



Sekisan-sha, one of the origins of Anritsu, was once located here. It is now known as "Kobiki-cho Dori (street)."

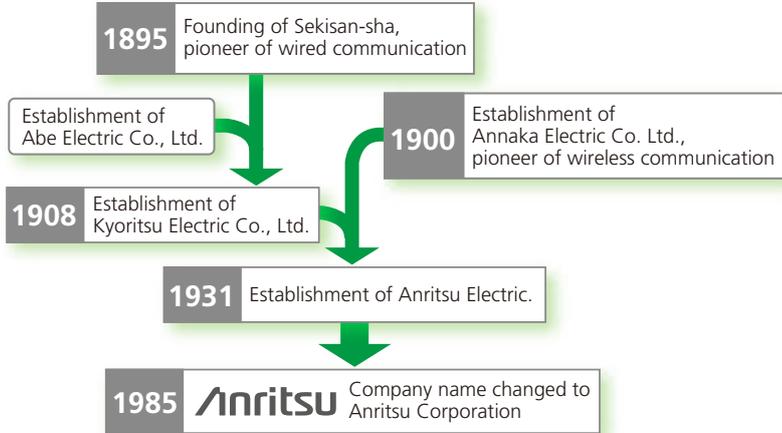
# Tracing 120 Years of Anritsu History

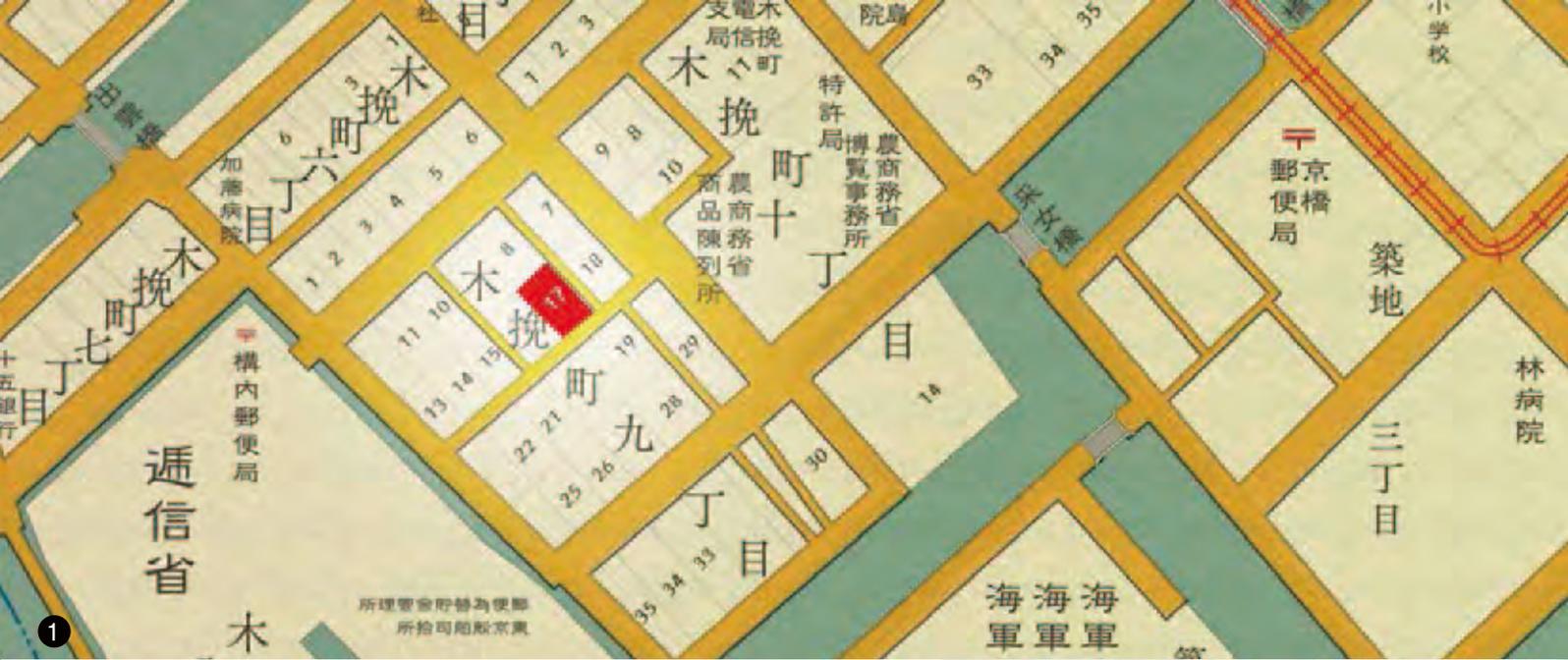
Kobiki-cho, Kyobashi-ku, Tokyo-fu (Present Ginza, Chuo-ku, Tokyo)

In 2015, Anritsu marked the 120th anniversary of its foundation. Anritsu has opened the way to the next generation, ahead of its time since the founding of Sekisan-sha in 1895, with achievements including the world's first practical wireless telephone "TYK Radio Telephone" and the "common-battery telephone" that was the origin of the public telephone, as well as the first Japanese radio receiver and magnetic sound recorder.

### Roots of Anritsu

Integration of wired and wireless communications companies





- ① A map from the time of Sekisan-sha's founding. We can see that the company was located next to the Ministry of Communications and Transportation. Sekisan-sha later moved to Uneme-cho.
- ② Keizaburo Ishiguro, one of the founders of Sekisan-sha.
- ③ The original Kabuki-za (November 1889 to July 1911) (Collection of the National Diet Library)
- ④ Current Kabuki-za (April 2, 2013 -)

The Meiji Era saw the implementation of new structures in Japan such as the promulgation of Constitution and the opening of the Imperial Diet. Social infrastructure such as the railway, telegraph and telephone was also put in place in line with the Meiji government's call-out for "Civilization and Enlightenment" policy. The spirit of the new era pervaded Kobiki-cho in Kyobashi-ku, where the Ministry of Communications and Transportation was located, and which was also close to Shimbashi Station. This is where Anritsu originated.

### From a town of sawyer to a theater town, and a town that supported the "Civilization and Enlightenment" policy

The area to the southeast of the current Ginza Showa Street between the Sanjikkenbori canal and the Tsukiji River, which have since been filled in as reclaimed land, used to be called Kobiki-cho. This is where Sekisan-sha was born. What kind of place was Kobiki-cho originally? The name is believed to date back to the Edo period, when many sawyers who did repairs on Edo Castle lived in the area. These sawyers used large saws to cut logs into lumber. Later in the period, around the mid-1600s, three playhouses known as the "three theaters in Edo" were built, and roadside teahouses and other establishments increased. The area became such a major theater hub that "going to Kobiki-cho" came to be synonymous with "going to see a play." The current Kabuki-za is one trace of the neighborhood's past.

With the dawn of the Meiji Era, Japan's first railway opened at Shimbashi Station in 1872, and the first horse tramway began running from in front of Shimbashi Station to Nihombashi in 1882. Presumably, humming with activity, the area became the embodiment of the new era. Furthermore, the Ministry of Communications and Transportation was launched in 1885 and located in Kobiki-cho, taking over the Ekitei Kyoku (Postal Bureau) and the Kansen Kyoku (Shipping Bureau) from the No-Shomu-Sho (Ministry of Agriculture and Commerce), and the Denshin Kyoku (Telegraph Bureau) and the Todai Kyoku (Lighthouse Bureau) from the Kobusho (the Ministry of Industry). Then, in 1895, Keizaburo Ishiguro and Kentaro Sugiyama, who had been working at the Ministry of Communications and Transportation lighthouse product factory, founded Sekisan-sha and located their factory at 9-17 Kobiki-cho. Sugiyama later left the company, and it was therefore newly organized as a limited partnership company with JPY30,000 in capital. An extract of the company registry at the time reads "manufacture of electrical and other types of equipment, sale of equipment and materials manufactured in Japan and overseas, and undertaking of construction."



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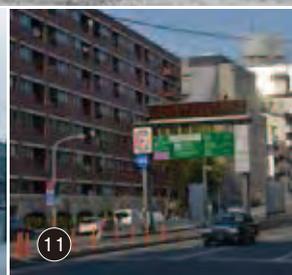
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- 5 Ministry of Communications and Transportation, established in 1885, the central government for administration of transportation and communications from the Meiji to Showa Eras. (Collection of the National Diet Library)
- 6 Ginza Post Office, located on site of the former Ministry of Communications and Transportation
- 7 Shimbashi Station (Collection of the National Diet Library)
- 8 The first Japanese public telephone box set up near the bridge in Kyobashi in 1900.
- 9 The beloved common-battery telephone, known as the "Clink-clink" model for the sound made by inserted coins.
- 10 Kyoritsu Electric Co., Ltd. at the time of establishment
- 11 The original site of Kyoritsu Electric Co., Ltd., currently Minami Azabu 4-chome.

### Contributing to the popularization of the telephone through the automatic telephone: the period of Kyoritsu Electric Co., Ltd.

The year after the establishment of Sekisan-sha, the Ministry of Communications and Transportation launched its first plan to expand telephone service. Enhancement of the telephone network was considered one of national projects, and the number of subscribed lines climbed rapidly from a mere 344 in 1890 to 18,668 a decade later in 1900. The numbers clearly indicate how many people desired the convenience of the telephone. In the same year, 1900, the first public telephones appeared on the streets of Japan. Referred to at the time as "automatic telephones," these were installed in Shimbashi and Ueno Stations in September, and the first public telephone box was set up near the Kyobashi bridge in October. The white-painted, hexagonal pyramid-shaped box is reported to have attracted a great deal of attention. The automatic telephone was set up so that calls from a user to the intended recipient were placed via the telephone exchange switchboard, and the call would be connected once the operator had verified that money to cover the charge had been inserted. Amazingly, it seems the operators were able to discern the different sounds made by various coins, and thus confirm the amount entered.

Later, Sekisan-sha moved from Kobiki-cho to Uneme-cho, Kyobashi-ku (near the current Harumi Street). The company merged with Abe Electric Co., Ltd., which had supplied cords to Sekisan-sha, and established Kyoritsu Electric Co., Ltd. in 1908. A factory was set up in Fujimi-cho, Azabu-ku, and production of "automatic telephone" began. Kyoritsu Electric Co., Ltd. engaged in production of telephones and switchboard equipment in response to the Ministry of Communications and Transportation plans, and saw business operations expand steadily along with the second and third expansion plans rolled out by the Ministry. Its technical abilities were highly praised, and in 1911 Kyoritsu Electric Co., Ltd. became the designated factory for the Ministry of Communications and Transportation, the Kaigun-sho (Navy) and Rikugun-sho (Army). It was in 1925 that the automatic telephone was officially renamed the "public telephone." By this time, the number of public telephones installed in Japan had reached 5,546. Anritsu has been supporting comfortable and convenient communication between people since the dawn of the era.



Nitta Junior High School stands on part of the former site of the Yoshida Factory

## Tracing 120 Years of Anritsu History

### Shinyoshida-cho, Kohoku-ku, Yokohama (Present: 5-chome, Shinyoshida-higashi)

In the early Showa period, an era when the dark shadow of war began to loom over life in Japan, Anritsu succeeded in developing the magnetic sound recorder that would become the original tape recorder. As all of Japan became swept up in the current of war, Anritsu established a huge factory in the north of Yokohama to meet military production demand. This installment will look at another Anritsu, the one that survived this turbulent era.

#### Developing the magnetic sound recorder that would become the original tape recorder

In 1934, a research lab was set up at Anritsu Electric Co., Ltd., the precursor of Anritsu. This was the magnetic sound recording laboratory. The originals of many products were born at Anritsu, and it was here that development of the magnetic sound recorder, the origin of the tape recorder, took place. From that point, Anritsu would begin to trace its path as Japan's founding maker of magnetic sound recorders.

By the following year, 1935, a prototype was already completed. In 1937, the laboratory perfected the first magnetic wire sound recorder. Furthermore, in the following year, 1938, the research team completed the "AC-bias magnetic sound recording method," which was registered as Patent No. 136997 in June 1940. This was truly the origin of the contemporary tape recorder, and can be termed a notable achievement in the history of the communications industry.

By this time, the Pacific War was drawing near, and Anritsu too was caught up in that huge wave. It was against the background of that era that the Yoshida Factory was built at 1600 Shinyoshida-cho, Kohoku-ku, Kanagawa Prefecture (the address at the time).



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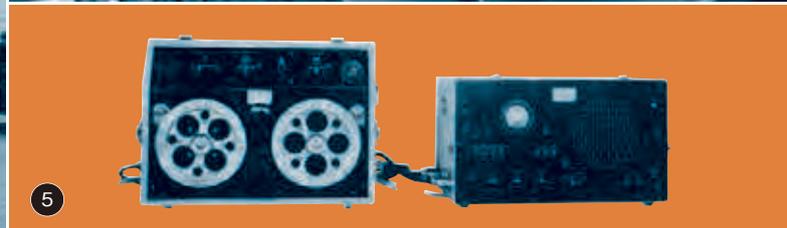
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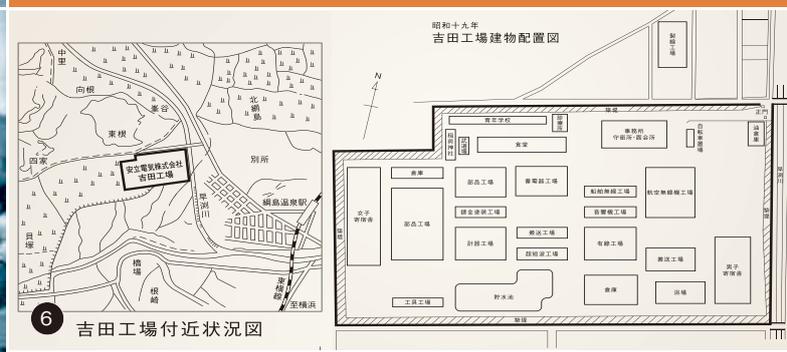
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- 1 A view of the former factory site from Yoshida Bridge.
- 2 Damage at Yoshida Factory caused by flooding from the Tsurumi River (July 16, 1941)
- 3 Physical exercises by employees at Yoshida Factory (1941)
- 4 Typing work using magnetic sound recorder
- 5 AC-bias magnetic sound recorder
- 6 Situation map of Yoshida Factory area and building site plan (1944)

## A giant factory appears in the countryside After the war, the building materials and premises were reused for schools

In July 1940, a large factory was established on a site 103,911 square meters in area (including later expansion), in a farming district 15 minutes' walk north-north-west of Tsunashima Station on the Tokyo-Yokohama Electric Railway (present Tokyu Toyoko line). The scale of the site was such that it occupied the east half of what is now 5-chome, Shinyoshida-higashi. This area, where the Hayabuchi-gawa River and Yagami-gawa River flow into the twisting Tsurumi River, has struggled with damage from flooding since the distant past, to the point that people in the Edo period are reported to have said: "Don't send your daughters to marry in Tsunashima." The Yoshida Factory also went through such an experience. In July 1941, the Tsurumi River burst its banks due to violent wind and rain, flooding the factory with 1.36 meters of water, and forcing it to suspend operations for a month.

The factory recovered after the flood, and at its peak consisted of 60 buildings, floor area of 42,975 square meters, and 3,635 employees. It manufactured products including telephone and telegraph carrier systems, switchboards, telephones, radio telephone and telegraph equipment, meters and measuring instruments, batteries and

resistors. Magnetic sound recorders were also produced, although these were few in number.

However, on April 15, 1945, the Yoshida Factory lost 11 buildings in an air raid, sustaining damages that reached a total of JPY20 million. Nevertheless, production of telephones, radio telephone and telegraph equipment, batteries and resistors resumed. Unfortunately, the Company encountered financial difficulties after the war, and the Yoshida Factory was closed in May 1950. However, the idle materials from the factory (215 square meters of warehouses) were effectively utilized; for example, construction material was used in the enlargement of Yokohama City Takata Elementary School, and part of the factory site became the grounds of Yokohama City Nitta Junior High School.

Meanwhile, with regard to the magnetic sound recorder, the manufacturing department was eliminated after the war. With the closure of the Yoshida Factory, patent rights for Patent No. 136997 were transferred to Nippon Electric Company, Limited (NEC) and Tokyo Telecommunications Research Institute (present Sony) in November 1949. As this tumultuous period came to an end, a chapter of Anritsu history closed as well.



The Kobe Sales Office was opened just beside the port in 1917. The Kobe Central Post Office now stands on the site.

## Tracing 120 Years of Anritsu History

Kobe-city Chuo-ku area (Present: 6-chome, Sakaemachidori, Chuo-ku, Kobe-city)

Kobe saw an unprecedented surge in its shipping and shipbuilding economy with the start of the First World War in Europe in 1914. Annaka Electric Co., Ltd., one of the predecessors of Anritsu, opened its Kobe Sales Office responsible for installation and maintenance of marine radio equipment in this port town where an exotic atmosphere hung in the air.

### First Anritsu Sales Office Opened in Bustling Kobe

The history of the port town of Kobe began on January 1, 1868, two days before the Decree for the Restoration of Imperial Rule. The area formerly home to the Navy Steerage Training Center was opened as an international trading port. Western-style buildings lined the streets of the Foreign Settlement and the Yamanote area, where Western people went to and fro. This was indeed the world of "civilization and enlightenment" advocated by modernizers in the Meiji period.

Moving ahead to 1914, the outbreak of the First World War in Europe brought a previously unparalleled economic boom to Japan, which was outside the war zone, due to a sudden rise in export products. The industrial structure would also undergo tremendous change, including rapid expansion of industrial production and progress in heavy chemical industries. Kobe saw more and more economic activity as a shortage of vessels worldwide spurred on accelerated development of the shipping and shipbuilding

industries. Amid these circumstances, shipping lines to Europe and the U.S. flourished, including those of Nippon Yusen and Osaka Shosen, and the importance of marine radios grew accordingly. Then, in 1917, Annaka Electric Co., Ltd. opened its Kobe Sales Office in a wooden building near the Port of Kobe, which was marking the 50th anniversary of its opening. The main business of Anritsu's first sales office was installation and maintenance of marine radio equipment for which demand was increasing at the time. Annaka Electric Co., Ltd. supplied key components for the naval type 36 radiotelegraph that had radioed the message "enemy ships sighted" during the battle of the Sea of Japan in 1905, and made its name with the related Annaka type radio equipment (Ministry of Communications and Transportation type quenched spark transmitter and type D receiver). Both in name and in fact, Annaka Electric Co., Ltd. was a leading presence in Japan's wireless communications industry.



- ① Map from the time of the Kobe Sales Office opening. You can see that the office was right beside the port.
- ② The Kobe Sales Office in 1952. The location was slightly to the east of the original site.
- ③ A current view of the location in ②. (The neighboring building is still there.)
- ④ Nippon Yusen Terukuni Maru
- ⑤ 2kW Remote Operation Wireless Transmitter for foreign route ship
- ⑥ Kobe today

## Wireless telegraph message travels over 10,000 km from the coast of Italy to Japan

Annaka Electric Co., Ltd. supplied a 500W vacuum tube transmitter as a marine radio to the Osaka Shosen Bujun Maru in 1925. In 1928, even after the collapse of the economic boom known as the "Taisho bubble" resulting from the wartime surge in exports to Europe mentioned above, orders were received for ART-253 vacuum tube type Remote Operation Wireless Transmitter to be installed on five excellent vessels newly-built by Nippon Yusen for foreign routes. In 1930, one of these ships, Terukuni Maru, sent a radio telegraph message while travelling on the Mediterranean Sea off the coast of Italy. Those radio waves were received by the Choshi radio station and Ochiishi radio station over 10,000 km away. The event was reported in the newspapers at the time as the greatest achievement in Japan's radio telegraph history.

The Terukuni Maru, in addition to regular twice-monthly routes from Yokohama to London, was also a luxury passenger ship that toured the cities along the North Sea coast including Antwerp, Rotterdam, and Hamburg as the "North Continental Cruise." The ship's interior design, said to have been popular with foreigners, incorporated many Japanese elements such as the maki-e lacquer art by Gonroku Matsuda, who later became a Japanese National

Living Treasure, that was featured in the deluxe cabin salons. A 300W transmission power short wave-length transmitter was installed on the vessel, and the Asama Maru, which travelled the North American routes, carried the same type of transmitter.

However, dark shadows began to fall over the ensuing years. What became of the Kobe Sales Office afterwards? In 1942, in the middle of the Pacific War, the Kobe Sales Office was integrated into Senpaku Musen (Marine Radio) KK and dissolved, and reopened after the war as the Kobe Sub-branch Office in 1946. Deteriorating performance at the company led to the independent establishment of Anritsu Electric Industrial Co., Ltd. in 1949, which dissolved in 1952 when performance recovered, and the office was launched again as the Kobe Sales Office. It closed eventually in 1965, after the Osaka Sub-branch Office became the Osaka Branch Office, and reopened in 1982 as the Kobe Branch Office. Its long history came to a close in 1999.



The world's first practical wireless telephone was installed in the Kamishima Lighthouse official residence in 1914.

## Tracing 120 Years of Anritsu History Toba, Mie Prefecture

**TYK Radio Telephone, the world's first practical wireless telephone, which can be called the origin of the smartphones and cellular phones whose usage everyone takes for granted today.**

**In this installment featuring places connected with Anritsu, we turn to Mie Prefecture's Toba, Kamishima, and Toshijima where the TYK Radio Telephone was born.**

**As shipping grew in importance, there was a keen desire for safe and rapid information transmission at difficult sea crossings**

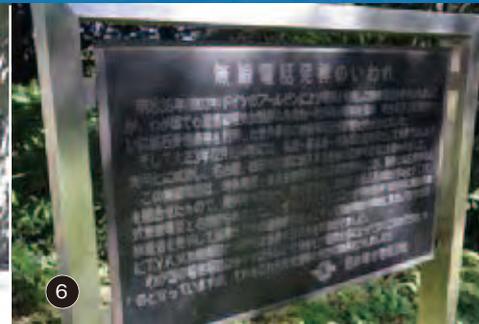
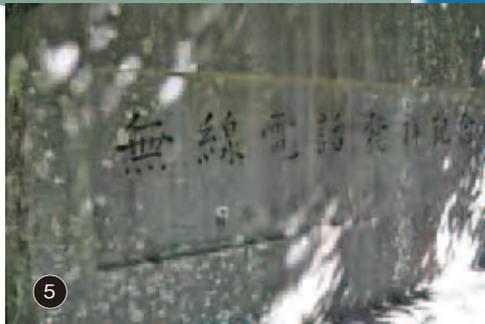
Toba City is located in eastern Mie Prefecture; overlooking Ise Bay, the entire city is designated as part of Ise-Shima National Park. This scenic fishing port played a key role in information communications history as the place where voice-based wireless communication received practical application for the first time in the world.

It was the end of the Meiji period (1868 - 1912). Shipping was gaining increasing importance as industry developed, and Toba played a role as a hub leading to Nagoya and Yokkaichi. However, the Irago Channel between Kamishima and Iragomisaki was a difficult crossing that had even been sung about since days gone by in sea chanteys that ranked Irago among the three most difficult straits in Japan: "Awa no Naruto (Rapids of Awa-no-Naruto), Ondo-no-seto (Straits of Ondo), and Iragodoai are dreadful." Furthermore, at the time, people often had trouble loading and unloading since they prepared the barges after they saw the ships

from the port, so the local Chamber of Commerce and Industry wanted to convey information about the ships to the port before they entered. They submitted a plan to the Ministry of Communications and Transportation to lay an undersea cable between Kamishima and Toba, where it is suitable for observing ships. However, after considering the cost and other factors, the Ministry of Communications and Transportation decided to introduce the TYK Radio Telephone. Radio Telephone Offices were set up in three places including Toshijima, which had requested the installation of an undersea cable.

**The world's first public communications service using a wireless telephone which began at the entrance of Ise Bay**

The TYK Radio Telephone was installed in the Kamishima Lighthouse official residence in Kamishima, in the Toshijima Town Office in Toshijima, and in the Hiyoriyama Guiding Light official residence in Toba. Then, on December 16, 1914, the world's first public telephone service via a voice-



- ① Toba, Kamishima, and Toshijima from the Meiji (1868 - 1912) to Taisho (1912 - 1926) periods. Kamishima Radio Telephone Office, Toshijima Radio Telephone Office, Toba Radio Telephone Office Toba Port, Irago Channel, Iragomisaki
- ② Panoramic view of Kamishima
- ③ The Denshin Kyoku (Telegraph Bureau) of the time
- ④ TYK Radio Telephone
- ⑤ The Memorial for the Cradle of Wireless Telephone, which stands near the peak of Hiyoriyama, located south of Toba Station (Kintetsu Toba Line)
- ⑥ Explanatory panel for the Memorial for the Cradle of Wireless Telephone

based wireless communications system got underway. In this service, when a ship heading for Nagoya or Yokkaichi passed close to Kamishima, the name of the ship, its destination, the nature of the cargo on board, etc. were reported to Kamishima Lighthouse via flag semaphore. From Kamishima Lighthouse, the information was reported to Toba by TYK Radio Telephone, and transmitted to the owners of the cargo and ship by telegram from Toba. As a result, owners were able to promptly grasp docking information, which contributed to increased efficiency in loading and unloading operations.

### Residents of a small island utilize the most advanced means of communication of their time

The contribution of the TYK Radio Telephone was not limited to loading and unloading operations. In Toshijima and Kamishima, fishing was also a thriving industry. However, the two islands had no means of telegraph communications at the time. They had to rely on a ferryboat even to use the telegraph to get market price information, and as a result, this information of great importance for shipping the catch could not be obtained until the next day. Use of the TYK Radio Telephone made it possible to get market price information on the same day, which was a great convenience.

“Uta-jima – Song Island – has only about fourteen hundred inhabitants and a coastline of something under three miles”: thus begins Shiosai, a novel by Yukio Mishima set in Kamishima. The residents of this small island are said to have boasted about the TYK Radio Telephone saying, “Nagoya brags about being ‘the big city between Tokyo and Kyoto,’ but they are still using the wire telephone.” And on Toshijima, where many villagers had doubts about the success of the TYK Radio Telephone, the village mayor faced a vote of expulsion for deciding on his own authority to go ahead with installation. However, once people began to use the service, they valued its tremendous convenience; the mayor came to be revered like a god, and the telephone became a source of pride for the local residents of the time.

The TYK Radio Telephone helped to modernize ship navigation systems and kept oceans safe and secure, but after more than eight years of service, its role came to an end on July 15, 1923, with the emergence of vacuum tubes, which further improved the quality of radio waves. The newest advances of civilization that blossomed on isolated islands of Toba now send a message from Hiyoriyama through a stone monument about Japan’s accomplishments in world-leading innovation.



The Technical Institute for Wireless-Communications was created in 1918 from a private training center in the Annaka Electric factory, and became the University of Electro-Communications of today.

## Tracing 120 Years of Anritsu History Chofu, Tokyo

The Taisho Era (1912-1926) saw a blossoming of popular culture such as movies and radio that became known as "Taisho Roman." It was also a period when the lack of marine wireless communication engineers became an issue for society. This installment tells the story of the establishment by Annaka Electric Co., Ltd. (predecessor of Anritsu) of Japan's first privately operated training center for wireless communications engineers, which was the origin of the current University of Electro-Communications (UEC).

### Wireless communication equipment in the Taisho Era, when Annaka Electric Co., Ltd. stood unrivaled in the field

Japan's wireless communications technology achieved astonishing development from early on, including successful contact between Tsukushima and Kanasugioki, a distance of 1.8 km, in November 1897, just two years after Marconi's invention of the wireless telegraph. In 1903, the navy adopted the Type 36 radiotelegraph, capable of communication at a distance of 370 km, which was installed on most naval vessels just before the Battle of Tsushima and contributed to the sighting of the Baltic Fleet. It was Annaka Electric Co., Ltd., one of the founding companies of Anritsu, that developed the induction coil described as the heart of the Type 36 radiotelegraph. The Annaka-type induction coil was outstanding, recognized by the highest acclaim in tests at the Imperial University Faculty of Engineering, and evaluated at "8% superior"

in comparison tests with German products. As a result, wireless equipment in the Taisho Era was almost entirely dominated by Annaka Electric, which truly displayed an unrivaled command of the field. In these circumstances, the Wireless Telegraphy Act was enacted in 1915, and ship owners were under pressure to install wireless telegraphy quickly. Furthermore, Japan-U.S. wireless communication services began between the Funabashi Wireless Telegraph Station and the Kahuku Wireless Station (Hawaii) in the following year. At the time, Japan's shipbuilding industry was continuing its remarkable development, making the country competitive with world powers as a maritime nation, so there was growing demand for marine wireless from shipping and merchant marine as well as fishing vessels. Then it was the lack of engineers to operate the wireless equipment that became a major problem.



- ❶ Type 36 radiotelegraph
- ❷ First marine-use type wireless telegraph device
- ❸ ART-922 marine-use shortwave transmitter (manufactured by Anritsu Electric, October 1942)
- ❹ A bustling Osaka fish market during the Taisho Era
- ❺ Quenched spark transmitter
- ❻ Rokuro Aoyama, the first president of Annaka Electric
- ❼ Vicinity of Ikuramachi, Azabu-ku, from the time of the Technical Institute for Wireless-Communications

## Founding of Japan's first private training institute for wireless communications engineers

It was Rokuro Aoyama, who later became the first president of Annaka Electric Co., Ltd., who tackled the problem. In September 1916, Aoyama set up the "Imperial Wireless Telegraphy Training Course" in the Annaka Electric factory in Hongo Kikuzaka, Tokyo. This would become Japan's first private training institute for wireless communications engineers. The facilities of the entire factory were made available for experimental use. The training course was transferred voluntarily to the Wireless Association in 1918, and in December of the same year, the association established the "Technical Institute for Wireless-Communications" (Ikuramachi, Azabu-ku, Tokyo City). Until being made part of the Ministry of Communications in 1942, the institute contributed to Japan's wireless industry as a private training institute by educating many excellent personnel.

So, what was the fate of the training institute after it was transferred to the Ministry of Communications?

In April 1945, it was renamed the "Central Technical Institute for Wireless-Communications," and in August 1948, was transferred to the Ministry of Education as a result of government reorganization. The following year,

in May 1949, when the National School Establishment Act took effect, it opened as the University of Electro-Communications, a university under the new system of education with a Faculty of Electro-Communications. The departments of Maritime Communication, Communication Engineering, and Electric-Wave Engineering were set up as specialized courses in communications.

The UEC Museum of Communications, located on part of the current campus in Chofu City, Tokyo, collects, stores, and exhibits historical equipment and materials related to education and research at the university, such as wireless devices and computers. Many devices connected to Anritsu are also on display, such as the quenched spark transmitter, the first marine-use type wireless telegraph device, and marine shortwave transmitters.

The connections that have linked Anritsu and the University of Electro-Communications since the Taisho Era still hold firm today, and every year students who have studied at the university join the Anritsu Group and play an active role as engineers.



Hamamatsu Advanced Technical School, which was about two kilometers northwest of Hamamatsu station on the JR Tokaido line, is where Japan's first television transmitter, designed and manufactured by Anritsu Electric Co., Ltd., was delivered.

## Tracing 120 Years of Anritsu History

### Hirosawa-cho, Hamamatsu-shi, Shizuoka (now Hirosawa, Naka-ku, Hamamatsu-shi)

In the 1930s, as European and North American countries were actively engaging in preparation activities to achieve TV broadcasting, Japan, keeping pace with the world, was also advancing the development of TV broadcasting. In 1933, Anritsu Electric Co., Ltd., designed and created the first Japanese short-wave transmitter for TV broadcasting by request from Mr. Kenjiro Takayanagi, known as “the father of Japanese TV.” This marked the dawn of the age of Japanese TV.

#### The first image broadcast on Japanese TV was the Katakana character [イ] (i)

With the aim of realization by the 2020 Tokyo Olympics, 4K TV broadcasting standard (resolution: 3840 x 2160 pixels/ equal to about 8 megapixels), which can provide precise image four times more than the currently common full HDTV (resolution: 1920 x 1080 pixels/ equal to about 2 megapixels), has begun to be fully implemented, and even the development of 8K TV (resolution: 7680 x 4320 pixels/ equal to about 33 megapixels) is advancing. Japanese TVs are now at the cutting edge of the world, but it was Anritsu Electric Co., Ltd. that made the first short-wave transmitter for TV broadcasting in Japan.

In 1924, Mr. Kenjiro Takayanagi, who was an assistant professor at Hamamatsu Advanced Technical School, (currently, the Department of Engineering, Shizuoka University) which was newly established in Hamamatsu, began researching “wireless distance vision” (currently, television), which he had been considering for some time. In 1926,

he succeeded in showing the character [イ](i). Eijiro Takagishi, the first Senior Manager of Research Department at Anritsu Electric Co., Ltd., had been at Kuramae Advanced Technical School together with Mr. Takayanagi. It is said that with such a reason, Anritsu Electric Co., Ltd. was asked by Mr. Takayanagi to design and create the broadcast transmitter. Yukio Muramatsu (ex-Senior Vice President), a member of the Machine Designing Department responsible for manufacturing parts, assembly and wiring, and inspection right after graduating from the Department of Electronics at Tohoku University and joining Anritsu Electric Co., Ltd., looks back on those days as follows. “Since above all it was so new, we really struggled. There were spec changes in the middle of the project, a hasty increase in power to reach effective value 75 watt output, and so on. Even as we began the manufacturing phase, we had some difficulties in processing parts in the built-in oven-controlled crystal oscillator, selecting lead wires, and so on.”



- ❶ Anritsu Electric Co., Ltd.'s short-wave transmitter for TV broadcasting.
- ❷ Mr. Takayanagi, when he was researching at Hamamatsu Advanced Technical School (right).
- ❸ Old-fashioned cathode-ray tube TV.
- ❹ Takayanagi Memorial Hall at the Hamamatsu campus of Shizuoka University, formerly Hamamatsu Advanced Technical School.
- ❺ The area around Hamamatsu Advanced Technical School at the time.

## Design and manufacturing of Japan's first TV broadcasting device Success in transmitting test waves

At the end of October 1933, Muramatsu visited Hamamatsu Advanced Technical School with the completed broadcast transmitter and worked on adjustments repeatedly with Mr. Takayanagi for about two and a half months. The transmitting antenna was gold-plated for electronic and advertising effects and was said to have glittered in the morning sun.

At last, on the day of test transmission, under the watch of an engineer from the Ministry of Communications and Transportation, they waited to begin the test until after the Hamamatsu radio broadcast ended at 10:00 p.m.

"Sensitivity 5, frequency OK."

Report of success came in from the Iwatsuki Receiving Station. Muramatsu recalls that it was the moment when all fears vanished.

The image "appeared as though through a bamboo blind," and it is told that Mr. Takayanagi said "It must be as good as a movie."

In 1936, with the goal of practical application in sight, in order to broadcast the Tokyo Olympics live, which was four years away, Mr. Takayanagi joined NHK, and in 1938 the Television Investigation Commission decided on a provisional scanning standard which requires 441 scan lines, 25 frames

per second, and interlaced scan.

Unfortunately, the 1940 Tokyo Olympics ended up as a phantasm, and television research was put on hold for the war, but technological innovation and research into actualizing broadcast resumed after the war ended.

In 1949, television broadcasting began, and in 1960, color television broadcasting has also started. After that, TV monitors continued to evolve from cathode-ray tubes to LCD, LED and so on, and broadcast transmission shifted from analog to digital, as you all are aware.

Japanese television technology is at the top of the world. Even in the early days of television in Japan, Anritsu has left a solid footprint.



**A transmitter made by Annaka Electric was used as backup equipment at the Tokyo Radio Station in Atagoyama, where Japan's first regular radio broadcast was conducted.**

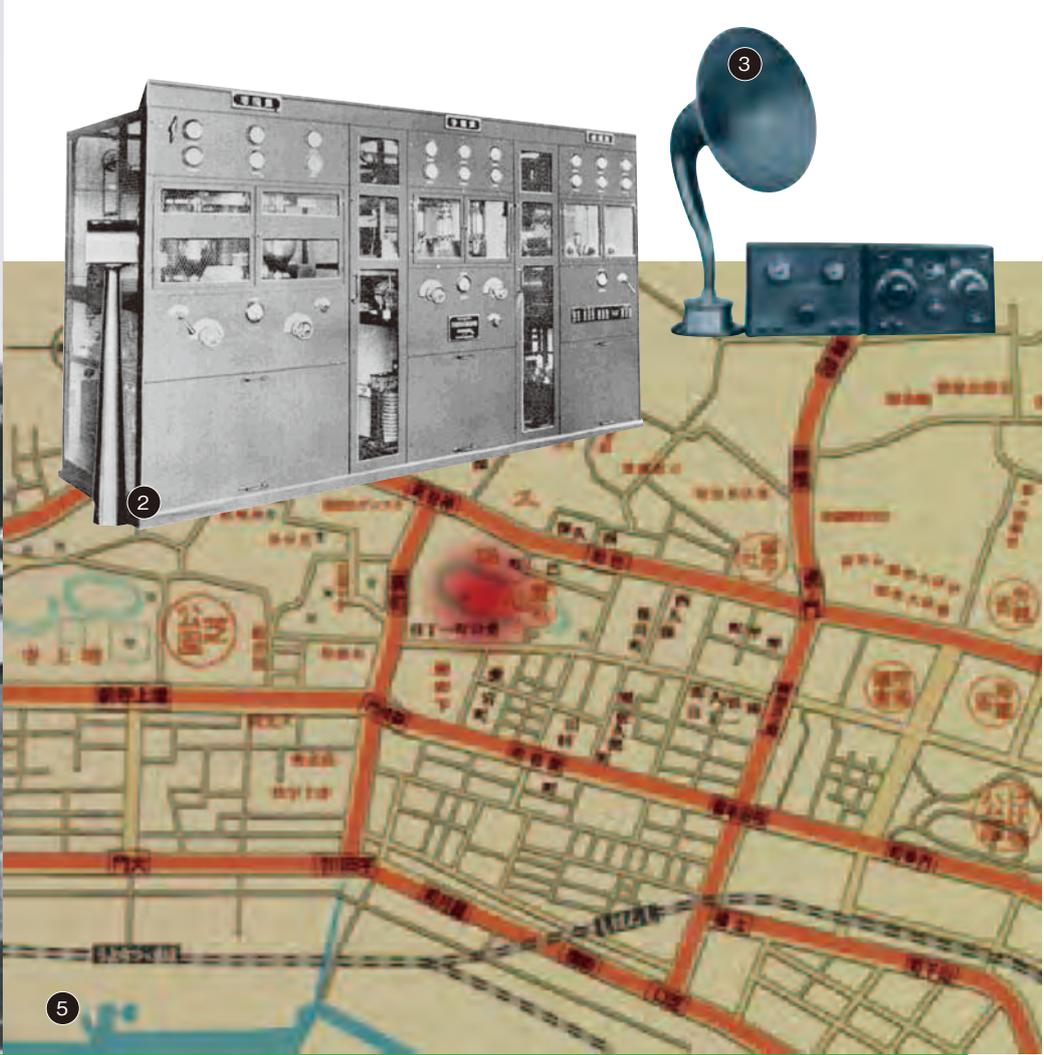
## **Tracing 120 Years of Anritsu History** **Shiba-ku, Tokyo-shi, Tokyo-fu (now Minato-ku, Tokyo)**

**It was in the Taisho Era (1912-1926), when the usefulness of the wireless telephone as a means of communication linking ship and port began to be widely known, that broadcasting of information simultaneously from a single transmitting station to multiple receivers, or in other words, "radio," got its start. During this period, Anritsu supported the dawn of radio broadcasting through the design and manufacture of both transmitters and receivers.**

### **Annaka Electric's Radio Transmitter Used at Tokyo Radio Station at Atagoyama**

"Ah, ah, can you hear? ... JOAK, JOAK. This is the Tokyo Radio Station. We will now begin the broadcast."  
This was the first radio voice broadcast in Japan, heard in the city of Tokyo at 9:30 a.m., on March 22, 1925. There are said to have been approximately 3,500 receiving contracts when the official broadcast was made from a temporary transmitting station in Shibaura, Tokyo. Five years earlier, in 1920, the world's first radio station had opened in Pittsburgh, U.S.A. The news quickly spread to Japan, and interest in radio grew. Magazines about making receivers were published, and experimental broadcasts were conducted by newspapers.  
The Great Kanto Earthquake that struck in September 1923 made people aware of the importance of radio as a medium for communicating information. In December of the same year, the Ministry of Post and Communications established Regulations on Privately Established Wireless

Telephones for Broadcasting, and in the following year came out with a policy to permit radio broadcasting businesses in Tokyo, Nagoya, and Osaka. On July 12, 1925, some four months after the temporary broadcast, the Tokyo Radio Station began regular broadcasts from the regular broadcast facilities at Atagoyama. At this time, a 500-watt transmitter made by Annaka Electric was used as backup equipment for broadcasting equipment made by Western Electric.  
Incidentally, the first chief engineer at the Tokyo Radio Station when it opened was Masajiro Kitamura, one of the developers of the TYK Radio telephone.



- ❶ The Tokyo Radio Station in Atagoyama, which launched regular radio broadcasting (photographed in July 1925)
- ❷ Manufacture of 500-watt broadcasting equipment for Fukuoka Broadcasting Station in May 1930
- ❸ First radio produced in Japan (ANNAKA AR37)
- ❹ Children listening to the radio
- ❺ Area around Tokyo Radio Station at the time

### Successful Manufacture of Made-in-Japan Radio Receivers Meeting Strict Standards

At that time, Annaka Electric had established a firm position in the wireless industry, to the point where it would be fair to say the company had a near monopoly on wireless equipment products such as the TYK Radio telephone.

With the implementation of radio broadcasting in Japan, foreign-made receivers and speakers naturally began to flow into the country. In this context, Annaka Electric took the lead in efforts to produce such products domestically, and carried out a defensive fight against imports. Radio receivers of the time were subject to restrictions in types and wavelength, and it was quite costly to manufacture receivers that would receive type certification; as a result, it is said that profit-focused operators ignored the manufacturing of equipment. Nevertheless, Annaka Electric devoted itself to manufacturing receivers under these demanding conditions, and succeeded in bringing to market products that would serve as models for ordinary manufacturers.

The receivers sold like hotcakes, with some customers even showing up at the Annaka Electric offices with the money to purchase a set. What's more, engineers in those days, after finishing work, would bring the radios that had been assembled during regular hours to the people who had ordered them and set them up. Stories are still told of how

the engineers were sometimes treated to fabulous dinners by customers when they were able to listen to the radio right away.

However, the regulations of the Ministry of Post and Communications soon changed, and type certification was no longer required for receivers. With that, local radio shops began selling low-priced products, and demand for Annaka Electric's radio receivers unfortunately dried up. On the other hand, as the broadcasting business developed, Japan Broadcasting Corporation announced a policy of using domestically produced broadcasting equipment rather than the foreign-made equipment mainly used previously. Annaka Electric was the first to respond to this change, and designed and manufactured a 500-watt broadcasting equipment that was delivered to the Fukuoka Broadcasting Station in May 1930. This was the first broadcasting equipment produced in Japan. Anritsu's wireless technology has clearly left its mark on the history of radio stretching over 90 years.



Location of Japan's first wireless telegraph station, which was supplied with a spark-gap transmitter made by Annaka Electric. Choshi Port Tower now rises over the site.

## Tracing 120 Years of Anritsu History

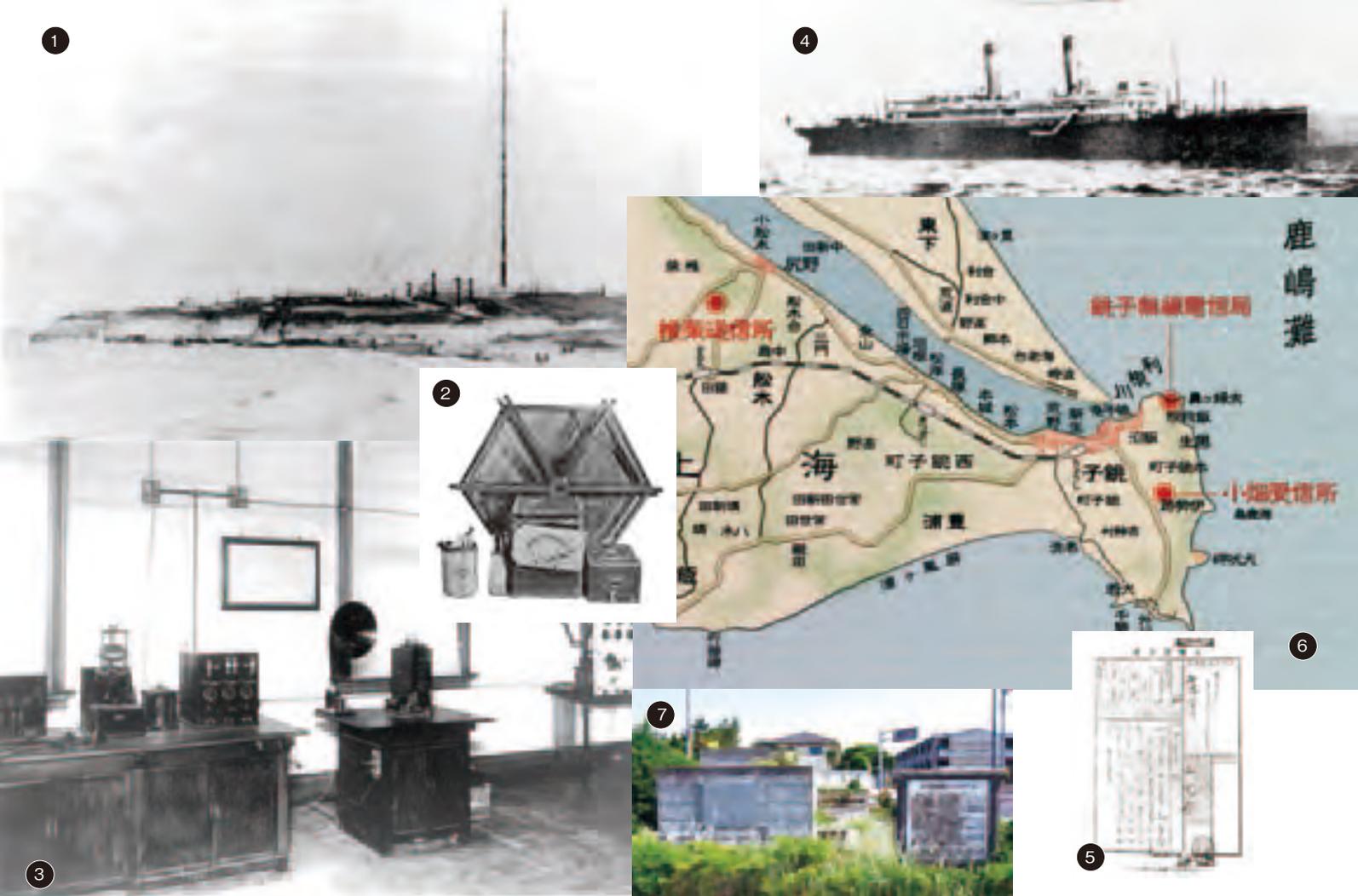
### Motochoshi-machi 6385-banchi, Kaijo-gun, Chiba Prefecture (currently Kawaguchi-cho 2-chome, Choshi-shi, Chiba Prefecture)

The first International Wireless Telegraph Conference was held in Berlin in 1906, where the International Wireless Telegraph Convention was concluded, establishing international regulations on wireless communications. Two years later, coastal stations were opened in Japan to conduct wireless communication with ships. Spark-gap transmitters made by Annaka Electric Co. ("Annaka Electric", Anritsu's predecessor) were supplied to wireless telegraph stations and ships, and played an important part in marine public telegraph services.

#### International regulations for marine wireless communications established at First International Wireless Telegraph Conference

In December 1901, Marconi, the father of wireless telegraphy, made a successful attempt at trans-Atlantic communication across a distance of approximately 3,400 km from Cornwall, UK, to the island of Newfoundland in Canada. Following this, practical applications of long-distance communication were developed, and at the same time, companies such as UK's Marconi Company and Germany's TELEFUNKEN engaged in intense competition as they expanded their spheres of influence, including for shipboard stations. Use of wireless communication thus increased, and nations in Europe and North America began to take an interest in its utility. It was in this context that the plenary meeting of the first

International Wireless Telegraph Conference took place in Berlin, Germany in 1906, with 29 countries participating. A delegation of six people attended from Japan, and the creator of the Type 36 wireless telegraph, which was firmly established at the time, Professor Shunkichi Kimura was among one of them. The results of the conference were collected in the International Wireless Telegraph Convention, and 23 articles covering wireless telegraph stations (coastal and shipboard stations) that handled public wireless communication services between land and ships at sea was established. With this, attention turned toward public communication services even in Japan, which had previously focused on military use of the technology.



- 1 Choshi Wireless Telegraph Station in the early Taisho Era (1912-1926)
- 2 Main parts of a spark-gap transmitter
- 3 Interior of Ochiishi Wireless Telegraph Station (Nemuro-gun, Hokkaido)
- 4 An ocean-going vessel of the time
- 5 Japan's first public wireless telegraph (sent from the Tangomaru)
- 6 Area around Choshi Wireless Telegraph Station at the time
- 7 Commemorative monument at the Birthplace of the Wireless Telegraph Industry (in the parking lot at Choshi Port Tower).  
Inscription reads "Birthplace of Wireless Telegraph Industry. Site of Choshi Wireless Telegraph Station. Opened May 16, 1908. 2,600th anniversary of founding of Japan. Ministry of Posts and Communications."

## Annaka Electric spark-gap transmitters supplied to coastal stations and ocean-going ships

In preparation for the opening of wireless telegraph stations, the Ministry of Post and Communications began training wireless technicians and communications operators in 1907. Preparations were moved ahead rapidly, along with domestic production of wireless telegraph equipment.

The following year, on May 16, 1908, the Choshi Wireless Telegraph Station opened as Japan's first coastal station. In addition, a shipboard station opened the same day on Tenyomaru, followed 10 days later by stations on Tangomaru, Iyomaru, and other vessels. Furthermore, Shionomisaki Wireless Telegraph Station (Wakayama Prefecture), Tsunoshima Wireless Telegraph Station (Yamaguchi Prefecture), and Osezaki Wireless Telegraph Station (Goto Islands, Nagasaki Prefecture) opened in July, and in December, Ochiishi Wireless Telegraph Station opened in Nemuro-gun, Hokkaido. Annaka Electric's spark-gap transmitter played an important part in this development, being supplied to this series of newly opened coastal and shipboard stations. The first station opened was Choshi Wireless Telegraph Station. It was set up at Hiraisodai on the northeast end of what was then Motochoshi-machi, Chiba Prefecture, a spot considered well suited for sending and receiving marine

wireless communications because it was located at the tip of the Choshi Peninsula and projected into the Pacific Ocean. On May 27, 1908, wireless communication was achieved off the coast of Nozaki Island (Boso Peninsula, Chiba Prefecture) with Tangomaru, which had left the port of Yokohama heading for Seattle in North America. This was Japan's first wireless telegraph. Records show that the shipboard station on the Tangomaru carried on communicating for 13 hours through the night until 9 a.m. the next morning, and over 30 telegraphs were processed.

The receiving station and the transmission station of Choshi Station, which will thereafter make substantial contributions to marine public telegraph service in Japan, were later moved to Kobatakeshinmachi, Choshi-shi, and Nojiricho, Choshi-shi (which later became the Choshi Wireless Telegraph Station). Handling communications with ships traveling the seven seas and with Showa Station in Antarctica, among other places, Choshi has played its part as one of the world's leading wireless telegraph stations in both name and in fact. Having supported Japan's marine transportation, the station concluded its service in March 1996.

Meanwhile, Anritsu's wireless equipment continued to develop with the adoption of improvements and advanced technology, and helped to protect safety at sea until the Company withdrew from the ship communications equipment business in 1999.