercept). Since the interceptor may now be several hundred miles from the radar, there is a communications problem. The computer needs to know where the interceptor is and what its course and speed are so that it may properly control the interceptor to collision with the target.

To try to indicate the magnitude of the task involved, it takes several minutes for an IBM 704 to calculate a trajectory from a few radar data points. An IBM 704 is one of the large scientific data processing machines and itself occupies several hundred feet of floor space. In order to calculate an intercept, it undoubtedly would require more equipment than this, or at least more complex equipment.

What has been described is a single interception of a single ballistic missile. Some consideration of the probable tactics which might be used in a ballistic missile war will immediately indicate that it is more probable that a large number of missiles would be sent over simultaneously. It is then necessary to assign trackers to each of these, to assign interceptor missiles to each target, to decide which areas need the greatest amount of defense, and which ballistic missiles are likely to be harmless. The computation system must make all these decisions in such a short time that the effectiveness of the defense is not reduced thereby.

Electronic battle direction of magnitude such as this requires inter-connection of units covering a large portion of the country. Warning and acquisition information must be fed from the stations in the far north and from other locations remote from the interceptor sites. This is a communications or data transmission problem of the first magnitude. Because the communications have to be ready to operate at any time, it is necessary to have private lines for this purpose standing by 100% of the time. The problem of how best to interconnect the various units of the system for lowest cost and maximum efficiency requires a great deal of study.

For instance, let us consider that long range tracking radar that we were talking about earlier. The data communicated to it from the early warning radar is short and straight-forward. It is simply a message which says that there is a missile at a certain location in space. The tracker searches this volume in space, locks on, tracks, feeds information to the computer. At this point the computer may find that it is tracking a missile intended, not for New York City, but for Columbus, Ohio. The most efficient thing might be to have this tracker instruct the Columbus defenses and guide the Columbus interceptor. In this case all of the guidance messages need to be transmitted from New York to Columbus. Likewise the Detroit radar may have to participate in the interception of a missile destined for Boston. Now if we simply interconnect every site with every other possible site with which it may need to communicate, we find that we have a genuine rat's nest of communication lines completely covering the country.

This is not the entire problem however. There must be provision for human monitoring of the system and an opportunity for decisions based on up-to-date accurate information of the situation, with chance for manual override of any decision made by the computing machinery. The obvious way to do this is to connect a line from each unit of the system to a central headquarters where monitoring takes place -- again a mass of circuits which must operate all the time. As if this weren't enough, one more considera-

tion must be added. The system must operate during an enemy attack, when very likely some enemy nuclear warheads will land. The system must still function with unknown pieces of it bombed out. Again, the obvious way is to duplicate all the circuits by very different routes.

Now let me sum up the picture I have painted here. Let us say that there are 100 defense points and that each must be connected with each other. This gives us 100 factorial circuits. This is a ridiculously large number. An alternative possibility is to use some sort of common bus system where all the information is transmitted over one single circuit. Such a system is very likely to overload unless an excessively high data rate, and hence bandwidth, is employed.

The final element of the active defense system is the interceptor itself. An axiom of anti-aircraft interception has always been that the interceptor must have a speed advantage, that is, it must be flying faster than the aircraft that it is attacking. If this is not done, it is obvious that there are many situations in which the anti-aircraft missile gets into a situation where it is chasing something which is going faster, and therefore is outrunning it. A ballistic missile, though, operates at Mach 21 and above, and when it reenters the atmosphere, very special precautions have to be taken to prevent it from burning up. An interceptor which has to fly up through the atmosphere has similar problems and would assuredly burn up were it going as fast or faster than the ICBM which is its target. A speed advantage therefore is only a hoped-for ultimate goal.

In the meantime we must conceive of interceptor systems which are capable of operating at a speed disadvantage. The speed disadvantage means that the interceptor must somehow position itself in the path of the ballistic missile in such a way that the ballistic missile will fly into it. The reason that this is possible, of course, is that the ballistic missile is by definition "ballastic", in other words free-falling; so that it is possible to predict its future position very accurately from its past positions. This fact alone causes us to use entirely different versions of the intercept guidance equation and hence to impose some very different requirements on the autopilot system in the interceptor missile.

Another thing which causes great differences in the autopilot design is the lack of a sensible aerodynamic atmosphere at the altitude at which intercepts must be made. When an airplane or a missile makes a turn in the atmosphere, it banks and places its wings in such a way that a skid is prevented. Outside the atmosphere, there is no such fluid as the air and only the propulsive force of engines may be employed for reaction. Figure 4 is intended to indicate the maneuvers a steerable rocket motor must make. This is a conventional missile having the rocket motor considerably aft of the center of gravity. The first thing is to turn the rocket motor to one side which will produce some skidding motion, but chiefly will cause a rotation about the center of gravity. After the missile has rotated through the proper angle and is headed in a suitable direction, the rocket motor is fired in the opposite direction to stop the rotation. However, the missile is still moving along almost the original flight path. It is then necessary to fire the motor straight ahead, that is, through the center of gravity, sufficiently to result in the desired flight path. Such a maneuver is considerably more complicated than that performed in the atmosphere and serves to illustrate another problem which must be solved.

I have tried to show very briefly now the problem of intercepting a ballistic missile is considerably different and considerably more difficult than those problems we have had to solve in the past. It is necessary to make major improvements in the state of the art of radar, computing machines and computation, communications, and missile design and guidance in order that there may be any possibility of making a successful interception.

Let me conclude by outlining how the kind of system I have been imagining would work overall; so as to show that there are not only problems of the major components I mentioned but also serious operational problems of equal magnitude.

Let me assume that the early warning system detects ten objects in ballistic trajectories headed in the general direction of the United States. It immediately sends the message to U. S. offensive and defense headquarters to all parts of the country, where it appears as a yellow alert. The yellow alert causes the defensive system to be warmed up. It also alerts the Civil Defense authorities and starts many other operations.

Very shortly after the alert, the early warning system is able to have a sufficient track so as to inform the defense complex that all ten of the objects are headed toward the Northern Middle West, as an example. The assignment computer then instructs all trackers in the Middle West to search for and lock on the incoming objects. As soon as a tracker finds an object and locks on it, the improved data that it obtains is relayed to all other trackers so that they will not also track the same object (without special assignment).

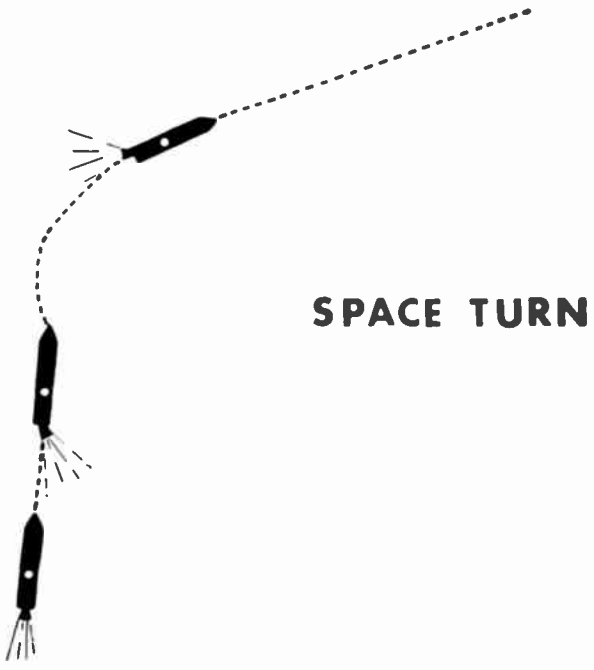

FIGURE 4
An attempt to illustrate some of the maneuvers vers necessary to make a turn without aerodynamic reaction.

Remember that these other trackers are located over an area of tens of thousands of square miles. Therefore, there will be tremendous parallax between the various elements of the tracking network. Position transmission is thus made more difficult.

Another complication is that the ballistic missile is traveling on a true ballistic course outside the atmosphere and therefore is not affected by the rotation of the earth. Hence the earth rotates under it, and predictions of impact must make allowance for this rotation, which, in a half-hour, amounts to some 500 miles at the equator.

The early tracking data is used to give an improved impact prediction for interceptor assignment. An interceptor missile near the predicted impact point is assigned to the interception and is launched at a time which is calculated to be approximately correct. This question of timing is very important since there is no speed advantage. The interceptor must be launched at exactly the correct time so that it arrives not only at the correct point in space but at just the instant of time when the ballistic missile is travelling through that point in space. The problem is made more difficult if there is a group of decoys being tracked on the same general course, because at the launch time the true target warhead will probably not have been identified. Therefore, only an approximate course can be given to the interceptor. The interceptor must not only have a very high speed so as to take a minimum of time arriving at the proper point in space, but it must also have very great maneuverability so that it may make corrections in mid-flight after the warhead has been identified.

Once the interceptor is launched, some method must be provided to tell the computer the location, course, and speed of the interceptor as well as the location, course, and speed of its target, the ballistic missile. Given these quantities for both missiles, it should, in principle, be possible to cause the interceptor to maneuver so that it arrives at a point in space at the same time as does the ballistic missile. This then is an interception.

The imaginary system I have described up to now has left off most of the detailed complications of the problem which make the solution even more difficult than I have described. Of course, many of these necessary sophistications either exist in NIKE-ZEUS or will be added later.

ARPA is currently engaged in sponsoring a very large research effort on all the facets of the defensive problem, in order to meet every conceivable form of the ballistic missile threat. We are studying the physics of the upper atmosphere and its interaction with objects and with electromagnetic radiation. We are making measurements on actual ballistic missiles using radar, optical and all other devices that we are able to think of. We are sponsoring experiments in very elaborate high power radars having great accuracy and resolution and having range capability far greater than have ever been built up to now. We are supporting work on the controls and propulsion for missiles which operate both inside the atmosphere and in a vacuum and which have high speed and high maneuverability. We are investigating many destruction methods against ballistic missiles and we are sponsoring studies on systems concepts which are intended to tie all these things together in various ways. In addition to all this, we are trying to get several groups in this country thinking about the problem as a whole so that they may come up with entirely new concepts which can form the basis for further research and, we hope, for still better systems in the future.

All this costs money. But all this research and development, even extended considerably beyond what we are doing today, is expensive compared with the damage which could be caused to this country were a full scale ballistic missile war to take place. All this is even inexpensive in comparison with

the cost of actually building the complete defensive system. The cost of the research and development on one of these large systems is usually of the order of 5 or 10% of the final installed cost. If we double our research and development budget, it is quite possible that the improvements which derive from this would actually save the additional development costs in the form of reduction of over-all costs by 5 or 10%. Let us continue our research and development at a high level, even higher than that presently employed, because our weapons are constantly getting more costly and more complicated and the only way in which we can minimize our costs is by more thorough study and design.

ARMSTRONG PATENTS RULED VALID

The United States District Court in New York has recently upheld the validity of the FM patents of our late and esteemed Fellow, Major Edwin H. Armstrong. Judge Edmund L. Palmieri's findings were contained in a 100 page decision in a suit brought by the estate of Major Armstrong against the Emerson Radio & Phonograph Corp.

Many members will be warmly pleased to learn that the inventive contributions of Major Armstrong have been fully and legally recognized.

Of perhaps even greater import is that this is the first instance in years, of which your Editor is aware at least, in the radio-electronic industry in which patents have been adjudicated in favor of the inventor. Perhaps this decision marks a turning point in the application of patent law in this industry.

RADIO CLUB PEOPLE

Frank Gunther, past President 1956-57 of the Club, has been elected Executive Vice President and General Manager of Radio Engineering Laboratories, Inc., a wholly owned subsidiary of Dynamics Corp. of America. Frank, a 34-year veteran with R. E. L., became Vice President in 1929 and has served in virtually every department of the company. He is an active amateur, W2ALS, in Dongan Hills, Staten Island. R. E. L. is a leading manufacturer of receiving and transmitting equipment for "tropo scatter" long distance techniques.

BACK ISSUES AVAILABLE

Back issues of a number of issues of The Proceedings of the Radio Club are available to the members at $1.00 per copy. Call or write the club office for specific requests. Miss Kunkel will be happy to assist you.

Also on the available list is the 1 BCG Commemorative issue, dated October 1950. This issue commemorates the First Transatlantic short wave message which was accomplished in December 1921. It is the complete, well-illustrated story of the events leading up to, and the fulfillment of this historic event.

ACKNOWLEDGMENT

Grateful acknowledgment was made in the Golden Anniversary Year Book to the many sponsors who made the Year Book possible.

Some contributions, however, arrived too late to have the names of the contributors included. These contributors graciously accepted our apologies and insisted on making their contributions regardless.

We take pleasure in acknowledging their contributions to the Year Book, in this issue of Proceedings.

Airborne Instruments Laboratory
Litton Industries, Inc.

MEASUREMENTS
"FAMOUS FIRSTS"
in
Laboratory Standards

1939 MODEL 54 STANDARD SIGNAL GENERATOR—Frequency range of 100 Kc. to 20 Mc. The first commercial signal generator with built-in tuning motor.

MODEL 65-B STANDARD SIGNAL GENERATOR—This instrument replaced the Model 54 and incorporated many new features including an extended frequency range of 75 Kc. to 30 Mc.

1940 MODEL 58 UHF RADIO NOISE AND FIELD STRENGTH METER—With a frequency coverage from 15 Mc. to 150 Mc. This instrument filled a long wanted need for a field strength meter usable above 20 Mc.

MODEL 79-B PULSE GENERATOR—The first commercially-built pulse generator.

1941 MODEL 75 STANDARD SIGNAL GENERATOR—The first generator to meet the need for an instrument covering the I.F. and carrier ranges of high frequency receivers. Frequency range, 50 Mc. to 400 Mc.

1942 SPECIALIZED TEST EQUIPMENT FOR THE ARMED SERVICES.

1943 MODEL 84 STANDARD SIGNAL GENERATOR—A precision instrument in the frequency range from 300 Mc. to 1000 Mc. The first UHF signal generator to include a self-contained pulse modulator.

1944 MODEL 80 STANDARD SIGNAL GENERATOR—With an output metering system that was an innovation in the field of measuring equipment. This signal generator, with a frequency range of 2 Mc. to 400 Mc. replaced the Model 75 and has become a standard test instrument for many manufacturers of electronic equipment.

1945 MODEL 78-FM STANDARD SIGNAL GENERATOR—The first instrument to meet the demand for a moderately priced frequency modulated signal generator to cover the range of 86 Mc. to 108 Mc.

1946 MODEL 67 PEAK VOLTMETER—The first electronic peak voltmeter to be produced commercially. This new voltmeter overcame the limitations of copper oxide meters and electronic voltmeters of the r.m.s. type.

1947 MODEL 90 TELEVISION SIGNAL GENERATOR—The first commercial wide-band, wide-range standard signal generator ever developed to meet the most exacting standards required for high definition television use.

1948 MODEL 59 MEGACYCLE METER—The familiar grid-dip meter, but its new design, wide frequency coverage of 2.2 Mc. to 400 Mc. and many other important features make it the first commercial instrument of its type to be suitable for laboratory use.

1949 MODEL 82 STANDARD SIGNAL GENERATOR—Providing the extremely wide frequency coverage of 20 cycles to 50 megacycles. An improved mutual inductance type attenuator used in conjunction with the 80 Kc. to 50 Mc. oscillator is one of the many new features.

1950 MODEL 111 CRYSTAL CALIBRATOR—A calibrator that not only provides a test signal of crystal-controlled frequency but also has a self-contained receiver of 2 microwatts sensitivity.

1951 MODEL 31 INTERMODULATION METER—With completely self-contained test signal generator, analyzer, voltmeter and power supply. Model 31 aids in obtaining peak performance from audio systems, AM and FM receivers and transmitters.

1952 MODEL 84 TV STANDARD SIGNAL GENERATOR—With a frequency range of 300-1000 Mc., this versatile new instrument is the first of its kind designed for the UHF television field.

1953 MODEL 59-UHF MEGACYCLE METER—With a frequency range of 420 to 940 megacycles, the first grid-dip meter to cover this range in a single band and to provide laboratory instrument performance.

1954 FM STANDARD SIGNAL GENERATOR. Designed originally for Military service, the commercial Model 95 is engineered to meet the rigid test requirements imposed
1955 on modern high quality electronic instruments. It provides frequency coverage between 50 Mc. and 400 Mc.

1956 MODEL 505 STANDARD TEST SET FOR TRANSISTORS. A versatile transistor test set which facilitates the measurement of static and dynamic transistor parameters.

Laboratory Standards

MEASUREMENTS
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RESEARCH AND MANUFACTURING ENGINEERS
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Standard Signal Generators	**Crystal Calibrators**	**Megacycle Meters**	**FM Signal Generators**	**Square Wave Generators**
Vacuum Tube Voltmeters	**UHF Radio Noise & Field Strength Meters**	**Pulse Generators**	**Television and FM Test Equipment**	**Intermodulation Meters**

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Famous since 1935 for Accuracy, Sensitivity and Reliability

Ballantine Voltmeters feature the same accuracy of reading on a logarithmic voltage scale. Alone or in combination with Ballantine accessories, they may be used to measure AC voltages from 20 microvolts to 10,000 volts, DC voltages from 10 microvolts to 100 volts, and AC and DC currents from 0.1 microampere to 10 amperes.

Prices for modifications in mountings, finishes, special scales, terminal arrangements, etc., will be furnished on request.

All prices shown are net, F.O.B. Boonton, New Jersey, and are subject to change without notice.

MODEL	FREQUENCY RANGE	VOLTAGE RANGE	INPUT IMPEDANCE	ACCURACY OVER ENTIRE SCALE	APPLICATIONS	PRICE
300 Voltmeter	10 CPS–150 KC	1 MV–100 V	0.5 meg shunted by 30 pf	2%	General purpose, precision laboratory AC VTVM.	$220
300-D Voltmeter	10 CPS–250 KC	1 MV–1000 V	2 meg shunted by 15 or 25 pf, depending on voltage range	2%	General purpose, precision laboratory AC VTVM, a product improvement on the Model 300.	$255
300-E Voltmeter	30 CPS–100 KC	300 μV–300 V	2 meg shunted by 20 or 30 pf, depending on voltage range	2%	For mounting on 9½ inch relay rack. Rear connections for input, power, and decade switching.	$255
302-C Voltmeter, Battery Operated	2 CPS–150 KC	100 μV–1000 V	2 meg shunted by 10 or 25 pf, depending on voltage range	3% 5 CPS–100 KC; 5% elsewhere	Portable, battery-operated; no hum, with gain to 60 db. May be used on ungrounded or symmetrical circuits.	$255
305-A Voltmeter Peak Reading	5 CPS–500 KC, sine waves. Pulses, 0.5 μs up and 5 PPS up	1 MV–1000 V Peak or Peak-to-Peak	2 meg shunted by 10 or 25 pf, depending on voltage range	2%, sine waves 20 CPS to 200 KC; 4% elsewhere. 3%, pulses above 3 μs and 100 PPS, and up to 5% other conditions	Measures Peak or Peak-to-Peak value of any repetitive waveform, distorted or undistorted sinewaves, or pulses. Its operating mode can be selected to respond to a peak to peak and positive or negative peak of the waveform.	$395
310-A Voltmeter	10 CPS–2 MC or 5 CPS–4 MC as a null detector	100 μV–100 V (Down to 40 μV at reduced accuracy)	2 meg shunted by 9 or 19 pf, depending on voltage range	3% 15 CPS–1 MC; 5% elsewhere	Multi-purpose broadband VTVM for measurements such as low and high-level acoustics, low-level vibration, carrier telephone transmission, ultrasonic, and rf measurements. For use as an extremely sensitive null detector for signals as low as 10 microvolts.	$250
314 Voltmeter Wide Band	15 CPS–6 MC	1 MV–1000 V (100 μV–1 MV without probe)	11 meg shunted by 8 pf with probe, or 1 meg shunted by 25 pf without probe	3% 15 CPS–3 MC; 5% elsewhere	Wide-range unit of great sensitivity to facilitate development and servicing of equipment in video applications, and R.F. heating, vibration, ultrasonics, piezo-electricity, etc.	$300
316 Voltmeter Very Low Frequency	0.05 CPS–30 KC	0.02 V–200 V Peak-to-Peak	10 meg shunted by 17 or 40 pf, depending on voltage range	3%	For development, design and routine testing of automatic control systems involving low frequency servomechanisms and where sub-audio frequencies down to 0.01 cps are encountered. Minimum pointer "flutter" down to 0.05 cps.	$330
320 Voltmeter True RMS	5 CPS–500 KC	100 μV–320 V	10 meg shunted by 8 or 18 pf, depending on voltage range	3% 15 CPS–150 KC; 5% elsewhere	Determines true root-mean-square magnitudes of periodic complex waves or voice potentials. Built-in calibrator. Crest factor range at full scale is 4.5 for high voltage scale and 15 for low voltage scale. Immune to severe overload.	$445
220-C Decade Amplifier, Battery Operated	10 CPS–150 KC	Amplifies precisely 10 times or 100 times, as selected	5 meg shunted by 15 pf	2%	To increase sensitivity of Model 300 to 20 μv. Provides no-hum preamplifier of accurate gain over wide band. Output source impedance less than 900 ohms in series with 2 μf for 10 x gain, and less than 7000 ohms in series with 2 μf for 100 x gain.	$110

420 DC and AC Precision Calibrator

Provides accurate, convenient way of calibrating voltmeters, oscillographs, and other voltage-sensitive devices. Voltage Range: 0-10 V RMS, Peak-to-Peak, or DC. Frequency: 1 KC. Accuracy: better than 0.5% above 1 MV. Distortion and Hum: less than 0.25%. Setting Resolution: approaches 0.01% above 10 MV. Output Impedance (AC): 2-20 ohms depending on range setting. Output Impedance (DC): 0-4000 ohms depending on dial setting. Price: $365

520 Direct Reading Capacitance Meter

Provides one of the most convenient ways of measuring capacitance over an extremely wide range of values as encountered in paper, plastic, mica, ceramic, and air-dielectric types. Capacitance Range: 0.01 pf to 12 μF. Accuracy: 2% above 0.1 pf; 5% below 0.1 pf with dissipation factors as high as 0.05. Test Frequency: 1 KC. "Go-No-Go" acceptance limit pointers may be set to any desired limits, making it easy for completely untrained personnel to make accurate selections. Price: $295

700 Sensitive Inverter

A stable, precise voltmeter accessory that permits the measurement of DC potentials as low as 10 microvolts by converting the DC into a precisely amplified AC signal to which a Ballantine voltmeter is responsive. Input Voltage Range: 10 μv — 100 V DC. Features a built-in calibrator of 0.25% accuracy. Accuracy: better than 1% above 100 μv; Input Resistance: 10 meg for 1:100 or 50 meg for 10:1. May be used with Ballantine series 600 Shunt Resistors to measure DC from 0.01 μa to 10 a. Price: $365

710 Linear AC to DC Converter

Converts an AC voltage to a precise DC voltage which can be measured with a DC device such as a Type K Potentiometer, Digital DC Voltmeter, Recorder, etc. Features accuracy better than 0.25%. Input Voltage Range: 1 MV — 1000 V. Frequency Range: 30 cps — 250 KC. Input Impedance: 2 meg shunted by 15 pf, except 2 meg shunted by 25 pf on most sensitive range. Accuracy: ±0.25% 50 cps — 10 KC; ±0.5% 30 cps — 50 KC; ±1% above 50 KC. Price: $450

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The Radio Club of America

ORGANIZED FOR INTERCHANGE OF KNOWLEDGE OF THE RADIO ART, THE PROMOTION OF GOOD FELLOWSHIP AMONG THE MEMBERS THEREOF, AND THE ADVANCEMENT OF PUBLIC INTEREST IN RADIO

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PROCEEDINGS OF THE RADIO CLUB OF AMERICA

Volume 39 NOVEMBER • 1964 No. 1

WHAT ABOUT THE FUTURE?

During the past couple of years an intensive study has been carried on to up-date the scope of our operations and to find new objectives that better meet the wishes of present members. A Scope and Objectives Committee has been set up for this analysis. From personal contact and correspondence with many members several suggestions have been received. These will be thoroughly analyzed and brought before the Board of Directors for action.

The Club is more than solvent, even though its dues structure has not been changed during its whole existence. Competition with other organizations, periodicals and technical meetings has taken its toll. Nevertheless the Directors believe that a way may be found so that the Club can take on new life, and be of service both to long-time members, (a great many of whom have retired) and to younger ones.

It is hoped that other members who have not been contacted yet will send in thier own ideas immediately. Our Club is small, compared with thousands of members to other contemporary organizations, However, it is able to undertake operations more personally oriented to its members' needs. This phase we hope to do better in the future. Some of the suggestions being looked into (or already under way) are:

(a) Preservation of the memorabilia of early years, the personal information from those who were there, the documents, notes about who did what, and examples of the equipment that played important roles in early developments.

(b) Encouraging efforts of members who have the knowledge and maybe plenty of time of late to try out new fields of technical acitivity. The art now has dozens of interesting processes that have been uncovered by other developments. Many of these would make ideal hobbies if applied to uncommon applications. Some would require help from other club members to make things more interesting. Thus, publicizing contemplated and active efforts in any field to get like-minded experimenters together, is one task easily handled in our Proceedings. Some of these ideas are now being written up.

(c) We have established annual Honor Achievement Awards to the top two high school students who are active in the Science Honors Program handled by Columbia University School of Engineering, and who show the most promise in the opinions of the faculty members handling that Program.

(d) Another project being studied is how to include more information of personal interest about our members in the issues of the Proceedings.

There are other suggestions about possibilities, so if you want to get more in return for your dues expenditure, let us know how we can help.

Ralph R. Batcher
President

* * * * * * * * * * * * * * * *

CITATION ON THE OCCASION
OF THE
AWARD OF THE ARMSTRONG MEDAL
TO

HAROLD A. WHEELER

"in recognition of his outstanding contributions to the art and science of radio communications. Although his contributions have been recognized by his professional colleagues by numerous preeminent awards, it is particularly appropriate that this year, which marks the 25th anniversary of F. M. broadcasting, the Armstrong Medal is awarded to one who also pioneered in the field of frequency modulation. His theoretical analyses of frequency modulated signals helped outline the boundaries of this new discipline.

In forty years devoted to the radio art, Harold A. Wheeler has made substantial contributions to the theory of television systems, wideband amplifiers, transmission lines, antennas, microwave elements, circuits and receivers. The awarding of this Medal is in recognition of his rare ability in reducing to practice, for the good of all, the results of individual research."

Awarded November 20th, 1964.

ROSTER OF MEMBERS

ABRAMS, STEPHEN J., (M) 1961 - Consulting Engineer, 632 West 125th St., New York 27, N.Y. Res. 1305 East 18th St., Brooklyn 30, N. Y.

ADAMS, ROBERT H. (M) 1956 - Field Engineer, Electronic Instrumentation Manufacturers Rep.; Education, B.S. Psychology, Rutgers University; Military Service USAF Auto Missile Tracting Officer; lst. Lt. USAF; amateur call letters K2BTC, 6 yrs; hobbies, amateur radio, flying, res. 2439 3rd St., Fort Lee, N. J.

ADELMAN, LEON L. (F) 1950 - Retired; formerly Sales Representative, Leon L. Adelman Co., 25 Chittenden Ave. N. Y. C. 33; b. Russia, August 19th, 1903; married; ed. Syracuse Central High School, Brooklyn Polytech 1 year, Cooper Union 1 year; Amateur since 1917; W2AFS since 1923; Charter Member - Syracuse Radio Amateur Club 1917; Syracuse Central High Radio Club, 1921; Bronx Radio Club 1921; F. A. D. Andrea 1922/1923; Radio Editor "Science and Invention" "The Experimenter"; Technical Editor "Radio News", Associate Editor "Amateur Radio", Radio World 1923/1926, Assistant Advertising Manager of Chas. Freshman Co. 1926/1927; Sales Manager for A. M. Flechtheim & Co. 1927/1932, Sales Manager Cornell-Dubilier Corp. 1934/1944; Manufactured "Supreme AF - 100" All-band AM-FM Transmitters 1946/1948; Member Planning Committee for "Hugo Gernsback Testimonial Trophy" at Chicago, May 17th, 1953.

AKIN, ROBERT M., JR. (F) 1925 - President, Hudson Wire Co., Ossining, N. Y.; res. 28 Evergreen Way, North Tarrytown, N. Y.; ed. Morristown Preparatory; interested in radio since 1918; b. Ossining, N. Y., June 26, 1904; Professional Experience - Westchester Radio Laboratories 1923/1929, Director of Research, Hudson Wire Co. 1934; Radio Club of America Vice President 1948.

ALBERTSON, FRED (WOODWARD), (M) 1957 - Munsey Bldg., Washington 4, D.C.; American lawyer and engineer; radio and communications legal counsel for radio, television, telegraph, telephone and broadcasting companies and stations since 1935; partner in Dow, Lohnes & Albertson (specializing in communications, radio and air law), Washington, D.C., and N.Y.C., since 1944 engaged in research on Dualex communications systems and products since 1948; Licensed radio operator since 1924; b. 1908; educ. University of Michigan (A.B. 1931; LL.B. 1934); m. 1942, Catherine Frances Dolan; s. Fred Woodward, Jr.; dau. Helen Dolan. Engineered construction and operation of several radio broadcast and radio telegraph stations 1925/27; radio equipped and handled communications with several remote meteorological expeditions and stations for University of Michigan 1927/34; Admitted to Michigan Bar 1934, District of Columbia Bar 1935, and Supreme Court of the United States 1940; member, Board of Trustees and Director of Delta Theta Phi Foundation 1945/46; Registered Professional Electrical-Communications Engineer in the District of Columbia; Senior Member, Institute of Radio Engineers (Chairman, Washington, D.C., Section 1946/47; Board of Editors of Proceedings of I.R.E. 1946/54; member, American Institute of Electrical Engineers and Broadcast Pioneers; President, American Federal Communications Bar Assn. 1953/54; Fellow, American Bar Association 1953/54; Chmn., Standing Cttee. on Communications of the American Bar Association 1957--; member, District of Columbia Bar Association, The American Judicature Society, Delta Theta Phi Law Fraternity; Past Vice-President and Treasurer, Engineers Club of Washington; Past President, Washington Radio Club; co-founder and Past President, University of Michigan Radio Club; member, Congressional Country Club and The Capitol Hill Club (Washington, D.C.); Licensee amateur radio station W3RMC and W4FMC. Address: Munsey Building Washington 4, D.C., and 3512 One Wall Street, New York City 5, and (home) 3753 Jenifer Street, N.W., Washington 15, D.C.

ALEXANDER, JAY R. (M) 1957 - res. 1655 Flatbush Ave., Brooklyn, N.Y.

ALEXANDER, LOUIS (F) 1924 - Field Engineer, Cornell Dubilier Elec. Corporation, South Plainfield, N.J.; res. 322 West 72nd St., New York 23, N.Y.; b. New York City, February 1, 1900; married; ed. High School of Commerce, evening courses at Cooper Union and CCNY; Purchasing Agent for DeForest Radio 1918/1921; Sales Engineer Dubilier Condenser Co. 1921/1926; Sales Engineer for Aerovox Corp. 1926/1946 and Sales Engineer for Cornell Dubilier Elec. Corp. 1946/1953; Sales Engineer, General instrument Corp. and Melco Products, Inc. 1954 to date.; Member IRE and Elmwood Country Club, Elmsford, N.Y.

AMERMAN, EDWARD ANDREW (F) 1953 - Electronic Design Engineer, Kay Electric Company, 14 Maple Avenue, Pine Brook, N.J.; res. 59 Harrison Ave., Roseland, N. J.; b September 16, 1908 at Newark, N.J.; ed. Grammar School Miller Street, Newark; High School East Side Commercial and Manual Training, Newark; Two terms Newark College of Engineering; U.S. Army Signal School Fort Monmouth, N.J. Graduate U. S. Army Armor Officers communication School, Fort Know, Ky.; U. S. Army and New Jersey National Guard since 22nd December 1926, Present status Chief Warrant Officer, Communications Advisor on the Staff of Combat Command "C", 50th Armored Division (Jersey Blues) at Paterson Armory; Married, two sons; Sports - Hiking, Hunting, Fishing and Base Ball; Hobbies - Rifle and Hand Gun Shooting, Radio and mechanics; Societies - Member of Radio Club of America since 1938, National Guard Association of the U. S., U.S. Army Armor Association, Military Amateur Radio Society, Armed Forces Communication and Electronic Association, National Rifle Association, Roseland Rifle and Pistol Club, Communication Officers Club, Army and Navy Union of the U.S., National Guard Radio Amateurs Association, Past Post Commander, Post #4 Legion of Guardsman.

AMY, ERNEST V. (CM, LM, F) 1910 - President, Amy, Aceves & King, Inc., Consulting Engineers, organized 1928, 11 West 42nd St., N. Y. C.; res. 61 Bay Blvd., Atlantic Beach, N.Y.; b. N.Y.C., February 11, 1892; married; ed. E.E. Degree Columbia University 1917; U. S. Army, 1st Lieut. Eng. Corps, 77th Div., Overseas Service 1917; Engineer, Test Dept., New York Edison Co. 1918/1920; Marconi Wireless Telegrapn Co. 1920/1922; Radio Corporation of America, Engineer in Charge of Radio Relay Station, Belfast, Maine, 1923/1925, Antenna and Transmitter Design Section 1926/1928; Amy, Aceves & King, Inc. 1928 to date. Inventor and co-inventor of many radio and electronic devices; granted over 30 U. S. Patents, others pending. Member AIEE, Society of IEEE American Military Engineers, Armstrong Memorial Research Foundation - Charter Member 1955, Director to date. Treasurer Radio Club of America, Inc. 1911/1920, Director 1921, Vice President 1922, President 1926/1928, Director 1929 to date. Recipient Armstrong Medal 1950 for IBCG activities 1921.

ANDERSON, NORMAN J. (M) 1951 - Consulting Radio Engineer; res. 152 Fairview Ave., Boonton, N.J.; b. Brooklyn, N. Y. April 24, 1916; ed. RCA Institute, Stevens Institute Graduate School; member IRE, ARRL.

ANDREWS, RAYMOND W. (M) 1946 - Manager, Finished Goods Planning and Tube Industry Sales, Electronic Tube Division, Westinghouse Electric Corp., Elmira, N. Y. res. 110 Sickles Road, Rt. 2 Elmira, New York; b. September 15, 1907 at Buffalo, N. Y. married; ed. Nichols Prep. School, Buffalo - Lehigh University, University of Buffalo, George Washington University; 8CMF in 1925, W8OLB in 1935; W3OLB in 1946; K2KZJ currently. Em-

ployed since 1930 in various phases of Retail Wholesale and Manufacturing as technician, supervisor and manager. Coordinated design, production, marketing. 1942, 1944 in charge allocating and distributing all Navy fire control radar. 1944/1945 in command of activity assembling and testing combat units and other electronic programs. Currently Captain USNR, member ARRL, IRE, Naval Reserve Assn., American Ordiance Assn.

ARNOLD, JOHN WILLIAM (F) 1929 - res. 37 Washington Square, New York 11; b. Paulding, Ohio on September 13, 1899; married; ed. AB 1921, AM 1923, University of Illinoise; radio since 1915; Engineer, Western Union Telegraph Company, 1923/1941, Artillery and Signal Corps Officer, Army of U.S.1941/1946: Engineer. International Telephone and Telegraph Corporation 1946/1950,retired, 1951. Senior member Institute of Radio Engineers.

ATKINS, C. E. (M) 1962 - Director, Advanced Development at Tung-Sol Electric, Bloomfield, N. J. With Tung-Sol since 1940, including sales engineer, Director, R & D, Director, Engineering, Radio and Tube Div.; Director Engineering and Marketing, Semiconductor Div. Sparks-Withington Co., Jackson, Mich. 1928/1940. Author of 15 technical papers and holder of 43 U. S. Patents. Senior Member, IEEE; Member, SMPTE, SAE.

ATWOOD, HORACE, JR., (M) 1956 - President and Chief Engineer, Industrial Television, Inc., Clifton, New Jersey, 12 yrs., prior Chief TV Engineer, Allen B. DuMont Labs., Inc., res. RR1, Box 715, Montville, N. J.; b. Morgantown, W. Va., April 22, 1918; ed. B.S. and M.S. Physics, West Virginia University, Amateur Call Letters. Present WASXW, prior W8RFP, W8TNC, since 1937; hobbies, etc., active in Civil Defense Communications and Rad-Chem.

AULL, WILSON, JR., (F) 1920 - Hogan Laboratories, Inc. 155 Perry St., New York 14, N. Y.; Research and Development Engineer 1929 to present.

AVALLONE, ALFONSO (M) 1956 - res., 882 First Avenue, Franklin Square, New York.

BAILEY, ARNOLD BROWN, (M) (L)(F)1961 - M.I.T. Staff Lincoln Lab., Arnold B. Bailey Corp., Francestown, N.H. formerly Bell Telephone Lab., M.I.T. Dept. Engineering Adm., amateur call letters ImB 1919/1925, 2UQ 1926-19-30, W2GYF 1931/1940, Patents, Books, First Basic Omni-Directional Range Patent, First Basic Coaxial Antenna Patent Book: TV & Other Receiving Antennas (1950), Hobbies, American Rocket Society, Photographic Circle of Confusion, N.Y.C., Music, violin, Consultant to U. S. Navy on Shipboard Antenna Coordination, Trustee, Francestown (N. H.) Library, Deacon, Unitarian Church, Francestown, N. H., School Board Chairman, Francestown, N. H.; b. July 12, 1903, Providence, R. I., res. Francestown, N. H.

BAILEY, GEORGE W. (F) 1948 - Consultant, Institute of Radio Engineers, res. 61 East 66 St., N. Y. C.; b. May 14, 1887 at Quincy, Mass.; ed. A.B. 1907 Harvard; SC D. 1958 Lawrence College (Hon radio since 1923, Director NE Div., ARRL 7 yrs, Vice President. ARRL 4 yrs, Pres. ARRL 12 yrs., Pres. Int'l. Am. Radio Un., 12 yrs., Amateur Stat. W2KH; Pres. Certificate of Merit, Honorary Member, Veteran Wireless Operators Assoc. Marconi Medal of VWOA, QCWA, AFCEA National Pres. 1954/56, AFCA N.Y.R.C., State Dept. 1957, Consultant on Telecommunications to Undersec'y. Dillon, Cosmos Club of Washington, D.C.

BAILEY, WILLIAM F. (F) 1960 - V. President, Key Color Studios Inc., Mineola, L. I., N. Y. res. 37 Chestnut St. Garden City, N. Y. b. May 4, 1911, Buffalo N.Y. M.E., 1933, M.S., 1941, Stevens Institute of Technology, Fellow IEEE. Of IEEE Committees: Television, 1946 - 49; Television Systems, 1949, vice - chairman, 1955-58, chairman, 1958-60; Standards; Tellers, 1953-55, chairman, 1954. Sections: Long Island, Chairman, 1954-55.

BARA, STANLEY (M) 1964 - res. Blackwell Ave., Morristown, N.J.

BARBER, ALFRED W. (M) 1951 (F)1958 - Chief Engineer, Alfred W. Barber Laboratories, 32-44 Francis Lewis Blvd., Flushing, N.Y.; b. Portsmouth, N. H., July 24, 1906; ed. B.S. in Communication Engineering, Harvard Engineering School 1928; interested in radio for 40 years Browning Drake Corp., Radio Frequency Laboratories, Hazeltine Corporation, Electrical Research Products, Inc. own business from 1936; married; registered Patent Attorney with over 15 U. S. Patents in communications field; about 20 magazine articles and Rider's "Vacuum Tube Voltmeters"; Hobbies - Photography and Golf.

BARONE, SALVATORE A. (F) 1926 - President Northern Radio Co., Inc., 134 West 20th St., New York.. N.Y. res. F oot of Clocks Blvd., Amityville, Long Island, New York; Radio Club of America Director 1950.

BATCHER, RALPH R. (F) 1943 - Electronic Consultant, Product Design and Automatic processes. 240-02 42nd Ave., Douglaston (63) N. Y. b. Iowa 1897; ed. E. E. Iowa State College; sarted in radio 1909, amateur stations 9IT AND 9YI from 1911 to 1917. Inspector (radio) Dept. of Commerce, 1918; circuit engineer automatic switching 1920/24. Receiver Design Engineer, A.H. Grebe & Co., 1924/28; Director of Engineering A. D. Cardwell Corp., till 1944; Editorial Consultant, Electronic Industries, 1944/48. Chief Engineer Electronic Industries Assn. (then RETMA) 1950/54; Professional Engineer N. Y. State; Fellow I. R. E.; Chairman of Board, National Electronics Conference 1955; Director Radio Club of America 1944 to date; Past Pres. Instrument Society, New York Sec., Several patents and author "Prepared Radio Measurements", "Cathode Ray Oscillography" "Electronic Engineering Handbook", "Electronic Control Handbook" and several hundred for technical publications. Tau Beta Pi. Editor IEEE Transactions Product engineering and production. Radio Club of America President 1963 -

BAUM, ELMER (M) 1950 - Electrical Engineer, ITT Labs. 500 Washington Ave., Nutley, N. J.; res. 375 Fifth Ave., River Edge, N. J.; b. Brooklyn, N. Y., Nov. 7, 1917; ed. B. E. E. Polytechnic Institute of Brooklyn, B. S. EM Fairleigh Dickerson Unit; interested in radio for 28 yrs.; professional experience RCA, Radio Wire Television Co., Signal Corps Labs. and ITT Labs; married.

BEHR, JOSEPH (F) 1948 - Vice President, Radio Engineering Lab's. Inc., 29-01 Borden Ave., Long Island City 1, N. Y.; res. 118-44 223 St., Cambria Heights, New York; b. N. Y. C., August 22, 1908; ed. Primary and High School graduate, Stuyvesant High School, 1925; radio ten years; Associate member Institute of Radio Engineers; Member Armed Forces Communications and Electronics Association.

BERNARD, HERBERT S. (F) 1941 - Engr. Ware Marine Products 6763 SW 81 St., Miami, Fla. res. 6321 SW 80 St. Miami, Fla. (Automatic Pilot for marine use) President of Ware Marine Prod. b. N. Y. C., July 26, 1900; radio since 1912; amateur 1929 to 1947; Air Force, World War I; Hobby - Flying; Patents 2,521,564 and 2,520,749; married.

BEIN, ALFRED A., (M) 1957, Buyer - Ladies Coats, Arnold Constable, 13 yrs., Amateur 6 yrs., Sports, hobbies, etc. weight lifting, music, dancing, ALFCE and SSBARA, ed., New York University, b. July 6, 1910, The Bronx, N. Y. C.; res. 4521 E. Washington St. Indianapolis Indiana.

BEVERAGE, HAROLD HENRY (F) 1920 - Consultant, Radio Research Laboratory, Radio Corporation of America, RCA Laboratories Division, 66 Broad St., New York 4, N.Y.; 1942/1957 Chief Technical Advisor, Communications, 1957/1958. Retired 1958, retained as consultant RCA Lab., Rocky Point, New York Res., PO Box 312 Stoney Brook, Long Island, N. Y.; b. North Haven, Maine October 14, 1893; ed. B. S. E. E. University of Maine, 1915. Honorary Degree, Doctor of Engineering, University of Maine, 1938; interest in radio since 1908; Amateur license in First District 1911/1915, W2BML 1919/22; General Electric Company 1915/1920, Radio Corporation of America 1920 to date engaged in radio research and development; IEEE (President 1937,) American Institute of Electrical Engineers, American Association for the Advancement of Science, International Geophysical Union American Radio Relay League; Hobbies - Amateur photography, sound re-recording; Eight published papers Forty one U. S. Patents; married. Armstrong Medal

BIGGS, J. ALLEN (M) 1949 - Sales Engineer, J. Alan Biggs Co., P.O. Box 450, Doylestown, Pa., b. Indianapolis, Ind., January 9, 1911; res. Gardenville, Pa.; ed. State State School of Mines, Rapid City, South Dakota; interested in radio thirty years; amateur 28 years; W8BXK, W 9EH, W8LO, W2ZW, W1ZX, W3ZP; RCA International Division, Lulu Shrine, Philadelphia; Private Pilot, Hunting Valley Hunt Club, QCWA, Farmer.

BOGHOLTZ, RICHARD, JR., (M) 1957 - res. MacGregor Drive, RFD #1, Austin Road, Mahopac, New York.

BOHMAN, ALBERT KASPER (F) 1926 - Retired formerly Staff Assn. to Manager Ground Operation, Pan American Airways, International Airport, Miami Fla.; res. RFD 1 PO Box 183-B Horse Shoe, N. C.; b. Long Island City, N. Y. on August 9, 1900; ed. Grade and High School N.Y.C., Brooklyn Polytechnic Institute, Brooklyn, New York; interested in radio forty years; Engineering Department, Radio Corporation at Marion, Mass., New Brunswick, New Jersey and 66 Board St., N.Y.C. from 1920 to February 1929, Communications Department of Pan American Airways from February, 1929 to September, 1957 Ground Operations September, 1957 to date; Served in U. S. Naval Reserve from September 1917 to 1921, Active Service during World War I, September 1917 to August 1919; married.

BOLIN, RAY E. (M) 1959 - res. 26 Twin Springe La., St. Louis 17, Missouri.

BORST, JOHN M. (F) 1934 - Radio Engineer, Haskins Laboratories, 765 United Nations Plaza, New York 17, New York; b. Lienden, Province of Gelderland, Netherlands; ed. Technical University at Delft, Netherlands; interested in radio since 1914; Ship's radio operator 1922/1927, Broadcast station engineer 1926/1927, Technical Editor Radio News 1931'1937, Engineer Aerovox Corporation 1937/1938, Recording Engineer 1941, Engineer and Writer John Rider 1941/1944, Engineer Halstead Traffic Communications Corporation 1944. Hammerlund Manufacturing Corporation 1944/1946, Haskins Laboratories 1946 to date; IEEE and Audio Engineering Society; single.

BOSE, JOHN H. (F) 1938 - Senior Lab. Supervisor, Electronics Research Lab., 632 W. 125th St. N. Y. C., Columbia University; res. 549 W. 123rd St., N. Y. 27; b. New York, March 26, 1912; ed. B. S. 1934, E.E. 1935, Columbia School of Eng., Gano Dunn Fellowship, Columbia 1934/1935; interested in radio from boyhood hobby; Ass't. in Dept. of E.E. 1935/1937, 1937 to 1954; Engineer for E.H. Armstrong, Development in FM Transmitter, CW Radar FM Multiplex Transmitters and Receivers; U.S. and British patents in CW Radar and FM multiplexing; 1954 to date at Columbia University Electronics Research Labs - Development of Long Range Radar - appointed Associate Prof. of Engineering 1957. Tau Beta Pi, Sigma Xi, Epsilon Chi, Senior Member IEEE; Member Audio Eng. Soc. Radio Club of America, Pres. 1952/1953; Corr. Sec'y. 1949; Rec. Sec'y. 1944'1948. Radio Club Armstrong Medallist 1959; married.

BOUCHERON, PIERRE (F) 1920 - Writer; editorial advisor to college newspapers; res. 2813 Bellaire Drive, Fort Wayne, Ind.; b. Paris, France on August 22, 1889; ed. Schools in France and U. S., Journalism, Radio, Naval Science plus residence and correspondence course during adult years in radio, literature; radio amateur in N.Y.C. 1908/1912, ship wireless operator Marconi Co. 1912/1916; U. S. Navy 1917/ 1919, then editor of the original Radio News magazine 1919/1920, then Public Relations Director for RCA 1920/1928, then Sales Manager, Promotion Manager for RCA 1928/1932, then Merchandising Manager for Remington Arms 1933/1938, then General Sales Manager for Farnsworth Television Corporation, U. S. Navy 1941/1946, then retired as Captain (Permanent Grade) 1950; Senior Member I.R.E.; Life Member Veterans Wireless Operators Association, Army and Navy Club, Washington; Explorers Club; Numerous U. S. and Foreign decorations including French Legion of Honor.

BRADLEY, WILLIAM D. (F) 1941 - Monmouth Radio Supply Co., 404 Shrewsbury Ave., Red Bank, N. J.; b. November 18, 1908 at Lyons, N. Y.; ed. High School; interested in radio for 32 years; married; P. P. Red Bank Lions Club, P. P. MCBC of the Methodist Church, P. P. Red Bank Community Chamber of Commerce, P.C. JOUAM, Mystic Lodge #21, Tall Cedars, BPOE #233, Radio Old Timers; Radio Club about 10 years; Member of Navy League of United States; Crescent Temple A.A.O.N.M.S. of Trenton, N.J.; Ancient Scottish Rite Valley of Trenton N.J.; President of Atlantic Township Fire Co., Colts Neck, N. J.

BRANDEAU, EDWARD P., (M) 1960 - Patent Attorney, Curtis, Morris & Safford, 530 Fifth Ave., New York 36, New York.

BRIDGELAND, CHARLES J. (M) 1951 - Canadian National Telegraphs, Radio Engineer, 347 Bay St., Toronto, Ontario; res. 191 Riverside Dr., Toronto 3, Ontario, Canada; b. December 1908 at Barrie, Ontario; ed. M.A. Sc. in radio engineering University of Toronto; interested in radio for thirty years; National Research Council, Ottawa, Research Enterprises, Ltd., Toronto on Propagation and Antenna Design for Radar - Canadian National Telegraphs on application of point to point and mobile radio for systems operation; Senior Member of IRE, Associate Member of Institute of Electrical Engineers; married; Hobbies - High Fidelity Sound.

BROWN, HERBERT H. (M) 1960 - bus. Technical Appliance Corp., Sherburne, New York res. East Hill, Sherburne, New York.

BRUNET, MEADE (F) 1928 - Vice President, Radio Corporation of America, 30 Rockefeller Plaza, New York 20, N. Y., res. Millsdale Farm, Mendham, N. J.; b. Petersburgh, Va., June 21, 1894; ed. B. E. Union College 1916; Sigma Phi, Sigma Xi; interested in radio since 1919; G.E.Co. and R.C.A.; Served as 1st Lieut., Co. A, 56th Engrs. World War I, military combat service with French 8th Army and First Am. Army A.E.F.; member IRE, Acad. of Polit. Science, American Soc. of Naval Engineers, Director of Far-East American Council of Commerce & Industry, Vice Chairman of Bd. of Trustees of Union College, Chairman of Business Council for International Understanding; Clubs - University (N.Y.), Army & Navy (Wash., D.C.), Somerset Hills (Bernardsville, N.J.) Radio Pioneers; Author; History of the 56th Engineers in First World War; married; Director of R CA Victor Argentina, SAIC; RCA of Australia Proprietary Ltd; RCA Victor Company Ltd. (Canada); Photophone Equipments Private Ltd. (India); RCA Victor Mex-

icana, S.A. de C.V.; National Foreign Trade Council, Inc. Dir of American Electronic Enterprises, Ltd.

BUTTNER, HAROLD H. (F)1928 - Director Hewlett Packard Co., Palo Alto; res. Belmont Ave., Rye, New York; b. November 3, 1892 at Port Costa, Cal.; ed. B. S. in Electrical Engineering, University of California; interested in radio 43 years; amateur 1910/1915; Bay Counties Radio Club; 1915/1917 U. S. Navy Radio Development and Installation Mare Island Navy Yard and American Samoa; 1918/1920 U.S. Navy Installation Lafayette, France; 1921/1924, member of the staff of Western Electric Company and Bell Laboratories; 1926/1946 International Telephone and Telegraph Corporation; 1946/1951 President Federal Telecommunication Laboratories; 1951 to 1957 Retired; Vice President in charge research and development International Telephone and Telegraph Corporation; Decoration - Commendatore dell 'ordine della Corona d' Italia; married; Westchester County Club Downtown Athletic Club, University Club, San Francisco.

CALLAHAN, JOHN L. (F) 1921 - Research Administrator, Radio Research Laboratory, RCA Laboratories, Radio Corporation of America, Rocky Point, New York; res. 67 Nassau Ave., Malverne, Long Island, N.Y.; b. Minneapolis, Minn. - December 9, 1898; married; ed. High School, Army Signal Training, Sorbonne University Paris, France, New York University,; interested in radio since 1912; amateur crystal receiver and straight gap transmitter experiments 1912/1917; Signal Corps Laboratories, Little Silver, N.J. 1919/1920; Radio Corporation 1920 to date; research and development on marine shore station receivers and antennas; long distant point to point radiotelegraph, telephone and radiophoto receivers and antennas; aircraft beacon receivers; terminal facilities radiophoto, time division multiplex, teleprinters, etc.; Research Administrator IRE and American Institute of Electrical Engineers; Three published papers; six U. S. Patents; Sports, tennis; Hobby - gardening; Radio Club of America President 1941; Vice President 1940; Director 1935/1948.

CANAVACIOL, FRANK E. (F) 1934 - Professor of Electrical Engineering Polytechnic Institute of Brooklyn, 99 Livingston Street, Brooklyn 2, N.Y.; res 7119 Juno St., Forest Hills 75, New York; b. January 16, 1896 in N.Y. C.; ed. Polytechnic Institute of Brooklyn, E.E. 1918; married; interested in radio about 40 years; Professional experience in consulting and teaching fields; co-author "Radiophone Receiving" and Swope's Lessons in Electricity," Fellow AIEE, SM-IRE, Member AAUP Member ASEE.

CANO, JOHN R., (M) 1956 - res. 58 Cocas Lane, Locust Valley, N.Y., b. November 12, 1925, Bronxville, New York ed. Clarkson College of Tech., Potsdam, New York; Research Eng., Photo Circuits Corp., 31 Sea Cliff Ave., Glen Cove, L. I., N.Y., Military Serv., U.S.Army, Amateur Call Letters EX K2 MAK; U.S. Power Squadron, U. S. Coast Guard Aux., IRE, Etched Ckt. Society.

CARINI, LOUIS F.B. (F) 1930 - Engineering Manager, Apparatus Development Co. Inc., Wethersfield, Conn.; res. 246 Wolcott Hill Rd., Wethersfield 9, Conn.; b. Salisbury, Conn. 246 Wolcott Hill Rd., Wethersfield, Conn. June 21, 1911; ed. Hillyer Junior College, Conn. Teachers College, Temple Bar College, Ph. D.; amateur station 1-BOC in 1928. Served as technical field rep. for E. H. Scott Radio Labs.; training supervisor Underwood Elliott Fisher Co.; plant supt. Hershey Products Co. etc. U. S. Coast Guard 1943.1946 as instructor, laboratory research, and engineering writer at Coast Guard Headquarters, Communications Engineering Section, Washington. Project engineer, LaPointe Plascomold Corp.; Ass't chief engineer and research director for LaPointe Electronics Inc., Since 1955 Engineering Manager of Apparatus Development Co.; Author of "Drafting For Electronics," "How To Do Your Own Electrical Servicing" "All About FM Antennae and Their Installation" and numerous technical articles published in electronic and hi-fi magazines. Hobby, sports car and collecting antique vacuum tubes.

CARLEBACH, WALTER M. (M) 1939 - Retired; res. 47 East 64 St., N.Y.C.; Electrical Engineer; Columbia University.

CASTRIGNANA, ROBERT A., (M) 1960 - Audio Engineer, CBS Laboratories, 227 High St., Stamford, Conn. Res. 157 Idlewood Dr., Stamford, Conn.

CERVANTES, HOWARD T.(F)1939 - President Electronicraft, Inc., Mt. Kisco, New York; res. 34 Johnson Road Binghamton, New York, ; b. December 15, 1902 in N.Y.C.; married; ed. N.Y.C. Grade and High Schools and N.Y.U.; Amateur 1920 to date with present call W2 DB: Lieutenant Commander U. S. Navy Communications Officer 6 1/2 years World War II.

CHALFIN, NORMAN LEONARD (M) 1948 - Sub. Group Hd. Member of Technical Staff, Hughes Aircraft Co. Ground Systems, Fullerton, Cal.; res. 460 San Juan Place Pasadena, Cal.; b. Philadelphia, Pa. October 15, 1942; ed. B. S. University of Georgia 1936; Graduate studies Columbia Univer. 1936/1941; presently studying law at Southwestern Univ. Law School; professional experience - instructor, electrical engineer, chief engineer; technical editor and writer; W. E. Co. 1942; Crystal RES Lab 1943; Recordograph Patents 2,477,160 and 2,632, 811; Registered Patent Agent. Many articles in Radio and TV News, Radio Electronics, Pop. Science, Pop. Mechanics, Electronics, Televisor, Radio and TV Maintenance, Radio Service Dealer and Tele-Tech., Hi-Fi column in local newspapers Southern Cal. area, 1957, Treas. Los Angeles Section, Audio Engineering Society; 1958, Vice Chairman Section, AES, 1959, Chairman, Section, AES, Member Los Angeles Patent Law Ass'n.; Papers before AES 1956, 1957, 1958, 1959; Member, International Ass'n. for the Protection of Industrial Property; Dir., Bd. of Dir. Los Angeles Science Center Founding Com.

CHAMBERS, ALBERT B. (M) 1949 - RD2 Box 227 A. Absecon, New Jersey; b. Jersey City, New Jersey August 18, 1896; ed. Pace Institute 1917/1919; member American Television Society. Empire State T. V. Guild; Sons of American Revolution; Institute of Radio Engineers; Licensed Real Estate Broker-New Jersey-New York.

CHITTICK, K. A. (F) 1941 - Eng. Manager, Consumer Prod. Div. RCA, Indianapolis, Ind., res. 8020 College Avenue, Indianapolis, Ind.; b. Old Bridge, New Jersey November 6, 1903; married; ed. B.S.E.E. Rutgers University; amateur pre World War I; General Electric Co. 1925/1930; RCA 1930 to date; Ten patents; several papers Fellow IEEE; Franklin Institute Electronics Club; Many Committees RETMA, EH, Hobbies - Golf, fishing and baseball.

CHRISTALDI, P. SAMUEL (F) 1940 - Executive, Celco, Mahwah, New Jersey; formerly Product Manager, Electronics Div., Curtiss-Wright Corp., Carlstadt, New Jersey, Prior, Div. Mgr. Technical Products, Div., Instrument Div. Allen B. DuMont Laboratories, Inc.; res. 132 Squire Hill Rd., Upper Montclair, New Jersey, b. November 26, 1914 in Philadelphia, Pa.; e. Rensselaer Polytechnic Institute; E.E. 1935 Ph. D (Physics) 1938; interested in radio since about 1931; amateur since 1931, W3BHT, W3AWZ, W2ZZBH, W2DMH, W2ZZDJ, W2ENY; presently active on 50 mc; Professional experience Dumont, engineer on cathode ray tubes and oscillographs from 1938, 1941/1947 Chief Engineer CRO, oscillographs TV receivers, transmitters; 1947/1952 Engineering Manager, Instrument Division; numerous U. S. and For-

eign Patents and applications; electronics; numerous lectures and papers in technical journals; hobbies, ham radio, scouting (committeeman); Montclair Society of Engineers (President 1953/1954).

CIMORELLI, JOSEPH T. (F) 1956 (M) 1950 - Manager, Manfacturing, Receiving Tube Operations, Electron Tube Division, Radio Corporation of America, Harrison, New Jersey; Res. 10 Cromwell Dr., Morristown, New Jersey; b. March 18, 1912 in Catskill, New York; ed. St. Patrick's Academy, Catskill, N. Y., Massachusetts Institute of Technology B. S. 1932, M. S. 1933; Professional Experience, Tube Department RCA Victor Division, Harrison, New Jersey Laboratory 4 years, Field Engineer 6 years, Manager Application Engineering Laboratory 8 years, Assistant to Vice President and Director of Engineering, Radio Corporation of America, Camden, New Jersey 3 yrs.; 2 years; IRE, Secretary-Treasurer of New York Section, Chairman, New York Section; Various IRE Section Committees; Charter member of Vatican Philatelic Society.

CLARK, LOUIS E. (M) 1939 - res. 298 Highwood Ave., Glen Rock, New Jersey; b. Jersey City, New Jersey, August 9, 1898; member IRE, Curtiss-Wright Corp., Prop. Division, Caldwell, New Jersey, since 1940 to date.

CLEMENT, LEWIS M. (F) 1919 - Consultant, RFD3 Doylestown, Penn. (18901); b. Oakland, Calif. January 25, 1892; married; University of California B.S. in E.E. 1914; Amateur 1905/1914 at Oakland, Calif.; Professional experience 1914/1959, radio operator summer 1911 and 1912. Marconi Wireless Tel. Co. of America, Kahuku, Oahu, T.H., and Bolinas, Calif., Western Electric Co. and Bell Telephone Laboratories; FADA RADIO; KOLSTER RADIO; Federal Telegraph and European I. T. T. Companies; RCA Mfg. Co., Camden, New Jersey and Crosley and Avco Mfg. Corp., Crosley Div. Many patents and Technical Articles; Chairman Advisory Group Reliability of Electronic Equipment Dept. of Defense; Fellow IRE Cosmos Club, Washington, D. C.; Member American Ordinance Assn.; member Armed Forces Communications and Electronic Assn.; Awards: Modern Pioneer Award, February 1940; National Assn. of Mfgrs.; Naval Ordinance Dev. Award; Bureau of Ordinance-U.S. Navy, December 10, 1945; Pioneer in the Field of Aircraft; Electronic Dev., May 4, 1950; Dayton Section I.R.E.; Contribution to Creation of Color Television Standards, June 17, 1954; RETMA-Placque Presented to Lewis M. Clement for Distinguished Service to Industry and Government in the field of Reliability, October 18, 1959; RETMA AND IRE, A Pioneer Award, presented by The Professional Group on Aeronautical and Navigational Electronics to Lewis Mason Clement by IRE 1951; Radio Club Director 1920 / 1930; Recording Secretary 1921; Vice President 1928 and President 1929.

COBB, HOWARD L. (F) 1934 - Engineer, Aircraft Radio Corporation, Boonton, New Jersey; res. 250 Rockaway Avenue, Boonton, New Jersey; b. July 17, 1896 at Salina, Colo.; married; ed. MIT 1923 S. B. Electrochemical Engineering; interested in radio since 1910; professional experience Radio Laboratory Philadelphia Navy Yard; RCA; Benjamin Elect.; [illegible]nsteel Products Co.; Ballantine Laboratories; Aircraft Radio Corporation; School Board; P.P. of A.E.S. Newark Branch; member A.S. M.; Mason.

COHN, HUGO (F) 1939 - Consulting Eng., 221 W. 57 St., New York, N. Y.; Formerly President Radio Receptor Co. Inc., 84 Noth 9 St., Brooklyn, N. Y.; res. 905 West End Ave., N. Y. C.; b. November 26, 1887 in N. Y. C.; married; ed. E.E. Columbia University, 1909; interested in radio 36 years; professional experience engineering and management with Radio Receptor Co., Inc. 1922 to date.

COLLISON, PERCE BRAWN (F) 1934, Retired (1958) res. 9 Lorraine Dr., Eastchester, N.Y.; b. Brooklyn, New York, June 15, 1891; married; e. High School followed by various special courses in Physics, Electrical Engineering, Television. interested in radio since 1905, 2KN with rotary spark gap until World War I; Vice President New York Radio Club, Amateur (K2DZ) "Extra Grade" Lic. Charter Member "Quarter Century Wireless Assn." Member "Westchester Amateur Radio Ass.", President Hammond Organ Society of Westchester; Professional experience, United Wireless Co. installer, Marconi Co. shipboard inspector and superintendent of construction, Field engineer, Stromberg Carlson Co., Export manager; Hollicrafters Co., Lieutenant Commander U. S. Naval Reserve set up Radio Material School for Navy Radio, Radar, Sonar, and Visual Signalling. Charter Member IRE, Wireless Institute, Wireless Assn. of America; Antique Wireless Association; Member ARRL, Armed Forces Communications Assn., Military Order of World Wars, Naval Order of the U. S.; Radio Club Recording Secretary 1949, Membership Com. Chairman 1950/1953.

CONNOR, GEORGE C. (F) 1936 - Senior Vice-President, Sylvania Electric Products Inc., Batavia, N. Y. res. 135 Pearl St., Batavia, N. Y. b. Hoquiam, Washington, May 28, 1903; s. John Henry and Anna Mary (Brisel) C.; student, U. Wis. 1922/1924; m. Helen Loosbrock, 1933; children, George Carley, Terrance Curtis. Mfg. br. service Brunswick Radio Corp. Chgo., 1926/1930; gen. mgr. Electronic Radio Corp., N. Y. C., 1930/1933; sales engr. Sylvania Electric Products Inc., NYC, 1933/1950; gen sales mgr. photolamp div., 1950/1958; vp., marketing, eastern region, 1959/1960; senior vp of marketing, 1960/1962; sr. vp gen. mgr. home and comml electronics div., Batavia, N.Y., 1962--Fellow, Radio Club Am. mem. IEEE, Photog. Mfrs. and Distbrs. Assn., (dir) Photog. Soc. Am. (Corner Stone mem.) A. A. A. S., Electronic Industries Assn. Clubs: N. Y. Athletic, Sales Executives NY, Stafford Country, Batavia. Home, 123 Pearl St., Weisdale, Fla. Radio Club Vice President, 1949.

COOK, LAWRENCE (M) 1939 (F) 1957 - Engineer, Boonton Radio Corporation, Boonton, New Jersey; res. 610 William St., Boonton, New Jersey; b. Bryan, Ohio October 4th, 1908; ed. Bliss Electrical School; member IEEE.

COULTAS, CHARLES (M) 1960 - bus. 4035 Lindell Blvd., St. Louis, Mo. res. 1610 Topping Rd., St. Louis 31, Mo.

COYNE, THOMAS F. (M) 1961 - bus. R. M. C. Associates, 236 East 75th St., New York, N. Y. res. 18 Sunnyside Blvd., Plainview, New York.

CRAMER, BRUCE G. (M) 1955 - Electronics Engineer, Research Division, Philco Corp., res. P. O. Box 273 Blue-Bell, Pa.; b. November 22, 1930 in Harrisburg, Pa.; ed. Pennsylvania State University, BSEE, 1952, current graduate study, University of Pennsylvania, previously with Bendix Aviation Corp. 1952/54; Military Service, Signal Corp. 1954/1956.

CRAWFORD, JOHN D. (F) 1939 - res. 16 Lodge Road, Great Neck, New York; b. Barberton, Ohio April 30, 1904; Senior Publication Engineer, Hazelton Corp. 59-27 Little Neck Parkway, Little Neck 62, New York.

CRAWFORD, ROBERT V. (F) 1940 - Electrical Engineer-General Electric Company, Schenectady, N. Y. 1928 to 1930; Bell Telephone Laboratories, Inc., Murray Hill, N.J. 1930 to date; Residence 11 Crest Circle, Murray Hill N.J.; Education: Rensselaer Polytechnic Institute; New York University, B. S. in E. E. - Senior Member IEEE; Member of Professional Group on Vehicular Communications; Member of various Special Committees of Radio Technical Commission for Marine Services (R. T. C. M.); Member of U. S. Study Group XIII of International

Radio Consultative, Committee (C. C. I. R,) member of U. S. Delegation to IXth Plenary Assembly, Los Angeles, 1959; patents in mobile radio and control fields; interested in radio since 1920; amateur license W2JLH since 1936; Telephone 1st Class License; Member, Telephone Pioneers of America; former president, Westchester Amateur Radio Association; Member, Quarter Century Wireless Association and North Jersey DX Association. Hobbies, boating, photography.

CRONKHITE, MINTON (F) 1919 - Radio Club Corresponding Secretary 1920; Director 1921/1922; Armstrong Medal 1950; IBCG Group. P. O. Box 805, Rancho Sante Fe, Calif. President Liberty Electric Co. 1928 at Stamford, Conn.; Radio Club of America Armstrong Medal 1950 - IBCG.

CRONKHITE, WILLIAM GORDON FELLOWS, (M) 1955 - Industrial Management, res. P.O. Box 805, Pancho Santa Fe, California, e. Univ. of Southern California; Military Service U. S. Navy 1951/1955, Amateur Call Letters K6 QQN, 4 years.

CRONKHITE, M. B. (M)1955 - res. P. O. Box 805, Paucho Sante Fe, Calif.

CROSBY, MURRAY G. (F) 1939 - Pres. Mars Electronics. 135 Eileen Way, Syosset, N. Y. Formerly President and Research Director, Crosby Laboratories, Inc., 299 Robbins Lane, Syosset, N. Y.; res. 93 Muttontown Road, Syosset, New York; b. Elroy, Wis. September 1903; married; ed. University of Wisconsin 1927 B. S. E. E.; amateur W2CSY formerly 9AOX; professional experience RCA Laboratories 1927/1944; Press Wireless 1944/1945; Paul Godley Co. 1945/1948; Crosby Laboratories, Inc. 1948 to present; Approximately 180 U. S. Patents; 20 Technical Publications in Proceedings IRE, RCA Review, QST and others.

CUNNIFF, LEO C., (M)1958 - Vice Pres. (Eng.) for manufacture of electronic test equipment and analytical equipment for chemical industry, Industrial Instruments, Inc., 35 Hillcrest, Cedar Grove, N. J., (17 yrs.), Military Service U. S. Navy 1944/1946 Radar Maintenance on U. S. S. Princeton CV-37; Amateur Call Letters W2OEH, 1940 Patents, Books, etc. (Basics of Radio Control - Air Trails Model Annual 1953 - Street & Smith); (Plug-In 27 Mc. Radio Equipment - Air Trails June 1950) (Instruments - World War I to date, The Hudson Engineering Jr. October 1952) Sports and Hobbies, Skiing, Flying, Skin Diving, Photography, Music.

DARRELL, ROBERT D. (M) 1946 - Music Critic, freelance, res. Balmoral, the Vly, Stone Ridge, New York; b. December 13, 1903 Newton, Mass.; single (div.); ed. Newton Public Schs., New England Consevatory of Music; interested in radio; amateur audio amplifiers and testing since 1942; professional experience Instruction Book Editor (IFF) Hazeltine Electronics Corp. 1943/1946; Magazine articles (Electronics, Saturday Review, Audiocraft, etc. and lectures on audio subjects, Audio Engineering Society, IRE, Music Librarians Assoc., etc.) Books, Good Listening (Knopf 1953, Mentor reprint 1955; Schirmer's Guide to Books on Music and Musicians (1951, Supplement in prep. 1959); Gramophone Shop Encyclopedia of Recorded Music (1936); onetime Editor of Phonograph Monthly Review, Review of Recorded Music, Music Lover's Guide ; since 1956 Contributing Ed. High Fidelity Magazine; many articles and reviews (mostly on recorded music).; Guggenheim Fellowship 1939; Societies AES (CM); IRE (A); Acoustical Society of America (A).

DAVIS, E. STUART (M) 1961 - res. 1149 Heber St., Union, New Jersey.

DAY, HOWARD BLOODGOOD (F) 1912 - Retired, 1960; formerly Electrical Engineer Pennsylvania Power and Light Co., Allentown, Pa., res. 2131 Baker Drive, Allentown, Pa.; b. November 2, 1894 at N. Y. C.; married; ed. Westfield, New Jersey Public Schools and University of Illinois, B. S. E. E. 1922; interested in radio since 1908; Amateur station "HDF" Westfield in 1908/1918 and licensed as 2KK 1913/1917; Commercial First Grade Radio Operator License No. 2488 in 1913; Chief Operator U. S. Ambulance Ship "Surf" in 1917 with Atlantic Fleet Member IEEE; Registered Professional Engineer in Pa. Lehigh Valley Engineers' Club and The Pennsylvania German Folklore Society which is a hobby or side study as is photography and TV circuitry; founding member of the Armstrong Memorial Foundation.

DEAN, FRANK C., (M)1955 - Western Electric Co., Military Engineering Service, Winston-Salem, North Carolina. Permanent location: Bell Telephone Laboratories, Murray Hill, New Jersey (Dev. Engr.) res. Mountainside Ave, Brookside, New Jersey, ed. Morristown High school (rech), Morris County Junior College 1933/1936. (Engr.), Military Service U. S. Maritime Service, September 1944/September 1945 (Radio Officer), Amateur Call Letters W2CKN, September 1932 to present time, F. C. C. Radio Telegraph 2nd. 1944/1949; Sports, Hobbies, etc., Electronics, sports.

DELLENBAUGH, FREDERICK S., III, (M) 1961 - bus. De-Var Systems, Inc., 494 Glenbrook Road, Glenbrook, Conn. res. 4909 Congress St., Fairfield, Conn.

DEMARCO, MATHEW (M)1962 - bus. Boonton Electronics Corp., Morris Plains, New Jersey, res. 1 Rosemont Lane West Orange, New Jersey.

DiBLASI, JOHN (F) - Electronic Sales, Cooper-DiBlasi, 90 Main St., Port Washington, Long Island, New York; res. 155 Bayview Rd., Plandome, New York; b. New York City November 5, 1898; married; ed. New York City, Schools, Cooper Union, Electrical Engineering 1922; interested in radio since 1912; licensed as amateur 2AGD in 1915, re-licensed as 2FD in 1920, presently W2FX; electronic sales business since 1915; taught radio in YM CA Schools and Jamaica Vocational High School; Senior Member IRE, member ARRL, North Shore Radio Club; Past President North Shore Radio Club; President Quarter Century Wireless Association.

DICKEY, EDWARD T. (F) 1927 - Retired; formerly Engineer RCA Laboratories, Princeton, New Jersey; res. 104 Jefferson Rd., Princeton, New Jersey; b. November 16, 1896 Oxford, Pa.; Married; ed. B. S. College of the City of New York; interested in radio since 1909; held amateur license for station 2CN from about 1913/1928; professional experience RCA Research Department in New York 1919/1924; Technical and Test Department 1924/1929; RCA Victor 1929/1941, RCA Laboratories 1942 to date. Present position, Coordinator, Technical Publications; several patents on radio; about ten technical articles on Radio; Hobby - Photography; Senior member IEEE.

DIEHL, WILLIAM FRANCIS (F) 1924 - Formerly Engineering Executive, Dumont-Airplane and Marine Instrument, Inc., Clearfield, Pa.; res. 2024 Columbia Pka. Arlington, Va.; b. December 18, 1896 at New York City; ed. Flushing High School, Columbia University, Alexander Hamilton Institute, LaSalle; married; interested in radio since 1907; amateur 1907/1917, professional experience, Chief Radio U. S. N. 1918/1919, Chief Engineer A. H. Grebe 1919/1928, Assistant Chief Engineer and Division Manager RCA Mfg. Co. Camden 1928/1938; Director of Engineering and Manufacturing, Product Manager Assistant Vice President Dumont, Airplance and Marine Instruments, Inc. 1938 to date; patents Cathode-Ray Oscillograph, Apparatus for Calibrating Piezo-Electric Elements, Crystal holder; Publications; Section (2) Properties of Materials, Pender - McIlwain, Electrical Eng-Hand Book, Colume (5) Electrical Communications and

Electronics; Papers in Radio Club, Electronics, Radio; Chairman, Philadelphia Section, Chairman IRE Ninth Annual IRE Convention; Fellow IRE; Certificate of Commendation U. S. N. World War Two; Sports: Tennis, Badminton and Crokinole; Hobby - Photography including medical. Registered Professional Engineer, Commonwealth of Pa. Standard Teaching Certificate (Photography), Commonwealth of Pennsylvania; Commercial Radio Operator's License-1913; Commercial Radio Operator-1919.

DOUCHA, ARTHUR FRANK (M) 1951 - Industrial Salesman Continental Sales Co., Inc., Newark, New Jersey; res. 41 Union Co. Pkway, Clark, New Jersey; b. New York City September 30, 1907; ed. Grammar and High School, New York Electrical School; married; interested in radio since 1924; built transmitters and receivers for amateur use in late 1920's; Radio Service business with a stress on sound installations; served in U. S. M. C.; member of A. E. S. and V. F. W.

DREHER, CARL (F) 1923 - Writer, Science Editor. The Nation, 333 Sixth Ave., New York, N. Y.; res. R. F. D. #3, Brewster, New York; b. Vienna, Austria, February 16, 1896; married; ed. B. S. City College of New York 1917; Assistant Research Engineer, Marconi Wireless Telegraph Co.; Receiving Engineer, Broadcasting Station Engineer, Radio Corporation of America; Staff Engineer, NBC, Chief Engineer RCA Photophone; Director of Recording, RKO Studios; Air Corp. AUS 1942/45; Fellow, IRE, Radio Club of America Director 1927/1928, Vice President 1929.

DROSTE, GEORGE THEODORE (M) 1926 - res. 8536 Oso., Avenue, Canoga Park, Calif.; b. N.Y.C. November 23, 1886; ed. Public School, Night and Trade Schools; interested in radio since 1903; School under Kolster 1904/1905; amateur 1912 2EU, after World War I call changed to W2IN; Signal Corps WWI; Production Engineer WW2 Bell Labs. at West Street and Western Electric at Kearney on radio, Architect and builder since 1901; Infantry 1906/1911, Signal Corps 1911/1936, Grade Captain N. G. N. Y., 1940/1942 Lieutenant Colonel Infantry; Member Staten Island Amateur Radio Club, IRE.

DUBILIER, WILLIAM (F) 1920 - res. 72 Esplanade, New Rochelle, New York; b. N.Y.C. July 1888; married; ed. Technical Institute, Cooper Institute; interested in radio since 1903; professional experience; experimental and original development of high frequency generators 1906, Chief Electrician Continental Wireless and Telegraph Co. 1907, President and Technical Director Commercial Wireless and Telegraph Co. 1909, organized Dubilier Electric Co. London 1910, Dubilier Electric Co. 1912, Dubilier Condenser Corporation 1913, Radio Patents Corporation 1917, all leading up to many present companies in this country and abroad.

DUSKIS, EPHRAIM F. (M) 1963. Director, of public utilities, A. S. Beck Shoe Co., 25 West 43rd St., New York 36, N. Y., consultant on most economic use of power and lighting; formerly, purchasing agent and auditor. res. 2109 Broadway, New York, N. Y.; b. June 26 1898, Leeds, Yorkshire, England. Ed., Public schools, Brooklyn Evening High School and Cooper Union in New York. Worked for patent attorney Bernam C. Stickney 1917/1918; Electro Experimental Publishing Co., Gernsback publication; 1918; to W. L. Cummings, facsimile experimenter, 1919/1920; Compensation Inspection Rating Bd. of New York 1920/1921; Safety Engineer, In, representing Amsco Products, Micamold Radio, Charles E. Chaping, DeForst Radio, etc., 1930. Amateur first grade license, 1916; member IRE and IEEE since 1916.

EGOLF, RICHARD S. (F) 1945 - Supervisor. International Program - Radiophoto Department, RCA Communications, Inc., 66 Broad St., N. Y. C.; res. 90 Eighth Ave. Brooklyn 15, N.Y.; b. Brooklyn, New York. December 30, 1895; ed. Public School 131, Manual Training High School, Pratt Institute, Brooklyn; married; interested in radio since 1909; Amateur station RS 1909, licensed 2LE in 1912, relicensed W2WX in 1919 and active ever since, hold Amateur Extra Class, First Class Radiotelephone and Radiotelegraph Licenses; Marine Radio Operator for Marconi Company 1914 SS Hamilton, SS North Land, SS Evangeline and for Nationl Electric Signalling Company SS Priscilla, SS Commonwealth and land station FNK Brooklyn; Radio Intelligence Division Signal Corp. U. S. Army World War I, Senior Member IRE, Member Veteran Wireless Operators Association, Quarter Century Wireless Association, Old Old Timers Club, DeForest Pioneers, Broadcast Pioneers.

ELDRIDGE, ALBERT B. (M) 1958 - Sales Engineer, "Measurements" A. McGraw Edison Div., Boonton, New Jersey; 23 Fern Road, 473, Sparta, New Jersey, e. attended, Rutgers University, Business Administration, RCA Institutes, Engineering; Military Service Signal Corps. Air Corps., 1942/1945.

ENGLE, KARL D. (M) 1929 - President, Karl D. Engle Co., sales representations, 4724 N. Sheridan, Chicago, 40, Ill,; res. 3621 W. Devon Ave., Chicago 45, Illinois; b. February 9, 1899 Shelbyville, Ky.; ed. High School. Ex. Courses in E. E. at Columbia University; interested in radio forty-five years; married; professional experience in radio parts manufacturing since 1917, mostly as Factory Superintendent and production Manager with large Eastern parts manufacturers; member Chicagoland Chapter of "Electronic Representatives Association," past President 1956.

ENGEL, FRANCIS H. (M) 1960 - Retired from RCA Washington, D. C.; res. RFD #1, Bennington, Vermont.

ESPENSCHIED, LLOYD (F) 1925 (H) 1963 - Research Consultant, retired from Bell Telephone Laboratories; res. 99-82nd Rd., Kew Gardens 15, N.Y.; b. April 27, 1889 St. Louis, Mo.; ed. Pratt Institute 1909, hon. D. Sc. 1957; married; interested in radio since 1904; amateur 1904/1909 Brooklyn, New York Station "XY"; summers 1907/1908 ship wireless telegraph operator United Wireless Teleg. Co.; 1909/1019 assistant engineer Telefunken Wireless Telegraph Co. of Amer., TWT at 111 Broadway, N.Y.C.; 1910 to 1954 with Bell Telephone System (AT&TCo and Bell Telephone Labs.) on research and development in radio and carrier systems; over hundreds U. S. patents dozens of technical papers, participated in national and international conferences on electric communications, received several honors; hobby - history, electrical and family (genealogical); Fellow AIEE, IRE; mem. Ocean Club of Forest Hills; Radio Club Director, 1931.

FAIRMAN, HARRY E. (M) 1946 - Chief Technical Editor, Polarad Electronics Corp., Long Island City, New York Business address: 34-02 Queens Blvd; home address: 41-41 Forty-First St., Long Island City, New York. Other memberships: Senior Member, I. E. E. E. and S. T. W. P., Resident Member, Museum of Modern Art, Member, Mensa. Graduate Pragmatist.

FARRAND, CLAIR L. (F) 1921 - President - Farrand Controls Inc., 4401 Bronx Blvd., N. Y. C.; President - Inductosyn Corp., 729 N. Carson St., Carson City, Nev.; res. 133 Pondfield Rd., Bronxville, New York; b. October 22, 1895 at Newark, New Jersey; ed. Central High School, Philadelphia, Pa. 1908/1911; married; interested in radio 45 years; amateur station WN 1908, Denver 1910; professional experience: 1912/1919 Design Engineer, Marconi Wireless Telegraph Co., 1919/1920 Assistant Chief Engineer Wireless Improvement Co., 1922/1924 Consulting Engineer Atwater Kent, 1924/1929 President Farrand Manufacturing Co., 1930/1936 President United

Research Corp. (subs. Warner Brothers Pictures, 1937/1940 President Independent Res. Service, 1940 to date President Farrand Optical Co., Inc.; about 30 U.S. Patents, about 10 Foreign Patents; Sports - Tennis, Fly Fishing, Yachting; Societies - Fellow IRE, Society Motion Picture and Television Engineers, Member American Physical Society, British Kinematograph Society Clubs - New York Yacht Club, West Side Tennis Club, Bronxville Field Club; Naval Ordinance Development Award, U. S. Navy December 10, 1945, Technical Mission to British Isles and Germany 1946, Honorary Degree of Mechanical Engineer, Stevens Institute of Technology, 1949.

FELCH, EDWIN PIERSON (F) 1939 - Director of Military Systems Development, Bell Telephone Laboratories, Inc., Whippany, New Jersey; res. 109 Fairmount Ave., Chatham, N. J.; b. January 10, 1909 at Madison, New Jersey; ed. A. B. Physics 1929 Dartmouth College; married; interested in radio about 35 years; amateur 1930/1937 W3AWT associate; professional experience Bell Telephone Labs. 1929 to date, electronic measuring apparatus development 1930/1953, Airborne Magnetometer Development World War Two, now in charge of Titan ICBM Guidance system development; several patents on automatic frequency control systems and Magnetometers; member AIEE, Fellow IRE: Hobby Sports cars.

FELIX, EDGAR H. (F) 1928 - Writer and editor, 400 East 85th St., New York 10028. Formerly, Manager, Planning-Co-ordination, Defense Electronic Products, Radio Corporation of America, Camden, New Jersey 1953/1962; Defense Marketing, DuMont Laboratories 1947/1953; Director, Radio Coverage Reports, 1928/1942. b. March 29, 1898; married; ed. Sheffield Scientific School, Columbia University School of Journalism and New York University. Amateur operator, 1915, 2ADQ. Professional writer, newspaper and magazine columnist, 1918/1932; public relations director, WEAF, A. T. & T. 1922/1925; allocation consultant, FRC and FCC, 1927/1942. Author "Using Radio in Sales Promotion," 1927, the first radio advertising text book; "Television, its Methods and Uses, 1931, presenting the cathode ray tube as replacement for the scanning disc. Military service: Signal Corps, U. S. A., 1918; 1942/1946; Lieut. Col., USAFR, 1946-1952. Senior Member, IRE, 1917/1962; Life member, 1963. Editor, Proceedings Radio Club of America, 1963, Director 1964.

FELT, MARCUS A. (M) 1964 - Teacher and author; res. 50 Prince Lane, Westbury, L. I., New York; ed. B. S. M. A. New York University; b. New York City March 8, 1919; married; interested in radio since 1932; holder of amateur advanced class license W2GYQ; licensed in teur radio operatons 1940-1945; First Class Radiotelephone license since 1948; teacher of history since 1949; writer on radio history subjects since 1964; member of Quarter Century Wireless Associaton, American Radio Relay League, Long Island DX Association; active on 20 meter single sideband as a member of the Rag Chewers Club; interested in radio, flying, history, education, writing, and walking.

FINCH, WILLIAM G. H. (F) 1927- Captain, USN. Retired consulting engineer. Res. "Elfin," Newtown, Conn.; b. Birmingham, Eng., June 28, 1895; s. William J. and Amelia (Skelding) Finch ed. Woodward H. S. (Cicinnati); Amateur Stations 8IE and 8MK in Cincinnati, O., 1912/1914. Elec. Engrg. course of Allis-Chalmers Co. at Norwood, O.; Radio Communications course at Marconi Inst., N. Y., 1917; Columbia Univ., radio engrg. & pat. law, 1922-23; profl. engrg lic., Univ. State N.Y., 1931; m. Cinn., O., Nov. 29, 1916, Elsie Grace George; ch.: Eloise Grace. With Cleveland Illum. Co., 1916-17; insp. engr., Natl. Dist. Telg. Co., N. Y. City, N.Y. Compen. Bd., 1917-19; elec. engr., Royal Indem. Co., 1919-21; radio engr., ed. Internatl. News Service, since 1921; radio ed., N. Y. Am; pat. adviser for Popular Radio and Wireless press circuit betw. N. Y. City and Chicago, 1932; first internatl. radiotypewriter circuit betw. N. Y. and Havana, 1933; chief radio cons. engr., Hearst Newspapers; tech. dir., Hearst Newspapers Radio Service; chief engr., sec., Am. Radio News Corp., 1929-34; asst. chief engr., chief of tel. engr., div. Federal Communs. Comm., chief engr., Fed. investiga. tel. cos., 1934-35; estab. (1935) and pres., Finch Telecommunications, Inc., N. Y. City, since 1935; v.p., Sta. WCAE, Pbgh.; communicatons aid to Wilkins Ellsworth Transarctic Sub. Expedn., "Nautilus," 1931; mem. Internatl. Radio Consit. Comm.; mem. tech. commn. on radio and cable communications Am. Publrs. Assn., since 1924; del. to Hon. Herbert Hoover's 3rd and 4th Natl. Radio Confs., 1924-25; apptd. mem. commn. on allocation of frequency, 4th Natl. Radio Conf.; del to Internatl. Teleg. and Radio Teleg. Conf., Madrid, Spain, 1932; N. Am. Radio Conf., Mex. City, 1933. Member, Defense Communications Board, 1940/1941, holds 160 odd pats. on telepicture, facsimile communications; automatic high speed radio printing system; radio relay and recorder; high fidelity transmission system (both black and white and in natural colors); radio and wire facsimile communications; automatic high speed radio printing systems. comd., U. S. Navy, Dec. 1, 1941; Naval observer in British Isles, 1942; now capt. U. S. Navy; Spl. Asst., Electronics to Asst. Chief Bur. of Ship for Electronics, Asst. Chief Officer of Naval Research, U. S. Navy, Navy Dept., Wash., D.C., Legion of Merit. Awarded Am. Defense and European-African-Middle Eastern Area Campaign medals, Author; over 360 tech. articles on radio and gen. elec. subjs., Fellow: I. R. E.; A. I. E. E.; A. P. S.; A. A. A. S.; Franklin Inst.; Radio Club of Am.; N.Y. Academy of Sciences and Armed Forces Communication and Electronics Assoc., N.T. State soc. Profl. Engrs. Clubs; Lotos, Bankers, Army & Navy (Wash., D. C.), Columbia Yacht, N.Y. Athletic, Crown Pt. Country.

FINK, DONALD G. (F) 1934 - Manager, I.E.E.E. formerly Director of Research Philco Corporation, Tioga and "C" Streets, Philadelphia 24, Pa.; res. 845 Dale Rd., Meadowbrook, Pa.; b. Englewood, N. J. November 8, 1911; married; ed. Bachelor of Science, N.I.T. 1933, Master of Science Columbia University 1942; interested in radio since 1921; amateur W2AFX 1928 to date, W3TVI 1952 to date; professional experience editorial staff Electronics 1934/1952, Editor-in-Chief 1946/1952, Staff Member MIT Radiation Laboratory 1941/1943, Expert Consultant, Office of Secretary of War 1943/1945, Director of Research Philco Corporation 1952 to date; Books; Engineering Electronics 1935, Principles of Television Engineering 1940, Microwave Radar 1942, Television Standards and Practice 1943, Radar Engineering 1947, Television Engineering 1952. Television Engineering Handbook-1957; Editor, Proceedings of the IRE-1956/57; President-IRE-1958.

FINLAY, JOHN C. (M) 1959 - Electronic Sales Engineer, Finlay Sales Company, Manager Washington, D. C. Branch, P.O. Box 1777, Hyattsville, Md.; res. 5902 31st Avenue, Hyattsville, Md.; b. New York City September 19, 1937; Married; ed. New York University, United States Military Academy, West Point, N.Y., Class of 1961; Association of Graduates, U.S.M.A., American Radio Relay League, I.A.R.L., Amateur K3YFG, A.F.C.E.A., Elelay League, I.A.R.L., Amateur K3YFG, A.F.C.E.A., Electronic Representatives Association, Radio Club of America 1959.

FINLAY, ROBERT H. (M) 1958 Manufacturers' Representative, 307 Lincoln Building, Ridgewood, N. J.; res. 50 Grand St., Hackensack, N. J.;

FINLAY, ROBERT (F) 1936 - Manufacturers' Representative, 45 North Broad St., Ridgewood, New Jersey; res. 104 Brookside Ave., Ridgewood, New Jersey; b. N. Y.C. December 17, 1901; ed. U.S.M.A. West Point 1924; married; First interested in wireless in 1911; Author of articles on radio servicing, 1929, in Radio News and on electronic testing, measurement and computing developments, 1936, in Electronics; Eastern Field Engineer and Washington Representative, Hallicrafters Co., 1938 to

1948; 1948 to present, Mfr's Rep.; Member, West Point Society of New York, Association of Graduates, U.S.M.A., Armed Forces Communications Ass'n., Electronic Representatives Ass'n., Radio Club of America: Director 1959, Membership Chairman 1960-3, Corresponding Secretary 1964.

FOWLER, CHARLES J. (F) 1951 - Supervisor Bldgs. & Grounds, Armstrong Research Field Lab. for Columbia Univ. at Alpine, New Jersey res. 135 E. Madison Ave., Dumont, New Jersey; b. Sea Bright, New Jersey July 10 1899; married; professional experience, Construction of radio stations for 27 yrs., Belfast, Maine, Tuckerton. N. J., Riverhead and Rocky Point, L.I., New York WEAF Bellmore, Long Island, WJZ at Bound Brook, N.J. Past 21 years at Alpine, New Jersey (17 yrs. with Maj. Armstrong).

FOWLER, HENRY L. (M) 1956 - MacSpar Drive, Mt. Fern New Jersey.

FRESEMAN, WILLIAM L. (F) 1957 - Executive, Radio Engineering Laboratories, 29-01 Borden Ave L. I. City, prior, Communication Engineering & Mfg. Co., Inter Standard Electric Corporation (ITT); e. B. S. U. S. Naval Academy 1922, M. S. Harvard University 1929, Director Radio Club of America, 1960 to date, Certificate, U. S. Naval War College 1935; Military Service, 29 Years, U. S. Navy; Patents, Books, etc. Book (with H. W. Hiser) Radar Meteorology, 1955, Various Technical Papers; Sports, Hobbies, etc. Yachting, University Yacht Club, Miami, Fla., Army Navy Country Club, Arlington, Va.

GAW, NORMAN, W., JR. (M) 1958 - Measurements Corp. Boonton, New Jersey.

GAWLER, HARRY (F) 1921 - Engineer, Gawler-Knoop Company, 168 Eagle Rock Ave., Roseland, New Jersey; res. 102 North 22nd St., East Orange, New Jersey; b. Washington, D.C.; interested in radio 1904; professional experience, U.S. Radio Inspector, New England 1912/1920, Army and Navy Radio, Graduate of First Navy Wireless Class 1904 at Brooklyn Navy Yard; married; Senior Member IRE.

GERNSBACK, HUGO (F) 1919 Publisher - Gernsback Publications, Inc., 154 West 14th St., N.Y.C.; res. 263 West End Ave., N.Y.C.; b. August 16, 1884 at Luxembourg, Luxembourg; ed. Ecole Industrielle, Luxembourg; Founded Electro Importing Co. 1905 offering first spark transmitters and receivers to public; Modern Electrics 1908, Electrical Experimenter 1913, Radio News 1919, Radio Craft 1929 (now Radio Electronics) and a series of technical publications to date.

GHIRARDI, ALFRED A. (F) 1933 - Consulting Electronics Engineer, Technical Publications Consultant, Author Technical Books, self-employed; res. 94 Alpine Street, Stamford, Conn.; b. New York City August 16, 1904; ed. Cooper Union Institute of Technology B. S. and post Graduate E.E.; interested in radio since 1917; professional experience, Electrical Engineer, Livingston and Co. 19-23/1924, Engineer of Experimental Laboratory and Associate Editor Radio Engineering Magazine 1924/1926, Head of Electrical and Radio Department Technical Institute N.Y.C. 1926/1934, Technical Consultant Pilot Radio and Tube Corp. 1931/1934, President Radio and Technical Publishing Co. 1930/1943; author Radio Physics Course, Modern Radio Servicing, Radio and Television Receiver Troubleshotting and Repair, Pix-O-Fix TV Trouble Finder Guide, Radio Troubleshooter's Handbook; Co-author; Radio & TV Reciver Circuitry & Operation, TV Probes & Their Application; Senior Member IRE: Member Tau Beta Pi.

GILLETTE, EDWARD CLINTON, JR. (F) 1947 - Retired Colonel U. S. Army Formerly "Professor and Head of Dept. of Physics and Chemistry" U. S. Military Academy, West Point, N.Y.; res. Main Street, Box 131, Castine, Maine; b. Philadelphia, Pa. July 25, 1900; married; ed. B. S. West Point Military Academy 1920, M. S. E E. Purdue University 1931; attended Harvard University, Columbia Univ., Penn State Univ., Atomic Energy Com. Nuclear Institute, Purdue Univ. 1958; interested in radio since 1912; amateur 1929/1936; professional experience military only 1918 to present in Reg. Army, Artillery and Signal Corps, appointed permanent Prof. of Physics and Chemistry at U. S. Military Academy 1946; World War Two service in ETO 1943/1945, Signal Div. SHAEF, Chief Signal Officer First Allied Airborne Army and Chief Signal Officer Berlin District; Decorations include Legion of Merit, Bronze Star and ACM (US), Order of British Empire, Croix de Guerre (Belgium), Croix de Guerre (France); Sports - Tennis, Swimming, Handball, Squash, and Sailing; Hobbies - Radio and Electronics, metal and wood-working, collecting and refinishing antique furniture, collecting old clocks, repairing and restoring antique automobiles; Member IRE, Member Army and Navy Club, Washington, D.C. AFCEA, Member American Assn. of Physics Teachers, member Am. Soc. for Eng. Ed., Member Nat. Geographic Soc.

GIRDWOOD, JAMES, (M) 1952 (F) 1961 - P R Mallory Co. Indianapolis, Indiana, formerly Associate Publisher, Electronics Magazine, McGraw-Hill Publishing Co., 330 West 42nd St., New York 36, N.Y.; b. Maplewood, N.J. November 12, 1919; ed. Kent School 1938, M.I.T. 1942, Mechanical Engineering University of Main 1943; Business Administration, Harvard Graduate School of Engrg., 1944, M.I.T Graduate School 1945 electronics engineering; Military Service, U. S. Marine Corps. 1st. Lieutenant Radar Counter-Measures Officer and Electronics Engineering; Patents, Paper, etc. Textbooks-Govt. prepared on Radar Theory and Maintenance, editorial work on marketing in the electronics field; Sports, Hobbies Clubs, etc., U. S. Amateur Roller Skating Ass., exec. Board and dance rom., U. S. Bronze & Silver Bar Medalist, National Skating Judge, member Phi Gamma Delta Club, N.Y.C., Loantaka Skeet Club, Florham Park, New Jersey, Ganahgoate Gun Club, Gardner, N.Y.; 1948/1956. Advertising Salesman, New Jersey, Electronics and Nucleonics, 1957/1958 Sales Mgr., Electronics and Nucleonics, 1959 Association Publisher Electronics.

GLASER, EDWARD M. (F) 1946 - Chief Electrical Engineer, Kollsman Instrument Corporation, Elmhurst, L.I., N.Y.; res. 2733 Wallace Ave., Bellmore, L.I., N.Y.; b. Brooklyn, N.Y. September 19, 1905; ed. B.S. in E. E., assorted graduate courses; married; interested in radio since 1920; amateur W2BRB 1921 to date, 8AX during 1929, schedules Byrd Antarctic Expedition; professional experience 3 years in radio manufacturing, test, foreman, engineer, 5 years Pioneer Instrument Co., development engineering aviation instruments, 24 years Kollsman as Chief of Electrical Experimental Department in charge of laboratory; Senior Member IRE, Member AIEE Hobbies - piano, small orchestra, fishing, bowling, gardening, photography, piloting; Avocation - free servicing and consulting on electronic gear for friends, relative and neighbors, Organ; Coast Guard Auxiliary Training Officer.

GLASER, MARCUS (F) 1941 - Professional Engineer, N. Y. & N. J. DeWald Radio and TV Corp., 35-15 37 Ave., Long Island City, N.Y.; res. 226-07 137 Ave., Laurelton, N.Y.; b. Brooklyn, N.Y. February 5, 1908; ed. Pratt Institute E.E.; married; interested in radio since 1918; amateur W8IE & K2GR; professional experience 29 yrs.

Chief Engineer and Vice President United Scientific Laboratories and Chief Engineer and Vice President DeWald Radio and DeWald Radio and TV Corporation; Senior Member IRE, Member Filicity Lodge 1100 New York, AIEE.

GODLEY, PAUL F. (F) 1914 - Consulting Radio Engineer, Paul Godley Co., Great Notch, N. J.; res. Old Quarry Rd., Great Notch, N.J.; b. Garden City, Kans., 9/25/1889; ed. Defiance College & University Illinois; married professional experience United Wireless Tgh. Co. 1909; radio instructor 1909/11; Radio Engineer Brazillian Govt. Amazon River Radio Service 1912/13; Independent VT circuit research 1914/15; partner Adams Morgan Co. 1915/24 also, design engineer Marconi's Wireless Tgh. Co. 1918/19; Technical Editor, Wireless Age 1918/19; design engineer Liberty Electric Co. 1920; Receiving Operator ARRL Trans-Atlantic Tests 1921; Radio Editor Newspaper Enterprise Assn. 1922/24; Organizer VP & GM Farrand Mfg. Co. 1924/25; VP Chalmers-Godley Corporation, 1926/27; Consulting Radio Engineer 1926 to date; Radio Club of America President 1939, VP 1923/25, Director 1915/17, 1919/22, 1926, 1931/33; Armstrong Medal 1950 for IBCG reception at Ardrossan, Scotland; Marconi Memorial Award, Veteran Wireless Operator's Association 1947; Life Member I. R. E.

GOLDSMITH, DR. ALFRED N. (HM) 192 - Consulting Engineer, 597 Fifth Ave., N.Y.C.; b. New York, New York September 15, 1888; ed. College of the City of New York, Columbia University; married; interested in radio since 1901; amateur 2XN, New York; professional experience Professor of Electrical Engineering, College of the City of New York, Vice President and General Engineer Radio Corporation of America, Director of Research, Marconi Wireless Telegraph Company of America, Consultant to General Electric Co.; about 200 patents; numerous technical papers; Fellow AIEE, Fellow American Physical Society, Fellow Acoustical Society of America, Fellow IRE: Medal of Honor IRE-Radio Pioneers Award; Progress Medal Award, Society of Motion Picture and Television Engineers; Director, RCA Communications, Inc.

GOLDSMITH, T.T.JR. (F) 1939 - Vice President, Allen B. DuMont Labs.; res. 519 Highland Ave., Upper Montclair, New Jersey; ed. Furman University B. S. 1931, Cornell Ph. D. 1936; member IRE and American Physical Society.

GRAHAM, CHARLES B., (M) 1960 - Associate Editor, Radio-Electronics Magazine, 56 Seventh Ave., New York N.Y. res. Box 262, New York 29, New York.

GRAHAM, VIRGIL N. (F) 1931 - Associate Director Engineering Department, Electronic Industries Association, 11 West 42nd St. New York 36, New York, formerly Director of Technical Relations, Sylvania Electric Products, Inc., Bayside, N. Y.; res. 40 Brompton Road, Great Neck, New York; b. Rochester, New York January 22, 1902; ed. University of Rochester; married; interested in radio since 1916; professional experience 1923/1935 Head of Radio Laboratory, Stromberg Carlson, 1935/1942 Director of Tube Application Department Sylvania Electric, Plant Manager 1942/1946 and 1946 to 1954 as above; Fellow IRE, Standards Engineers Society IRE Australia, Member Engineers Club, AIEE, Acoustical Society of America and Societe' des Radioelectriciens.

GRAY, ALFRED RAYMOND, (F) 1960 - Consultant, Reliability & Production Processes, formerly, The Martin Company, Baltimore, Md. and Orlando, Fla. res. 1110 South Woods St., Orlando, Florida.

GREBE, ALFRED HENRY (M) 1952 - Engineer Veeco, Plainview, N.Y., formerly Dept. Hd., New Product Design and Development, Allied Control Company, Inc., Plantsville, Conn. (main offices, 2 East End Ave., N.Y. C., res. 60 Sherbrook Dr. Smithtown, N.Y.; b. Jamaica, Long Island, N.Y., April 3, 1926; ed. B.S. E.E. (electronics) Rensselaer Polytechnic Institute, 1950, 11 months U. S. Navy Aviation Electronics Technician Training, World War II; Professional Experience, Chief Eng., Filtors, Inc., Port Washington, N. Y., Owner Grebe Radio & Television Co., sales and service, 1 1/2 years, Asst. Project Eng., Sperry Gyroscope Co., 1 1/2 yrs., Aviation Electronics Technicians Mate Second Class, U. S. Navy, 2 yrs., Professional Societies and memberships, Tau Beta Pi, Eta Kappa Nu, Institute of Radio Engineers, American Management Ass'n.

GROB, W. MANNING (F) 1925 - Field Engineer, Lepel High Frequency Laboratories, Woodside, Long Island, New York; res. 136 Davis Ave., White Plains, New York; b. Brooklyn, New York September 14, 1890; ed. South Side High School, Ex. Courses Penn State College, Army Signal Corps School; married; interested in radio since 1913; W2AQJ 25 years; professional experience signal engineer, telephone fire alarm, traffic control, communication radio, metal heating by high frequencies, affiliated Signal Corps 1925/1935; Hobbies - old automobiles, models; Societies - ARRL, Army Ordinance Association, American Society for Metals, International Municipal Signal Assn.

GROGAN, WILLIAM F. (M) 1949 - Purchasing Director, Times Facsimile Corporation, 540 West 58th St., N.Y.C.; res. 243 East 39th St., N.Y.C.; b. Acworth, Georgia May 19, 1898; ed. High School; married; interested in radio since 1922; amateur licenses 4 QY 1922, J9NB and J9ANB 1946 Okinawa; Commerical Telegraph and Telephone Operator Licenses; Professional experience 3 years commercial operator (ships), 1 year Blimps, Goodyear Rubber Co.; Commander, Naval Reserve, (Retired), Two years instructor Navy Radio School, 3 years Commanding Officer, Naval Training School (pre-Radar) Grove City College, Pa.; secretary Greater New York Chapter Retired Officers Association.

GRUBER, PAUL, (M) 1957 - Electrical Engineer, Radio Engineering Laboratories, 29-01 Borden Avenue, Long Island City, 8 yrs.; res. 1357 Prospect Ave., East Meadow, New York; ed. Polytechnic Institute of Brooklyn, B.E.E. (Communication Engineering), Graduate School Adelphi College, Physics Major; RCA Institute, General Course Electrical Technology; Military Service, 1942/1945 U. S. Army; Patents, Papers, etc. "Electronics" April 11, 1958 Crystal Converter for Tropo-Scatter Receivers.

GUNTHER, FRANK A. (F) 1940 - President & General Manager. Radio Engineering Laboratories, Inc., 29-01 Borden Ave., Long Island City 1, N.Y.; res. 10 Highpoint Rd., Dongan Hills, Staten Island 4, N.Y.; b. New York February 3, 1908; ed. Grade Schools, N.Y.C., Stuyvesant High School, Columbia University Ex. N.Y.C. Wagner College, S. I., N.Y.C.; interested in radio since 1919; professional experience REL 34 years - First two way police radio; Fellow IEEE, member Armed Forces Communications and Electronics Association - Director New York Chapter, member ARRL, member Quarter Century Wireless Association, Director - Single Side Band Amateur Radio Association; Retired Major U. S. A. Air Force, Reserve Civil Air Patrol, Commercial Pilot; Radio Club of America - President 1956 and 1957, Vice President 1954 and 1956, Recording Secretary 1952 and 1953, Director 1951, 1958 and 1959.

GUY, RAYMOND F. (F) 1939 - Retired, formerly Engineering Executive, National Broadcasting Company, 30 Rockefeller Plaza, N.Y.C. Lighthouse Point, Florida; b.

Hartford, Conn. July 4, 1899; ed. E.E. Pratt Institute 1921; married; interested in radio since 1911; amateur station 1911 to present, W2AK; professional experience Marconi Co. 1916, WJZ 1921, RCA Research 1924/1929, National Broadcasting Company 1929 to present; U. S. Army 1918/1919 AEF, president IRE 1950, Director IRE 9 Yrs. Trea. IRE, Chairman TV Advisory Committee N.A.R.T.B., Life Member VWOA, Fellow IRE, Member Radio and TV Executive Club, Manager Radio and Allocations Engineering, NBC, Radio Club Director 1941, President, Broadcast Pioneers, 1956, Now Secretary, Chairman, Engineering Committee and Member, Industry Advisory Committee, Voice of America, Member, National Executive Reserve, Television Allocation Study Organization; First Vice President, Veteran Wireless Operators Ass'n. Recipient of Marconi Gold Medal of Achievement. Member Ass'n. of Federal Communications Consulting Engineers, Member, CCIR Study Group 10, Member American Institute of Electrical Engineers, Member, Broadcast and TV Systems Com., AIEE, Member, Executive Com., IRE Professional Group on Broadcasting, Member IRE Admissions Com., Member NAB Convention Program Committee (Former Chairman).

HACKBUSCH, RALPH ANTHONY (F) 1929 - President and Managing Director, Hackbusch Electronics, Ltd. 23 Primrose Ave., Toronto, Canada; res. 55 Arjay Cres Willowdale P.O. York Mills, Ontario, Canada; b. Hamilton, Ontario, Canada September 18, 1900; ed. Public Schools Hamilton, Hamilton Collegiate Institute, Hamilton Technical and Art College, Alexander Hamilton Institute; married interested in radio since 1912; amateur 1912/1914, VE9AE 1937/1954; professional experience 1914/1926 Canadian Westinghouse Co., 1926/1930 Associate Radio Engineer Kolster Radio Co., Toronto, 1930/1939 Radio Engineer, Chief Engineer, Vice President and General Manager Stromberg-Carlson, Co., Ltd., 1940/1943 Vice President and Director Radar Division Research Enterprises, Ltd., 1944 to present as above; Fellow IRE, Member Acoustical Society of America, member Rochester Engineering Society, Member Royal Canadian Institute, Golden Fleece Lodge AF and AM, registered Professional Engineer, Past Vice President and Director IRE, Past President RTMA of Canada, Past President Canadian Radio Technical Planning Board 1949/1953, Granite Club, Toronto General Technical Coordinator CRTPB 1955/59; Member IRE Gen. Standards Committee 1954/59; Member BIA Gen. Standards Committee 1930/59; Dir. of Engineering BIA of Canada 1932/39 & 1945/59; Chairman CSA Sectional Committee on Radio 1957/59.

HALL, F. SUMNER, (F) 1949 - Audio Engineer, Audio Accessories, 279 Broadway, Amityville, N.Y.; b. Worchester, Mass. February 26, 1907; ed. High School; married; interested in radio since 1920; professional experience Control Room and Field Engineering (broadcasting), theatre sound service and inspection, disc and film recording, design and installation broadcast audio facilities and recording facilities, presently design production and sales; Past President & Fellow Audio Engineering Society.

HALLIGAN, WILLIAM J., SR., (F) 1964 - Chairman of the Board, The Hallicrafters' Co., 4401 West Fifth Avenue, Chicago, Illinois; res. 179 East Lake Shore Drive, Chicago, Illinois; born South Boston, Massachusetts, December 8, 1899; ed. Grade Schools, Charlestown High School, Boston, Mass., BSEE Extra Ordinem Tufts College, Medford, Mass. 1923, United States Military Academy, West Point, N.Y., married; interested in radio since 1913; amateur since 1916 IAEH, currently W9AC and W4AK; United States Navy Wireless Operator 1917-1919; professional experience: newspaper reporter, Boston 1922/1924, Tobe Deutschmann Co., Boston, Mass. Sales Manager 1924/1928; founder of the Hallicrafters' Co. 1933; memberships Fellow IEEE, permanent Director and past President Armed Forces Communications and Electronics Assoc., Mayor's Committee for Economic and Cultural Development of Chicago, past Director Illinois Chamber of Commerce, past President West Point Society of Chicago, Quarter Century Wireless Association, North Sea Mine Force Association, Navy League of the United States, Radio Electronics-Television Manufacturers Assoc., Newcomen Society of the United States, American Radio Relay League, Single Sideband Amateur Radio Assoc., Chicago Athletic Assoc., Chicago Press Club, Executive Club.

HANNAH, MERLE R., 1960 - Senior Project Engineer, CBS Laboratories, 227 High Ridge Stamford, Conn. res. 56 Sherwood Road, Stamford, Conn.

HAMILTON, HUGH G. (M) 1950 - res. RFD #2 Dover, N. H.; b. July 21, 1905; ed. B. S. in Engineering (Communications) M. I. T.; amateur 2GK 1921/1926, W2AIF Schenectady; President Eastern Air Devices; Vice Pres. Norbute Corp.

HARA, BENJI (M) - res. 630 W. 135th St., New York, New York.

HARMATUK, SAMUEL N (F) Engineer, New York Fire Dept., 20 yrs., res 1575 Odell St., Bronx 62, New York, military service WW II 4. 1942/1946. Lt. Col.--A. F. Reserve Current, amateur call letters W2ELE (EX.) Patents, Books, Etc., New York Fire Dept.--Radio System; Sports, Swimming. Radio Club of America; Vice P.

HARNETT, DANIEL E. (F) 1926 - Engineer, General Electric Co., Syracuse, New York; res. 408 Brampton Drive DeWitt, N.Y.; b. Elmira, New York July 20, 1899; ed. Columbia University A. B. 1922, E. E. 1925; married; interested in radio since 1923; professional experience Pacent Electric Co. 1925/1929, Hazeltine 1929/1948, Emerson Radio-Phonograph 1949, General Electric Co. 1949 to date.

HAYNES, N. M. (M) 1940 - res. 1115 Beach Street, Far Rockaway, 91, New York; b. Brooklyn, New York June 15, 1908; ed. Brooklyn Technical High School, CCNY, Long Island University Ph. G.; Amplifier Corp. of America 1944.

HAZARD, THOMAS T. (F) 1939 - Pensioner Public Service Corporation, Newark, New Jersey; res. Box 57 Cherry La., Brookside, New Jersey; b. August 5, 1875; single; interested in radio since 1922; member American Radio Relay League, The Universal Radio DX Club, Newark News Radio Club.

HEALEY, WILLIAM J. (M) 1952 - Sales Manger, Weston Electrical Instrument Co., 50 Church St., N. Y. C. res. 4 Cambridge Road, Glen Ridge, N. J.; b. Tacoma, Wash., March 5, 1895; ed. Electrical Engineering ICS; interested in radio since 1924; professional expeience in engineering and sales; Boy Scouts, Scout Master 18 years, Church Trustee 12 years, Masonic Orders.

HEES, GEORGE C. (F) 1943 - Purchasing Agent, Sperry Gyroscope Co., Great Neck, N. Y.; res. 701 5th Ave., New Hyde Park, N. Y.; b. Brooklyn, New York May 10, 1899; ed. Pratt Institute, Brooklyn, New York; married, interested in radio since 1918.

HEISING, RAYMOND A. (F) 1921 - Consulting Engineer and Patent Agent, 232 Oak Ridge Ave., Summit, New Jersey; b. Albert Lea, Minn. August 10, 1888; ed. E. E. University of North Dakota 1912, M. S. (physics) University of Wisconsin 1914; married; interested in radio since 1907; professional experience Western Electric Co., and Bell Telephone Laboratories 1914 to 1953; research and development on all pioneer commercial and military radio telephone applications; retired from Bell Telephone Laboratories 1953; over 120 U. S. Patents,

dozen engineering papers, 1 book; American Physical Society, AIEE, Radio Club of America Director, Armstrong Medal 1952 for Heising Modulation, D.Sc. - University of North Dakota, 1947.

HENNEY, KEITH (F) 1927 - Retired, formerly Editor, McGraw-Hill Publishing Co., N.Y.C.; res. Snowville, N.H.; b. McComb, Ohio October 28, 1896; ed. A.B. Western Reserve University 1921, A.M.; Harvard University 1925; married; interested in radio since 1913; amateur 8ZD and 8ADP Marion, Ohio 1915, 2EJ-1925, W1QGU-1947, K2BH-1948; professional experience Engineer, Western Electric Co. 1923/1924, Radio Broadcast Magazine 1925/1930, McGraw-Hill 1930 to date; Radio Operator United Wireless, 1918 and Marconi 1922; Books - "Principles of Radio" 1930, "Color Photography for the Amateur" 1938, "Electron Tubes in Industry" 1934, "Handbook of Photography" 1939, "Radio Engineering Handbook" 1933; Fellow IRE, Member Harvard Club of N. Y. C.; Radio Club of America, President 1940, Vice President 1939, Recording Secretary 1934-1938.

HIRSCH, CHARLES JOACHIM (F) 1947 - RCA Laboratories, Princeton, N.J., Formerly Executive Vice-President, Hazeltine Research Corporation, 59-25 Little Neck Parkway, Little Neck 62, N.Y.; res #1 Fox Ridge Lane, Locust Valley, N.Y.; b. Pittsburgh, Pa. October 25, 1902; ed. Columbia College A. B. 1923, Columbia School of Engineering E. E. 1925; married; professional radio experience since 1925; several patents; papers in IRE, Radio Club, IEE, SMPTE, Onde Electrique, Acta Electronica; Contributing author; "Pender-McIlwain Electrical Engineering Handbook," "Principles of Color Television"; Fellow IRE and Radio Club of America, Member IEE (Great Britian), Societe des Radio-electriciens (France), SMPTE, SPSE. Past Chairman Long Island Section IRE, Past Chairman of U. S. Committee for CCIR Study Group XI and of several U. S. delegations abroad on TV standards, Chairman Broadcast Television Systems Committee of EIA; Panel 1 NSRC; Certificate of Commendation from U. S. Navy for contributions to Radar in World War II.

HLADKY, WALTER, (M) 1960 - Engineer, Shepard Laboratories, Broad and Park, Summit, New Jersey res. 7 Warwick Road, Chatham, New Jersey.

HORN, CHARLES W. (F) 1921 - Partner, Impulsora Mexicana S. A., Radio Manufacturers, Calle Rhin #33, Mexico City D.F., Mexico; res. Montes Auvernia 220, Mexico City, 10 D.F. Mexico; b. New York City July 9, 1894; ed. High School, 2 years college and special courses in electricity; married; Amateur station HN at Far Rockaway, N.Y. 1908 before licenses; United Wireless Ship operator 1909, United Fruit five years, World War One Lieutenant (JG) and World War Two as Captain as Asistant Chief of Naval Communications; Westinghouse 1920/1929 as Manager of Radio Operations; National Broadcasting Co. as Vice President and Director of Research and Development 1929/1941; number of patents including parabolic microphone, rectifier; Fellow IRE, VWOA, Princeton Engineering Association, Captain in U. S. Naval Reserve, Retired, in Mexico - Churubusco Country Club, Rotary Club, American Club, American Society, Radio Club Vice President 1932, President 1933.

HOUCK, HARRY WILLIAM (F) 1920 - Vice President and Divisional Manager Measurements, a McGraw-Edison Division, Boonton, N.J.; Director Sag Harbor Industries; Pres. Measurements Corp. Canada; Vice President Armstrong Memorial Research Foundation, Res. Mountain Rd., Wallpack, New Jersey; b. New Cumberland, Pa., April 11, 1896, Married; Interested in radio since 1909; 1909/1917 operated amateur wireless station. Professional experience: 1917/1919 World War One U. S. Signal Corps Laboratory in Paris, France; original development work of superheterodyne method of reception with the late Major Edwin H. Armstrong. Later designed the first second harmonic super-heterodyne broadcast receiver to be placed in commercial production; 1922/1923 Consulting Engineer; 1923/1931 Chief Engineer Dubilier Condenser and Radio Corp., where his research and development of capacitors made practicable the filter systems used in modern receivers; 1931/1933 Federal Telegraph Co., Special research and development, Consulting Engineer through 1937, and Measurements to the present. His pioneer work on alternating-current operated radio receivers resulted in many patents - over 80 U. S. issued to date. Life Member AIEE, Engineers' Club, N.Y.C., former Manager IRE, Fellow IRE, President Radio Club 1934, Vice President 1933, Recording Secretary 1930/1932, Director 1928 to present.

HUGHES, MATTHEW J, (M) 1938 - res. P.O. 701 Bucher Drive Maitland Fla; b. Harrison, New Jersey March 17, 1902; radio serviceman.

HULL, LEWIS N. (F) 1951 - Consultant, Aircraft Radio Corporation, Boonton, N. J.; (ret. Chairman of the Bd) Director, Lab. for Electronics, Boston, Mass.; res. Boonton, N. J.; b. Great Bend, Kansas, February 27, 1898; ed. University of Kansas, Harvard University; married; interested in radio since 1911; active as amateur 1912/1917 - none since; professional experience World War One Signal Corps Laboratory at Bureau of Standards 1918/1920 Assistant and Associate Physicist Radio Section Bureau of Standards; Consulting Engineer and various engineering positions 1920 to date; various patents in radio field 1922/1930; contributor to technical journals; Clubs - Metropolitan, Anglers of New York, Cosmos (Washington), Tabusintac N.B. Canada; President IRE 1933.

HULTS, ELLSWORTH H. (F) 1956 - res. 1600 Grand Ave. Baldwin, N.Y.; b. Pa. February 23, 1904; ed. Germantown High School 1918/1922; United Nations Sound 1947.

HUMPHREY, GEORGE B. JR. (M) 1958; Ass't. Vice President, First National City Bank of New York, 55 Wall St., N.Y.C., 28 Yrs.; res. 10 Grove St. Dobbs Ferry, N. Y.; b. Cherubusco, N.Y.; ed. Columbia University, B.S. and M.S.; Amateur Call Letters W2REQ 1958; Sports, etc. Amateur Radio, Boating, Hiking, Columbia University Club.

IRELAND, FREDRICK (F) 1937 - Box 5282 Pasadena, Cal.; b. N.Y.C. May 19, 1911; ed. Harvard A.B. Physics 1933; married; interested in radio since 1921; amateur w1DK 1930/1939; professional experience General Radio Company Engineering Department 1934/1937, Field Engineer New York 1937/1940; Los Angeles 1940/1958; Senior member IRE, Chairman Los Angeles Section 1944, Registered Professional Engineer, State of Cal.

JACQUET, LLOYD (M) 1959 - Res. 233 Arleigh Road, Douglaston, New York.

JAFFE, D. LAWRENCE (M) 1953 - President and Chairman of the Board, Polarad Electronics Corp., 43-20 34th St., Long Island1, N.Y., res. 33 Nassau Drive, Great Neck, N.Y.; b. Brooklyn, New York, July 6, 1913; ed. B.S. in E.E. City College 1935, M.S. in E.E. Columbia University 1936, Ph. D. in E.E. Columbia University 1940; married; interested in radio since 1940; professional experience College of the City of New York Instructor 1935/1937, Awarded Bridgham Fellow in E. E. at Columbia University, associated with Professor E. H. Armstrong on fundamental problems in frequency modulation 1937/1939; Columbia Broadcasting System television Studio equipment 1939/1942; Raytheon Manufacturing Company, Waltham, Mass. Radar 1942/1944 Templetone Radio Manufacturing Corp. Chief Research Engineer 1944/1945, Polarad Electronics Corp. 1945 to

date; eleven technical papers in various publications; Fellow, IEEE. past member Young Presidents' Organization, member Presidents' Professional Ass., director, Armstrong Memorial Foundation, member, Columbia University Club.

JAMES, WALLACE M. (F) 1930 - Engineering Manager, Radio Corporation of America, Harrison, New Jersey res. West Caldwell, New Jersey; b. Hutchinson, Kan. September 2, 1901; ed. University of Kan., 5 years, B. S. in E.E. and B.S. in Engineering, other miscellaneous courses; married; interested in radio since 1925; Member T B Pi, Sr. Member IRE; Am. Assn. for the Advancement of Sciences; Listed in "Who is Who" in Engineering. Director 1940.

JARVIS, KENNETH W. (F) 1935 - President, Jarvis Electronics Corporation, 6058 West Fullerton Ave., Chicago 39, Ill.; res. 1140 Cherry St., Winnet ka, Ill.; b. Mansfield, Ohio, October 18, 1901; ed. Graduated E.E. Ohio State University 1923; married; interested in radio since 1912; amateur 1915/1916; professional experience Westinghouse Engineering School and Radio Laboratory, Crosley, Colonial, U. S. Radio, Director of Engineering Zenith, Consulting Engineer 18 years, Manager Electronics Department Automatic Electric; 20 Patents several pending; Chapter on Detection and Modulation Henney's Radio Engineering Handbook, many papers IRE; Fellow IRE, AIEE, Member ASM, AAAS, AFCA, Chicago Radio Engineers Club; Lecturer Graduate School Northwestern University; Reserve Officer Signal Corps, Princ. Staff Eng. Electronics & Electric Dept., The Martin Co., Boy Scout Leader; Hobbies - Camping, Travelling Flying own Plane.

JENNINGS, MALBON H. (F) 1948 - Sperry Gyroscope Div. Sperry Rand Corp., Great Neck, New York; b. Haverill, Mass. April 3, 1917; ed. University of Maine - Columbia University; married; interested in radio since 1930; professional experience E. H. Armstrong Junior Engineer 1938/1942, Radiation Laboratory MIT Staff Member 1942, BuShips U. S. Navy 1942/1943, Radio Engineering Laboratories 1943/1951 (Chief Engineer 1944/1951), Laboratory for Electronics 1951 to 1953. Director, GCA Division, 1953/1955. Independent Consultant, 1955/1956. Ramo-Wooldridge, 1956 to present. Patent on FM Recording on film or tape; Hobbies - private flying, restoration of early American houses and furniture.

JOHNSON, JOHN KELLY (F) 1927 - Consulting Engineer, Office & res. 184 South Ave., New Cannan, Conn.; b. Oskaloosa, Iowa, January 27, 1903; ed. A.B. and B.S. Penn. College, Oskaloosa, Iowa 1923; A.B. Columbia 1924, B. S. Columbia 1925, E.E. Columbia 1927; married; interested in radio since 1916; professional experience - Instructor in E.E. Columbia 1927/1929; Chief Engineer Silver Marshall 1930, Wells Gardner 1934/1937, Engineer Hazeltine Corporation 1930/1934 and 1937/1942, U. S. Navy Consultant 1943/1944, Hammerlund 1944/1945 and Consultant 1945 to present; Numerous patents all assigned to Hazeltine; Fellow IRE, Member AIEE; Columbia University Club, N.Y.C., The Engineers Club N.Y.C.

JOLLIFFE, CHARLES BYRON (F) 1939 - Radio Executive, Radio Corporaton of America, Princeton, New Jersey & Camden, New Jersey; res. 1204 E. Cherry Hill Apt., Merchantville, N.J.; b. Mannington, W. Va. November 13, 1894; ed. W. Va. University B.S. 1915, M.S. 1920 Hon. LL. D. 1942, Cornell University Ph. D. 1922; widower; interested in radio since 1917; professional experience: Instructor in Physics W. Va. University 1917/1918 and 1919/1920, Physics Instructor Cornell University 1920/1922, Physicist Bureau of Standards Radio Section 1922/1930, Chief Engineer Federal Radio Commission and Federal Communications Commission 1930/1935, Radio Corporation of America Engineer-in-Charge RCA Frequency Bureau, Chief Engineer of RCA Laboratories, Assistant to President, Vice President and Chief Engineer RCA Manufacturing Company 1935/1945, Vice President of RCA in charge of RCA Laboratories 1945, Executive Vice President in Charge of RCA Laboratories Division since 1945, 1951 Vice Pres. & Technical Advisor, RCA,; World War Two Chairman of Communication Division of the National Defense Research Committee, Secretary of the Industry Advisory Committee, Board of War Communications, Member Engineers Defense Board, Certificates of Appreciation from Army and Navy; Fellow AAAS, AIEE, IRE, Member Radio Pioneers.

KAHN, LEONARD, R. (F) 1953 - Owner and Research Director, Kahn Research Laboratories, Elizabeth Building, 22 Pine St., Freeport, N.Y.; res. 46 West 95th St., N.Y.C.; b. N.Y.C. June 16, 1926; ed. B.E.E. Polytechnic Institute of Brooklyn; single; interested in radio since 1940; amateur W2NOW since 1940; professional experience Consultant in Communications and Electronics, Re-search Director of Communications Laboratory, Adjunct Professor of Electrical Engineering Department, Polytechnic Institute of Brooklyn; number of patents and patentpendings. Papers published in Proceedings of IRE and AIEE Electrical Engineering.

KARDAUSKAS, EDMUND (M) 1950 - Shepard Laboratories 430 Morris Ave., Summit, N.J. res. 185 Priscilla Drive, Redbank, New Jersey; b. Elizabeth, N.J. October 26, 1924; ed. B.S. EE Newark College of Engineering 1949; married; interested in radio since 1938; Hobby - Audio.

KATZ, LOUIS L., (M) 1964 - Engineer, Electric Research Laboratories of Columbia University, New York, N.Y. b. Poland, May 15, 1938. U.S. Citizen. res. 1521 Sheridan Ave., Bronx, N.Y. Ed. College of the City of New York, B.E.E., Columbia University, M.S., 1964. Member, IEEE.

KELLERMAN, KARL F. (F) 1946 - Engineer, Asst. V-P.-Engineering, Bendix Aviation Corp., Washington, D. C.; res. 8711 Burring Trec Road, Bethesda, Md.; b. Washington, D.C. May 11, 1908; ed. E.E. Cornell University 1929, Graduate work in Law, Economics and Electronics; married; interested in radio since 1921; amateur work extensive but unlicensed; Registered Professional Engineer member IRE, Cornell Society of Engineers, AAAS, Tau Beta Pi, Cosmos Club, Columbia Country Club, ex-Commander USNR; Hobby - Golf.

KELLEY, BRUCE LEWIS, (M) 1964 - Senior Industrial Engineer, AOD Division, Eastman Kodak Co., Rochester New York; b. 1914, Bartlett, New York, Res., Holcomb, New York. Member, Antique Wireless Association, Old Timers Club, Bloomfield Scientific Club. Curator, Ancient Wireless Association Museum.

KELLEY, LEO A. (F) 1938 - res. 34-38 87 St., Jackson Heights, New York; b. July 7, 1897 Arlington, Mass.; ed. M.I.T., Harvard B.S. in E.E. 1918; professional experience - U. S. Signal Corps 1918/1919; Engineering Department Western Electric Co. 1920/1925, AT and T 19/25/1929, International Communications Laboratories 1929/1932; Consulting Engineer to Date.

KENNEDY, ROBERT E. L. (F) 1942 - Consulting Engineer Kear and Kennedy, Washington, D.C.; res. Forest Hgts. Md.; b. Norfolk, Va. January 19, 1910; ed. High School, Engineering Courses University of Va. extension, George Washington University and Catholic University; married; interested in radio since 1921; Amateur station 3RT 1924/1928, W3CQK 1930/1935; professional experience 1945 to date. Partner Kear and Kennedy, 1942/1945 Assistant Head Radio Section Bureau of Aeronautics, 1940/1942 Senior Engineer with John Barron 1938/1940 Engineer with Paul Godley; Lt. Cmdr. U.S.N.R. Senior Member IRE, Charter Member also Past President Association Federal Communications Consulting Engi-

neers, Hobby - Yachting, Capitol Yacht Club, Washington.

KING, FRANK (CM, F, LM) 1909 - Consulting Engineer, Amy Aceves and King, Inc., 11 West 42 St., N.Y.C.; res. 85 Willow Ave., Larchmont, New York; b. N.Y.C. January 12, 1893; ed. New York University, Columbia University E.E. 1917; interested in radio since 1907; married; amateur station "FK" 1907, later 2MP 1925, W2 MP 1929, constructed and operated first amateur Telephone Broadcasting Station in U. S. in 1911; professional experience, Radio Operator S/S Montgomery 1912; President King Radio Corporation New York 1922/1926, 1926 to date Consulting Engineer New York City, Licensed Professional Engineer New York State 1941; military, organized and was officer in Charge of the First U. S. Naval Aircraft Radio Laboratory, Hampton Roads, Va. 1918, Officer in Charge of Aircraft Radio Telephones Headquarters Northern Bombing Group (U.S. Navy) France 1919, U. S. Naval Headquarters Washington, D. C., and Anacostia; Sports - Tennis, Golf, Horseback, Hunting; Societies - Senior Member IRE, Life Member Friendly Sons of St. Patrick, Phi Gamma Delta; Radio Club of America Charter Member and First President

KISHPAUGH, A. W. (F) 1921 - Retired; res. 10 Yale Terrace, West Orange, N. J.; b. Newberry, Mich. November 5, 1891; ed. E.E. University of North Dakota 1912; professional experience; General Electric Co. 1912/14; Utah Power and Light Co. 1914/16; Western Electric Co. and Bell Telephone Laboratories 1916/56. Member AIEE and IRE.

KNOOP, WALTER A., JR. (F) 1942 - Professional Engineer, Gawler-Knoop Co. 178 Eagle Rock Ave., Roseland, N. J.; res. 63 Grover La., W. Caldwell, New Jersey; b. Chicago, Ill. May 14, 1919; married; ed. B.E.E. Rensselaer Polytechnic Institute; amateur W9KHG 1932, W2 PXR and operated at W8XYR Whiteface Mountain Observatory; professional experience Manager Contract Division DuMont Laboratories until 1946; two patents on CR Tubes, articles for QST, Radio News, IRE Proceedings, Istruments Magazine; Member AIEE, IRE and Montclair Society of Engineers, Member-Sibma XI; Tau Beta Pi; National Pilots Assoc.

KOBI, JOHN THOMAS, (M) 1956 - Electronic Engineer, Radio Engineering Laboratories, 6 years; res. 2 Henrietta La., Massapequa Pk., L.I., N.Y.; b. November 10, 1924, Atlas, Pa., Military Service U.S.A.F. 1942/1945, Education, B.E.E., Brooklyn Polytechnic Institute, Brooklyn, New York.

KOLJANE, DONALD F. (M) 1959 - Sales Engineer, 29-01 Borden Ave., Long Island City 1, New York res. apt. 6D-2 Redfield Village, Metuchen, New Jersey.

KOHLER, GERHARD MAX, (M) 1964 - Senior Project Engineer, Measurements, Inc. PO Box 180, Boonton, N. J. res. Intervale Gardens, 3379 Route 46, Parsippany, New Jersey; b. Austria, December 17, 1917; ed. Dr. Schmidt College, E.E., 1949. Rhode & Schwarz; Telefunken Nord-Mende Laboratory, 1949/1963.

KOUSHOURIS, JOHN LOUIS, (M) 1960 - CBS Laboratories, High Ridge Road, Stamford, Conn. res. 27 Hannah's Road, Stamford, Conn.

KUNIK, I. JORDAN (M) 1952 (F) 1964 - Patent Lawyer, 521 Fifth Ave., New York, N.Y.; b. Hartford, Conn, November 10, 1912; ed. Wesleyan University, Harvard Law School; interested in radio since 1938; professional experience in Patent Law including all phases of electronics; IRE, AAAS (Fellow), American Bar Association, New York Patent Law Association, American Chemical Society, American Institute of Chemists (Fellow), American Society for Metals.

LAFFERTY, RAYMOND E. (M) 1947, (F) 1957 - Engineering Manager, Instruments, Boonton Electronics Corporation, Parsippany, New Jersey since 1960; res. 12-05 Sumner Pl., Fairlawn, N.J.; b. Brooklyn, N.Y. July 12, 1918; ed. High School, RCA Institutes, General Engineering Course; married; interest in radio since 1930; Amateur W8VTJ in Ogdensburg, N.Y. (expired), First Class Radio Telephone License since 1939. Professional experience: Engineer with Boonton Radio Corporation, Ferris Instrument Corporation, A. B. DuMont Laboratories; Chief Engineer WSLB; Instructor with N.Y. State Signal Corp Training School, Paterson Radio Institute, Development Engineer, 1948-1957, with NBC; Assistant Chief Engineer, Daven Company, 1957-1960; 4 patents and numerous papers dealing with audio and radio devices and radio frequency measurements, 1956 IRE National Convention paper on High Frequency Shields; Chairman of several IEEE Convention Committees, 1957 to date; Senior Member IEEE.

LAMB, FRANCIS XAVIER (F) 1945 - Vice Pres. and Chief Engineer, Weston Instruments, Div. of Daystrom, Inc., 614 Frelinghuysen Ave., Newark, N.J.; res. 12-05 Sumner Place, Fair Lawn, New Jersey; b. Newark, New Jersey, August 5, 1905; ed. Newark Technical School 1927-AE; Newark College of Engineering B.S. in E.E. 1930; married; interested in radio since 1920; amateur nonlicensed experiments; professional experience 1928/1936 Electrical Eng. with Weston; 1937/1939 Res. Eng. in Japan for Weston, 1940/1942 Project Eng. on Research and Development, 1942/1943 Liaison Eng. for Weston assigned to Sangamo-Weston Co., Springfield, Ill., 1944/1951 Asst. Chief Engineer, Weston, 1952/1953 Chief Eng., Weston, 1954 Vice Pres. and Chief Eng. Weston; Profession Eng. License #5573, 25 U.S. Patents; Fellow A IEE, Member IRE, ISA, RCA, SAMA, ASA, NAM, AFCEA Company Rep. ASA (C39), ASA (Indicating Instruments C39. I). Honorary Membership Eta Kappa Nu Assn.; Technical Publications 9.

LAMB, JAMES J., (F) 1958 - Chief Scientist, U.S. Army Electronics R & D Activity, Fort Huachuca, Ariz. res. 2600 Mockingbird Drive, Sierra Vista, Ariz. B. November 30, 1900 at Michigan City, North Dakota, November 30, 1900. Married Josephine Gleason May 5, 1930. Children: Ann Marie, Josephine (Lamb) Krossa, Helen (Lamb) Patterson, Maureen (Lamb) Buhrman, Patricia Glenn. Scientific Advisor and Director, Signal Communications Dept., USAEPG, Ft Huachuca, 1961/1962. Member, Tech. Staff, Ramo-Wooldridge, 1959-61. With Remington Rand, Inc., and Univac Div., Sperry Rand, successively as, Chief Engineer and Manager, Electronic Div., Director of Electronic Research and Senior Staff Consultant from Jan., 1941 to Nov., 1959. Previously on staff of ARRL, as Tech. Editor, QST, etc., from April 1928 to Dec. 1941. Formerly W1AL, W1CEI, 3CEI, 9CEI. BSEE Catholic Univ. of America, 1922. 6 patents on Tri-Tet Oscillator, Variable Selectivity Crystal Filters, Noise Silencer Circuit, Automatic Iris Control for TV Cameras, Semi-Conductor Devices - Pat. Pend. on Character Recognition System. Over 70 published technical papers and articles including Proc. of Radio Club (Apr., 1936). IARU representative 3rd CCIR, Lisbon, 1934; 4th CCIR, Bucharest, 1937. OSRD Certificate of Appreciation, 1945. ARRL Merit Award, 1959. Fellow; IREE; Fellow, Radio Club of America; Member, AAAS. Registered Prof. Engr., Conn. Hobbies, stereo, photography and radio communication experiments.

LANGER, PETER LAWRENCE (M) 1954 - Sylvania Electric Products Co., 700 Ellicoh St., Batavia, N.Y.; res. 43-55 168 St., Flushing, L.I., N.Y.; b. N.Y.C. February 17, 1915; ed. Lawrence High School 1928/1934, Navy Electronics School 1943/1944; professional experience - Philco Field Service Engineer 1946/1949; 1949 to date Field Service Engineer, Sylvania Elec. Products; M IRE.

LANGLEY, RALPH H. (F)1928 - Retired; res.1601 Chestnut Ave., Winter Park, Fla.; b. N.Y.C., January 5, 1889; ed. Columbia University, E.E. 1913; married; interested in radio since 1906; built IKW Quenched Gap Transmitter in the Electro-Chemical Laboratory at Columbia; professional experience 1913/1916 with Colonel John Firth, 1916/1920 Marconi Wireless Telegraph Co. of America, 1920/1927 General Electric Co., Radio Department, Schenectady, 1927/1931 Director of Engineering Croley Radio Corporation, Cincinnati, Ohio, then as Consulting Engineer following 1931; Underwater Sound Laboratory, New London, Conn. 1941/1943, Asst. to Dir. Hazeltine Electronics Corp., Little Neck, L.I., N.Y. 1943/1946; in charge of Licensee Laboratory Olympic Radio & Television Corp. Long Island City, N.Y. 1946/1948, Vice Presidnt in charge of Engineering, Farrand Optical Co., Inc. Bronx N.Y. 1948/1957 Asst. to the President; Radio Club of America President 1935/1936, Vice President 1934, Corresponding Secretary 1933, Director 1932.

LaPENNA, FRANK (M) 1949 - Assistant Professor, Hudson Valley Tech. Inst., Troy, N.Y.; res. 167 Chestnut Ave. Staten Island 5, N.Y.; b. N.Y.C. December 18, 1898; ed. RCA Institutes; married' interested in radio since 1933.

LAYMAN, PAUL N., JR., (M) 1956 - Bus. 465 East 57th St., New York, N.Y. res. 50 Sutton Place South, New York, N.Y.

LeBEL, CLARENCE J. (F) 1926 - Chief Engineer, Audio Instrument Co., Inc., 70 East 10th St., N.Y.3, N.Y.; Vice President, Audio Devices, Inc.; res. 370 Riverside Dr., New York 25, N.Y.; b. New York, N.Y. December 16, 1905; ed. S.B. and S.M. in E.E. MIT; single, interested in radio six years, audio 32 years; professional experience 32 years Raytheon, Inc. Research Engineer 1927/1929, 1929/1932 Research Eng., Hygrade Sylvania Co., Consulting Engineer, Audio Devices Inc., Maico Co., Audio Instrument Co., 9 Patents, many papers, one book "How to Make Good Tape Recordings;" member AIEE, Acoustical Society of America, SMPTE, Fellow AES, Past President and now Secretary; Radio Club of America Director.

LEMMON, WALTER S. (F) 1914 - President Radio Industries Corporation, 1 East 57 St., New York 22, New York; res. Old Greenwich, Conn.; b. N.Y.C. February 3, 1896; ed. E.E. degree Columbia University; married; Amateur Station "AX" New York 1908 and later licensed 2IE until 1917; professional experience U. S. Navy Radio Officer Development Engineering Radio Receivers, general radio executive work, developed radiotype for International Business Machines Corp.; International Broadcasting stations, WRUL, Boston; Radio Club of America Recording Secretary 1917/1920, Director 1915/1916, 1921/1922.

LEMPERT, IRVING E. (M) 1941 - Engrg. Sector-Mgr., Westinghouse Electric Corp., Metuchen, New Jersey; res. 51 Linden Ave., Metuchen, N.J.; b. N.Y.C. April 11, 1917; ed. Lehigh University B.S. in E.E.

LEWIS, HAROLD MILLER (F) 1925 - Professional Engineer N.Y. State; res. 510 Blanchard Parkway, West Allenhurst, N.J.; b. Geneva, N.Y. January 12, 1893; married ed. B.E. Union College 1916, Radio Engineering Course, Sorbonne, Paris 1919; interested in radio since 1906; amateur: electrolytic receivers 1906/1910; professional experience General Electric Research 1916/1917, Signal Corps Division of Research Paris 1918/1919, Radio Engineer Signal Corps 1919/1921, President Radio Service Laboratories 1921/1925; President LeMor Radio 1925/1927, Signal Corps Fort Monmouth 1927/1930, Hazeltine Electronics Corp. Engineer in charge of Television 1930/1937, Consulting Engineer 1939/1941, Hazeltine Corp. in charge of I.F.F. Training 1942/1944. Technical Adviser Hazeltine Patent Department 1945/1946, Patent Adviser Signal Corps 1948 to 1955; about 60 U.S. Patents, papers in IRE and Electronics; original superheterodyne development with E. H. Armstrong 1918, Television Standards Committee 1931/1936, devised Whip Antenna for Army Tanks; member AIEE, IRE, Chairman, N.Y. section 1944; Director Radio Club 1934/37.

LIGORI JOSEPH (M)- res. 64-10C - 186th Lane, Fresh Meadows, New York.

LONG, ESCO C. (M) - Senior Standards Engineer, Stavid Engineering, Inc., Plainfield, N.J.; res. 883 Springfield Ave., New Providence, N.J.; b. Twin Rocks, Pa. August 24, 1906; ed. Indiana State Teachers College B.S., Penn. State and University of Pittsburgh Graduate Work; married; five children; intersted in raio since 1918; amateur; built various types transmitters and audio amplifiers; professional experience: Radio Engineering Naval Research Laboratory, Washington, D.C.; three years Stavid Engineering, Inc., Supervisor of the Standards Section; eleven years Shepard Laboratories, Summit, N.J. as Project Engineer in Electronics; High School Instructor in Mathematics (12 years); Metropolitan Life Insurance Co. (2 years); U.S.N.R. (Electronics) during World War II, Boy Scout (Eagle Scout), Played Baseball, Football, Basketball and Tennis; Hobbies - Gardening, Hunting and Fishing; Lions Club (Secretary), PTA (President).

LOUGHLIN, BERNARD D. (F) 1940 - Electronic Research Consultant; res. Little Neck Rd., R. D. 5, Huntington, N.Y.; b. May 19, 1917; ed. Cooper Union B.E.E. 1939; Fellow IRE, member AIEE, IRE Zworglin TV Prize Award, 1952, SMPTE Sarnoff Gold Medal Award, 1955, IRE, 1957 award of PGBTR.

LOUGHREN, ARTHUR (F) 1960 - Consulting Engineer; formerly Vice Pres. Airborne Instruments Laboratory Division of Cutler-Hammer, Inc., Mineola, N.Y. Applied Research Division; res. 22 Broadlawn Ave., Great Neck, N.Y.; Radio Eng.; b. Rensselaer, N.Y., September 15, 1902; ed. Columbia University A.B. 1923, E.E. 1925; Phi Beta Kappa, Sigma Xi, Tau Beta Pi; married; Gen. Elec. Co., Schenectady 1925/30; RCA Mfg. Co., Camden, New Jersey 1930/34; Gen. Elec. Co., Bridgeport, Conn. 1934/36; Hazeltine Electronics Corp. 1936/1956 - Ch. Eng. 1946/49, V.P. charge research 1951/1956 - also Exec. V. P. Hazeltine Research Corp. 1952/1956. Holder of 29 patents, and continuously in radio and TV since 1925. Fellow of IRE, SMPTE, AIEE, and Radio Club of America; President IRE 1956; member Joint Technical Advisory Committee; National Stereophonic Radio Committee; holder David Sarnoff Gold Metal, 1953; Morris Liebmann Memorial Prize 1955; U.S. Navy Certificate of Commendation, 1947.

LUNDAHL, TORE, (M) 1959 - Executive V.P., Technical Appliance Corp., 1 Taco St., Sherburne, N.Y. res. East Hill, Sherburne, New York.

LYNCH, ARTHUR H. (F) 1922 - Field Engineer, Arthur H. Lynch and Associates, 2878 Valencia Way, Fort Myers, Fla.; b. Brooklyn, New York July 2, 1894; ed. 3 yrs. High School several correspondence courses electronics etc.; married; interested in radio since 1908; amateur station Brooklyn and Jamaica, Long Island 1908; presently W4DKJ all bands; professional experience Marconi Wireless Telegraph Co. 1912, Army Officers Training School, Tours France World War One, Radio Department New York Times 1920, Director of Publicity RCA 1920, Editor Radio Broadcast 1924/1928, Manufacturer Fixed Resistors 1929/1940 and Noise Reducing Atennas 1937/1942, Editor Radio News 1935/1936, now represents 30 manufacturers in Fla.; Senior Member, IRE, Life Member VWOA and Recipient VWOA Marconi Medal; Hobbies - amateur radio, flying yachting; Director Lee County Chamber of Commerce, Florida; Radio Club of America Recording Secretary 1924/1926.

LYONS, WALTER (M) 1951 (F) 1961 - Vice Pres., Tele-Signal Corp., 198 Miller Place, Hicksville, New York; res. 3326 160 Street Flushing 58, L.I., N.Y.; b. October 5, 1906 N.Y.C.; ed. Morris High School, McGill University B. Sc. in Electrical Engineering 1928, M. Sc. in Physics and Mathematics 1932; married; interested in radio since 1918; Professional experience Hazeltine Service Corp. 1929/1932, 1934/1937, Chief Engineer Wells-Gardner 1932/1933, Chief Engineer Emerson Radio TV corp. 1933, Chief Engineer Majestic Radio TV Corp., 1937/1938 RCA Victor, Design Engineer 1938/1945, RCA International Division Staff Engineer 1945/1946, RCA Communications Manger, Station Facilities (Equipment & Systems) 1946/1962, Tele-Signal Corp.; 1962 to present; 15 U.S. Patents, several papers in Electronics RCA Review, Proceedings I.R.E. and A.I.E.E. Transactions PT GCS. Articles on radio receivers and transmitters, First Edition-McGraw Hill Encyclopedia of Science and Technology. Member Sigm a Xi, IEEE, Cold Iron Society, Societe Francaise des Electroniciens et des Radioelectriciens, Roslyn Rifle and Revolver Club, Chairman E.I.A. TR 6 Com. on Long Distance Point- to Point Radio Communications 1949/1962; member U. S. Study Groups II & III of CCIR, Chairman Paper Study and Procurement Committee, IRE-PGCS 1959/1960 and on the Administrative Committee 1962/1965, member Experts Advisory Committee (PEAC) - U.S. Dept. of State for IFRB; Professional Engineer, N.Y. State, Consulting Communications Engineer, Adjunct-Professor of Electrical Engineering Polytechnic Institute of Brooklyn.

MacLAREN, FRED B. (M) 1951 - President, F. B. MacLaren Inc., 15 Bay Drive West, Huntington, L.I., N.Y.; Vice - President, Photomechanisms; res. same; b. Jersey City September 9, 1915; ed. B.E. Degree E.E. Yale University 1936; married; interested in radio since 1928; amateur WIGYE; professional experience Engineering Consultant electronic and mechanical component design, development and production, Perkin - Elmer Corp. computer design 2 years, Glenn L. Martin Co. (airborne Fire Control System) 2 1/2 years, Officer in Charge A.A. Fire Control Development Army Ordnance Department 4 1/2 years, The Bristol Co. Electronic Development Engineer 4 1/2 years; six patents on various industrial electronic instruments; "Servo-mechanisms for Industry" Applied Hydraulics 1953; Hobbies - Tennis, swimming, golf, bridge.

MALLORY, HENRY ROGERS (M) 1957 - Technical Consultant, P. R. Mallory & Co., Inc., President Round Electric Products Co., Inc.; P. R. Mallory & Co., Inc., 41 East 42nd St., New York 11, N.Y.; b. May 9, 1912, Rye, N.Y.; ed. The Hill School; 2 yrs; Patents, Papers, etc., Several; Sports, Hobbies, etc., Electronics, boating, tennis, music, photography.

MANIELLO, JOHN BAPTISTE LOUIS - (M) 1961 - Vice President, CBS Laboratories, Stamford, Conn. b. New York City, October 31, 1923. res. 2723 Sylvia, North Bellmore, N.Y. Married, three children. ed. Polytechnic Institute of Brooklyn, B. M. E., Columbia University, M.B.M. Industrial College of the Armed Forces. Salesmanager, Fairchild Camera & Instrument Corp. 1942/1960; CBS Laboratories, 1960/ to date. Instructor, Physics and Engineering Department, Hofstra University. Pilot, USAF, Purple Heart, 3 clusters, Air medal, 4 clusters. Member Tau Beta Pi, P. Tau Sigma, Sigma Alpha; Past President, Civil, North Bellmore, N.Y.; Cubmaster, North Bellmore, Honorary Member Cerebral Palsey; research in electronic graphics, radar and infra red reconnaissance, data recording, image transmission system, photo grammetry.

MANSON, WALTER B., JR., (F) 1957 - Asst. Division Manager, Measurements, Boonton, New Jersey; res. 115 Lake Dr., Moutain Lakes, N.J.; b. September 13, 1911; Elyria, Ohio; ed. Newark Academy, Cornell University, E.E. 1936; previous emp. Thomas A. Edison Industries, 2 years; Sports, hobbies, sailing, skating, swimming, Hi-Fi, model railroad.

MARTIN, DEVEREAUX (F) 1959 - Assistant to Manager, Product Engineering Department, Hughes Aircraft Company, Communications Division, P.O. Box 90902, Airport Station, Los Angeles 45, Calif.; res. 802 Primrose Ave., Placentia, Cal,; ed. Electrical Engineering, Mass. Institute of Technology, Class of 1929; married; interested in radio since 1922; professional experience since 1929, in fields of aircraft equipment, navigational systems, high power transmitters, industrial controls and military airborne systems equipment, with Westinghouse Electric Corp., Federal Telephone & Radio Corp., J.H. Bunnel & Company, WilcoxGay Corp., Radio Receptor Company, Electronic Corp, of America, Viking Instrumnets Inc., member of AIEE and IRE, including many professional groups.

MARK, ERNEST A.(F) 1949 - General Manager, Fairchild International; 515 Madison Ave., Division of Fairchild Camera and Instrument Corp.; formerly Director International Division, Allen B. DuMont Laboratories; res. 333 East 53rd St., N.Y.C.; b. N.Y.C. March 9, 1896; ed. Columbia University B.S. E.E., U.S. Naval Research Laboratory, Bowdoin College, Electronics; interested in radio since 1910; Amateur 1910/1917; professinal experience: General Manager DuMont Television, Chief Radio Theory Instructor U. S. Navy World War One, Electronics Officer Third Naval District (radar) World War Two; Member, Electronic Industries Association International Department Executive Committee, Senior member, IEEE; Regional Group National Export Expansion Council, New York area, U. S. Dept. of Commerce; Hobbies - Sailing (Ocean), Painting.

MARX, FRANK LOUIS (F) 1956 - Vice President in charge of Engineering American Broadcasting Co. empolyed there from 1944 to present; res. 35 E. Hartsdale Ave., Hartsdale, N.Y.; b. January 31, 1910, Birmingham, Ala.; ed. Shreveport College, University of Virginina, William & Mary College, Columbia University; Call letters W3OF - 15 yrs. given up about 1931; Patents, Papers etc., Papers published in numerous technical journals, holder of several patents.

MASIN, OLDRICH F. (F) 1946 - Field Engineering Representative, O. F. Masin Co., 1 Wolf's La., Pelham, New York; res. 92 North Ave., New Rochelle, N.Y.; b. N.Y.C. June 7, 1900; ed. B.S. in E.E. Cooper Union Day Technical School; married; interested in radio since 1921; professional experience: Radio Corporation of America Harrison, N.J. Development 200A and 201A, Ward Leonard Electric Co., Mt. Vernon, New York Design and Development of resistors and rheostats 9 years, past 25 years in O.F. Masin Co.

MAYHEW, BENJAMIN ALAN (M) 1922 - Consultant, National Sugar Refining Co., N.Y.C.; res. Harbourton Woosville Rd. P.O. Box 337-B, Pennington, N.J.; b. Englewood, N.J. March 12, 1897; ed. M.E. Stevens Institute of Technology, P.E. N.Y. State; married; interested in radio since 1911; amateur 1913 2HP. 1KB in 1916, W2BYW 1921, K2DD 1951, extra class 1953; member of Tenafly Boro Council 1944/1951 (Police Commissioner); Hobbies-Amateur Radio, photography; Societies - ASME, Sugar Industry Technicians.

MAYO, HARRY L. (M) 1962 - Field Engineer, Hewlett-Pakard Co., RMC Sales Div., Englewood N.J.; res. 280 Prospect Ave., Hackensack, N.J.; b. October 12, 1926 at Hartford, Conn.; Ed. BS in EE, Northeastern Univ., Boston, Mass. 1953; married; interested in radio since 1937, licensed as W1QPQ in 1947, presently WB2EDS. Radar technicians, Signal Corps, U.S. Army 1945-46;

electronic technician National Co., Inc., Malden, Mass. alternately with periods of school as part of Northeastern Univ. co-operative work plan, 1947-1953; Test Engineer, Hazeltine Corp.k Little Neck, N.Y., 1953-1956; Field Maintenance Engineer, Tektronix, Inc., 1956-1959; Hobbies, Amateur Photography, stamp collecting; Member -- IEEE. ISA. ARPL.

McCOY, DANIEL C. (F) 1921 - Consulting Engineering, Refrigeration, and Food Technology, Sales and Sales Management; 7546 Normandy La., Dayton 59, Ohio; res. same; b. N.Y.C. December 22, 1894; ed. Public Schools of Tarrytown and Yonkers, N.Y., Cornell University (Chemistry); married; interested in radio since 1900; active amateur since 1906 except for war periods and brief periods due to change in residence; professional experience: Marine operator 1911/1916 (summer vacations); Lecture Assistant Department of Chemistry Cornell University 1914/1917; Commissioned Officer Signal Corps and Air Service World War One; Sales and Sales Management in automobile business 1919/1925; Frigidaire Division of General Motors Corp. 1925-retired October, 1955, activities included sales, sales engineering, and sales management work in commercial and industrial refrigeration and air conditioning, directed field engineering organization, edited three commercial refrigeration engineering manuals, directed frozen food research, final assignment Technical Consultant staff of General Sales Manager; Fellow, American Society of Refrigerating Engineers; Charter Member and Emeritus Professional member; of the Institute of of Food Technologists, Member of Engineer's Club of Dayton, ARRL, Old Old Timers Club, Quarter Century Wireless Assn. Dyton Amateur Radio Association (past president), Delta Upsilon Fraternity, Scabbard and Blade, Alembic (Cornell); hobbies are amateur radio, fishing, and sailing. Amateur Radio Station, W8WG.

Mc GONIGLE, JOHN HUGH, (M) 1962 - New York Telephone Co., 89-63 163rd St., Jamaica 36, New York N.Y. res. 247-49 90th Ave., Bellerose 26, New York.

McKENZIE, ALEXANDER ANDERSON (F) 1948 - Editor, Engineering Books, McGraw-Hill Book Co., 330 West 42nd St., New York 36, N.Y.; res. 245 Poplar Ave., Hackensack, N.J.; b. Albany, N.Y. Ocotber 2, 1908; ed. Albany public Schools and Albany Academy 1928, Dartmouth College A.B. 1932; married; interested in radio since 1920; amateur W1BPI (1931) and W2SOU 1946 but continuously licensed; professional experience; radio operator or radio operating engineer at Mt. Washington, N.H. Observatory, Research Assistant Yankee Network, Inc., Research Assistant Carnegie Institution of Washington, Staff member Radiation Laboratory MIT; Member (SM) IRE, Institute of Navigation, ARRL, Appalachian Moutain Club, Mt. Washington Observatory Inc.; Active in Hackensack politics, PTA and similar school-centered work, Member, Board of Education 1955/1960, President 1959/60, local church work; Co-editor "Loran", author and publisher "Key and Answers to New Radiotelegraph Examination Questions," Radio Operating Questions and and Answers," pioneered in 5 meter and 2.5 meter communications between Mt. Washington and Blue Hill Observatory 1935/1937 and with Radiosonde at 60 mc and during 1937 on similar sounding at the Bartol Research Foundation, returned to Mt. Washington to install Yankee Network 41 mc FM station and heard first FM Signals from Alpine in 1938; transferred to Paxton 1939 on first 50 KW FM station, Radiation Laboratory MIT 1942 on Loran with field work in U. S., Canada, Labrador and Newfoundland; Electronics magazine 1945 to 1957; McGraw-Hill Book Co. 1957 to present.

McMANN, RENVILLE H. (F) 1919 - Consultant; res. 60 East 96th St., New York City 28, N.Y.; b. N.Y.C. June 29, 1895; ed. Choate, U.S. Naval Radio School, Harvard University; married ; interested in radio since 1912; amateur 2 MC from 1919 to 1928; professional experience R. H. McMann, Inc. radio distributors, 12 Warren St., N.Y.C., Procurement Director Republic Aviation, December 1942 to 1945, Westinghouse Electric Corp. 1945/1957; Past President West Side Tennis Club, Past Presidnnt United States Lawn Tennis Association; Radio Club of America Corresponding Secretary 1921/1924.

McMANN, RENVILLE H., JR. (F) 1944 - Vice President, CBS Laboratories, Stamford, Conn.; res. 60 East 96 St., N.Y.C., b. N.Y.C. August 20, 1927; ed. B.E. Yale University, 1950; single; Pioneer in amateur teletype activities; Professional Experience, 5 summers plus one and one-half years in Columbia University and Alpine, New Jersey Laboratories of Major E. H. Armstrong; TV Development Laboratory National Broadcasting Co., 52/55 Pilot Member Soaring Society of America, Patents in Color TV field.

MERRIAM, ROBERT WEIS (M) 1963 - Owner, Merriam Marine Radio, Electronics Editor, Fishing Gazette; b. July 18, 1923 at Providence, Rhode Island; res. Deep Peace Farm, Tillinghast Rd., East Greenwich, Rhode Island; ed. S. B., S. M., Harvard University, 1949, 1950; Amateur WINTE from 1941; Signal Corps 1942-1946, Pres-Harvard Wireless Club 1947 and 1948; Instructor in E. E., Swarthmore College 1950-1953; Automation Engineer, Metals and Controls Corp., 1953/1956; New England, Wireless Museum; Member IEEE, Reg. Prof. Eng., R. I., Secretary, National Marine Electronics Ass'n; Member, R.I. Historical Society; Hobbies, Sailing and Radio History; Married to librarian, New England Wireless Museum, Home address, Tillinghast Road, East Greenwich, Rhode Island.

MEYER, STUART F. (M) 1955 - Engineering Dept. Supervisor, Allen B. DuMont Labs., 5 1/2 yrs.; res. 1103 Kent Pl., Linden, New Jersey; b. N.Y.C. February 4, 1918; ed. High School and DeVry Institute Correspondence Course (Radio & TV) and 6 months Technical Course U. S. Navy; Military Service 5 yrs. U.S. Navy, Maintenance Radar and Communication Equipment 2 1/2 yrs. as Instructor; Amateur Letters, W2GHK since 1933; Patents, Papers, etc. IRE Papers, a Manually Operated Demand Repeater, Vehicular Noise Problems in Modern Land-mobile Systems, plus many technical talks before; Association of Police Communication Officers, International Municipal Signalmans Assn. Pennsylvania Elec. Assn. Forestry Conservation Service, etc., "Many Radio Clubs;" Sports Hobbies, etc., Bowling, Woodworking, Member IRE, ARRL, RSGB, Tri County Amateur Radio Assn., Former President Staten Island Amateur Radio Assn., Currently finishing up installation of San Francisco Police Radio System which is used in Filming of Current "Line-Up" series.

MEYERSON, ART H. (F) 1956 - Lieutenant, New York Fire Department, Bureau of Fire Communications, 22 yrs.; res. 60 Knolls Crescent, New York 63; b. August 1, 1909, N.Y.C.; ed. Fordham University 1 yr., Pratt Institute, 2 yrs., New York University 1-1/2 yrs.; Patents, Papers, etc., Various papers published in "Communications," on superregeneration VHF techniques, Coil Q, portable mobile XMTRS and RCVRS; Sports, Hobbies, etc., Member IRE, Member AES, Hobby High Fidelity.

MEZGER, G. ROBERT (M) 1956 - General Manger, Gawlor-Knoop Co., 178 Eagle Rock Ave., Roseland, New Jersey; formerly Electrical Engineer, Allen B. DuMont Labs., Inc., 20 yrs., Measurements Corp., 1 yr., Avion Div. ACF Industries, 2 yrs; res. 617 Beverly Road, Teaneck, New Jersey; b. November 11, 1914; ed. Elec. Engr. Rensselaer Polytechnic Institute, Troy, N.Y.; 1936; Amateur Radio, ARRL, AIEE.

MIESSNER, BENJAMIN F. (F) 1963 - President and owner, Miessner Inventions, Inc., 680 N.E. 105th St., Miami Shores, Fla. b. July 27, 1880, Huntingburg, Ind. ed. U.S. Naval Electrical School, 1908/1909, Purdue Univ. 1913/1916. Pioneered in development of radio controlled boats line power for radio receivers and holder of numerous patents. Fellow, IRE, 1937.

MILLER, ARTHUR G. (F) 1949 - Electrical Manufacturing, Delta Electronics, 259 Green St., Brooklyn, New York; res. 1560 5th Ave., BayShore, N.Y.; b. N.Y.C., January 3, 1916; ed. Cooper Union; married; interested in radio since 1925; First Class Radio Operator.

MILLER, DONALD H. (F) 1944 - New York District Manager, Electronics, Advertising Sales Dept., McGraw-Hill Publishing Company, Inc., 500 Fifth Ave., NewYork 36, N.Y.; res. 177 Clinton Ave., Dobbs Ferry, N.Y.; b. Cambridge, Mass. May 4, 1902; ed. B. S. in Engineering Tufts University; married; active in radio and electronics since 1921.

MILLER, JOHN HAROLD (F) 1933 - Retired, Consultant to Weston Instruments, Division of Daystrom Inc., Newark, N.J.; res. 205 Palmetto Ave., Harbor Bluffs, Largo Fla.; b. Oak Park, Ill. June 6, 1893; ed. B.S.E.E. University of Illinois 1915; married; interested in radio since 1907; amateur spark transmitter and receiver Oak Park, Ill. 1907/1911; professional experience in conjunction with engineering work on electrical measurements, application to radio in all its aspects has always played a prominent part; some 38 patents, miscellaneous papers on measurement before AIEE and IRE; Radio Club of America President 1937/1938, Vice President 1936, Director 1934, Fellow-AIEE; Fellow-IRE.

MINTER, JERRY B. (F) 1942 - President, Components Corporation, Denville, N.J.; res. Normandy Hts. Rd., Morristown, N.J.; b. Ft. Worth, Texas October 31, 1913; ed. B.S. MIT 1934; married; interested in radio since 1925; amateur ex-W1EQC and ex-W2RDH; professional experience: Boonton Radio Corporation 1935 development bandpass intermediate frequency transormers, Radio Frequency Laboratories 1936/1939 in charge of development of a signal generator, a radio noise and field strength meter, 1939 assisted in organizing Measurements Corporation and Vice President and Chief Engineer until 1953; member Aircraft Owners and Pilots Association, American Society for Metals, Past President & Fellow, Audio Engineering Society; assisted in organizing Northern New Jersey Sub-section IRE and acted as Chairman of the Sub-section 1947/1948; numerous RMA, IRE, SAE and ASA Standards Committees; several patents in his field of work and numerous papers ranging from Audio Distortion to Standard Signal Generators; Radio Club of America President 1948/1949, Director.

MITCHELL, LEN B., (M) 1962 - Automatic Electric Sales Corp., 730 Third Ave., New York, New York res. 731 Bonton Place, Arlington Heights, Ills.

MITCHELL, ROBERT JOHN, (M) 1962 - Decca Radar, Inc., 386 Central Park South, New York, N.Y.; res. Three Springs, Pound Ridge, New York.

MOORE, J. KENNETH, (M) 1960 - Dept. Mgr., CBS Laboratories, 227 High Ridge Road, Stamford Conn. Res. Woodbrook Rd. Member, IEEE, 1957.

MOREHOUSE, RAYMOND LYNUS (M) 1956 - Field Engr., Sales Rep. 1946 present prev. Adolph Schwartz, Sales Rep. Eitel McCullough, Inc., res. 2609 Ave. "R," Brooklyn 29, N.Y.; b. Topeka, Kans. October 4, 1898; ed. High School 3 yrs. Elec. Engrg., Night courses Columbia University; former emp. Sales Manager, 1935/1945 Allan D. Cardwell Mfg. Corp., Brooklyn, New York, Lab. Tech. 1924/1934 Allan D. Cardwell Mfg. Corp.; Brooklyn, N.Y., Lab. Tech. 1924/1934 Allan D. Cardwell Mfg. Corp.; Wireless Operator 1919/1922, Telegrapher, A.T.SF to 1917; Military Serv. U. S. Naval Reserve 1917/1919; Amateur Call Letters W2QA, over 25 yrs.; Hobbies, Veteran Wireless Opr. Assoc., Radio Club of America, Quarter Century Wireless Assn., Inc.

MORELOCK, JAMES (F) 1937 - Consulting Engineer, The Morelock Company, Box 348, Millington, New Jersey; res. Millington, N.J.; b. Lockport, N.Y.; ed. Rensselaer and Brooklyn Polytechnic Institutes, E.E. 1932; married; interested in radio since 1925; professional experience: engineer, Weston Electrical Instrument Co. 1930/1939, Chief Engineer Electronics Div. 1940/1952; Consulting Engineer to date, private practice, electronics in the field of measurement, instrument and component design and manufacture, tubetesters, signal generators resistors, counters, infrared generators, computor amplifiers, air and ground navigation systems; 14 patents, National Product Design Award; avocation: country farm at Millington with horses and some cattle; Radio Club of America President 1950, (conducting the 1BCG Monumnet Dedication) and 1951, Vice President 1944 thru 1947, Corresponding Secretary 1942/1943, 1954 thru 1959, Director 1941, 1948/1949, 1952.

MOSS, JOEL FREDERICK, (M) 1960 - Motion Picture Engineer, California Studios, Melrose and Bronson Sts., Hollywood, Cal. res. 205 2nd Anita Drive, Los Angles 49, Cal.

MUNN, W. FAITOUTE (CM) - Analytical and research chemist, res. 75 Walker Rd., West Orange, N.J., b. January 20, 1891, East Orange, N.J., ed. Columbia University, interested in radio since 1905. Professional experience: Laboratory of Thomas A. Edison; 2-1/2 years Laboratory Assistant to Dr. S. A. Tucker, Electrochemical Laboratory, Columbia University; Chemist, West Virginia Pulp & Paper Co.; Ass't Director, Lederle Laboratory, New York; Electrical Engineer, Electrical Alloy Co.; Chief Chemist, General Chemist, General Chemical Co., Baker & Adamson Plant, Easton, Pa.; Chief Chemist, Brewster Film Corp., Chief Chemist, Colura Pictures Corp.; Chemist, Carroll Dunham Smith Pharmaceutical Co.; 10 years Certified Chemist, American Bureau of Shipping; Consulting Microscopist, Evans Research & Development Corp., 1948----. Private research laboratory (optical, chemical, microscopical, electric furnace, high frequency, photographic). Patents No. 2371405, "Gas Analysis Apparatus," and No. 2537-846, "Knife-Edge Device for Three-Dimensional Effect Images Through Microscope." Societies: Fellow, Royal Microscopical Society, New York Academy of Sciences, and Charter Member, Radio Club of America.

MUNROE, ROBERT KING (M) 1959 - Consulting Engineer, res. 315 East 68th St., New York 21, N.Y.; b. August 3, 1894, Litchfield, Conn.; ed. Horace Mann Sch. N.Y.C.; Groton School, Groton, Mass., Columbia Univ. Engineering Sch., E.E. 1917; employed by Coverdale & Copitts, 15 yrs.; Military Service Capt.. Corps of Engrs. U. S. Army, 1917/1922; Grad. Army Sch. of the Line and Gen. Staff College A.E.F.; Hobbies, Clubs, St. Anthony Club, N.Y.C., Developing own sound systems, Citizens Union of N.Y., vice chairman (civic organization), Member ASCE.

MURPHY, GLYNN M (M) 1960 - Retired; formerly, Communications and controls engineer, Broadway Maintenance Corp., 22-09 Bridge Plaza North, Long Island City 1, N.Y. res. 7116 Hershey Way, Orlando, Fla.

NELSON, WAYNE M. (M) 1964 - res. 396 South Union St., Concord, N.C. (Mail: Box 72, Concord, N.C.); b. June 25, 1900, Kernersville, N.C. Married, one son, Philip

(Chief Engineer WHIP, Mooresville, N.C.) Graduate Kernersville, N. C. High School 1917. Leaned heavily on Hawkins Electrical Guide and extension study for early technical training. First business venture at age 15 as owner 10-mile toll circuit while working with local telephone company. Commissioned officer USNR 1932-'38. Maintained U.S. Antarctic Service Message Center WL MC at W4AA for two years, 1939-1940, handling up to 1600 messages monthly from Byrd's East and West Bases. have built and owned individually several standard broadcasting stations, 1925-34 WNRC Greensboro, N. C.; 1946-50 WWNF Fayetteville, N.C.; and 1954-56 WPET Greensboro, N.C. Currently professionally engaged as owner and manager WHIP, Mooresville, N.C., since 1950 and WAYN, Rockingham, N.C. since 1946. Original and continuous holder W4AA since November 24, 1919, the first license issued in Fourth Radio District after WW One. Extensive hobby time spent as collector and historian early wireless equipment and supporting library.

ODGERS, ARTHUR J. (F) 1950 - Vice President, Northern Radio Co.; res. 82 North Rd., Smoke Rise, Kinnebon, N. J.; b. Calument, Mich. August 6, 1912.

OFFENHAUSER, WILLIAM H. (F) 1936 - Engineer, self-employed; res. Box 594 New Canaan, Conn.; b. Brooklyn, N.Y. May 8, 1904; ed. B.A. Columbia (with Engineering Option); married; interested in radio since 1915; always on fringe of amateur station, still have hopes of running ham set; made first recordings of mosquito sounds, confirming Hiram Maxim's findings after 75 yrs,; about 20 odd patents (such as noiseless recording for sound films, direction finder with response to the tangent of the field angle, a system for recording and utilizing low energy sound of insects to effect control of them); one book on 16 mm Sound Motion Pictures, A. Manual (Interscience 1949, reprinted 1953, 1958) another book on Microrecording (microfilming) with C. Lewis (Interscience 1956); also numerous technical papers. Fellow - Sc. Motion Picture Television Engrs., Ands Eng. Society. Member - Acoustical Society of America, Inst. Radio Engrs. Am. Ordnance Assn.; Awards - OSRD Certificate (VT Fuze Project); ASA War Standards Certificate (252 Project); Naval Ordnance Development Award Certificate (NDRC Tropic Deterioration Project).

OLSON, ALFRED ELLIOTT (M) 1956 - res. 31 Jervis Rd. Yonkers 5, New York.

OSBAHR, BERNARD F. (M) 1951 (F) 1956 - Editor, Electronic Industries, (Chilton Company) Chestnut & 56th Sts., Philadelphia 39, Pa.; res. 923 Longview Rd., King of Prussia, Pa.; b. Brooklyn, N. Y. December 17, 1918; ed. University of Pennsylvania, RCA Institutes Inc.; married; interested in radio since 1933; professional experience 1939/1942 Engineer RCA Mfg. Co. Camden, New Jersey; 1942 Chief Engineer New York School of Radio; 1943/46 U. S. Army 1946/1947 Chief Electtical & Mechanical Procurement USFET Corps. of Engineers (Germany); 1947/1948 Director Services Division U.S. Army Exchange Service (Germany) 1948 to present Editor Electronic Industries, Senior member IRE, Member AES, AFCA; Hobbies - fishing, boating.

OSBORN, PERRY H. (F) 1944 - Senior Engineer, Radio Engineering Laboratories, Inc., 29-01 Borden Ave., Long Island City 1, N.Y.; res. 546 Sunset Ave., Haworth, N. J.; b. Buskirk, N.Y. August 31, 1904; ed. E.E. Rensselaer Polytechnic Institute, M. Sc. University of Pittsburgh; married; interested in radio since 1920; amateur W2FAA; Radio Engineer with Westinghouse, Signal Corps, RCA and E.H. Armstrong, Director Radio Club 57 Member IRE.

OSTERLAND, EDMUND (F) 1950 - Electronic Instrument Design and Manufacture, EO Electronics, Inc., Moutain Lakes, N.J.; b. Brooklyn, New York 1909; ed. B.S.E.E. New York University; married; professional experience Chief Engineer Ballantine Labs., Inc. until January 1952, own Business since that time.

OTIS, G. EDWIN (M) 1953 - Site Manager, General Electric Co. in Product Service, Biloxi, Miss.; res. 301 Pleasant Ave., North Syracuse ; N.Y.; b. Plattsburg, N. Y. 1915; ed. graduated Union College 1938; interested in radio since 1930; professional experience - General Electric Co. 1941/1943, U. S. Army Signal Corps 1943/1946, instructor in radio and television at Veterans Vocational school, Troy, N.Y.; presently President of Otisonde, Inc., majoring in Hi-Fi Custom Sound Installations and Industrial Television; Technical article in "Radio" 1943 on volume expander, U.S. Army, developed special test equipment for carrier telephone and a noise suppressor for background line noise.

PACKARD, LUCIUS E. (F) 1940 - Engineer, President, Sales Manager, Technology Instrument Corporation, Action, Mass.; res. Framingham Centre, Mass.; b. Sommerville, Mass. January 21, 1914; ed. Graduate MIT 1935; married; interested in radio since 1928; amateur WIDFL; patent, variable resistor, Patent Electric method and system for measuring Impedance and Phase Angle (conjunction with Hermon H. Scott).

PAGE, ESTERLY CHASE (F) 1945 - Consulting Engineer, Partner, Page, Creutz, Steel and Waldschmitt, President Page Communication Engineers, 710 14th St. N. W., Washington 5, D. C.; Vice Chairman Board of Director Edison-Page S.P.A. Rome, Italy; res. 10822 Alloway Drive, Potomac, Md.; b. Chicago, Ill. July 16, 1902; Senior Member IRE, member Engineers Club, New York, ex-Lieut. Colonel AUS Signal Corps.; Awards - Legion of Merit Order of British Empire.

PAINE ROBERT C. (F) 1935 - Test Engineer, Measurements Corporation, Boonton, N.J.; res. 436 Cornelia St., Boonton, N.J.; b. South Randolph, Vt., August 10, 1895; ed. Electrical Engineering at Worchester Polytechnic Institute and Marine Engineering at Webb Institute of Naval Architecture 1914/1917; married, four grandchildren; interested in radio since 1928; left college for Army 302nd Field Artillery 1917/1919, attended Royal Technical College, Glasgow, Scotland, Technical Staff Bell Telephone Laboratories 1923/1932, Ferris Instrument Corporation 1934/1948; Senior member IRE, Morris County Engineers Club, Masonic Lodge, Author of many articles in radio magazines.

PALMER, CHARLES WALTER (F) 1935 - Formerly Engineer, Western Electric Co., Inc., Lexington Rd., Winston-Salem, N.C.; res. 8701 Marble Dr. El Paso Texas; b. Kingsbridge, N.Y. August 26, 1907; ed. E.E. Cooper Union and Cornell University, also studied at Columbia University, N.Y. University and Stanford University; married; interested in radio since 1919; amateur formerly W2BV, W2BOY until 1940, Present W4ASV; professional experience: Technical Assistant Bell Telephone Laboratories 1928, Engineer Dresser Mfg. Co. 1929, Engineer Western Electric Co. 1929, Technical Editor Radio News Magazine 1931, Technical Editor and Managing Editor Radio-Craft Magazine 1933, Engineer, Section Chief and Department Chief Western Electric Co., Inc., Radio Division 1936 to date, presently Chief of Training Department; numerous articles in technical publications AIEE, Radio Magazine, Radio News, Radio-Craft; associated with radar and sonar engineering since 1940; Senior Member IRE, Member of Executive Board Boy Scouts of America, Old Heckory Council.

PANTER, PHILIP F. (F) 1946 - Fellow 1958 Executive Engineer ITT Laboratories (formerly Federal Telecommunication Laboratories) Nutley, New Jersey; res. 6 Hooper Ave., West Orange, N.J.; b. Poland 1908; ed. McGill University 1929/1936, B.S. 1933, B. Eng. 1935 and Ph.D. 1936; married; professional experience: teaching one year in Palestine, teaching mathematics and physics

Sir George Williams College, Montreal and staff of Physics Department McGill University until 1945, 1941 Canadian Marconi Co. Montreal, 1945 Federal Telegraph and Radio Corporation, Senior Engineer in Charge of Development of FM Broadcast Equipments, 1946 Federal Telecommunication Laboratories, 1950 International Standards Electric Corporation technical adviser on telephone installations in Israel; Federal Telecommunications Laboratories since June 1952; Senior Member IRE and Member American Technion Society; author, various papers on FM and PCM; "Modulation, Noise and Spectral Analysis", McGraw-Hill Book Co., 1965.

PAPAMARCOS, GEORGE (F) 1940 - Sales Engineer, Radio Engineering Lab's, Inc., 29-01 Borden Ave., Long Island City 1, New York; res. 14 Grayley Pl., Huntington Station, N.Y.; b. N.Y. August 6, 1914; ed. Brooklyn Technical High School, RCA Institute; married; interested in radio since 1933; ex W2FZM advanced class; professional experience: five years with U.S. Navy as Chief Radio Technician and Electronics Officer, with REL since 1940 except for five years with Navy; Member IRE, AFCEA, ARRL.

PARKES, ALANSON WILLISTON JR. (F) 1947 - President Ballantine Labs., Boonton, N.J. formerly Vice President, Aircraft Radio Corporation, Boonton, N. J.; res. 200 Overlook Ave., Boonton, N.J.; b. Sandwich, Mass. December 24, 1899; ed. Clark University A.B. 1922, Lafayette College A.M. 1926, Harvard University A.M. 1929; married; interested in radio since 1912; amateur intermittently 1912/1930; Physics Instructor at Lafayette College & Harvard 1922/1930, Radio Engineer & Executive Specializing in Airborne Electronics 1930 to present; Director Ballantine Lab., Boonton, N.J. 1953 to date; Trustee, Clark University Worcester, Mass., 1959/1963; U. S. Navy World War One-Chief Electrician Radio, Aviation, currently Vice President in charge of Field Engineering and Sales Division of Aircraft Radio Corp. since 1948.

PECK, GORDON V., (F) 1961 - The Gordon V. Peck Company, 130 Casa Linda Plaza, Dallas 18, Texas.

PETTERS, DANIEL P., (M) 1964 - res. 105 Briarcliff Road, Mountain Lakes, N.J.

PERRETTO, ARMAND, (M) 1952 - Assocaite Member of Technical Staff, Bell Telephone Labs since 1954; res. 23 Waverly Place, Freehold, N.J.; b. Jan 31, 1927, Brooklyn, N.Y.; ed. High School 1944, RCA Institutes Advanced Technology T3 Course 1954; married; research assistant Edwin H. Armstrong Columbia University Laboratory 1945/1954.

PETRY, CHARLES B. (M) 1942 - Chief Engineer, Radiaphone Co. Inc., 600 Evergreen St., Monrovia, Cal.; res. 1458 Bonita Ave., LaVerne, Calif.; b. Paterson, N. J. May 13, 1904; ed. Paterson High School, Bell Laboratories Technical School, Columbia University Extension courses; married; interested in radio since 1918; amateur W6NIV; professional experience: in all, branches of engineering since 1923; several patents; Senior Member IRE; Hobbies - Gunsmithing and Gem and Lapidary Work, amateur radio.

PFEIFER, CLARENCE H. (M) 1957 - Pres. & Treas., Frederick Pfeifer Corp., Mfrs. Rep. & Distributors, 44 years; 53 Warren St., New York 7, N.Y.; b. November 15, 1894, Brooklyn, N.Y.; ed. High School; Military Service 1918/1919 U. S. Sign. Corp, Radio Intelligence; Amateur Call Letters 1908/1911 (RD); 1912/1918 (2FA); 1942-present (W2FG); Hobbies, Amateur Radio, Q.C.W.A., V.W.O.A.; Always enjoy meeting old and new friends in the club, personally and over the air.

PILLER, S. EDWIN (F) 1958 - Radio Engineer, Allocations Engineering Trnasmitting Station Design & Construction, National Broadcasting Company, 11 yrs.; 157-32 20th Ave., N.Y.C.; b. August 6, 1921, N.Y.C.; ed. B. E.E. City College N.Y., 1943; Military Service U. S. Army Signal Corps 1946/1947; Amateur Call Letters, W2KPQ, licensed in 1937; Patents, Books, etc. Editor of the Sidebander, Official Publication of SSB Amateur Radio Assn., Contributor to CQ and First Army Mars Newspaper QUA; Hobbies, etc., President SSB Amateur Radio Assn., Member I.R.E. and N.Y. Radio Club; Dir. of the First Army Mars SSB, Technical Net - "For the Dissemination of Technical Knowledge by Radio Communication," Wednesday Evenings at 9 P.M. on 4030KC upper sideband.

PLAMJACK, HAROLD J. (F) 1961 - Engineer, RMC Division, Hewlett-Packard Co., res. 34 Stauber Dr., Plainview, N.Y.; b. N.Y. July 4, 1926; ed. MIT, BX in EE 19-42; married Virginia Getty; military service, U.S. Navy 1942/1946; hobbies, boating. Director, Radio Club, 1964.

POPKIN - CLURMAN, J. R. (M) 1950 - Formerly President (Radio Engineer), Telechrome Mfg. Corp., Amityville, L. I., N.Y.; res. 134 Wheatley Dr., Brookville, Glen Head, L. I., N.Y.; b. Brockton, Mass., August 29, 1916; ed. M.I.T. S.B. 1938, Harvard Business Sch. M.B.A. 1940, also Brooklyn Polytechnic Institute and Columbia; married; interested in radio since 1922; amateur W1EPH W2LNP; professional experience Hazeltine Electronics Corp., Panoramic Radio Corporation, Servo Corp. of America, Signal Corps, Automatic Radio; 4 Patents pending; over 40 technical articles published; Senior Member IRE, Nassau Radio Club; Sr. Member, Fernseh Technische Gesel. (Germany), Sr. Mem. British Soc. of Television Engineers, Sr. Mem. Institution of Elect. Eng. (Brit), Sr. Mem. Institution of Elect. Eng. (India), Sr. Mem. Institute of Television Eng. (Japan) Sr. Mem SM PTE (Soc. of Mot. Pict. & Tel. Eng.) U. S. Delegate: C CIR (Com. Consultative International Radio Telecommunications), NTSC (Nat. Tel. Systems Com.), Member: NAB (Nat. Assoc. of Broadcasters), EIA (Electronic Industries Assoc.), AFA (Air Force Assoc.).

POPPELE, J. R. (F) 1940 - Voice of America, Washington, D.C.; Advisory-Committee; res. 9 Crest Circle, South Orange, N.J.; b. Newark, N.J. February 4, 1898; married; professional experience: radio operator on commercial vessels 1915/1920, Chief Engineer WOR Broadcasting Station 1922/1952, Vice President 1946/1952 Secretary 1936/1948, Director 1936/1952, Mutual Broadcasting System Board of Directors 1947/1952, Radio Consultant to New Jersey State Police; President of Television Broadcasters Association for seven years, Founder of original FM Broadcasters Association, President Radio Pioneers Club, Fellow IRE, Member Board of Directors Veteran Wireless Telegraph Operators Association, Trustee South Orange Presbyterian Trinity Church, member Advisory Council Upsala College, member American Physics Society, Society of Motion Picture Engineers, member Committee on Civil Defense ; Hobbies Golf, Photography. President, Green Moutain Enterprises, Vt.

PRATT, HARADEN (F) 1930 - Engineer, Retired, 2612 N.E. 7th St. Pompano Beach, Fla.; b. San Francisco, California, July 18, 1891; ed. University of California B.S. in Electrical Engineering 1914; married; interested in radio since 1905; amateur 1905/1915; President and Secretary Bay Counties Wireless Telegraph Association 1910/1914; professional experience: United Wireless Telegraph Co., and Marconi Wireless Telegraph Co., San Francisco ship and shore station operator and installer 1910/1914; Marconi high power 300 kw trans - Pacific stations at Bolinas and Marshall, Cal. 1914/19-

15; U. S. Navy Department Bureau of Steam Engineering Expert Radio Aide at Mare Island Navy Yard and then at Washington in charge of construction and maintenance of all high power naval radio stations during World War One; Federal Telegraph Co. engineer in charge of factory and design and construction of its Pacific Coast public service telegraph system 1920/1923; private business in Cal. 1923/1928; Western Air Express constructed and supervised high frequency radio telegraph system between Los Angeles and Salt Lake City 1925/1927; Bureau of Standards Washington development radio aids for air navigation 1927/1928; Mackay Radio and Telegraph Company Chief Engineer in 1928 and then Vice President unitl 1951; Telecommunications Adviser to the President of the United States 1951/1953, Vice President, Dualex Corp. 1953/1958; Fellow, Direcotr, Secretary and past President of IRE, Fellow AIEE, Associate Fellow Institute of Aeronautical Sciences, Honorary Life Member of the Institution of Radio Engineers Australia, Life Member VWOA.

PROUDFIT, ALEXANDER (M) 1958 (F) 1960 - res. 48 Thompson Park, Glen Cove, New York.

QUINBY, EDWIN JENNYSS (M) 1958 - Product Mgr., Shepard Laboratories, Inc., (Electronic); res. 30 Blackburn Rd., Summit, N.J.; b. January 13, 1894, N.Y.C.; ed. St. John's Cathedral (Military School) City College, New York, (B.S.E.E.); North Jersey Rapid Transit (Interurban Electric R.R.) when I first got out of school, 2 yrs. Marconi, DeForest, Sarnoff, RCA (Communications at Sea, Ashore and in RCA Labs.) 20 yrs.; Monroe Calculating Machine Co. (Monrobot Corp.) 5 years, Philco Corp., G. & I. Div. (Transac Computers) 2 yrs.; Military Service, U. S. Naval Reserve since 1932, active duty, World War II (Commander) 5 yrs. (Ashore and at sea) Officer in Charge, Naval Ordnance Unit, Key West, Fla. (Electronic Weapons); Amateur Call Letters 2 XK (N.Y.C.) 3 yrs.; Patents, Papers, etc., 12 U. S. Patents, 3 Foreign. Founded RCA's "Broadcast News" and edited, 4 yrs. - also various magazine articles; Sports, Hobbies, etc. Founder and Honorary President, Electric Railroders' Assn., Co-Founder, President, Branford Electric Railway, Chairman of the Board, Greene Line Steamers, Inc. (S.S. Delta Queen); Member, I.R.E., DeForest Pioneers, Steamship Historical Society, National Railway Historical Society, American Guild of Organists, Association of Theatre Organists; have a rather unusual Pipe organ in Summit residence that occupies entire main floor 30' x 72' with 10 h.p. electric power plant in basement. This "20 year project" now has over 1000 pipes controlled from a 4- manual console, and is still being expanded, - my wife plays organ, piano and harp.

QUIST, ANDREW HAROLD (F) 1940 - Electronic Engineer, Signal Corps., Ft. Monmouth, N.J.; res. 1106 Aileen Rd., Brielle, N.J.; b. Brooklyn, N.Y. December 31, 1911; ed. Brooklyn Technical High School, Cooper Union; married; interested in radio since 1931; professional experience: radio servicing 5 years, production foreman and FM Test Engineer Radio Engineering Laboratores, Inc. 5 years, Signal Corps Maintenance Planning Engineer 15 years; Papers "FM Mobile Equipment" FM Magazine 1942, "Radio Control for your Model Railroad" The Model Railroader 1941; Hobbies - High Fidelity Audio, model railroad electronic control, Member AIEE, National Model Railroad Association, Armed Forces Communications Association.

RASER, EDWARD G. (F) 1956 - Technical Advisor and Radio Supervisor, N.J. State Police Radio System, P.O. Box 1420, Trenton, New Jersey from 1942/1959; previous employment, Marconi Wireless Telegraph Co. 1917, Pioneer Broadcast Engineer established WMAL, 1922, designed and constructed Trenton's first 500 watt station WOAX, 1923/1929, Senior Partner Raser & Kale, 1930/1940; Engineer, Squire Signal Laboratory, Ft. Monmouth, N.J., 1941/1942; res. 19 Blackwood Dr., Wilburtha Gardens, Trenton 8, N.J.; b. April 1, 1899, Bordentown, N.J.; ed. Grade Schools, School of Industrial Arts, Technical Schools in Electrical Engineering and Physics; Military Service, Radio Operator, U.S. Navy 1917/1921. On duty at Naval Air Station, Cape May, N.J. Installed and test hopped first 500 cycle spark sets aboard an aircraft. Duty at Naval Radio Stations NSD, NAH, NAI and various Naval vessels; Amateur Call Letters, licensed amateur radio operator since 1914 to date, continuous service. On the air since 1910, held calls as follows: 3NG (1914) 3CS (1919) 3ZI (1922) 2ZI (1946 to date); Historical collection of over 200 books, magazines, and early data and papers on subject of wireless history, dating back to 1895; Sports, Hobbies, Clubs, etc., Senior Member ARRL since 1915, Co-Founder Delaware Valley Radio Assn., Veteran Wireless Operators Assn., Historian; Antique Wireless Gear, Vacuum tubes, Morse and wireless keys, marine radio receivers in the country. Amateur historian and authority on wireless back to 1900. Wireless operator aboard ship from Marconi Co., United Fruit Co., Kilbourne & Clark, U.S. Shipping Bd. throughout the years, married, Licensed Radiotelegraph 1st. 1917 to date, amateur extra class license since 1952. DVRA Silver Cup Award for Faithful Service 25 yrs, ARRL Public Service Award, cited 5 times.

REDINGTON, EDMUND B., (F) 1960 - Staff Engineer, Electronic Industries Association, 1721 DeSales St., Washington 21, D.C. res. 3912 North Upland St., Arlington 7, Va. Commander, (retired) U.S. Coast Guard. b. Troy, Penn. Oct. 24, 1899.

REDINGTON, JOHN H. (F) 1935 - Sales Manager, Measurements Corporation, Boonton, N.J.; res. 324 Cornelia St., Boonton, N.J.; b. Brooklyn, N.Y. October 5, 1904; ed. High School and supplementary engineering courses; married; interested in radio since 1923; amateur W3FN M 1936/1941; professional experience Bell Telephone Laboratories 10 years, past 20 years engaged in design development and manufacturing of radio test equipment and in the sales engineering field.

REINHARDT, NICHOLAS J. (F) 1956 - res., 150 Bard Ave., Staten Island 10, New York.

RENWICK, ERLE B., JR. (M) 1955, Sales Engineer, Gawler-Knopp Co., 6 yrs., res. 29 Birchwood Rd., Denville, N. J.; b. July 13, 1921, Portland, Me.; ed. B. S. Electrical Engineering 1947 University of Me.; Military Service, U.S. Navy, 2 yrs. 1944/1946; Sports, Hobbies, Clubs, etc. HI - FI hobbyist, also automobile enthusiast.

REPLOGLE, DELBERT E. (F) 1928 - President, Electronic Mechanics, Inc., 101 Clifton Rd., Clifton, N. J.; res. 300 Godwin Ave., Ridgewood, N.J.; b. Douglas, Alaska July 31, 1896; ed. Pacific College A.B. and B. S. 1916, M. I.T. B.S. 1924, M. S. 1925; married; interested in radio since 1916; built and operate d station NZO in Alaska, 60 miles north of Arctic Circle, W2XAE at Ridgewood; professional experience: Vice President and Chief Engineer DeForest Radio 1930/1934, President Electronic Mechanics 1936 to present, President of General Electronics 1942 to present; patents on cable protection devices, radio and television circuits; Member DeForest Pioneers; Radio Club Director 1932.

RETTENMEYER, F.X. (F) 1928 - Engineer, Philco Corporation, Tioga and "C" Sts., Philadelphia, Pa.; res. 740 Stanwick Rd., Moorestown, N.J.; b. Kendrick, Okla. July 27, 1900; ed. M.A. Columbia University 1925; married; professional experience: Bell Telephone Laboratories 1922/1935, RCA Mfg. Co. 1935/1940, Federal and Philco to date; Radio Club of America Vice President 1935, Recording Secretary 1933, Director, 1929, 1931/1932.

RICHARDSON, AVERY G. (F) 1941 - Manager Technical Service, ITT Lab. (formerly Federal Telecommunication Lab.), 500 Washington Ave., Nutley, N.J.; res. 115 Vreeland Ave., Boonton, N.J.; b. Brooklyn, Polytechnic Institute Brooklyn E.E. 1924; married; interested in radio since 1928; professional experience: radio receiver design for Brunswick, Bremer Tully and DeWald, Radio Compasses at Fairchild, FM Signal Generators at Boonton Laboratories, military Direction Finders at Federal; about 18 patents, IRE papers at Rochester and Dayton; member AIEE, Institute Aeronautical Sciences, Acoustical Society of America, Fellow IRE.

RICHARDT, JOHN W. JR (M) 1951 - Electronic Engineer, Last 6 years Proprietor of John W. Richardt Co., Pine Brook, N.J. Engineering Sales Representative; res. Box 267 Whippany, N. J.; b. May 28, 1922; ed. B.S. Physics B.S. Mathematics Ind. State, working on MS in EE at Stevens; widower; interested in radio since 1933; amateur W2WIY since 1947; professional experience Bell Telephone Laboratories six years, Chief Project Engineer at Tel-Instrument Corp., on Navy Subcontract, One Patent on electronic circuit assigned Bell Labs.; member Essex County Sherrifs Departments, PresidentNorth Jersey Mobile Amateur Radio Club.

RIDER, JOHN F. (F) 1931 - Author and Publisher, President, John F. Rider Publisher, Inc., N.Y.C.; b. N.Y.C. April 30, 1900; ed. High School of Commerce and Cooper Union. Radio Engineer, N. W. Jones Radio Mfg. Co. 19-21/1923; Chief Engineer, J. W. Jones Mfg. Co.1924/1925; Radio Research and Consulting Work 1926/1954; radio feature writer 1921/1930 for New York Sun, New York Telegram, New York Herald Tribune, New York World. Associate Editor Radio Engineering; Managing Editor, Radio Listener Guide & Call Book; Technical Editor, Motion Picture News 1929/1931. Served for three and one-half years in U.S. Signal Corps, World War II. Retired in August 1945 with rank of Lt. Col. Awarded Legion of Merit. Publisher of Rider Radio Manuals; Rider Television Manuals; also technical school tests relating to electricity, electronics, radio, television and allied sciences; physics, since 1927. Author of Cathode-Ray Tube at Work; How To Use Meters, Interpreting Test Scope Traces, and numerous other texts; co-author of Encyclopedia of Cathode Ray Oscilloscopes and Their Uses.

ROBERTS, WILLIAM (M) 1952 - Sperry Gyroscope Co., Surface Armament Division (R201) Great Neck, New York.

ROBERTSON, JOHN F. (M) 1942 - 129 Soundview Avenue, Huntington, New York; ed. B.S. University of Wisconsin.

ROCKETT, FRANCIS H. (F) - Engineering Staff Editor, McGraw-Hill Book Co., Encyclopedia of Science and Technology, 908 Rosser Lane, Charlottesville, Va.; b. Philadelphia, Pa., September 9, 1919; ed. B.S. in E.E. Lehigh University 1942; married; interested in radio since 1932; professional experience: Junior Radio Engineer The Johns Hopkins University, Laboratory Assistant Lehigh University, Laboratory Instructor Columbia University, Associate Editor "Electronics"; Technical Report Consultant Airborne Instruments Laboratory, Director of Advertising, Airpax Products Co.; member IRE, AIEE, STWE.

RONALD, THOMAS T. (M) 1946 - res. 470 Piaget Ave., Clifton, N. J.; b. Vrdnik, Yugoslavia January 19, 1906; ed. Technical College Mittweida, Germany, Newark College of Engineering E.E. 1933.

ROUND, HENRY JOSEPH (HM)1952 - Physicist, self-employed; res. c/o Barclays Bank, 1 Station Facade, Maswall Hill, London N 10, England. (Address for Letters) Lab. A 105 John St. London E. C. I. (telephone) Terminas 9117; b. Worchestershire, England June 2, 1881; ed. Chel-tenham Grammar School, Royal College of Science, London, City and Guild Technical College, London; widower, seven Children, thirteen grandchildren; interested in radio since 1902; professional experience Marconi Wireless Telegraph Co. of England, Marconi Wireless Telephone Co. of America (now Radio Corporation of America) and since 1932 own laboratory, pioneered in development of radio frequency amplifiers and their application to direction finders that spotted the departure of the German fleet leading to the famous Jutland engagement of World War One; very many patents on radio, gramaphones, microphones, loudspeaker, talking pictures, underwater signalling, magneto-stricture transducers; large number of technical papers and one book on Tetrodes (1927); Institute of Electrical Engineers (Britian) Duddell Premium (Twice); Radio Club of America Armstrong Medal 1952.

ROTH, RICHARD F., (M) 1960 - Radio Engineer, Hazeltine Corp., 59-25 Little Neck Parkway, Little Neck, N. Y.; res. 210-15 23rd Ave., Bayside, New York.

RUITER, JACOB H. (M) 1956 - Sales Manger, Electronic Equipment Dept. Curtiss-Wright Electronics Div., 1957-present, also, President J. H. Ruiter Advertising; pres. emp. Wm C. Copp Associates 1956/1957, Allen B. DuMont Laboratories 1943/1956, Signal Corps. Civilian Training School 1942/1943; res. 387 Highland Avenue, Upper Montclair, New Jersey; b. August 21, 1917, Montreal, Canada; Books, "Modern Oscilloscopes and Their Uses" published by Rhinehart & Co. 1949, revision 1955; Sports, Hobbies, etc. Montclair Society of Engineers, Senior Member IRE, Past Pres. N.J. Chapter of National Industrial Advertisers Ass. 1953/1954, Chairman of Exhibitors Com., IRE, 1954/1956, Chairman, Publications Com., Radio Club 1958/1959; Guest Lecturer, Newark College of Engineering on Industrial Advertising, 1952/present.

RUNYON, CARMAN R. JR. (F LM) 1912 - Chairman of Bd., Radio Engineering Laboratories, Inc., 29-01 Borden Ave., Long Island City 1, N.Y.; res. 130 East End Ave., New York 28, N.Y.; b. East Orange, N.J. August 9, 1893; ed. Cornell; married; interested in radio since 1908; professional experience: U.S. Naval Reserve Ensign World War One, U. S. Navy Commander World War Two; pioneered in the development and demonstration of frequency modulation broadcasting with Major E. H. Armstrong beginning in 1934; amateur station 2AG since 1908; Radio Club of America Vice President 1927, Treasurer 1926. Armstrong medal 1945.

RUNYON, C. R. III (F) 1948 - Purchasing Agent, Radio Engineering Laboratories, Inc., 36-40 37th St., Long Island City 1, N.Y.; res. 901 Lexington Ave., N.Y. 21, N.Y.; professional experience: Sales Manager, Sales Engineering and Purchasing.

RUNYON, JOHN B. (M) 1953 - Res. Box D. Eatontown, New York.

RUSSELL, WILLIAM GORDON (F) 1926 - Staff Technician, General Precision Lab., Inc., Pleasantville, New York; res. 24 Chestnut Ridgeway Dobbs Ferry, N. Y.; Hastings-on-Hudson, N.Y.; b. Yonkers, N. Y. October 14, 1906; ed. Columbia University, United States Navy, Mechanics Institute, RCA Institutes; married; interested in radio since 1923; professional experience: E.H. Armstrong Laboratory, Columbia University, Norden Lab. Corp., White Plains, N.Y.; Radio Club of America Recording Secretary 1954.

RUTHERFORD, ROBERT E, JR., (M) 1961 - Research Engineer, CBS Laboratories, High Ridge Road, Stamford, Conn. res. 93 North Spring Garden Ave., Nutley 10, N. J. Radio Club of America Director.

SANDS, LEO G., (M) 1960 - Communications Systems Consultant, also president Trans-World Public Relations, Inc. Office: 250 Park Avenue, New York, N.Y. 10017, telephone (212) YUkon 6-9100. Home: 43-32 Kissena Blvd., Flushing, N.Y. 11355, telephone (212) Flushing 8-0271. Born in Spokane, Washington March 20, 1912. ed. University of California, Golden Gate College, U.S. Army Air Corps Radio Engineering School, Philco Training School, Bell Telephone Laboratories School. Radio amateur 1926-1930 (W7PH, W7ABV). Previously sales engineer, Remler Co., Ltd. 1939/1941.

SARNOFF, DAVID (HM) 1926 - Chairman of the Board, Radio Corporation of America, 30 Rockefeller Plaza, New York 20, N.Y.; res. 44 East 71 St., New York 21, N.Y.; b. Uzlian, Russia February 27, 1891; ed. Special Course E.E. Pratt Institute, Brooklyn, N.Y.; married; interested in radio since 1906; professional experience: Wireless Operator 1908/1912, Chief Radio Inspector and Assistant Chief Engineer Marconi Co. 1913, Contract Manager, Marconi, Co. 1914; Assistant Traffic Manager, Marconi Co. 1915; Commercial Manager Marconi Co., 1917, Commercial Manager Radio Corporation of America 1919, General Manager Radio Corporation of America 1921, Vice President and General Manager Radio Corporation of America 1922, Executive Vice President Radio Corporation of America 1947 to date; 2 patents, U.S. Army Signal Corps Reserve Lieutenant Colonel 1924, Colonel 1931, Brig. General 1944; appointed Member of Committee on Department of Defense Organization 1953; appointed by President Eisenhower (1953) to serve indefinite term as Brigadier General (res.), Army of the U.S.; Member of New York State Chamber of Commerce, A.I.E.E., Armed Forces of Communications Association, Economic Club of New York, IRE, Newcomen Society of England, Poor Richard Club, Royal Society of Arts, U.S. Naval Institute, VWOA; Member of Army and Navy Club of Washington, D.C., Metropolitan Club, Washington, D.C., India House, Century Country Club and Engineers' Club of Philadelphia; He has received twenty-one honorary degrees from American Colleges and universities. Included among his many awards from scientific, industrial, military, civic and cultural groups are: Medal of Honor of the Radio-Television Manufacturers Association (1952); First Founders Award of the IRE (1953); First Keynoter Award from National Association of Radio and Television Broadcasters (1953); and the Gold Pin Award of the Radio Pioneers of America (1956). Included among the U. S. Government Decorations are the Legion of Merit (1944); Medal for Merit (1946); and the U.S. Army's Decoration for Exceptional Civilian Service (1956).

SCHMIDT, FRED W., JR. (M) 1950 - Engineer, Specialist, doing guidance and pulse automation on a missle test set for the Army; previous emp. project eng. Allen B. DuMont Lab., Inc. Los Angeles, Cal., Hoffman Laboratories Sr. Project Eng. receiver designs, Colonial Radio Corp., Buffalo, New York eight years test equipment design, Standard Coil Products, Project Eng. Front End design for TV receivers, res. 11468 Allerton St., Whittier, Cal.; b. November 25, 1908, Buffalo, New York, ed. B.S. Canusius College, Buffalo, N.Y.; Certificate Courses in UHF, Newark College of Engineering; married; interested in Radio since 1928; 10 patents.

SCHNABL, FRANK J. (M) 1956 - res. 144 Harrison St., Haworth, New Jersey.

SCHNEIDER, ROBERT E. (F) 1946 - Technical Writer, res. 10 Wagg Ave., Malverne, New York; ed. Pekin, Ill. Community High School, University of Illinois 1922, B.S. 1924; b. Iowa, U.S.A. June 11, 1902; Hazeltine Electronics Division, supervisor of airborne electronics engineering and maintenance, U. S. War Department 1942-1944; electronics engineer, Curtiss-Wright Corp., 1944-1945; marketing executive, The Bendix Corporation, 1945/1951; marketing director, Bogue Electric Manufacturing Co., Inc., 1951/1953; marketing consultant, Radio Corporation of America, 1953/1954; president, Sands Associates, Inc., 1953-1960; manager-industrial products, Philco Corporation, 1960-1962; independent consultant, 1962-present; president, Trans-World Public Relations, Inc., 1964 to present. Author of more than 600 technical papers and 15 technical books. Contributing editor to several publications. Senior member, I.E.E.E. since 1950.

SARA, JOSEPH (M) 1930 - Owner, Sara Electronics and Mfg. Co., 15 Ward St., Bloomfield, N.J.; res. 836 Bloomfield Ave., Montclair, N.J.; b. Avola, Italy December 10, 1885; ed. Technical Schools, Italy.

SCHNOLL, NATHAN (F) 1928 - President & Chief Eng. Industrial Devices Inc., Edgewater, N.J.; Founder, Industrial Instruments Inc., Cedar Grove, N.J.; res. 1485 Jefferson St., West Englewood, N.J.; b. N.Y.C. March 20, 1904; ed. Stuyvesant High School, B.S. Columbia University 1947; married; interested in radio since 1917; amateur 2AGG 1919/1927; professional experience: Assistant Chief Engineer Polymet Mfg. Co. 1929/1932, Chief Engineer Solar Mfg. Co. 1932/1939, President and Chief Engineer Industrial Instruments Inc. 1939/1949, Chairman to date; Senior Member IRE; about 15 U.S. Patents in electronic and capacitor fields.

SCHOMBURG, RICHARD A., (M) 1956 - PO Box 11605, Station A, Palo Alto, California.

SCHUMACKER, ALLAN L. (M) 1937 - Senior Eng., Research & Development, Arma Division, American Bosch Arma Corp., Roosevelt Field, Garden City, L.I., N. Y.; res. 40 Maple Ave., Westbury, L.I., N.Y.; b. Brooklyn, N.Y. September 14, 1904; interested in radio since 1915; amateur 2AJ 1923/1925; held First Grade Radiotelephone operators license 1933; professional experience: Freshman Radio Co. Laboratory Assistant 1923/1929, Colonial Radio Corp. Engineer 1921/1931, Wired Radio Inc. engineer 1931/1940, Research and Development Department Arma Division, 1942 to present, on design & development of precision components for Analog & Digital Computers Specializing in the design of Electromagnetic Components, Net-Works, Precision Electrical Measurements, Circuitry; Associate Member IRE 1942 to date; one paper "The Electromagnetic Resolver" AIEE 1951; Hobbies - Photography, music, Hi-Fi.

SCHWARTZ, ADOLPH (M) 1950 - Radio Manufacturers Sales Representatives, Eitel-McCullough, Inc. (Eimac), 23 years; res. 612 Sagamore Ave., Teaneck, New Jersey; b. December 25, 1898; ed. High School, Marconi Institute on Elm St., N.Y.C.; Military Service, U.S. Army, WW 1, Hon. Discharge; Amateur Call Letters, W2CN, Licensed since 1916, old calls 2 AFT, 2 ASK; Golf, Aldecress C/C.

SEKLEMIAN, ROBERT S. (M) 1942 - Manager, Real Estate Department, RCA Communications, Inc., 66 Broad St., New York 4, N.Y.; res. 135 Market St. San Francisco, California; b. Fresno, California, April 20, 1902; ed. LL. B. J. D., LL. D.; married; interested in radio since 1922; professional experience: Announcer, radio operator, in charge of terminal office installations of RCAC domestic radiotelegraph network; Former Ensign U.S. N.R.; member IRE Morse Telegraph Club, Real Estate Board of New York (Rental Conditions Committee).

SHACKELFORD, BENJAMIN E. (F) 1943 - Vice President, Ad. Auriema, Inc., 85 Broad St., New York 4, New York; res. 743 Mosswood Ave., Orange, N.J.; b. Richmond, Mo. August 12, 1891; ed. University of Mo. A.B. 1912, A. M. 1913, University of Chicago PH. D. 1916; married; "working" interest in radio since 1918; amateur experience, none, father of one; professional experience Westinghouse Physical Laboratory Tube Engineering 1916/1929, RCA Research, Patent and License activities 1930 to 1956.

SHARP, WATKIN WILLIAM, (M)1959 - Owner, Vocalaire, Inc., public address system rental and sales.; b. Far Rockaway, L.I., N.Y., March 12, 1898; res. 102 Roger Avenue, Inwood, N.Y. 11696; Amateur radio; 1910 through 1918. Call Letters 2NM (prior to 1918). Radio retail: 1918/1930.

SHEA, RICHARD F. (F) 1934 - Consultant, Solid State Circuits, 4 Coronet Court, Schenectady, New York, retired as Electronics Engineer, General Electric Co., Electronics, Pk., Syracuse, N.Y.; res. 225 Twin Hills Dr., Syracuse 4, N.Y.; b. Boston, Mass. September 13, 1903; ed. B.S. in E.E. M.I.T. 1924; married; interested in radio since 1917; amateur 1AZG, 1ADZ, W1BEC, W3 bai 1919/1931; professional experience 1925 to present American Bosch, Amrad, Kolster, Atwater Kent, Pilot (Chief EngineerI, Freed-Eiseman (Chief Engineer), Fada (Chief Engineer), General Electric; 10 patents on electronics circuits; numerous technical magazine articles over past 35 years; Editor of "Principles of Transistor Circuits" Wiley 1953; Chairman, Syracuse Section IRE, Senior Member IRE, member IRE Receivers, Standards and Papers Committees; currently Supervisor Semiconductors Applications G.E. Electronics Laboratory.

SHENIER, HENRY L. (M)1951 - Senior Partner, Shenier & O'Connor, patent lawyers, 230 Park Ave., N.Y.C.; res. 67 - 66 108th St., Forest Hills, N.Y.; b. New Jersey 1902; ed. U.S. Naval Academy B.S. 1922; Georgetown School of Law LLB 1931; married, Margaret Wilson, son, Richard, daughter, Patricia; communication officer, U. S. Navy 1925/1927.

SHEPARD, FRANCIS, H. JR. (F) 1936 - Consulting Engineer, and President of Shepard Laboratories, Inc., Summit, N.J.; res. 480 Morris Ave., Summit, N.J.; b. N.Y.C. May 6, 1906; ed. B.S. in M.E. Yale, Sheffield Scientific School 1929; married, interested in radio since 1930; professional experience: Laboratory Assistant to the late E.G. Sperry, Radio Corporation of America 1933/1940, Chief Eng. Revelation Patents Co. 1942/1945, Pres. of Shepard Labs. formed 1956, work in electro-mechanical fields, Computer input-output equipment, etc., about fifty patents mostly in electronics field on hearing aids, synthetic base response; Member IRE, member ASME, Director Kiwanis, member Chamber of Commerce, Summit, New Jersey; Radio Club of America, President 1954 and 1955. Director 1944 to present.

SHORTT, HUBERT, L. (M)1945 - President, Technograph Printed Electronics, Inc., 920 Northwest Blvd., Winston-Salem, N.C.; res. 3018 Cambridge, Winston-Salem, N.C.; Member IRE, & AIEE: Committee-PGPT-(IRE), 40C (EIA) Committee A(EIA).

SIEMENS, RUDOLPH H. (M) 1937 - Government Sales, rca electron Tube Division, 744 Broad St., Newark, N.J.; res. 31 Deer Trail Rd., No. Caldwell, New Jersey; b. N.Y.C. 1905.

SIEMINSKI, EDWARD (F) 1935 - Grumman Aircraft Engineering Corp., Avionics Engineering Dept. Bethpage, Long Island, N.Y.; res. 134-14 Franklin Ave., Flushing, 55, N.Y.; b. New Bedford, Mass. January 30, 1912; ed. M.I.T. B.S. in E.E. 1934, Polytechnic Institute of Brooklyn Master in E.E. 1953; married; interested in radio since 1927; amateur WIDFD in New Bedford 1929/1934; professional experience: Press Association, Inc. (Research) 1940/1941, Amy, Aceves and King (Research) 1935/1940 and 1941/1942, Fairchild Camera and Instrument Corp. Project Engineer 1942/1945, Aeronics, Inc. Chief Engineer 1945/1947, Sylvania 1947/1955 Section Head in Electronics and missile systems laboratories, American Machine & Foundry Company 1955/1958 Group Supervisor in military electronics development, Grumman since January 1959; member IRE, AIEE, ARRL, Society of Professional Engineers, Sigma Xi, RESA, articles and papers on television, etc.; Hobbies: ice skating, swimming, automobile mechanics.

SIMON, WILLIAM C. (F) 1946 - Retired; formerly Electronic Engineer United Fruit Co., General Manager, Tropical Radio Service Corp. New York; res. 1445 Boston Ave., Bay Shore, Long Island, N.Y.; b. Midway, Ky., June 16, 1899; ed. Grammar and some High School, U.S. Naval (Marine Corps) Radio School Parris Island 1917/1918; CREI; interested in radio since 1915; married; amateur 1913/1917; professional experience: U.S. Marine Corps 1917/1920, licensed commerical radio operator 1920/1924, United Fruit Co. 1924 to present; Senior Member Marine Corps League, American Legion, Masonic Lodge; Baptist Church; Served on numerous committees with RTCA, RTCM, SLS, ITU, American Merchant Marine Institute dealing with Marine Electronic and Radio Matters; Marconi Memorial Medal of Merit, VWOA 1947.

SINGER, CHARLES H. (F) 1947 - Vice President Page Communication Eng. Inc., 710 14 St., N. W. Washington 8, D.C.; res. 4201 Cathedral Ave., Washington, D.C.

SINGLETON, HAROLD C. (F) 1935 - Consulting Radio Engineer, Amcomlib Apartado 13, Palafrugell Spain.; b. Golden, Colo., February 7, 1904; ed. B.S. (EE) and E.E. University of Colorado; married; interested in radio since 1918; professional experience General Electric Co., RCA Victor Division, United Air Lines, Chief Engineer KGW Broadcasting Station; Resident Associate Harvard University (during World War Two); several patents on photo-electric controls. Tech. Dir. KWJJ, Portland, Ore.; V. Pres. KITN, Olympia, Washington, Owner KUTY, Palmdale, California.

SKIPPER, LIONEL CARLYLE (M) 1946 - Sperry Gyroscope Co., Lake Success, Great Neck, N.Y.; res. 5 Warner Ave., Roslyn Heights, L.I., N.Y.; b. Clacton-on-Sea, Essex, England November 30, 1915; ed. Ascham College, Clacton, England, Brighton Technical College, Brighton England, British Institute of Engineering-Technology, London England; married; interested in radio since 1932; professional experience: 1932/1935 Assistant Engineer Brighton Radio Circuit, Ltd., 1935/1940 Engineer Manager Radio Distribution Trinidad, Ltd., Port of Spain, Trinidad, BWI, 1940/1941 Director of Field Service, Radio Coverage Reports, New York City, 1941 to present Technician, Sperry Gyroscope Co. (Radar Engineering); U.S. Citizen June 10, 1947; Senior Member IRE, Massapequa Lodge No. 822 F & A.M., Rosicrusian Order amurc, civil Defense Rescue Service, Green Mountain Club, Dale Carnegie Club International; fond of all outdoor activities including flying (Student Pilot Rating). 1941 to present Technician - Engineering Section for Systems, Surface Armament Division, Sperry Gyroscope Co. (Radar Engineering).

SMITH, ARTHUR V. (M) 1960 - Patent Lawyer, Curtis, Morris & Safford, 530 Fifth Avenue, New York, N. Y. 10036; RES. 276 Riverside Drive, New York N.Y. 10025; b. Westfield, New Jersey, December 27, 1909; ed. A.B. B.S. and E.E., Columbia University, L.L.B., New York University; radio amateur 1922/1933; AIEE, IRE, IEEE, AES, AAAS.

SMITH, JAMES ERNEST (F) 1930 - Chairman of the Bd., National Radio Institute, 1956 to present., 3939 Wisconsin Avenue, N.W., Washington, D.C. 20016; res. "Macamor" 4521 Crest Lane, McLean, Virginia; b. Rochester New Hampshire February 3, 1881; married; ed. B.S. in .E. Worcester Polytechnic Institute; Conferred Honorary Degree of Doctor of Laws by Southeastern University, Washington, D.C. Conferred the Honor of International Knight of Achievement by Loyal Knights of Round Table; interested in radio since 1909; amateur station McKinley Technical High School 1910/1914 and at National Radio School Washington 1915/1922; professional experi-

ence: introduced study of wireless in Washington, D.C. high schools 1912, organized and conducted National Radio School 1914/1920, President National Radio Institute 1920/1956; supervised instruction of 800 soldier-students in wireless during First World War 1918; co-inventor of the Natrometer, an instrument for teaching radio code. Chairman, Advisory Board of YMCA of City of Washington; Vice President Metropolitan Washington YMCA Foundation; Director George Everett Partridge Memorial Foundation. Life member Institute of Electrical and Electronics Engineers; member Adult Education Association of U.S.A., American Radio Relay League, Association of Oldest Inhabitants of District of Columbia Arlington Round Table, University Club, Washington Golf & Country Club, Humane Lodge No. 21, Almas Temple - Shriner.

SMITH, MYRON T. (F) 1934 - Sales Manager, General Radio Co., West Concord, Mass.; res. Lowell Road, Concord, Mass.; B. Meriden, Conn. July 11, 1908; ed: S. B. and S.M. M.I.T. Cambridge, Mass.; married.

SNITZER, MILTON S. (M) 1956 - Technical Editor, Radio and TV News, Ziff-Davis Publishing Co. since 1956; b. May 9, 1923, Pittsburgh, Pa.; res. 83-28 257th St., Floral Park, N.Y.; military service, Electronics Instructor, U.S.M.S., 8 years; Amateur Call Letters, W2QYI since 1937; Books, Papers, etc., edited about 50 technical books wrote about 6 technical and semi-technical books including military manuals as well as many magazine articles.

SNYDER, CHRISTOPHER L. (M) Indiana General Corp. 20 N. Wachea Drive, Chicago, Illinois.

SPIES, DAVID (M) 1942 - Sales Manager - Owner, International Distributing Co., 185 Central Ave., Newark, New Jersey; res. 166 Sanford St. East Orange, New Jersey; ed. Newark College of Engineering E.E.; married; Long interest in radio; Affiliate - International Sound Engineering Co.

STANLEY, JOSEPH J. (F) 1912 - President Continental Sales Co., Inc., 521 Bloomfield Ave., Newark 7, New Jersey; res. 213 Harvard Ave., Point Pleasant Beach, New Jersey; b. Brooklyn, N.Y. September 16, 1891; married; ed. High School 2, years; Mechanics Institute 3 years, Pratt Institute 3 years; interested in radio since 1906; amateur 1906/1913-W2SC; professional experience; Secretary and Treasurer, Continental Radio Corp., 1920/1930, Secretary and Treasurer and General Manager Continental Radio Corp., 1922/1930, President, Continental Sales Co. Inc., 1930 to present; President Rochelle Park Bank, 1928/1952; Chairman of the Board Rochelle Park Bank, 1952 to present. Bank now is known as Community Bank of Bergen County, New Jersey; Treasurer, Armstrong Memorial Research Foundation, Inc., 1957 to present; Director, Radio Club of America, Inc., 1926; Treasurer, 1927 to present.

STANTLEY, JOSEPH J. JR. (F) 1944-1961 - Secretary and Treasurer, Continental Sales Company, Inc. Presently, Cost Accountant, The Lummus Company, res: 252 Hillside Avenue, Cranford, New Jersey, B. Teaneck, N.J. May 10, 1926; ed. Rutgers University (Business Adminstration), married.

STANTON, SAMUEL WARD (F) 1940 - Patent Engineer, a.b. DuMont Laboratories, Inc., 2 Main Ave., Passaic, N.J.; res. 289 Halsey Rd., East Parsippany, N.J.; b. Tottenbille, Staten Island, N.Y. June 25, 1908; ed. B.S. in E.E. Rutgers University; married; interested in radio since 1918; amateur 2AHY-1923, W2QZ-1929, W2EEW and W2EHR 1932; professional experience: United Electric Light and Power Co. 1931/1935, RCA 1936, Western Electric 1937/1939, DuMont 1939 to date; Two U.S. Patents.

STEEN, JEROME REED (F) 1947 - Division Reliability Coordinator, Sylvania Electric Products, Inc., 40 Sylvan Rd., Waltham, Mass. 02154; res. 50 Tamarack Road, Reading, Mass. 01867; b. West Bloomfield, New York June 29, 1901; ed. University of Wisconsin, BS in EE 1923, married; interested in radio since 1923; professional experience: General Electric Co. 1923/1929, Bell Telephone Laboratories 1929/1931, Sylvania 1931 to date; Registered Professional Engineer, Mass., Fellow IEEE, Fellow ASQC.

STEVENS, ARCHIE MCDONALD (F) 1928 - Radio Engineer, International Standard Electric Corporation, 67 Broad St., N.Y.C.; res. 539 Prospect Ave., Mamaroneck, N.Y.'; b. Gidden, Iowa September 22, 1887; ed. Glidden High School 1904, LeLand Stanford Jr. University 1909 A.B. in Engineering, post graduate courses in Columbia University; married; interested in radio since 1910; professional experience 1910/1913 Poulsen Wireless Tel. and Tel. Co. San Francisco, 1913/1914 Universal Radio Syndicate, London, Poulsen System, 1915/1921 Lt. Commander U.S.N.R.F., U.S. Navy Lafayette Station, Bordeaux, France, 1922/1928 American Radio News Co., N.Y., 1928/1950 International Tel. and Tel. Corp. 1950/1952 Federal Tel. and Radio Corporation, 1952 to present International Standard Electric Corporation, Fellow (life member) IRE, Senior Member AIEE (Life Member), member Telephone Pioneers of America, member Armed Forces Communication Association.

STEVENS, HERBERT V. (M) 1959 - Radio Engineer; res. 63 Edson St., Buffalo 10, New York; b. Buffalo, N.Y. 1904; ed. South Park High School, Buffalo Normal (2 yrs.), night school, Univ. of Michigan (2 summers & 2 falls), Adult Education 2 yrs. Cornell University Ext., Buffalo Museum, La Salle Ext. University, Cleveland Institute of Radio Electronics, Buffalo Radio Institute, Eng. Soc. of Buffalo P.E. Refresher Course; approximately 50,000 hours of formal and non-formal study; Range, Physics, Chemistry, atomic phsics, mathematics, economics, dietics, music, art, literature, poetry, philosophy, psychology, astronomy, astrology, criminology, law, jurisprudence, political science, accounting, auditing, business, industrial arts; Hobby, answering correspondence courses and Regents High School Question and Answer Texts. Have 50 scrap-books; Amateur Call Letters, W-2 GAF (ex. 8 AYT & W8 GAF); Correspondence Courses, CIRE, CREI, NRI, DeForest, Sprayberry, LaSalle Ext. Un., Alexander Hamilton Institute, etc. Have over 5,000 questions with their answers; Sports, swimming, golf, tennis, walking, cards, checkers, chess, discussion groups, weight lifting, etc.

STODOLA, E. KING (F) - Assistant to the President, Reeves Instrument Corp. East Gate Blvd., Roosevelt Field, Garden City, L.I., N.Y.; res. 118 Stanton Street, Northport, L.I., N.Y.; married; B.S. in Electrical Engineering & Electrical Engineering degrees, Cooper Union Inst. of Technology.

STOKES, WILLIAM EARL DODGE JR. (CM,F) 1909 - Economist, self-employed, Lenox, Mass.; res. Thistlewood Farm, Lenox, Mass.; b. N.Y.C. January 6, 1896; ed. Browning School, N.Y.C., Andover, Sheffield Scientific School, Annapolis, University of Chicago (Law School); married; interested in radio since 1909; early amateur stations in N.Y.C. and Monmouth Beach, New Jersey; First President Junior Wireless Club and Senate Committee witness 1910; Assistant Communications Officer USS Delaware Grand Fleet World War One; Four early U.S. Patents in radio; American Institute of Mining and Metallurgical Engineers, Chicago Bar Association, Econometric Soceity, Berzelious (Yale), Alpha Setta Phi, American Mining Congress, Union Club (NY), University (Wash.) Stock Exchange Lunch (NY), Lenox Club, Country Club of Pittsfield, Mid-Ocean Club, Royal Bermuda Yacht Club, Military: Naval Reserve Surface Division 1-14 LCDR USNR-R (Administration Officer); Publica-

tions: "Government Assistance to Small Gold Mines," "Free Power," "Report of the Aviation Committee - AIME," "Planetary Configurations and Stock Market Sentiment," "Origin of the Pennyweight" and numerous technical publications for the Navy on Torpedo manufacture, "Survey of the U.S. Army Catalog System" for the Navy, "Plan for a U.S. Navy Catalog System" (for the Navy), "Electrostatic Origin of Ore Deposits," Sports and Hobbies - Golf & Squash, Racquets family, stamps, sailing, education (Trustee etc.) Navy anti-Communist Activities (various); Radio Club of America President 1909/1911.

STONE, CLARENCE GEORGE (F)1925 - Consulting Engineer, Self-employed, Good Hill Rd., Weston, Conn.; res. same; b. Detroit, Mich. December 10, 1888; ed. E.E. and A.M. Columbia University, Professional Engineer since 1922; married; interested in radio since 1898; professional experience: taught physics at Columbia up to September 1952, also courses in Electronics and consulting work in this field; AIEE, IRE, American Physical Society.

STYLES, THOMAS J. (F)1915 - Secretary-Director, Armstrong Memorial Research Foundation, Inc., Philosophy Hall, Columbia University, New York 27, N. Y.; res. 160 -01 84th Dr., Jamaica 32, N.Y.; b. Ansonia, Conn., July 25, 1887; married; ed. Walworth Institute, Pace Institute, Columbia University, Sorbonne; radio amateur 1908-16 at Yonkers, N.Y.; operated station N.J. National Guard, Sea Girt, 1911; licensed commercial radio operator 1912; seaplane radio operator, Naval Aviation Detachment, Palm Beach, Fla., 1917; Ensign, USNRF, Bureau of Engineering, Navy Department, 1918-19; Bankers Trust Company, Paris, France, 1920/1923; laboratory of Edwin H. Armstrong, Columbia University, 1924/1954; Recording Secretary, Radio Club of America, Inc., 1916, Corresponding Secretary 1917/1920, 1925/1927, Director 1928/29.

SUYDAM, CLINTON H. (F) 1932 - International Tel. & Tel. Corp. N.Y.C.; res. 451 Heywood Ave., Orange, N. J.; ed. Standord University A.B. 1918, E.E. 1925; b. Los Gatos, Cal. October 25, 1896.

SWINYARD, WILLIAM O. (F) 1941 - Radio/TV Engineer, Hazeltine Research Inc. 325 W. Huron St., Chicago, Ill. res. 5445 West Diversey, Chicago 39, Illinois; b. Logan, Utah July 17, 1904; ed. B.S. Utah State University, graduate studies Columbia and Northwestern; married; interested in radio 1924; professional experience: Hazeltine since 1930, Chief Engineer 1942 to 1957; V. P. & Director 1958; Technical papers: Measurement of AM and FM radio receivers in Pender-McIlwain Handbook, Measurement of Loop Antenna Receivers IRE 1941; Member Chicago Radio Engineers Club, National Society of Professional Engineers, Lake Shore Club, Fellow IRE, Fellow AAAS; Eta Kappa NU, Registered Professional Engineer. Ill.

TALLEY, DAVID (F) 1949 - Radio Engineer, GT & E Service Corp., 730 Third Ave., New York 17, N.Y., General Telephone System operating staff, 1959 to date; res. 40 East 9th St., New York, N.Y. b. NYC. October 20, 1903; ed. E.E. Brooklyn Polytechnic Institute 1935: married. son, Edward S. Talley and granddaughter, Audrey R. Talley: interested in radio since 1915; amateur since 1915; W2PF in 1919, extra first grade amateur license; professional experience: Telephone engineer N. Y. Telephone Co. 1923 to 1946 except World War Two 1940/1945 as Lt. Colonel in Signal Corps, Telephone and Radio Engineer with International Tel, and Tel. Co. 1946/1951, Federal Tel. and Radio Corporation Govt. Contract Section 1951 to 1957, Telecommunications Operating Group of International Tel. & Tel. Corp., May 1957/1959; one patent on Signalling Systems; Senior Member IRE, member AIEE, ARRL, Radio Society of Great Britian, Reserve Officers Association of U. S. Military Order of World Wars, Vice President of N.Y. Chapter of Armed Forces Communications Ass., member Radio Club of Brooklyn, and Quarter Century Wireless Assn., Reserve Officer as Lt. Colonel in Signal Corps. to 1958, USAR, engineered and installed mobile radio telephone systems in Buenos Aires 1948, Mexico City 1948, Havana 1949 and Cairo, Egypt in 1948. Author "Basic Carrier Telephony" John F. Rider Publ. Co. 1960.

TAYLOR, WILLIS H. JR. (F) 1925 - Patent Lawyer, res. 330 Madison Ave. New York, N.Y. 10017; Chairman, Bd., of Trustees, Stevens Institute of Technology, Hoboken, New Jersey.

TENNIS, JOSEPH E. (M)1955 - Engineer, Radio Engineering Labs., res. 273 Mill Spring Rd., Manhasset, New York; b. July 15, 1920, Brooklyn, N.Y.; ed. Brooklyn Technical High School, Pratt Institute; clubs, IRE Member, Tau Beta Pi, Member.

THOMAS, LESLIE G. (M) 1928 - Management consultant, business address 610 E. Palisade Ave., Englewood, N. J.; res. 44 Marcotte La., Tenafly, N.J.; b. London, England; ed. M.E.; married; interested in radio since 1921; Professional experience: president Sheffco Mfg. Co., Palisades Park, N.J. and manufacturing executive, Vice President International Resistance Co., Philadelphia, General Manager Dejur-Amsco Corp., N.Y.C., Works Manager Fada Radio Co., Bronx 1926/1931; various patents on variable condensers.

THORP, WILBUR E. (F)1948 - Electronic Engineer, NOTtronics, Hawthorne, Cal.; res. 2213 Chelsea Rd., Palos Verdes Estates, Cal.; b. Santa Cruz, Cal. July 6, 1910 ed. B.S. in Engineering University of Cal.; married; interested in radio since 1923; professional experience 10 years Don Lee Television, Los Angeles, 3 years U.S. Navy Electronics Officer, Bureau of Aeronautics, 4 yrs. Radio Engineering Laboratories as Development Laboratory Supervisor, 9 years Northrop Aircraft and Nortronics, present assignment, Supervisor of Radiative Systems Group; senior member IRE, Lt. Cmdr. United States Naval Reserve; hobby - Gardening.

TUCKERMAN, LUCIEN P (F) 1928 - Eadio Engineer - Technical Aide, Diamond Ordnance Fuze Laboratories, Washington 25, D.C.; res. 2500 Q St., N.W., Washington 7, D.C.; b. Wallingford, Conn. May 15, 1905; ed. Bell Telephone Labs. Electrical Communication Course; married; active in radio since 1923; professional experience: DeForest Radio Co., Kolster Radio Corp., Federal Telegraph Co., U.S. Navy Bureau of Ordnance, National Bureau of Standards; Commander U.S. Naval Reserve, Senior Member IRE, Member AIEE, SMPTE, Engineers Club of Washington, National Rifle Ass.; one patent "Peak Limiting Amplifier." Registered Professional Engineer, District of Columbia.

TUXEN, NILS (M) 1952 - Manager, Communications and Electronics Division, North American Philips Co., 100 East 42nd St., N.Y.C.; res. 24 Nordleal Drive, Croton-on-Hudson, N.Y.; b. Copenhagen, Denmark, 1915; U.S. Citizen 1943; ed. Soroe Academy, Denmark graduated 1939 from Aarhus Electrotechnicum, Aarhus, Denmark (B.S.E.E.); married; amateur OZ9T; ship's radio operator Danish and British merchant marine World War Two; Four years 9th Airforce in Europe; member Danish Engineers Club, N.Y.C.

ULM, ERNEST H. (F) 1950 - General Sales Manager, Semi-conductor Divison, Woburn, Mass.; res. Winchester, Mass.; b. Ft. Dodge, Iowa January 8, 1916; ed. Carleton College A.B., Graduate work at University of Iowa and Northwestern Technological Institute; married; interested in radio since 1928; amateur license 1930; professional experience: Instructor in Radio and Electronics in High School and Vocational School and Army Signal Corps and Navy (Western Electric); member IEEE

VAN BEUREN, JOHN M. (F) 1942 - President and Director of Research, Quan-Tech Laboratories, Morristown, N. J.; res. Van Beuren Road, Morristown, N.J.; b. N.Y.C. March 4, 1915; ed. Princeton University 1933/1936; married; interested in radio since 1931, amateur license (1933/1941); professional experience: Staff Advisory Engineer for Electronics, Thos. A. Edison Laboratory 1956/1957; Chief Research Engineer, Measurements Corp., 1939/1956; several patents on electronic devices; Hobby-Music and Hi-Fi; member IRE, Engineers Club, N.Y.C.

VAN DEN MEERSCHE, A.J. (M) 1930 - res. 22 St. Pieters AAlst Straat, Ghent, Belgium; b. Ghent, Belguim November 29, 1903; ed. E.E. University of Ghent; instructor University of Ghent; Associate IRE.

VAN RENSSELAER, HENRY C. (M) 1949 - Investment Counselor, The Bank of N.Y., 48 Wall St., N.Y.C.; res. Round Hill Road, Greenwich, Conn.; b. Sao Paulo, Brazil May 17, 1920; ed. Kent School, Kent Conn., Princeton University; married; interested in radio since 1933; amateur WIHSY, 1933; professional experience: Major U.S. Air Force, Communications and Radar, 1942/1946 and 1951/1952, Sales Manager Electronic Parts Division Allen B. DuMont Laboratories 1947/1950; member Colonial Club, Princeton, N.J.; Hobbies - tennis, golf, skiing.

VAUGHAN, CARROL B. (M) 1964 - C.B. Vaughan Associates, Electronic Consultants, Box 441, Union City, New Jersey; res. 271 Williams Ave., Hasbrouck Heights, N. J.; b. 1910 Cattletsburg, Ky. ed. Fitchburg Mass High School; Milwaukee School of Engineering, Lowell Institute, N.Y. University. Experience: Principal, Delahanty Institute, 1945/1950; Curiss Wright, Sperry, IBM, Norden Ketay, Bendix, Sylvania, 1950/1958. Senior Engineer, new products, Bendix Corp., 1958/1963. Interested in automation and digital modules.

VOGEL, WILLIAM H., JR. (M) 1940 - Senior Project Engineer, Measurements, Div of McGraw-Edison Co., Boonton, N.J.; res. 24 Tudor Place Hartsdale, New York; b. Brooklyn, N.Y. October 23, 1909; ed. Graduate Cornell University E.E. 1931; interested in radio since 1926; amateur W2BXM since 1931; member M.A.R.S. AF2BXM; professional experience: television and FM transmitters, communication and test equipment 1945 to date; active service Air Force 1941/1945 Radar Officer; Member I.R.E.

VOORHIS, HAROLD VAN BUREN (M) 1964 - Consultant (Secretary & Treasurer 1947-59) Bull & Roberts, Inc., N.Y.C. Marine Chemists; Certified Gas Chemist, American Bureau of Shipping; V.P. Macoy P. & M. Supply Co., N.Y.C. (1946 to date); b. January 3, 1894, Red Bank, New Jersey; Married; ed. Red Bank, N.J. public and high, schools (graduated 1912). Attended Cooper Union (1912) and Columbia Univ. Teaches Ext. (1913-16). Editor (9 years) Christmas Seal & Charity Stamp Society. Author of ten research books of Freemasonry. Fifty year life member in 1962 of American Canoe Association; Charter Fellow (1932) American Friends of Lafayette. Commission (1939) American Indian Association. Ass't. Coordinator Civil Aeronautics Administration Ground School in N.J. (1940-41); V.P. (1931-32-44-45) Holland Society of New York; International Brotherhood of Magicians card No. 3000; Monmouth Boat Club, N.J.; Hon. Member Monmouth County Philatelic Society; Life Member Monmouth County Historical Society; Steamship Historical Society of America; Veterans of Foreign Wars; A.R.R.L. 22; Antique Wireless Asso; Garden State Amateur Radio Association; International Short Wave League (London, Eng.); Radio League of America 1915; Wireless Association of America 1911 (call NDM from 1908); First President Monmouth Councty Radio Association 1912; Yacht Captain 1930; U.S. Navy-Transport Service

VORPERIAN, HARRY (M) 1941 - Foreman in charge of Electronic Wiring Department. Aeroflex Laboratories, Inc., 34-06 Skillman Ave., Long Island City 1, N.Y.; res. 210 Clinton Ave., Brooklyn 5, N.Y.; b. N.Y.C. January 19, 1909; interested in radio since 1923, ed. Graduate Washington Irving High School, RCA Institutes and extra-curricula courses at Pa. University, Temple University and N.Y. University; professional experience: Electronic Technician with Federal Telecommunication Laboratories and Aeroflex Research Laboratories; married.

WALSH, DR. A. LAFAYETTE (M) 1952 - Dentist, self-employed, 509 Madison Ave., N.Y.C.; res. 14 North Ave. Elizabeth, New Jersey; b. N.Y.C. December 17, 1896; ed. College Dental and Oral Surgery of Columbia University; married; interested in radio since 1912; amateur since 1912, 2SP, 2BW since 1920; Past Director ARRL, Past President Radio Club, Past President N.Y. Radio Club, member IRE, member Armed Forces Com. and Elet. Soc., member U.S. Naval Institute, member ARRL, member Quarter Century Wireless Association.

WALSH, LINCOLN (F) 1934 - Consulting Engineer, Walsh Engineering Company and Caldeonia Electronics and Transformer Corp., 34 DeHart Pl., Elizabeth, New Jersey; res. 3 Old Farms House Road, Millington, New Jersey; b. R.I. November 3, 1903; ed. Stevens Institute of Technology, M.E. 1926, Post-Graduate Columbia, Brooklyn Polytechnic and Stevens; married; interested in radio since 1916; professional experience: Designer of transformers, high quality audio systems and radio receivers, Colonial (now Sylvania) Bell Telephone Laboratories and Hazeltine, RCA - Director - 1936; C.S. 1941.

WARE, PAUL (F) 1921 - Pres., Ware Marine Products, Inc., Miami, Fla; res. 3948 Little Ave. Coconut Grove Miami 33, Fla.; b. East Orange, N.J. June 26, 1893; ed. M.E. Stevens Institute of Technology 1917; wife, Josephine Varney; interested in radio since 1906; starting with amateur station at East Orange, N.J.; professional experience: Marine Wireless operator 1907/1912; second Lieut. Signal Corps during World War 1; manufactured Ware Neutrodyne receivers; invented INDUCTUNER and INPUTUNER for Mallory and DuMont respectively; sailed Atlantic Ocean in 17 days on Yacht ALOHA in 1912 averaging 8.06 knots; invented and presently manufacturing the Ware Automatic Pilot used on boats; hobbies - yachting and treasure hunting; Radio Club of America Director 1939/1940; 44/50 - V.P. 1941 Pres. - 1942/43.

WASHINGTON, GEORGE JR. (F) 1951 - Retired, res. 10 Harter Rd., Morristown, N.J.; b. N.Y.C. August 6, 1899; ed. High School; married; interested in radio since 1921; Inventor of Photo-Electric Engraver known as the Fairchild Scan-o-graver; Director RCA 1957/1958; Chairman 50th Anniversary Year Book Committee.

WATSON, PAUL GRISTOCK (F) 1922 - Commander USNR Retired, res. 10 Harter Rd., Morristown, N.J.; b. West Chester, Pa. January 6, 1900; ed. High School and 1923 Pratt Institute E.E.; widower; interested in radio since 1912; amateur 3VB spark and 2CJU in Brooklyn while attending Pratt, station 4ZD-4XX at Savannah working Dr. A. Hoyt Taylor at NKF; professional experience: commercial radio operator 1918/1923, Radio Inspector U. S. Shipping Board, N.Y., U.S. Radio Inspector Savannah, Ga., 1924/1926, Direction Finder Engineer RCA 1927/1928, Plant Engineer, Eastern Malleable Iron Co. Wilmington, Del. 1928/1940, Shop Superintendent U. S. Navy Yard Philadelphia with Bank of Commander USNR 1940/1946; about 30 articles in Radio News, Pacific Radio, QST during 1919/1925 period, dropped out of radio in 1928 and entered ship construction (engineer) and participated in building over 100 ships in Philadelphia Navy Yard dur-

ing World War Two; Life member The American Legion, Military Order of the World Wars, The Society of American Military Engineer, member DeForest Pioneers, Society of Naval Architects and Marine Engineers, The U. S. Naval Institute; Hobby - collecting early vacuum tubes and old apparatus and parts; Awarded Navy Commendation Ribbon for "outstanding performance of duty" during World War Two.

WATTS, W. WALTER (M) 1960 (F) 1964 - Fellow 1964; b. Chicago 1902; res. 12 E 88th St., New York City; group Ex. Vice President Radio Corp. of America, and member Radio Corp. of America Board of Directors. Associated with radio sales and distribution for past thirty years, joining Radio Corp. in 1945 as Gen. Sales Manager of Engineering Products, becoming Group Executive Vice President in 1958. Colonel and Commanding Officer, Signal Corps Distribution Agency during WW II. Prior to this he was Manager Mail Order Sales, Montgomery Ward (radio and electronic equipment,) and was Vice President Windcharger Corp. with Defense Production Adm. in Washington during Korean emergency, with leave of absence from RCA, as Deputy Director Administration Production and Procurement. Attended Lane Technical School and Chicago Telegraph Institute in Chicago, and operated 9BP in Evanston. Present call W4VI. In 1958 was confirmed by U.S. Senate with rank of Brigadier General USA Reserve. Past President AFCEA. Member IEE, ARRL, Am. Soc. Naval Engineers, Am. Ordnance Assn., Broadcast Pioneers, and VWOA.

WATTSON, HARRY B. (M) 1946 - res. 157 Prospect Pl., Rutherford, N.J.; ed. Columbia University A.B. 1925, M.S. Harvard 1928; Sperry Gyroscope Co. Garden City, 1945.

WEEKS, JOHN THAYER, (M) 1960 - Engineer, CBS Laboratories, High Ridge Road, Stamford, Conn. res. 57 Valley Road, New Canaan, Conn.

WEHNER, JOHN H. (M) 1964 - Engineer, DuMont-Fairchild, Clifton, N.J.; b. Paterson, N.J. July 24, 1918. Married, one child. Amateur operation 32OHJ. ed. Paterson Central, DeForest Radio, Cleveland Inst. of Radio Electronics, color television, Paterson Vocational. Hobbies, ham radio, fishing, stamp collection.

WHEELER, HAROLD A. (F) 1935 - Radio Engineer, Wheeler Laboratories, Inc., 122 Cutter Mill Rd., Great Neck, N.Y.; res. 18 Melbourne Rd., Great Neck, N.Y.; b. St. Paul, Minn. May 10, 1903; married; ed. George Washington University B.S. in Physics (with distinction), John Hopkins University, Physics Department (3 years), interested in radio since 1913; amateur station 3QK 1918/1922; professional experience: Hazeltine Corp. 1924/1945 Vice President and Chief Consulting Engineer Bayside and Little Neck Laboratories, Inc. 1947 to date; more than 150 U.S. patents and many foreign patents; Book "Wheeler Monographs Vol. 1" 1953; many technical papers in Proceedings IRE etc.; Fellow of IRE and AIEE Director IRE 1940/1945; Morris Liebman Prize IRE 1940 for "Theory of Wideband Amplifiers and Paired Echos in Television." Armstrong Medal 1964.

WITT, FREDERICK E., (M) 1961 - Research Engineer, Columbia University Electronic Research Laboratory, Sylvan Blvd., Alpine, N.J.; res. 117 Lohs Place, Harrington Park, New Jersey.

WINTERS, ARTHUR, (M) 1964 - Mailing address, 11 Warren Street, New York, New York.

YELLEN, ANTHONY F. (M) 1957 - Technical Writer, Radio Engineering Labs. 3-1/2 yrs.; res. 84-46 117th St., Richmond Hill 18, L.I., N.Y.; b. February 10, 1930, New York, N.Y.; ed. St. Johns Preparatory, St. Johns College Brooklyn Polytechnic Institute, U.S. Navy Class "A" Electronics School; Military Service, U.S. Navy, 4 yrs., seved on U.S.S. Charles R. Ware (DD865), 3 years, Electronics Maintenance; Amateur Call Letters W2EDA; Clubs, etc. ARRL, I.R.E.

YOKUM, CHARLES H. (F) 1937 - Sales Engineer, Eastern Sales Manager for San Fernando Electric Manufacturing Co., 1509 First St., San Fernando, Calif.; res. 463 Adamsville Rd., Central Village, Mass.; b. Deposit, New York July 13, 1906; ed. East Orange Grammar School and High School and B.S. 1927 Princeton University; married; interested in radio since 1937; Major Signal Corps Sig. O 23 HQ.

ZARET, MATTHEW E. (M) Professor, Electrical Engineering, The Cooper Union, Cooper Square, N. Y. C.; res. 67 Hollywood Ave., Huntington, New York; b. September 13, 1909; ed. B.S. College of the City of New York 1931, Sc. M. New York University 1936; married; interested in radio since 1922; professional experience: Fada Radio Co. 1928, Sonotone Corp. (Electroacoustic Research Engineer) 1942/1946, Polytechnic Research and Development Co. (Project Engineer) 1947, Teaching of Electronics and related fields Newark College of Engineering, Columbia, Cooper Union 1947 to date; publications "Development of Midget Earphones for Military Use" Journal of the Acoustical Society of America October 1946, "Electroacoustics," Newark College of Engineering Press 1949, "Electron Tube Circuits Laboratory Manual" NCE Press 1949; Senior Member IRE, Charter Member Audio Engineering Society, Fellow American Association for the Advancement of Science, Member Acoustical Society of America, Member American Association of University Professors, Member, American Society for Engineering Education; Hobby - Music, President of Nutley Symphony Society (1953/1954), Chaiman, Nutley Council of Music, Drama & the Arts 1958/59.

ZAYAC, FRANK R. (M) 1948 - Vice President, Ballantine Laboratories, Inc., Boonton, N.J.; res. Boonton Lakes Road, Boonton, N.J.; b. Boonton, N.J. March 28, 1911; ed. Boonton, High School; married; interested in radio since 1929; amateur W3FYY 1938, now W2FYY; member IRE and ARRL; Director, Radio Club 1955.

ZBODULA, JOHN W., (M) 1957 - Radio Engineering Laboratories, 36-40 37th St., Long Island City, New York; res. 303 Bay 10th St., Brooklyn 28, New York.

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THE HERITAGE OF THE RADIO CLUB OF AMERICA

By Lloyd Jacquet

While the Radio Club has its distinctive personality, it is and has stayed the *individual's* Radio Club: the pioneer, the lone researcher, the staunch amateur, the independent inventor. It is the place—in a conformist-ridden industry overshadowed by "big business" aspects—for the independent amateur, the theoretical physicist, the practical engineer, the famed inventor, the beginning experimenter, the business man and marketer, the independent scientist, to mingle and to fraternize on the one, common level of good fellowship.

There seems to be a shrinking of places where the essential pioneer spirit can survive: the spirit of independent investigation and scientific research so essential to the progress of the whole electronic art. The value of the *individual* person, his character and his achievements, can best flourish in the proper environment. There are few oases as inviting today as the forum and fellowship of the Radio Club.

Though a half century old, it is a strange thing that it is so young in spirit. The continued policy of recognizing primarily the value of the individual and his personal worth; the giving of full recognition to individual achievement in fields of pioneer investigation; the encouragement to individuals to expand the opportunities for individual achievement in the fields of electronics...these are all powerful factors at work at the Radio Club, all lineal descendants of the pioneer qualities built into it by those who went before, the unique heritage that insures continuity of existence, into the second half of the century mark, and beyond...

But as for our ideals, and our thinking, and our philosophies—those, we like to believe, were lofty, and noble, worthy of permanence. We can look at ourselves face to face, and be not ashamed. Even though our scientific iconoclasm caused some to raise eyebrows among the uninitiated, the secret something that drew us together originally and kept us together ever since has proved to be real and substantial. As ethereal as this substance is, it was the base upon which we erected this clan of kindred minds that we call the Radio Club of America.

Proudly do we proclaim to the world that we belong together in a tight fellowship defending the last one of us if challenged; or to back fully the single individual bold enough to challenge the world building up all about the Universe with new concepts and ideas.

Our fellows loved radio—they had to. They knew its fill of mystery, its compelling challenge. They knew too that the future was filled with an awe and a wonder which they were determined to investigate, and pass on to all the members of the Radio Club, and to the outer world in a modest reverent way, carrying the inspiration of 1909 ever forward, ever bright. That is the wonderful heritage of the Radio Club of America. We all partake of it, as we continue to contribute to it—and the next half century is bright with promise.

•MEMBERSHIP—

The entrance fee is $1.00; the annual Membership dues are $3.00 per year, except that for members elected after July first of any year the dues are $1.50 for that year. Additionally, it is required that the application for membership shall include the names of three Fellows or Members to whom the applicant is personally known.

Want to learn more? Write . . .

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Allen, George Y.
Armstrong, Edwin H.
Ayer, Oliver G.
Baker, Thomas S.
Baker, W. R. G.
Ballantine, Stuart
Barclay, R. H.
Baunach, Edward L.
Bingham, Wilbur Fisk
Binns, Jack
Brett, Harold M.
Brown, David Seymour
Browne, Walram
Burghard, George E.
Burlingame, Bruce O.
Capen, William H.
Clark, Herbert A., Jr.
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Cooper, C. B.
Day, James R.
DeVine, Alexander A.
Dietrich, Fred
Dunn, Gano
Eastham, Melville
Ehrmann, Gustav J.
Eltz, George J.
Ferris, Malcolm
Forbes, Henry C.
Glavin, Edward F.
Godfrey, Dr. Charles C.
Goudy, C. F.
Goulden, Stantley W.
Grebe, Alfred H.
Grinan, John F.
Guggenheim, Dr. Sigmund
Guilfoyle, Thomas James
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Hinners, Frank A.
Hogan, John V. L.
Hold, Henry Walter
Hoppenberg, Joseph A.
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Jacobs, Charles
Jenkins, Victor F.
Kent, Roscoe
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Logwood, Charles V.
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Lovejoy, D. Ross
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MacKay, John R.
Manson, Ray H.
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Murdock, Daniel R. W.
Nicholas, Edwin A.
Pacent, Louis G.
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1953—Raymond A. Heising
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1959—John H. Bose
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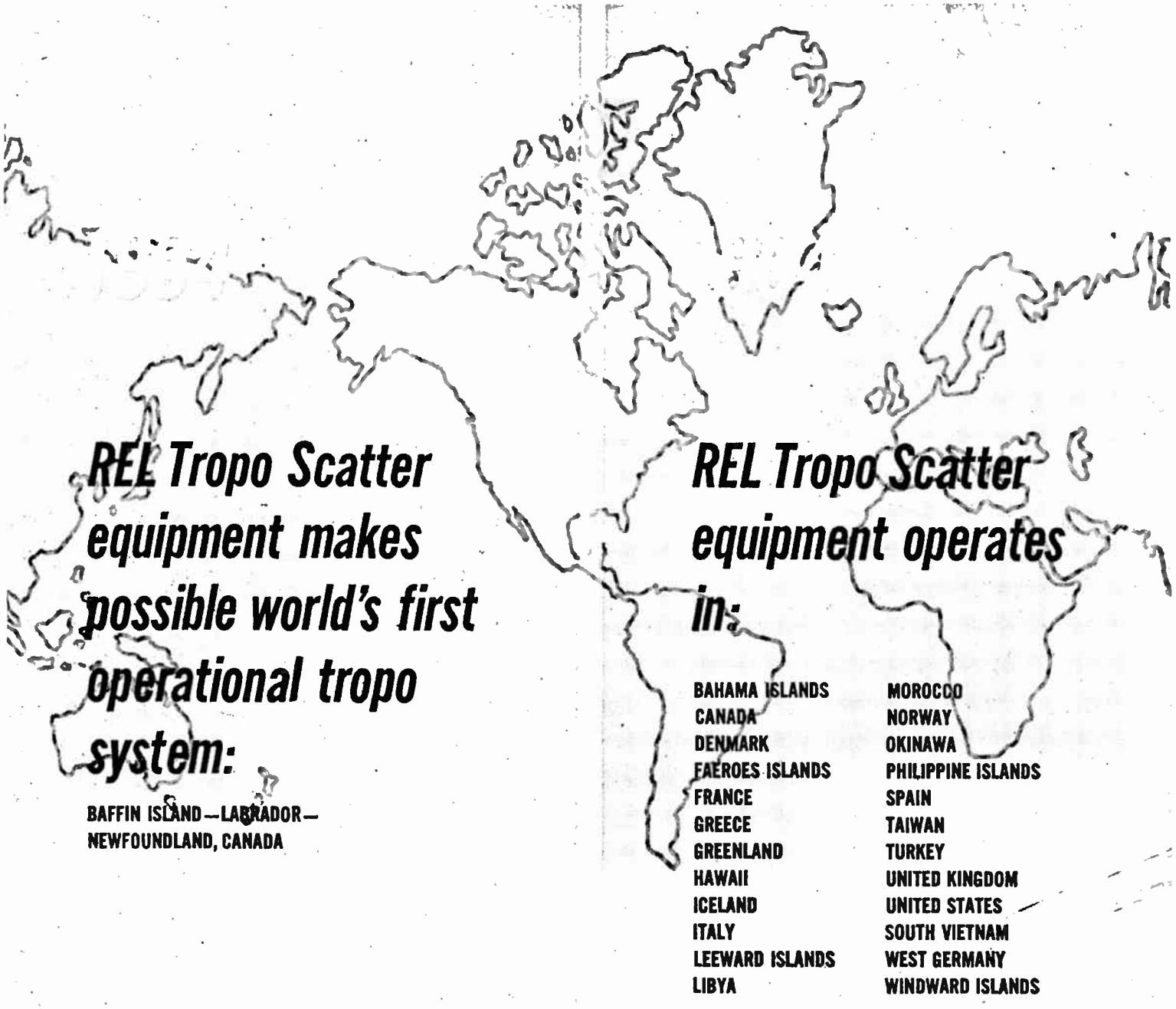
The Armstrong Medal is not awarded every year. This is because it is given in accordance with the conditions and requirements formulated in the establishment of this honor by the Board of Directors of the Club. Quoting from the Scroll: "The Radio Club this day hereby establishes an award to be known as the "Armstrong Medal," to be bestowed by the Board of Directors of The Radio Club of America upon any person within its membership who shall have made, in the opinion of the Board of Directors, and within the spirit of the Club, an important contribution to Radio Art and Science."



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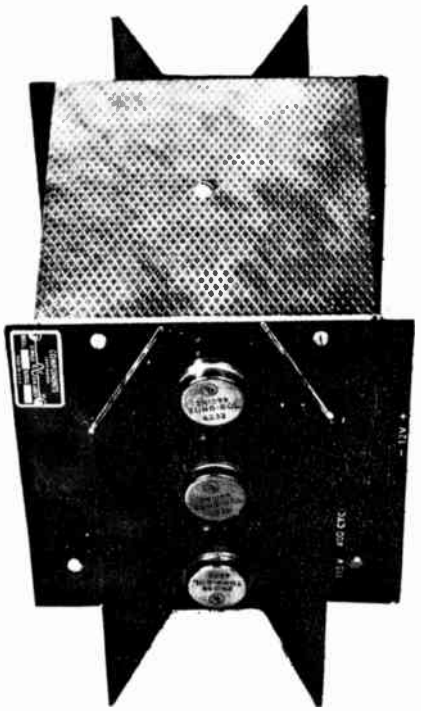

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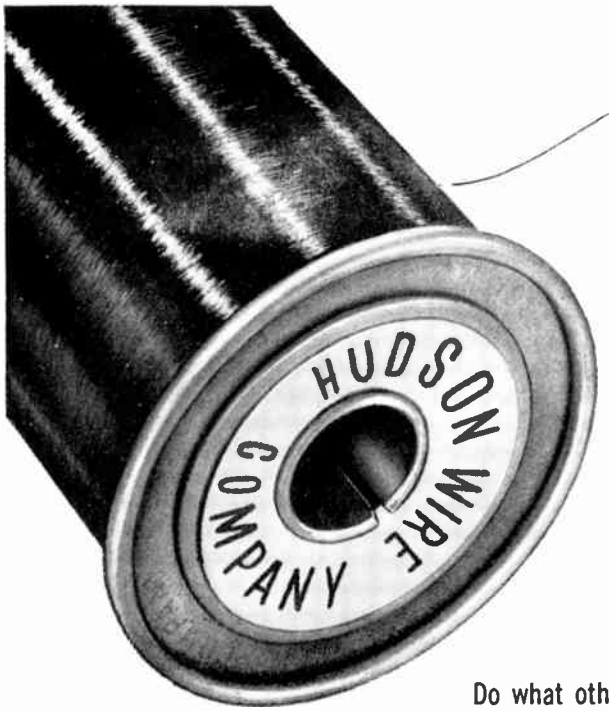

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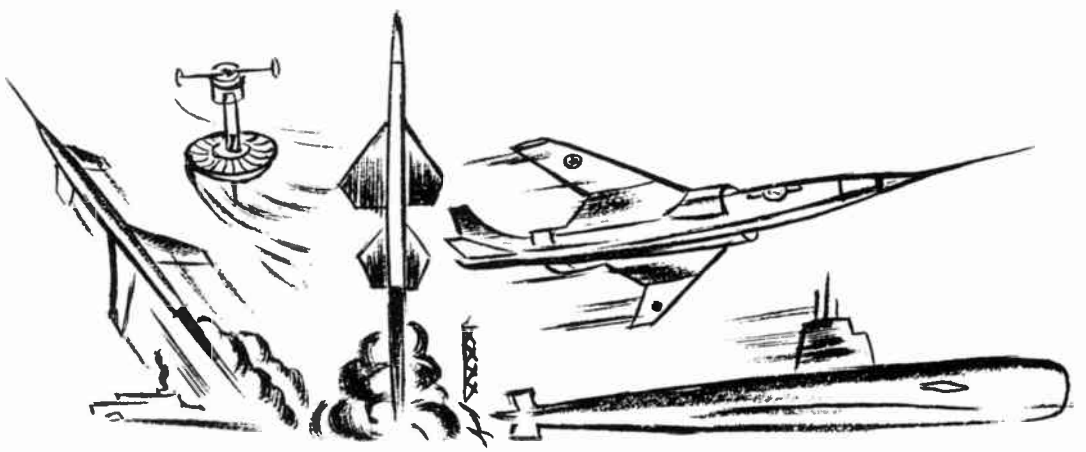

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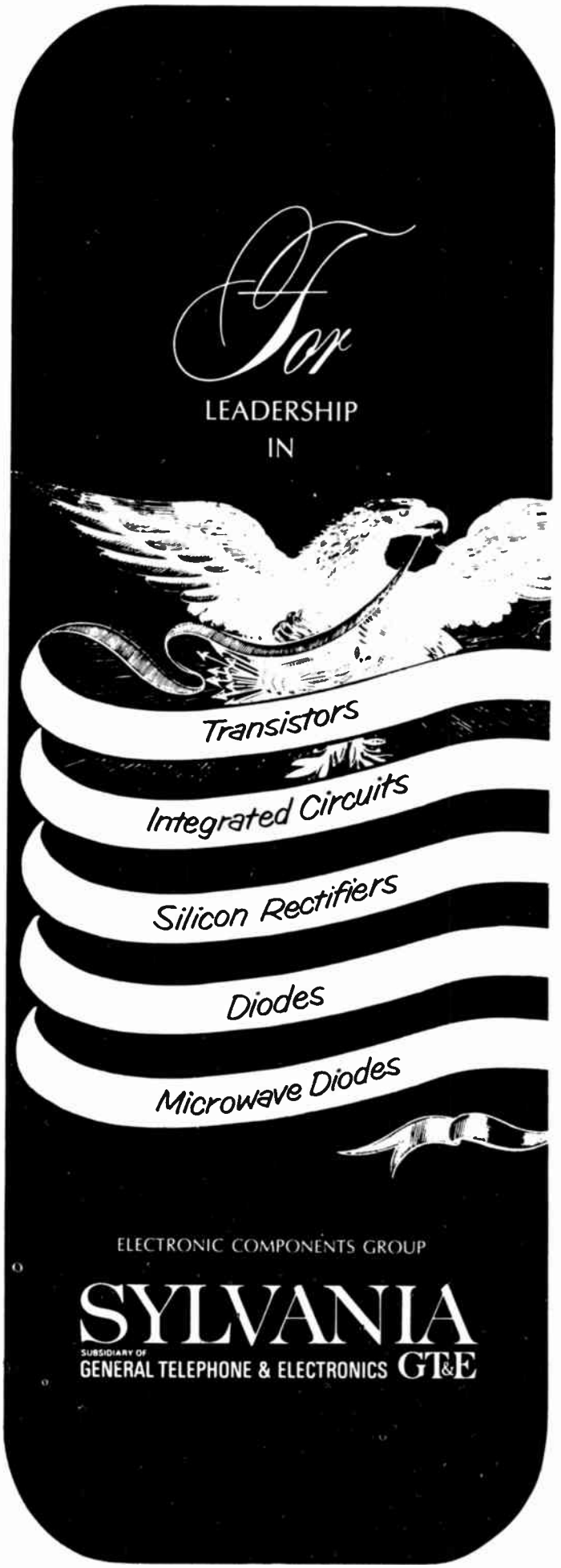

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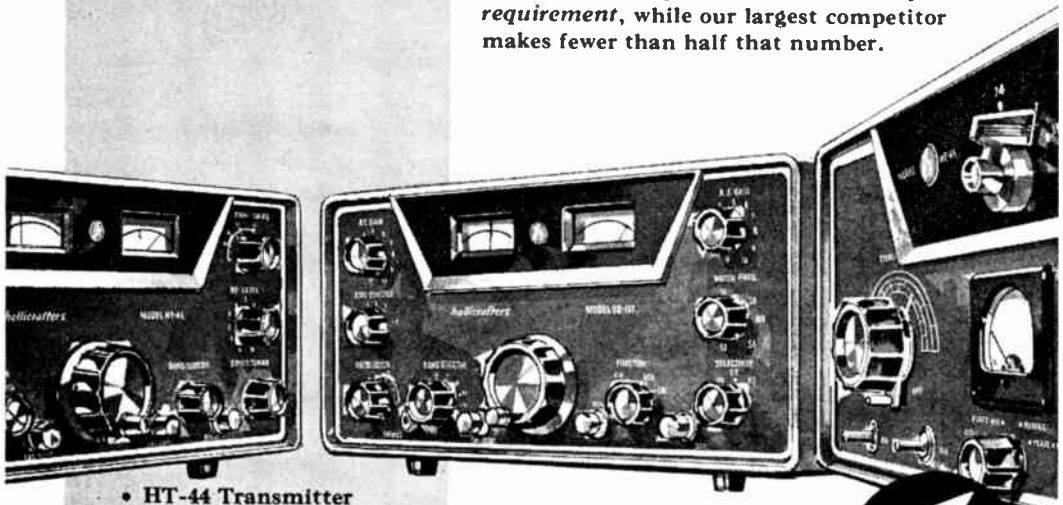
Every year for 31 years, Hallicrafters has engineered more high performance amateur radio equipment than any other manufacturer in the world. For the last 30, we've had to fight every inch of the way.

In 1933, we had less than a dozen competitors. In 1964 we have over two dozen (at last count). Naturally, they all want to be the leader.

Early in the game, we learned that staying ahead of the crowd would depend on two things: Dedication to the needs of *all* amateurs; and very superior, *progressive* engineering.

So it's no coincidence that our SR-150 and SR-160 amateur transceivers *alone* offer *both* Receiver Incremental Tuning and Amplified Automatic Level Control. Or that we manufacture 19 products to answer *any amateur requirement*, while our largest competitor makes fewer than half that number.



- HT-44 Transmitter
- SX-117 Receiver
- HT-45 Amplifier

- SR-150 Transceiver
- SX-122 G.C. Receiver

"Quality through Craftsmanship"

hallicrafters

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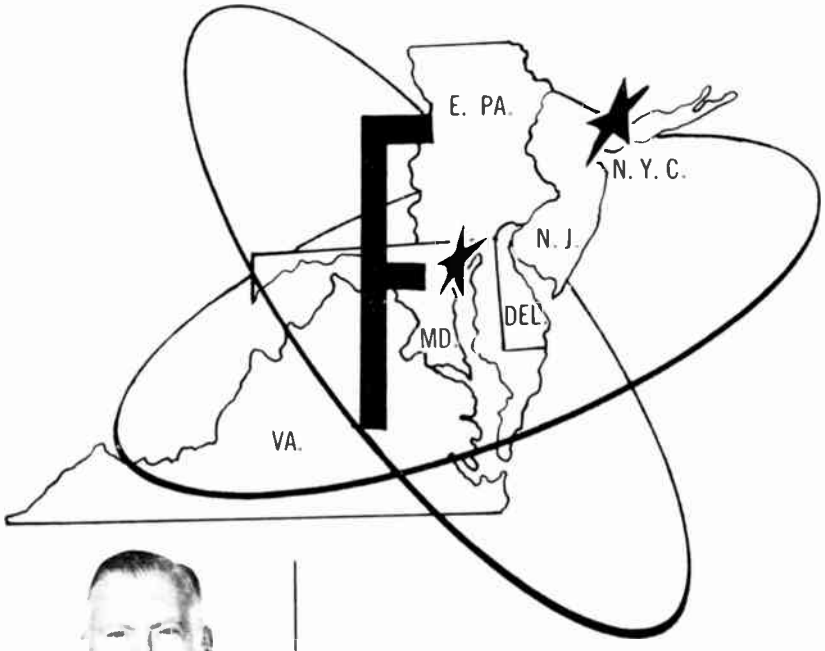

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MEASUREMENTS' — "FAMOUS FIRSTS"

1939

MODEL 54 STANDARD SIGNAL GENERATOR — Frequency range of 100 Kc. to 20 Mc. The first commercial signal generator with built-in tuning motor.

MODEL 65-B STANDARD SIGNAL GENERATOR — This instrument replaced the Model 54 and incorporated many new features including an extended frequency range of 75 Kc. to 30 Mc.

1940

MODEL 58 UHF RADIO NOISE AND FIELD STRENGTH METER — With a frequency coverage from 15 Mc. to 150 Mc. This instrument filled a long wanted need for a field strength meter usable above 20 Mc.

MODEL 79-B PULSE GENERATOR — The first commercially-built pulse generator.

1941

MODEL 75 STANDARD SIGNAL GENERATOR — The first generator to meet the need for an instrument covering the I.F. and carrier ranges of high frequency receivers. Frequency range, 50 Mc. to 400 Mc.

1942

SPECIALIZED TEST EQUIPMENT FOR THE ARMED FORCES. WORLD WAR II.

1943

MODEL 84 STANDARD SIGNAL GENERATOR — A precision instrument in the frequency range from 300 Mc. to 1000 Mc. The first UHF signal generator to include a self-contained pulse modulator.

1944

MODEL 80 STANDARD SIGNAL GENERATOR — With an output metering system that was an innovation in the field of measuring equipment. This signal generator, with a frequency range of 2 Mc. to 400 Mc. replaced the Model 75 and has become a standard test instrument for many manufacturers of electronic equipment.

1945

MODEL 78-FM STANDARD SIGNAL GENERATOR — The first instrument to meet the demand for a moderately priced frequency modulated signal generator to cover the range of 86 Mc. to 108 Mc.

1946

MODEL 67 PEAK VOLTMETER — The first electronic peak voltmeter to be produced commercially. This new voltmeter overcame the limitations of copper oxide meters and electronic voltmeters of the r.m.s. type.

1947

MODEL 90 TELEVISION SIGNAL GENERATOR — The first commercial wide-band, wide-range standard signal generator ever developed to meet the most exacting standards required for high definition television use.

1948

MODEL 59 MEGACYCLE METER — The familiar grid-dip meter, but its new design, wide frequency coverage of 2.2 Mc. to 420 Mc. and many other important features make it the first commercial instrument of its type to be suitable for laboratory use.

1949

MODEL 82 STANDARD SIGNAL GENERATOR — Providing the extremely wide frequency coverage of 20 cycles to 50 megacycles. An improved mutual inductance type attenuator used in conjunction with the 80 Kc. to 50 Mc. oscillator is one of the many new features.

1950

MODEL 111 CRYSTAL CALIBATOR — A calibrator that not only provides a test signal of crystal-controlled frequency but also has a self-contained receiver of 2 microwatts sensitivity.

1951

MODEL 31 INTERMODULATION METER — With completely self-contained test signal generator, analyzer, voltmeter and power supply. Model 31 aids in obtaining peak performance from audio systems, AM and FM receivers and transmitters.

1952

MODEL 84 TV STANDARD SIGNAL GENERATOR — With a frequency range of 300-1000 Mc., this versatile new instrument is the first of its kind designed for the UHF television field.

1953

MODEL 59-UHF MEGACYCLE METER — With a frequency range of 420 to 940 megacycles, the first grid-dip meter to cover this range in a single band and to provide laboratory instrument performance.

1954

FM STANDARD SIGNAL GENERATOR. Designed originally for Military service, the commercial Model 95 is engineered to meet the rigid test requirements imposed on modern, high quality electronic instruments. It provides frequency coverage between 50 Mc. and 400 Mc.

1955

RADIO INTERFERENCE MEASURING SET. An aperiodic noise meter useful to 1000 Mc.

1956

MODEL 505 STANDARD TEST SET FOR TRANSISTORS. A versatile transistor test set which facilitates the measurement of static and dynamic transistor parameters.

1957

RADIO FIELD STRENGTH AND INTERFERENCE MEASURING SET. A tuned radio interference and field strength set covering the frequency range of 150 Mc. to 1000 Mc.

1958

MODEL 560 STANDARD FM SIGNAL GENERATOR — First successful FM Signal Generator using solid state modulator.

1959

MODEL 700 FREQUENCY METER — A completely new concept of frequency measurement. An instrument capable of direct and continuous reading to one cycle in 25-1000 Mc. range.

1960

MODEL 139 TEST OSCILLATOR — A compact, versatile, and portable instrument for rapid and accurate alignment of I.F. circuits in all types of radio receivers.

1961

MODEL 760 STANDARD FREQUENCY METER — An accurate, simple to operate, direct read-out, portable instrument designed for servicing two-way mobile radio equipment.

1962

MODEL 140 STANDARD DEVIATION METER — A portable, self-contained instrument designed to accurately measure the peak deviation of F.M. transmitters. Frequency coverage from 25 to 1000 Mcs.

MEASUREMENTS

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