(Top) At the Wailuku, Maui switchboard in 1939 operators placed all calls, but automatic dial service — new positions at right — was just around the corner. (Bottom, left to right) The state of the art in turn of the century telephone design; Honolulu’s 1895 directory with 1300 subscribers; C.M. Dickey, who installed Hawaii’s first telephone line on Maui.
The growth of telecommunications, a word whose Greek and Latin roots mean "to share at a distance," is a subject of compelling interest to any student of Hawaii's economic history over the last century. Separated by thousands of miles of ocean from its main markets, Hawaii recognized earlier than many European nations the importance of quick and dependable communication with the rest of the world. Just twenty years after the telephone was invented, Hawaii had achieved the U.S. national average of sixty households per telephone and had a telecommunications infrastructure twenty years ahead of those in use in Great Britain, France and Germany. In the decades that followed, telecommunications emerged as the very lifeline of Hawaii's economy as invisible bursts of energy traveling at the speed of sound or light through undersea cables or upwards to satellites orbiting the earth enabled residents of a mid-Pacific archipelago to communicate instantly with the rest of the world.

Remote though it was from the centers of technological innovation on the mainland, Hawaii had by the early years of this century emerged as a pioneer in the field of telecommunications through the perfection of a statewide telephone system that provided optimum service at low cost. The telegraph, first introduced in 1872, never really took hold in the Islands, but just two years after the first telephone conversation took place in Alexander Graham Bell's Boston lodgings, a Maui shopkeeper named C.W. Dickey was making daily calls between his two stores in Haiku and Makawao. Dickey tried to set up a phone company in Honolulu in 1878 but failed, and his competitor, Castle & Cooke, fared little better despite an advertising campaign in the Pacific Commercial Advertiser: "Telephones — Those useful and amusing instruments may be seen in full working order at Castle and Cooke's where the agent, Mr. C.W. Cooke, has one on exhibition. Just the thing for plantation managers to connect their dwelling places with their mills. The price is reduced to $5.00." Discounts notwithstanding, the Hawaii public was skeptical about the new technology and after eighteen months in the telecommunications business the company had only a few applications from Honolulu's population of 14,000 residents.

The problem was that a central switchboard had not yet been introduced and service connected only two points, such as a home and a business office. Potential customers were also leery about buying an untried product, and no suppliers offered rental arrangements. It took a new company, The Hawaiian
Bell Telephone Company, to implement Hawaii's first central switchboard. A month after its founding on December 30, 1880, Hawaiian Bell reported signing on 75 subscribers before running out of phones. The cost was $6.00 a month, then the equivalent of several days work for the average plantation worker. Today a similar plantation worker has a telephone that costs him about two hours' labor for a month's service.

Hawaiian Bell's directory for 1884-85 listed 354 subscribers and noted that service was "used by all classes of the community for business and social purposes to an almost incredible extent." The central switchboard, "Central" as everyone called it, notified subscribers of important community events. When Central informed subscribers of the steamer's arrival on April 28, 1882, the Advertiser reported, "7½% asked how far she was off; 6% wanted to know what steamer it was; 2% asked where she was from; 50% asked if it really was the steamer and the balance said 'thank you.'" The telephone found itself increasingly in the news, as when the paper cautioned readers that conversations of several parties could sometimes be heard at once: "Be careful in your choice of language."

In 1881, Hawaiian Bell began work to extend service to leeward Oahu, and by June of 1883 there were lines to Waianae, Ewa and Waialua, Moanalua and Mikilau. Calls on business days were running 1300 to 1500 a day, with some businesses making as many as 40 calls a day. Before long merchants were advertising their phone numbers in the paper. In 1884 Hawaiian Bell's superintendant John Cassidy engineered a first for the Islands and perhaps for the United States, when he connected every room of the Royal Hawaiian Hotel with a line to the central switchboard. By the turn of the century there would be 18 such private boards, known as PBXs (Private Branch Exchanges) in Hawaii.

Telephone service was introduced to the Big Island in 1882, but it wasn't until November of 1885 that lines were set up service through the lava fields and heavy forests between Kona and Kau, there by completing the 245-mile loop around the Big Island. Service began on Kauai in 1884 and on Maui in 1890. The 56-mile line between Kuala Lumpur and Hana traversed some of the most rugged country on earth, connecting the remote community with the outside world thirty-seven years before the first automobile would travel the Hanila Highway. Within twenty years of the invention of the telephone, Hawaii had dependable service on all islands except Lanai and Molokai.

Bell companies on the mainland were protected from competition by the Bell patents which were in effect until 1893 and 1894. No such constraints applied to the independent kingdom of Hawaii, where the telephone business was wide open to any company with the resources to build its own plant. In Honolulu in the 1880s there was no shortage of astute investors impressed with Hawaiian Bell's performance — stock had increased in value about 6-fold in two and a half years. It came as no surprise when the Bulletin announced the formation of a new telephone company in its July 10, 1883 edition.

Mutual Telephone Company's stock offering of 2000 shares at $10/share was snapped up at once, and Mutual's superintendent James William Pratt began to construct a competing telephone system. Pratt's counterpart at Hawaiian Bell, John Cassidy, fought hard to protect the areas covered by his lines. 'He fought as hard for his company as I fought for mine,' Pratt later wrote. 'When the time came for us to run cables along South Street, found it necessary to cut the wires of the opposition company at the junction of King and began to do so. The Bell people got out an injunction and the case went to the courts, where I was beaten. That is I was beaten...
far as the damage for the Bell company went, but in the end I consider we had the best of it.

By April of 1885 Mutual had a line to Diamond Head and fourteen lines to Waikiki. It was connecting government offices and preparing to lay its Palama route. Hawaiian Bell responded by announcing it was reducing its rates to $5.00 for business phones and $4.00 for private residences. After Mutual opened for business in September of 1885, prices would fall to a low of $3.00 for businesses and $2.00 for residences, and the Honolulu public was delighted. "With the natural competition the rates are very low, but we think remunerative," read an article in The Directory in 1888. "A store or residence is not complete in Honolulu without a telephone."

By 1892 Mutual had 701 subscribers to Hawaiian Bell's 400, but low rates meant only marginal profits for both companies. The press had raised the prospect of an eventual merger as early as 1884, and apparently the idea was explored by both sides for several years before the consolidation was announced in 1894. Mutual in effect bought out Hawaiian Bell through a stock exchange, and became the sole provider of telephone services on Oahu. By the end of 1895 Mutual Telephone Co. had 1152 subscribers and was primed for rapid growth in its exclusive market.

U.S. Commissioner to the Territory of Hawaii William H. Eustis summarized the great events in the history of Hawaii in a speech delivered in Honolulu on January 2, 1903, as follows: "The first was the landing of Captain Cook; second, the coming of the missionaries; third, the installation of that grand old flag (pointing to the Stars and Stripes over the Capitol Building.) and fourth, the Pacific cable." The three thousand citizens who had assembled to celebrate the cable's inauguration were in enthusiastic agreement. Hawaii had recognized the need for a mainland-Hawaii cable ever since Cyrus W. Field completed the first trans-Atlantic cable in 1866. Steamers to Hawaii in the opening years of the twentieth century took seven days to transport mail from San Francisco, and the cable would reduce the communications lag to a matter of minutes.

There were no less than six major attempts to finance and build a Pacific cable before Commercial Cable Company finally succeeded. The project attracted an Italian diplomat, a Tasmanian sea captain, a British consortium and the Pacific Cable Company of New Jersey. After 1898 the stakes became higher, for the Hawaiian Islands had been annexed by the U.S. and the Spanish-American War had brought the Philippines under U.S. control. Companies maneuvered in Washington to obtain a large federal subsidy for a trans-Pacific cable, but the government dragged its feet interminably.

Back in Hawaii progress on an inter-island cable fared little better. The Hawaiian Pacific Cable Company laid cable between Oahu, Molokai and Maui in 1890, but its first message was its last. Instead of purchasing manufactured cable from England, the leader in electrical technology at the time, the entrepreneurs manufactured their own in a shed at the Honolulu waterfront. Around forty miles of copper core and sufficient gutta percha insulation they wound three layers of coconut fiber, each topped off with a heavy coating of "a tarish mixture." The cable's failure was eventually ascribed to sharp coral which extended further than the one mile of armored cable its builders had installed at either end.

The stalemate in Washington was finally broken by John W. McKay, one of the original claim holders for the Comstock Lode, the 1872 gold strike worth about $150 million. In his letter of intention to Secretary of State John Hay, McKay pointed out that his company had laid 13,000 miles of cable in the Atlantic, and that he could do the job "more cheaply, more quickly and more successfully than the Government can." Without official approval or disapproval he ordered the cable ship Silvertown to set forth from Portland on the English coast in September of 1902. Making stops for coal en route, the Silvertown rounded the Cape and reached San Francisco...
on December 4. After laying the shore end of the cable she left for Honolulu on December 5 and arrived on Christmas Day at a point about 35 miles from Honolulu where she buoyed the cable. The shore end was brought out from Waikiki and the final splice made on January 1, 1903. The first message from San Francisco was received at 8:40 p.m.: “Compliments of the season. Weather finer than California has ever known at this time.” During the first service day 9000 words were sent over the cable as three different operators rotated shifts, interpreting the wavy ink lines on their syphon recorders into letters and words at a speed of 8-15 words per minute. The Honolulu newspapers became big users of the cable and headlines now carried up-to-date news from the rest of the world; Honolulu and Washington were now just five minutes away. The laying of the cable to the Philippines soon followed, and on July 4, 1903 President Theodore Roosevelt sent the first message to travel around the world from his station in New York to another station nine miles away. The communication took nine minutes.

Forty-eight years later in 1951 the Federal Communications Commission authorized the Commercial Pacific Cable Company to close down its Pacific operations. Although competition from radio telegraph made it no longer profitable, Hawaii’s first cable was still usable when checked for continuity in 1955. In the eighty-five years since the cable was laid, technology has advanced to the point that the trans-Pacific fiber optic cable now being laid to Hawaii will have about ten million times the capability of Hawaii’s first telecommunications link with the world.

In 1909 most telephone systems in the United States depended on manual switching systems controlled by human operators. Mutual’s central office employed twenty women for this purpose, and with the number of phones doubling every seven years the company would certainly require more. It became clear that this created a possibly unsolvable engineering problem, for as the manual board increased in size, the unit cost of operation became higher because of the need to add more well-paid operators. Looking down the road, Mutual could see the day when increased volume would force rate increases that customers might not tolerate.

Mutual, 1891 and was in use in some cities. An option for the exclusive use of the automatic, or “step by step” system had been obtained by Hawaiian Telegraph and Telephone Co., Ltd., a radio company operating the Islands from the rest of the world, to ship wireless service, and Mutual suddenly faced the prospect of a second phone company with more advanced technical capabilities entering the market.

Gartley tested step-by-step switches in cities he visited by dialing twenty or thirty calls, and he never failed to get the right connection. He then surveyed customers, and reported, “In every place I visited I made extended inquiry of subscribers and found more than 95%... preferred the automatic to the manual.” He then performed a cost analysis and satisfied himself that the automatic system would be more profitable than the manual when the number of subscribers exceeded 2500.

Acknowledging that the step-by-step system was superior to the manual from every standpoint, the Mutual board of directors had no choice but to negotiate with HT&T to obtain rights to the new technology. After buying all HT&T’s stock, Mutual immediately began to install the new system, which was completed on August 28, 1910. The Evening Bulletin’s reporter was moved to remark, “The almost human intelligence, or perhaps more than ordinary human intelligence, which these metal operators use in answering calls is almost uncanny.” He noted with approval that “the number of poles has been reduced to about one fourth or less than those used under the old system and in this way alone has done much to improve the scenic beauty of Honolulu streets. There are about 200,000 feet of cable used in constructing the new system, this cable holding all the way from twenty to as high as 300 pairs of wires.”

Customer response was universally favorable, and the number of instruments grew from 1,800 in 1910 to 5,800 in 1915. L.E. Pinkham, Governor of Hawaii, was quoted as saying, “In our Mutual Telephone Company’s automatic system we think we have the best extant. In my own experience in the United States and abroad I have never known its equal.” Mutual sought next to extend the same service to the Neighbor Islands, and embarked on a program of acquisitions. By 1920 it had purchased a four telephone companies on the Big Island and installed trunk lines joining their local lines into one island-wide
In 1912 the wireless station at Heeia was the tallest wooden structure in the world. Mutual's president John A. Balch greatly expanded Hawaii's inter-island telephone service.

If all the telecommunications technologies introduced to Hawaii, radio had the most difficult time in securing a foothold. This is hardly surprising given the state of the science in April of 1900, when engineers erected the first transmission station on the heights of Kaimuki. Marconi had successfully demonstrated his invention at Sandy Hook in New York only six months previously, and there were still many bugs to be worked out. When stations were in place on all the major islands and transmission began on March 1, 1901, service was found to be spotty and unreliable. Private and government subsidies kept the new enterprise limping along until 1907, when J.A. Balch and a partner acquired the business, renamed it Hawaiian Telephone & Telegraph Co., and hired an expert radio engineer to rehabilitate the system. By 1908, the company was generating satisfactory profits, primarily through its shore to ship wireless business.

HT&T's Kahuku Point installation had a 10kw transmitter which made it one of the most powerful in the Pacific. On the evening of October 15, 1908, the station opened a night communication with San Francisco 2100 miles away. This was the first direct radio communication between Hawaii and the mainland and was a record for successful long distance communication at the time. Balch's operation, which was presently bought up by Mutual Telephone Co. to obtain its automatic switch license, enjoyed a virtual monopoly on shore to ship radio, but it was unable to prevent Federal Telegraph Company from setting up a commercial radio circuit between Hawaii and the mainland. Federal's 608-foot wooden lattice mast station at Heeia, Oahu, was the tallest wooden structure in the world at the time, and the Hawaii-San Francisco link was the longest commercial link in the world. Further additions to the infrastructure were made by Marconi, who built a 360kw duplex transmitter at Kahuku and a receiving station at Koko Head in 1914. Soon the Marconi stations were in direct radio communication with stations in California and Funabashi, Japan.

In 1925 J.A. Balch, who was about to be appointed Mutual's new president, returned from a trip to New York that he later said gave him the supreme surprise of his life. Demonstrations of trans-Atlantic radio communications between Long Island and Great Britain convinced him that it would soon be possible to conduct telephone conversations between Hawaii and any point in the United States. Balch waited a few years until the cost of radio equipment dropped and then contracted with RCA to furnish the inter-island system and with AT&T and Western Electric to build the Hawaii terminus of the Hawaii-Mainland system. Inter-island service began on November 2, 1931, and ran continuously from 7:43 a.m. to 11:00 p.m. without a shutdown. Then a few weeks later on November 20, the first call between Hawaii and the mainland was successfully placed. On December 23, 1931 commercial service was inaugurated; fifty-five years after Bell's invention Hawaii could speak to the mainland.

Mutual's annual report for 1932 recorded a total of 15,238 inter-island calls, resulting in a loss of $4,461.23 in the operation of the system. These were the depression years, and the inter-island telephone business would not become profitable until 1937. For the Hawaii-mainland service, a total of 11,690 calls were made in 1932, billed at $15.00 for the first three minutes and from $4.00 to $5.00 for each additional minute. Rates were reduced gradually, and customers responded by placing more calls. In 1936 weekday calls were averaging 8.2 per day, but by 1940 the rate had climbed to 26.6 a day. Traffic increased
greatly with the advent of World War II, resulting in the creation of new circuits. By 1954, the year before the first Pacific undersea cable was installed, there were fourteen radio telephone channels in operation, and service could be provided to sixty-seven foreign countries. With its much better reception, cable soon replaced radio telephones, but radio would soon return in another form, the satellite, to take over thousands of times the traffic of Hawaii's first trans-Pacific radio links.

The rapid development that occurred in Hawaii after Statehood precipitated an explosion of expanded telecommunications capabilities. When Bell Labs overcame the engineering problems entailed in producing reliable tube repeaters, the final barrier to an undersea telephone cable connecting Hawaii and the mainland was overcome. Hawaii-I was installed in 1957 with 36 channels, which were soon expanded automatically to 48. Time Assigned Speech Interpolation, which utilizes the pauses between words in voice communications to carry additional signals, almost doubled the cable's circuitry with a comparatively modest investment in equipment. This technology was badly needed for traffic on Hawaii-I increased at roughly 30-40% a year between 1957 and 1961.

In 1964, when Japanese tourist traffic to Hawaii began in earnest, the 147-channel PAC-I cable linking Hawaii, Guam and Japan was cutover, followed by a second cable, Hawaii-II, between Hawaii and the mainland. In 1963 ANZCAN, connecting New Zealand and Vancouver through Hawaii, was cutover with 800 channels. In 1974 a third cable to the mainland and a second cable connecting Japan and Hawaii with 943 channels were installed. Hawaii, hailed as a "Pacific Bridge" when PAC-I began operation, was well on the way to becoming an international telecommunications hub with spokes extending throughout the Pacific Rim.

Concurrent with these developments, satellite stations were added to Hawaii's infrastructure, beginning with the COMSAT station built at Paumalu on Oahu's north shore in 1966. It was through the COMSAT station that the first live television broadcast in the Islands, the famous Notre Dame vs. Michigan State football game of 1966, was screened on Oahu. According to Bob Englebard, Hawaiian Tel's Vice President/International, who was on duty at the station at the time, the transmission came within a hair's breadth of infuriating thousands of fans. The satellite was not in a fixed synchronous orbit, as today's are, and as the game progressed it moved further and further away from Hawaii. Just as the game ended in a 10-10 tie, the satellite moved over the horizon and Hawaii lost the footprint entirely.

Over the next two decades the number of satellites accessible from Hawaii increased to the point that 22 satellites are in operation today, handling 80 percent of all trans-Pacific transmissions to and from Hawaii. That number is expected to increase to 30 satellites by 1995, when the newest INTELSAT birds will carry up to 36 transponders each with a capacity of 1200 voice circuits or one television station. Add to this the immense capability of the 40,000-channel mainland-Hawaii-Japan fiber optic cable which will begin service in 1988 and the equally powerful TASMAN cable arriving from Australia in 1991, and it becomes clear that Hawaii has access to telecommunications capabilities far in excess of its forestable needs for the next century.

News that took a week to reach the Islands 95 years ago can today be transmitted instantly throughout the world. Forty-five years ago there were 0.25 calls per telephone to the mainland every year; today the number has increased by a thousand times to 250 calls per year. Every day in Hawaii we make 7,000,000 local calls, 50,000 directory calls, 20,000 one-way pages and send 10,000 telex messages. Add to these the tens of thousands of hotel reservations, the tens of thousands of automatic teller transactions, the thousands of orders brokers, the hundreds of large pages of national and international news and the nearly infinite amounts of data, and our utter dependency upon telecommunications is evident.

Telecommunications has made possible Hawaii economic growth thus far, and it will be even more determinant in the future. By 1989 our telecommunications infrastructure for the 21st century will be largely in place. By 1992, when the Hawaiian Tel system in completely digitized, every home or office with a telephone in Hawaii will have access to telecommunications services whose range and sophistication boggle the imagination. How this will happen, and what those services will be, is described in the series of articles that follow.