

Report From Radio Central

by Ralph Williams with Marshall Etter, Bob McGraw and Chris Bacon

This article is one of a multi-part series about RCA's "Radio Central" operations at Riverhead and Rocky Point New York. Three installments were originally published in the Spring, 1992 issue (Vol. 20, No. 1) of The Antique Radio Gazette. Two of these were reprinted in our January and April issues, and this is the third. Some editing has been done, but the content remains unchanged.

Additional installments, focusing on Radio Central's antennas, receiving system and teletype equipment were published in the Vol. 20, No. 2 of The Gazette, and will be reprinted in future issues of The Journal.

In a speech before the Federal Communications Commission in 1940, David Sarnoff characterized the Radio Corporation of America as a tree with three branches: manufacturing, broadcasting, and communications. Most people interested in the history of radio are familiar with at least some of the products and inventions of RCA's manufacturing branch and the powerful influences of NBC, the radio and television broadcasting branch. The communications branch is not so familiar.

It is hoped that the present series of articles will help change that, for RCA Communications played a very large part in bringing the world together during the twentieth century, and this may ultimately be considered one of RCA's greatest and most lasting achievements.

Perhaps RCA Communications was overshadowed by the other branches of RCA because it was a utility whose primary customers were businesses and governments. It did not have the daily, personal impact on the public that NBC did and still does. Nor did it create the radios, televisions, and other products that reshaped our day-to-day lives as did RCA's manufacturing divisions. But in the first years of its existence, communications was RCA's "raison d'etre," and provided the

means for RCA's expansion into large-scale manufacturing and broadcasting.

With the emergence of the other branches of RCA, the original one was incorporated as RCA Communications in 1929. It developed into a huge worldwide short wave radio network that offered a variety of Teletype, telephone, broadcast, and facsimile services. In

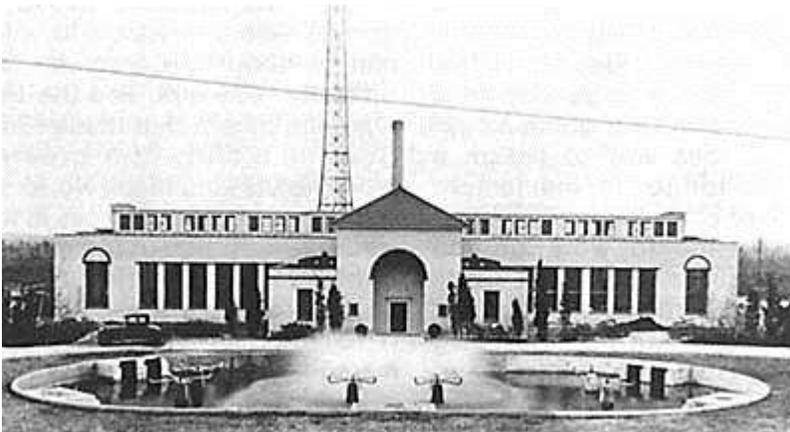


Figure 1. Rocky Point

its later years, computer data and television relay capabilities were added, and satellites and coaxial cable first augmented and then replaced the shortwave

network. RCA Communications also offered services to broadcasters such as relaying radio programs and precision carrier frequency measurements.

Another reason RCA communications is not as well-known as RCA's other branches is that its technology changed at a blinding pace. Many of its accomplishments were obsoleted by new developments before their historical impact could be assessed. If there was one thing RCA's managers and engineers understood, it was that clinging to the past--no matter how splendid--was both unprofitable and risky in a highly competitive business like communications.

By the late 1970s the short wave network was an anachronism. Yet short wave operations had reached their peak only in the mid-1960s. But as Bob McGraw, a former technician at RCA's Riverhead Receiving Station said, "like blacksmiths watching the first automobiles coming down the road, we knew the end was getting nearer every time a few more of our circuits got transferred to satellites." By the time people outside of RCA Communications' short wave radio network began appreciating its history, much of it was already gone.

A proper understanding of the technological history of RCA Communications begins with the realization that nothing of this size simply springs up overnight. Starting with the examples set by Marconi's wireless network and land-line telegraph systems, virtually everything from antennas to terminal equipment had to be developed and put into operation, often before anything similar existed elsewhere. The organization that became RCA Communications in Riverhead and Rocky Point, New York had to follow this path.

It is no exaggeration to say that for nearly seven decades, the scientists and engineers at RCA Communications did not merely follow the state of the art in their field; they defined it.

Although many discoveries and accomplishments made at Riverhead and Rocky Point were publicized in technical journals, few attracted much attention outside of engineering circles.

A brief overview of just a few of the discoveries and research projects from Rocky Point and Riverhead reveals a goldmine of radio history. It was at Riverhead that Dr. Harold Beverage developed the technique of diversity radio reception, which eliminated short term

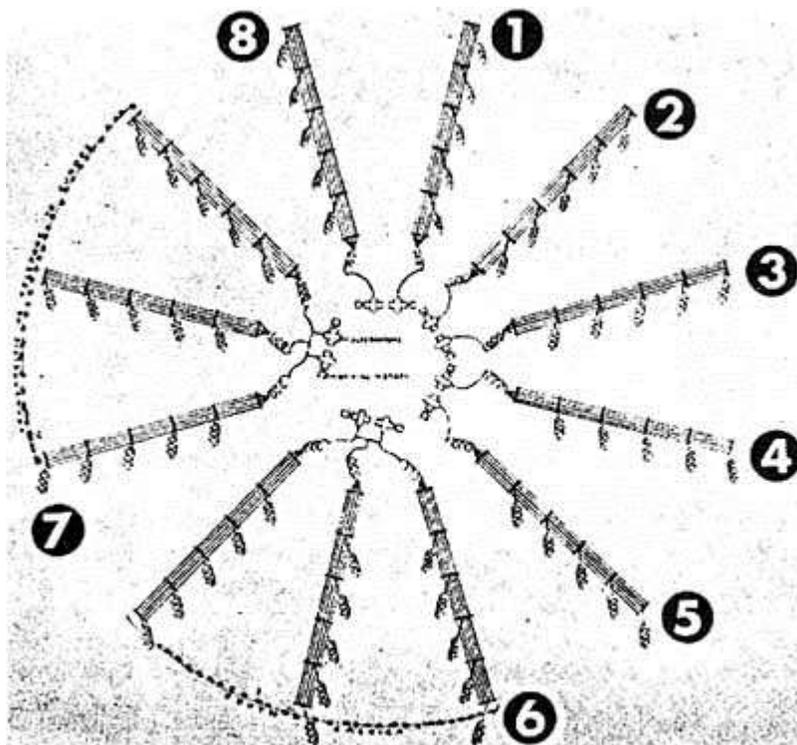


Figure 2. The Transmitting Wheel

fading, one of the most serious drawbacks to using short wave radio for long distance communications. Dr. Beverage went on to do much of his most important work on antennas here.

General Electric performed the first experiments with high-power vacuum tube transmitters at Rocky Point, using an Alexanderson alternator running at low power as an exciter for the tube transmitters. Those experiments were so successful that the alternators (and spark gap transmitters) immediately became obsolete, and the door was opened for short wave communications.

The first long-range single sideband radio channels were established between Rocky Point and England in 1923. Frequency shift keying, the basis of today's computer modems and fax machines, got one of its first trials using one Alexanderson alternator at Rocky Point to send the "mark" signals and another alternator at Tuckerton, New Jersey to send the "spaces." While this was too unwieldy for regular use, it proved the merits of the system.

In the 1930s the first radiophoto and facsimile message services were offered by RCA Communications, using equipment perfected by the organization. Some of the first efforts to record and comprehend the effects of sunspots on short wave propagation were made at Riverhead, and in the 1940s, experiments with VHF and UHF radio waves paved the way for television broadcasting.

Of course, as a provider of services, the main business of RCA Communications was carrying messages for other businesses, the public, and the government. It wasn't so long ago that undersea cable telephone and telegraph service to other countries was limited, slow, and very expensive. In the 1930s, RCA Communications had circuits to 43 countries and 11 major American cities, and it was often the fastest, most reliable, and least costly way to get a message overseas.

Originally, all traffic was handled in Morse code using 200-word-per-minute paper tape senders and ink recorders, as was typical for wire telegraph operation in the 1920s. Teletype circuits were introduced in the 1930s, originally using make-break keying, and later with frequency shift keying, but Morse code remained in use for some circuits into the 1950s.



Figure 3. Riverhead

There was some resistance to changing over to Teletype from some of the smaller countries served by the network, so RCA engineers developed machines that could translate Teletype to Morse code and back again. As the demand for circuits grew, electromechanical multiplexing arrangements were devised to fit four Teletype signals into the space formerly

occupied by one. Single sideband operation and electronic multiplexing eventually made it possible to fit thirty Teletype channels into one voice channel. Of course, such feats would be simple for today's microchips, but RCA accomplished them with electromechanical devices and vacuum tubes in the days when silicon meant glass and little else.

The voice channels were also used for radiotelephone, facsimile, radiophotos, and relaying radio broadcasts. The radio broadcasts, radiophotos, and facsimile messages, which required higher quality audio circuits than ordinary voice to Teletype were handled by a separate Program Department. One of the more historic programs to pass through this department was Admiral Richard Byrd's broadcasts from the South Pole in 1929. Byrd's transmissions were received at Riverhead and then rebroadcast by the AM networks.

One might have thought that the outbreak of World War Two and the cessation of normal business activity would have meant lean years for RCA Communications, but this was not the case. Following Pearl Harbor, Sarnoff placed all of RCA's facilities at the disposal of the government, and RCA went to work carrying messages for the Armed Forces.

The Alexanderson alternators, long considered out of date, took on a special importance when it was found that their long wave signals were easier for submarines to copy than short wave signals. Arrangements were made to key the Alexandersons at Rocky Point directly from Washington, and they remained in the service of the U. S. Navy throughout the war. One alternator from RCA's Marion, Massachusetts station, and another from its Bolinas, California installation were moved to Haiku, Hawaii, to provide communications for the Pacific Fleet. The Haiku installation was designed by J. L. Finch, RCA's Plant Design Superintendent in New York. Mr. Finch was assisted by Marshall Etter, who went on to become Engineer In Charge of Rocky Point and Riverhead.

The first challenge faced by RCA Communications at its inception was to establish a worldwide communications network independent of British Marconi. Short wave radio was yet to be discovered, so the network was designed for long wave operation. These waves are most effective over bodies of water and the loose, sandy soil of coastal areas.

Then, even more than now, New York City was the business capitol of America, so the new network logically had to be centered there. But land in and around the city was costly and too susceptible to interference for long wave radio stations. Eastern Long Island was a natural choice for such facilities because it is a coastal area with the prerequisite soil characteristics, and it then had thousands of acres of relatively inexpensive farmland ready made for the



Figure 4. Rows of Receivers at the Belfast, ME Station

huge antennas that were necessary.

The fact that it was largely undeveloped meant that interference was far less of a problem than it would have been elsewhere. Its proximity to New York City made telephone and telegraph links to the major business centers in Manhattan a simple matter, and the Long Island Railroad offered a convenient means of transporting people and equipment.

The practice of locating central offices in urban areas and connecting them by wire with transmitting and receiving facilities at remote coastal locations was used throughout the system. In most countries, RCA "tied in" with the existing telegraph networks, many of which were owned or controlled by the governments in those countries. Some countries such as Sweden and Poland did not permit foreign ownership of commercial radio facilities, and in these instances, RCA provided the equipment and installation expertise and then sold the stations to the governments in those countries.

In America, RCA tied in with Western Union. "Via RCA" was not only RCA Communications' advertising slogan, it was the code anybody could use in the local telegraph office to send a message over the RCA network. An ambitious transmission facility was planned for a former 5,100 acre farm at Rocky Point, near the Island's North Shore. Opened in 1920, "Radio Central," as it came to be known, (Figure 1) was originally envisioned to have twelve antennas suspended from towers 410 feet high and arranged like the spokes of a wheel, fed from ten Alexanderson alternators (Figure 2).

Only two of the antennas and two alternators were ever installed. "It was a good thing they didn't build the rest," said Marshall Etter, "because after the short waves were discovered, the whole thing would've been obsolete and RCA would have been in serious financial trouble." The alternators remained in service into the early 1950s and additional buildings and antennas were constructed for the short wave equipment. Although its circuits were with Europe, South America, and San Francisco, "Radio Central" was the only radio station ever built that could be heard any place on earth, any time of day.

As the transmitters and receivers had to operate simultaneously, the decision was made early on to build a receiving station at another location to avoid interference. A 2,000 acre parcel of undeveloped land in Riverhead, some twelve miles to the east of Rocky Point, became the "Ears of the East" following successful experiments by Dr. Beverage to determine the suitability of the site. (Figure 3 shows the Receiver Building as it was at the peak of traffic handling).

As Bob McGraw recalls the story, "It was in late 1919 or very early 1920 and Dr. Beverage and his crew were set up in a tent. The local residents were curious, and one went there to take a look. Upon his return he said, "it'll never amount to anything. They spent all morning trying to electrocute a snake!"

Whatever the outcome of that experiment, Beverage perfected the design of the antenna he had been developing for some time previously. The wave antenna, or Beverage Wire, as it was later called, was a long wire antenna of calculated height and length, terminated in such a way as to eliminate signals coming from anything but the desired direction. It became the standard for long wave radio reception, and gave RCA one of its first breakthroughs in the communications business.

The earliest receivers that were put in service at Riverhead to go with the Beverage antennas and the Alexanderson alternators were relatively simple radio frequency amplifiers with heterodyne detectors. The radio stages of the receiver were tunable but a receiver assigned to a link had to be considered as a fixed-tuned instrument.

Because the incoming frequency was in the band from 15 to 22 kilohertz, the coils in the amplifiers were bank-wound inductors whose mutual coupling was controlled by moving the coils on tracks behind the panels. (Figure 4 pictures the receivers at the Belfast, Maine station). Belfast had a receiving facility similar to Riverhead, which gave RCA a choice of stations when conditions favored one over the other.