Made in Japan - SONY's first transistor radio

(by Lello Salvatore *)

Fig.1: A Japanese girl shows the first transistor radio with the Sony brand: the TR-55. The model TR-72 from 1956 can also be seen on the left.

Brief history of Sony from 1945 to 1958

After the first atomic bomb was dropped on the city of Hiroshima on August 6, 1945, and three days later also on Nagasaki, ultranationalist and diehard Japan surrendered to the Allied powers, effectively marking the end of World War II. Itwas 12 noon on August 15, 1945 when Japanese radio could finally broadcast Emperor Hiroito's message announcing to his people Japan's unconditional surrender**:** on September 2, aboard the battleship Missouri anchored in Tokyo Bay, the Act of Surrender was signed[1]. The large, silvery American four-engine bombers, the Boeing B-29s, ceased to fly over, with their cargo of death, a country they had almost completely destroyed, where many cities looked like places where there was not hingleft to bomb[2]. Japan was occupied militarily and administratively by U.S. forces with the support of British forces until 1952, and the Japanese, in addition to having to struggle with hunger, poverty and disease, found themselves living those years following the end of the war with despair and deep collective prostration reported in the press as*kyodatsu*[3]In the Japanese capital, Tokyo, the war time disaster was worse than the 7.9-magnitude earthquake that had struck it, along with the entire Kantōregion (east-central Japan), on September 1, 1923.Against this catastrophic backdrop, in the fall of 1945, Masaru Ibuka (1908-1997) and AkioMorita (1921-1999), two men who had met during the war at meetings of the Wartime Research Comittee, a small group composed of army, navy, and civilian researchers who were all working on the design of heat-seeking devices, found themselves in Tokyo. When they met, Ibuka, one of the civilians in the group, a brilliant electrical engineer who graduated from Waseda University as wellas an inventor, was personally running NihonSokuteiki, or Japan Measuring Instrument Company, in Tokyo. Akio (pronounced Aki) Morita, a young man who had recently graduated in physics from Osaka Imperial University, was a naval second lieutenant

serving in Zushi, a small town across Sagami Bay. Although Ibuka was thirteen years older, the two men became close friends, and Ibuka was destined to have much influence in Morita's life. By September 1945, Ibuka had moved to Tokyo, where, a month later, in the central Nihonbashi district, he had set up a new firm, **Tokyo Tsushin Kenkyusho (**abbreviated to **Totsuken),** or Tokyo Telecommunications Research Laboratories, settling in the third-floor premises of what remained of the war-burned Shirokiya department store[4]. Here he had immediately set about making new and necessary items for daily needs: among the first were an electric rice cooker[5] made of wood with aluminum electrodes spirally arranged on the bottom and also a contraption for baking bread. The results were unfortunately disappointing for both artifacts while a very simple electrically heated cushion, unfortunately without even a thermostat control, which Totsuken devised and marketed under the fictitious brand name of *"Ginza NessuruShokai"* (Ginza Heating Company) starting in August 1946, had some luck. The conversion of all currency into the "new yen," imposed by the government as early as February of that year, had sent consumer prices soaring, and the design and sale of this product helped the company earn the new currency in a time of great shortage, providing some money for the families of the company's employees.But Ibuka's ideas were more interesting and still always tried to meet people's demands. In addition to selling vacuum tube voltmeters to various government offices, successful in those difficult beginnings and a real confidence booster for the firm was his design of an electronic single-vacuum tube shortwave converter. With this new electronic circuitry and a simple modification of the Medium Waves-band only (MW or BC-band) radio sets in use at that time in Japanese homes, Short-Waves (SW) radio transmissions, which were strictly forbidden during the war period because they were used by enemy propaganda but were now legalized under the new American administration, could also be heard. It was the ad on this converter, which appeared on October 6, 1945, in the *"Blue Pencil"* column of Japan'slargest newspaper, the Ashi Shimbun, which Morita was lucky enough to read in the Nagoya edition of the paper, that brought the two friends together. Just at that time Morita began, with the consent of his family (see footnote No. 6) his new job as a teacher at Tokyo Institute of Technology, and when he went to this city he immediately went to meet his friend Ibuka in Nihonbashi. The two friends were very pleased to see each other again and talked at length about setting up their own firm, recalling how they had both started thinking about it shortly after they met. Morita also had confirmation from his friend that, despite good sales of the electronic converters, the new firm's situation was difficult, that he was paying staff out of his own pocket, and that he was seeking financing. Morita said he was willing to help him in any way he could, and they both again entertained the idea of setting up another firm on their own, which they later decided to do in March 1946 as soon as they could work out the details. So it was that, the two visionary entrepreneurs, Masaru Ibuka, aged thirty-eight and his younger partner of twenty-five AkioMorita, pooled their resources (190,000 yen, a little over 500 U.S. dollars) and on the afternoon of May 7, 1946, they gathered, a total of about twenty executives and staff, on the third floor of the still-damaged Shirokiya department store building and where Ibuka had raised the Totsuken signboard the year before, to form their new company, which they called **Tokyo Tsushin Kogyo**, (shortened to **Totsuko**) i.e. Tokyo Telecommunications Engineering Company**[6].** Ibuka and Morita's new company did not want, as some within it suggested, to limit itself to making measuring instruments or short wave converters, nor to repairing or producing radio receivers for which there was also a strong demand in Japan. Effectively Ibuka was opposed to the production of radios, the industry's leading product at the time because he also believed that a small compagny like Totsuko would be unable to compete where major manufacturers were locking horns to produce bulky radios attached with a power cord, under the slogan "a radio for every household" *"The purpose of the company's founding was to 'create an ideal factory' that twould emphasize the spirit of freedom and open-mindedness and which, through technology, would contribute to Japanese culture."* and so much can be read in the 'Founding Prospectus'[7] that as early as January 1946 its founder Ibuka had drafted. From its very beginnings and as always later in the years, the new small company remained true to its basic concepts of being an innovative and intelligent company that produced new high-tech products in an inventive manner.

From the electronic vacuum tube recorder to the transistor radio

In August 1946 the Shirokiya department store was about to reopen so at Totsuko they were forced to move. After an initial makeshift location in one of Tokyo's older areas, in Kichijoji, in unsatisfactory premises, however, a few months later, on a cold January day in 1947, the firm began to move to Shinagawa, far south of the city, where it settled in a decrepit woodenshack, a dilapidated but spacious and very cheap location on Gotenyama Hill (Fig.2)[8] , once famous for the beauty of its cherry blossoms. Despite the hardships, the two partners never lost heart and while looking for an affordable item to put into production they realized that there were a lot of wartime and pre-war gramophones around and people wanted to hear from the records the new, popular swing and jazz music that the American occupation troops had brought with them. So there was a market for these items, and so in Totsuko they set about producing motors and phonograph heads for the old phonographs. These new parts produced by Totsuko wee as good as people could find in those days, and they kept the company financially afloat, which even managed to buy a third- or fourth-hand Datsun truck for the equivalent of a hundreddollars. However, making deliveries and transporting materials fell to the firm's two most senior executives (Ibuka and Morita) since they were the only ones with driver's licenses.

Fig.2

In 1947, thanks to referrals from a friend, Ibuka received a work contract from the U.S. Brigadier General in charge of NHK[9] to produce new technical equipment, such as mixing units and other studio and broadcast equipment. When the work was finished and handed over, the officer and his other colleagues were amazed that this new, small and unknown factory could bring out such a high-tech product: thus Totsuko could earn not only the money it needed but also the confidence of the occupying forces. In October 1947 their electric megaphone (power microphone) was also successful, but Ibuka always had in mind to produce a completely new consumer product, one that was unheard of or little known in Japan, a wire recorder that even Morita had attempted to make himself as a young high school student, fascinated by the fact that he could record his own voice. In 1948, assisted by his technicians, Ibuka disassembled and thoroughly studied a magnetic wire recorder that had been used by the Japanese army during the war. Later, thanks to his good relations with American officialsat NHK, he also got to know the magnetic tape recorder, the first one that had come under his eyes, that of the American company Wilcow-Gay, used by NHK and also the opportunity to show its operation to all his close associates in Totsuko.

The wire audio recorder did not hold a candle to the tape recorder, and the choice, almost unanimously, fell to the tape recorder. Confident of hisabilities and being able to count on a team of talented young engineers, once the decision was made he immediately started research on this type of magnetic tape recorder. They thus started from scratch noteven having an idea of how to build the magnetic tape that was the fulcrum of this new project and, after much trial and tribulation produced in September 1949 the first prototype recorder and tape which was followed by two more in January and February 1950. In the spring/summer of 1950 they were finally able to put on the market, the first in Japan, both the paper-based magnetite-coated recording tape they called **SONI-TAPE** and the magnetic tape recorder, the “Clear Voice” or G-type, big and stubby and weighing 35 kg, so indicated because it was intended for government offices and registered under the English name “Tapecorder.”

This was followed in 1951 by the H type, their first tapecorder for home use (where the H is the initial for home, meaning home in English) weighing 13 kilograms and housed in a briefcase-type

wooden case for easy portability. The school model, the P-type, was produced in 1952, and more and more sophisticated ones came in later years.

SONY Tapecorder by Totsuko, September 1953

Fig.3

It should be remembered that one of the keys to Totsuko's success in the recorder business was Dr. Kenzo Nagai's AC recording patent, which the company bought 50/50 from Anritsu Electric, a subsidiary of NEC (Nippon Electric Corporation)[10], and this patent enabled Totsuko to virtually monopolize the market. Interestingly, for the first time in the company's history the word **SONI** appears to indicate the name of the tape used for their recorders. Figure 3 shows the first page of four, of a September 1953 catalog/price list showing, at the top, the two SONI reels with the tape and the Totsuko logo (the stylized **T**) and where, in the table drawn at the bottom, the group of letters KW indicates the SONI paper magnetic tape while PW refers to the acetate type. In the second column of the table, the length in feet (ft.) of the tape isindicated; the duration follows and in the penultimate column the price in yen of the various types.

Sales of the tape recorders were going very well, the portable ones and the educational model (the P type) in particular, sold in all the schools in Japan and in 1951 what was a small company not only enlarged and renovated its headquarters in Gotenyama but increased its staff reaching about 120 employees in 1952, at hird of whom were high-level since they were graduates in electronic and mechanical engineering, as well as in chemistry. Now that other large and important companies such as Matsushita Electric Industrial Co., Ltd.[11] had also started selling tape recorders, Morita and his colleagues did not fear competition, confident that their products were competitive in quality and price. Although Japan was a fairly large and potentially active market, the time had come for Totsuko to expand and look at foreign markets in accordance with the unanimous opinion of Japanese industrialists that a Japanese company had to export in order to survive. In March 1952, Ibuka decided to go on a three-month exploratory trip to the United States to see for himself what use the Americans were making of tape recorders and, if possible, to observe how they were built by American companies on their assembly lines. From this point of view, the trip was a disappointment but, on the other hand, it was very important because it allowed him, through a Japanese friend living in New York, Shido Yamada, an expert stockbroker, a man of great respect and a good knowledge of the English language, to establish and maintain contact with Western Electric who were selling the patent for the transistor[12]. This device, equivalent in operation to the vacuum tube, had been invented in 1947at the Bell Laboratories and had since then been greatly improved by moving from the point-contact type to the junction type. Ibuka and Morita had already read about this new invention in the magazine "Bell Laboratory Record" and other specialized magazines and Ibuka, excited by the formidable technological innovation that this miraculous device, the transistor, promised, returned home bringing with him, in addition to a germanium diode and a vinyl table cloth (which did not exist in Japan at the time), the idea of being able to work on the transistor and prepare himself, together with his engineers and researchers, for this new challenge. The response from Western Electric took over a year (!), and in August 1953 Morita went to the United States to sign the contract for the use of the patent that had a cost of 25,000 dollars equivalent to about 9 million yen, an amount of money unimaginable for a small company like Totsuko. Here Morita, who like Ibuka, did not speak a word of English, found

Yamada again to assist him and accompany him everywhere, a person who despite not having working ties with Totsuko, had done a lot to inform the managers of Western Electric about the technological capabilities of this small but reliable company that alone had developed and produced, first in Japan, tape recorders. Since Totsuko still had to obtain approval from the bureaucrats of MITI (Ministry of International Trade and Industry), Morita hastened to sign a provisional agreement conditional on the approval of the Japanese government agency, approval that arrived after a few months (unofficially in January 1954). At the time of signing the contract, Western Electric engineers told Morita that the transistor was a very fascinating thing but, at least at this stage, it could only be used for audio purposes and so they strongly advised him to produce hearing aids or something similar when he returned to Japan. So, after signing the provisional agreement, Morita set out to collect as much reference material on the transistor as possible, hoping that it would prove useful. Once business in the United States was over, Morita left for his next destination, Europe, taking with him the only reference he had received from Western Electric, the book **"Transistor Technology"**[13], considered the bible of the transistor. The two partners, Ibuka and Morita, certainly had not bought the patent on the transistor to build hearing aids that were already being produced by American companies[14]; they wanted to produce something that could be used by everyone, and their dream was to make a radio, and to do so they first had to make transistors that could be work at frequencies much higher than acoustic, replacing the bulky, hot, and unreliable electronic vacuum tubes. Ibuka's genius had imagined building "personal radios", that is, a radio for each person, something small, portable and that did not require a power cord. A task force was immediately formed, headed by Kazuo Iwama, a thirty-five years old graduate in geophysics, Morita'sbrother-in-law, who at the beginning of January 1954 went to the USA to work at Western Electric and stayed there until April in order to study transistor technologies**:** his reports and notes sent while he was still in America were important and famous and on the basis of which his collaborators managed, by May, to produce the first prototypes of transistors, both point-contact and alloy-junction. However, since there was not yet a transistor capable of functioning at radio frequencies, the Totsuko technicians had to reconstructit and practically reinvent it.

They worked hard using for this radio frequency transistor the primordial technique of growth junction (or draw) adopted by Bell Labs and phosphorus for doping the germanium, a material that Bell Labs had abandoned. Eight or nine months after the patent was acquired, they had the hoped-for success and by the end of October 1954, the first Totsuko transistors, the **2T14** type, and the **1T23** type diodes were on sale, at 4,000 yen (the monthly salary of a managing director at the time in Japan) and 320 yen each, respectively, at the exhibition on transistors and transistorized products held at the Mitsukoshi department store in Tokyo. The Iwama group involved in developing the first Totsuko transistors and, before them, the complex apparatus needed to produce them (including the induction furnace), included physicists TetsuoTsukamoto and Saburo Iwata, mechanical engineer Sukemi Akanabe, chemist Akio Amaya, electrical engineer Junichi Yasuda and others from various fields. It is worth remembering that in the first half of the 1950s, in parallel and contemporaneously with Totsuko, other larger and already established electrical companies in Japan had begun research and development of semiconductor technologies (diodes and transistors) and among these Hitachi, Mitsubishi Electric, Toshiba and Kobe Kogyo signed agreements on transistor technology with Western Electric in 1954[15] a few months after Sony. These companies were soon joined by others that imported the technology from RCA and some from GE exploiting the patents of these American companies that used the alloy manufacturing process.On the website of the Semiconductor History Museum of Japan at the web page *https://www.shmj.or.jp/english/pioneers.html*, the Japanesepioneers of semiconductor technology are listed. From the writer and science communicator Yukio Shimura of the Society of Semiconductor Industry Specialistsat the web address

https://www.shmj.or.jp/shimura/shimura_E/ssis_shimura1_16E.html, we also learn that it was Kobe Kogyo, a small manufacturer of vacuum tubes, later acquired by Fujitsu TEN Ltd. and now in the hands of Denso TEN Global, to build in Japan, beforeTotsuko, point contact transistors and the same is reported below at the URL *https://www.shmj.or.jp/english/pdf/dis/exhibi310E.pdf*. Transistors with the ***TEN*** brand and junction type, are mounted in my beautiful shirt-pocket radio Kobe Kogyo model KT-61.

SONY TR 52

Fig.4

With r-f transistors now in place, Totsuko'sefforts focused on building a transistor radio (their dream!) with these new devices and this challenge was not without its ups and downs. In January 1955, the work bore fruit in the prototype of the TR-52 (Fig.4), a fairly small and practical radio, a pocket-sized one of decent size, which used five entirely junction transistors and smaller, miniature components, made specifically**:** a radio that was getting ready for mass production. The TR-52 would have been the first all-transistor radio in the world, but it was not be. While they were busy completing it, the news arrived unexpectedly from the USA that an all-transistor radio, the Regency TR-1, had been sold in stores since November 1954[16] (exactly 70 years ago this year!) at a price of $49.95. This fact encouraged Totsuko to work harder in the development of it stransistors and circuits. If only the MITI bureaucrats had authorized this company to conclude the purchase of the transistor patent earlier, this primacy would probably have belonged to the Japanese.... and that's what Ibuka thought.

In the spring of 1954 Morita made a second trip to North America to conduct market research and business discussions. On this two-month trip the entrepreneur took with him, along with otherTotsuko products, their $29.95 TR-52. One day in New York he also showed this radio to the famous and historic watch manufacturer Bulova and the company liked it so much that the purchasing manager wanted to order up to one hundred thousand pieces on the condition that he had to put the Bulova name on the radios, which Bulova had done with the Regency (see model 250). Even though it was a stratospheric and incredible order, impossible for littleTotsuko to sustain, Morita was adamant in refusing the offer, arguing that this company, although still unknown, wanted to establish itself in the world and continue for the next fifty years, just as Bulova had done since its inception. And, as Morita said to himself then, and as he often repeated to himself, that was the best decision of his life!

Before Morita left for America, Totsuko had started labeling all their new products with the Sony brand and this was because the company's managers had realized during their trips to the United States that Americans did not know how to pronounce either Tokyo Tsushin Kogyo or Totsuko and therefore it was useless to promote a product with an unpronounceable name; after all, a good name is essential for a company. Ibuka and Morita had been talking about the problem for a long time and were thinking of a new name for the company that was simple, easy to read, remember and pronounce in any language. Theydiscarded the acronym TTK, initials of Tokyo Tsushin Kogyo, very similar to the TKK of the Tokyo Kyuko railway company and the name “Sony” (only four letters of the Latin alphabet!) was the result of this process. Sony was the combination of the Latin word sonus, from which “sound” and “sonic” derive, with "sonny", English diminutive of "sonny-boys" which referred to bright and smart kids, hoping that their nascent company of young people would compensate in energy what it lacked in size.

In June 1957, Totsuko installed its first billboard with the name SONY in front of the entrance to Tokyo's Haneda International Airport and from January 1958 the company officially took the name of Sony Corporation and began to be listed on the stock exchange in December of the same year.
As for the TR-52, it unfortunately did not come to a good end. In the summer of 1955, a bad accident occurred that shocked Ibuka and his team but served as a good lesson. It happened that the white plastic front grille of the radio, in the heat of early summer, deformed and detached from the black cabinet, also made of plastic. The problem was not limited to a single set but to almost all of a batch of one hundred pieces produced, so it was never put on the market. Because of its design that recalls the United Nations (UN) building[17], the TR-52 is known among collectors as the "UN building radio" and has become legendary and remembered as the all-transistor radio that could have been the first to be marketed in the world but never was.

SONY TR 55

Fig.5

After this bad experience, every obstacle was finally overcome in that summer of 1955 when Totsuko began to mass produce and, starting from August[18], to market their first transistor radio, the first in Japan, indicated as model TR 55, evidently from the year of construction. Unlike the Regency TR-1 which uses only four Texas Instruments transistors, the TR-55 was the first all-transistor radio in the world to use transistors built by the same manufacturing company, Totusko: you can admire it in its splendid green color in the excellent photos that follow, starting from the one in Figure 5, kindly provided by radio collector Russ Abrams of the Facebook group *"Vintage Transistor Radios"*. On the front of the cabinet, above the large silver metal micro holes perforated grille, the set proudly displays the words "TRANSISTORIZED", extending over almost the entire upper side, in addition to the new Sony company logo that appears on the tuning dial with the indication of the numbers of the receivable frequencies (from 530 to 1,600 kHz). Below the dial, the tuning knob, also green, bears the embossed lettering of the company name "TOKYO TUSHIN KOGYO, LTD." Both, the name and the new Sony trademark, together with the words "MODEL TR 55" and "MADE IN JAPAN" are engraved in relief on the rear panel of the plastic cabinet (Fig.6) a cabinet with rounded corners measuring 5.5x3.5x1.5 inches (about 141x89x38 mm): in short, a pocket radio with horizontal orientation, a coat-pocket radio as American collectors say, in which the width is prevalent over the height. Also on the back there is a small plastic flap which

when turned reveals the earphone socket and the one for the external antenna.

Fig.6

(Fig.7)-

On the right side, at the bottom there is the on-off/volume control and at the top a small removable plastic cover which hides an adjusting screw for the tuning capacitor (Fig.8).

(Fig.8)

Fig.9

In those days there were battery-powered portable radios that used subminiature vacuum tubes and small components[19] but for a transistor radio even smaller, miniaturized components were needed and for these the Ibuka team was turning -starting with the TR-52- to individual manufacturers artisans by convincing them to make smaller pieces. The following photos show Russ's TR-55 disassembled to show the main parts that compose it: the cabinet with its front side without the tuning knob (Fig.9); the inside of the cabinet with the reverse side of the transparent plastic tuning dial made using the "reverse painting" technique and the three metal clips (Fig.10); the inside of the rear panel where there is a folded card, inside which the schematic diagram is printed (Fig.11); the lower side (the one not in sight) of the metal chassis with the speaker, the G-25 type made by Foster, with a diameter of 2.5 inches, approximately 64 mm (Fig.12); the upper side of the chassis (Fig.13) where we can see the metal variable tuning capacitor with air dielectric and equipped with a friction-type vernier, built by Kikuna Elec.Co and the the antenna, consisting of two windings rotated on a flat ferrite core 12 cm long, 1,8 cm wide and 0.4 cm thick, built by Totsuko itself and identified by the type number Ferrinver 503[20]. The chassis also houses a printed circuit bakelite board -another innovation of that time- where all the remaining electronic components are soldered including the five oval-shaped transistors and to complete, the compartment to house the 4 UM-3 type batteries (the very common 1.5 volt miniature or AA type batteries) to obtain a battery at 6 volts.

(Fig.10)

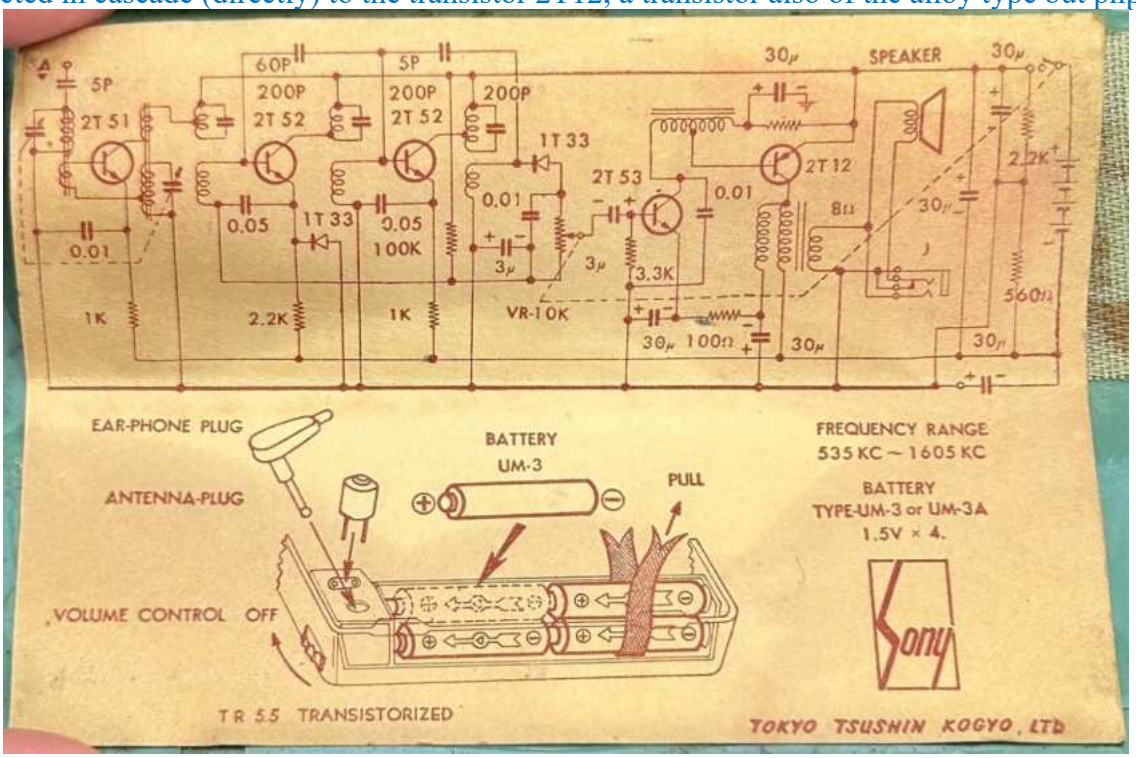
(Fig.11)-

With reference to the schematic diagram (Fig.14) attached to Russ's set with **SERIAL No.55425**, the TR-55 is a superheterodyne with five transistors and two germanium diodes, one signal detector and the other for the AGC (automatic gain control) circuit.
The radio frequency (r-f) stage and the two intermediate frequency (i-f) stages use three grown junction type npn transistors, respectively a 2T51 which serves as a converter (simultaneously performs the function of oscillator and mixer) and two 2T52 which amplify the intermediate

(Fig.12)

(Fig.13)-

frequency (i-f) signal at 455 kHz on the collector pin of the converter transistor. The audio signal taken off the detector diode 1T33 is fed to the volume control, where then is picked off at the desired level through an electrolytic capacitor, into the low frequency section consisting of two audio stages which use, the first, a preamplifier transistor, the 2T53, an alloy type npn which is connected in cascade (directly) to the transistor 2T12, a transistor also of the alloy type but pnp.



(Fig.14)

(Fig.15)

The power amplification is in class A as it occurs with the single-transistor (the 2T12) audio output stage and the declared maximum undistorted power output is 14 mW, certainly superior to that of the Regency TR-1 which with only one audio stage had to settle for a lower output. The battery life was estimated at more than 100 hours of operation, much more than the 22.5 volt (215 type) used in the Regency TR-1 estimated at 30 hours[21]. The first technical specifications of the TR-55 can be found, in Japanese, in the very useful and complete book "**The Magic of Sony**" by the late Enrico Tedeschi, published in 1999 by Hove Books, Brighton, UK[22], where the author publishes an excerpt from an article that appeared in the October 1955 issue of the Japanese magazine Radio Technology. More detailed and exhaustive technical details on this radio were published in the July 1956 issue of the American magazine ELECTRONICS, information that the magazine received directly from Kazuo Iwama, director in charge of the semiconductor division of Totsuko assisted by engineer Junichi Yasuda. Already in the previous autumn, in the December and October 1955 issues, the prestigious US magazine had given some previews of the launch of this Japanese transistor radio receiver, publishing the circuit diagram on page 174 of the December issue and a photo of the set in the October issue, on page 12.

In Italy, the first and detailed technical information on the first transistor radio receiver from the Land of the Rising Sun can be found in the press review of the magazine "l'antenna", issued in April 1957 and edited by Raoul Biancheri who in the article entitled *"Tecnica giapponese dei Transistor"* takes up the homonymous article in French *"Technique Japonaise, Montages à transistors"* published by the magazine *La Radio Television Professionelle* in December 1956. Other Italian news on the TR-55 was given in the March 1960 issue no. 3 of *"Costruire diverte"*, a magazine of applied technology aimed mainly at an audience of hobbyists and electronic experimenters where the friendly director Gianni Brazioli, not without some inaccuracies but with his contagious passion for transistorized pocket receivers, published the schematic diagram and talked about it together with other Japanese pocket receivers that arrived immediately after the TR-55. As can be deduced from an ad taken from a Japanese magazine of the time (Fig.1), this model was sold for 18,900 yen, approximately 52.50 USDollars[23] and was mainly intended for the domestic market.

K 4541 Transistormottagare SONY. En utmärkt transistormottagare för mellanvågsbandet. Tack vare sitt lilla format 14x8,5x4 cm kan den bäras i fickan eller handen. Trots det ringa formatet har den bra ljud och mycket goda mottagningsmöjligheter. För driften användes 4 st. hörapparatbatterier, som kostar 50 öre st. och räcker för mer än 100 tim. avlyssning. De 5 transistorerna som användes i stället för radiorör ha en livslängd av 70.000 timmar. Inbyggd 2,5" permadyn-högtalare. Frekvensområde 125—560 mtr. Spänning 6 V — 4 st. standard hörapparatbatterier. 5 transistorer och 2 dioder. Vikt med batterier 560 gram. Pris pr styck .. 225.00
K 4543 Antenn till ovanst. Pr styck .. 2.75
K 4542 Fodral. Pris pr styck 7.00
K 4553 Batterisats. Pris pr sats 2.00

(Fig.16)

While it is certain that the TR-55 was never exported to the United States, it nevertheless crossed the Pacific to arrive, in a maximum number of 50 units[24], as far as Canada, in Winnipeg, Manitoba, having a local wholesale import company, GENERAL DISTRIBUTORS Ltd, (predecessor of Gendis Inc.), signed in 1955 by its president Albert Diamond Cohen a first order amounting to $ 1,350 for the purchase of Sony TR-55 radios. From that moment on, Cohen's company acted as an import agency for what in 1975 would become the joint venture Sony Canada. Albert Cohen was the first man to sell products with the Sony brand abroad and for his long and profitable trade activity with Japan he was awarded the Order of the Rising Sun in June 2011.
A modified version of the TR-55 is the model TR-5 (Fig.15) which differs only in the presence of the earphone jack no longer on the back but on the right side of this model and in being devoid of the three metal clips closing the rear panel. This version was marketed starting from April 1956 (eight months after the TR-55) and exported to Europe where its traces can be found in an interesting Swedish catalogue of over 130 pages, from the autumn-winter 1956-1957, published with the number 18, by the publishing house Hobby, Borås, which can be found at the following link: *http://tmfk.org/*. On page 2 of the catalogue there is an image of a TR-5 -the two sockets, earpiece and antenna, on the right side are unmistakable- with a description and price (Fig.16). Further documentation, this time of an almost completely unknown variant of the TR-5 model, can be found on Radiomuseum at the URL *https://www.radiomuseum.org/r/sony_tr5_tr_5_tr_5.html* where, in the photo of the inside of the set that has a serial number that seems to start with **"67..."**, you can see very clearly (hear, hear!) a plastic dielectric variable tuning capacitor, the famous Mitsumi "Polyvaricon" used in the Sony TR-6 of June 1956 and in the pocket TR-63 of March 1957. This is quite surprising if you look at the inside of the TR-5 owned by Russ (Fig.15), garnet red in color and Serial No.66094, where the variable capacitor is instead of the traditional type, with air insteead of solid dielectric. Very curious, as a member of Radiomuseum, I wrote to the president of the association *"FreundederStaßfurter Rundfunk- und Fernsehtechnike.V"*, asking him to send me a copy of the document cited in the file on Radiomuseum, published in the magazine of the former East Germany *"Radio und Fernsehen"* ,issue21 of November 1957 and available from them. This document is an article signed by Weinert, entitled *"EinjapanischerTransistorempfänger",* i.e. "A Japanese transistor receiver", from which the photos with technical notes posted on Radiomuseum were taken, describing this variant of the TR-5 model which, as can be seen from reading the same article, it is not a prototype at all but a model intended for the market. I thank again Dipl.-Ing. Jürgen Hofmann, president of the aforementioned association, who sent me the relative file.

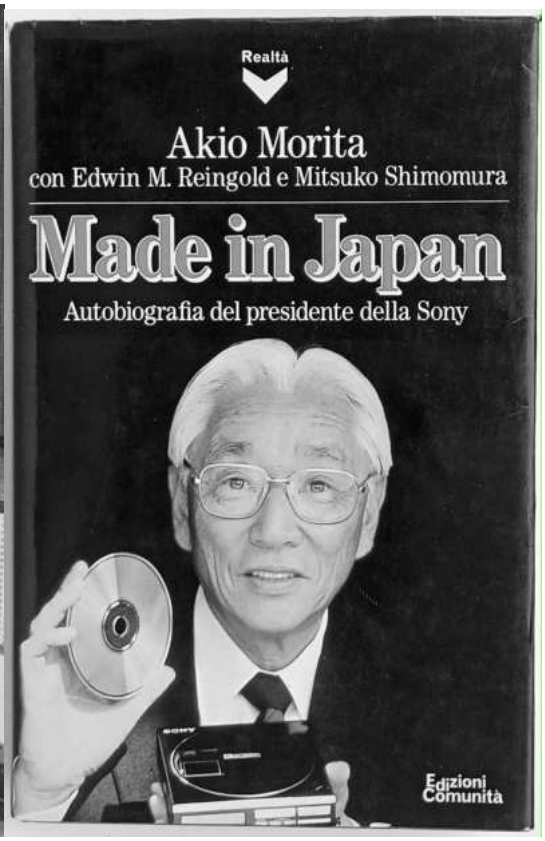
Epilogue

The TR-55 for its historical importance and rarity is the dream, or as English speaking people say, the *holy grail* of every transistor radios collector, that is, an object, a radio that is highly sought after and at the same time extremely difficult to find. Enrico Tedeschi, in his very interesting book on Sony, defined it as an almost mythical radio, given that there are quite a few examples -perhaps less than 10- in the hands of collectors and in museums around the world. The same obviously applies to the TR-5, which is also available in the version with a variable polyvaricon capacitor and shown, at the moment, only and exclusively on the Radiomuseum website, thanks to the article mentioned above. While the TR 55 is known in its green color, the TR 5 is known, in addition to green, also in the ivory and garnet red colors. The last TR-55 I spotted, still green and with **Serial No.60330**, the highest at the time among those found, was sold on January 16, 2017, for 13,650 USD in an eBay auction in which I also participated and which received fourteen bids. In the FB group *"Vintage Transistor Radios"* which as of December 21, 2024 counts 10,197 members, I tried to suggest a method to calculate the number of TR-55 pieces produced assuming that Sony began numbering this model starting from Serial No.55000 where 55 represents for the company their year zero, the year when production started, the 1955. In this way, assuming my method is valid, the set with Serial No.60330 would indicate, at a certain date, the 5,330th set produced since August 1955. Regarding the TR-5 model, according to the Canadian collector Michael Jack, there were around 3,500 TR-5s produced by Sony

(*https://www.flickr.com/photos/transistor_radios/4005679365/in/photostream/)* and that with the highest serial number known today (2024), is shown on the Radiomuseum website and is equipped with the innovative "polyvaricon" variable capacitor.
The small Sony TR-55, which on next August 2025 celebrates 70 years since its launch, became the precursor of numerous models of portable transistor radios, mainly pocket-sized, different from each other and increasingly smaller, indeed miniaturized and attractive in design, technologically innovative and cutting-edge**:** by the end 1958, that is, in about three years, Sony had marketed and exported abroad more or less two dozen different models of transistor radio receivers, mostly pocket-sized, and many Japanese and foreign companies followed this path, taking inspiration from Sony radios, whose name had become the top of the quality in transistor radios.
By the end of 1957, Japan was producing 600,000 transistors and 70,000 transistor radios per month[25].
After the TR-55, iconic radios models produced by Sony were, in March 1957, the TR-63, the first true pocket radio in the world or *"pocketable"* according to the new term coined by the manufacturer themselves and, even smaller, miniaturized was the TR-610 that arrived in June 1958, among other things the most imitated -even cloned- and sold (from 1958 to 1960) throughout the world in a number of almost half a million pieces. The main market for Japanese radios was, needless to say, the United States where *rock and roll music* was all the rage thanks also to the proliferation of radio stations dedicated to this musical genre and where millions of young people were eager to have these small radios that they could also listen to individually with their own earphones.

In 1959 more than six million portable radio receivers entered the United States: half of Japan'stotal radio production and almost all of them pocket-sized transistorized set (cit. Michael Brian Schiffer: see notes).

(Fig.16)



(Fig.17)

In Japan, a new industry was born, that of semiconductors (transistors and diodes)[26] and with it that of consumer electronics, of transistor radios with which Sony first and, soon after (from 1957) many other Japanese companies, flooded, like a beneficial tsunami, the world making their fortune.
The two entrepreneurs, partners and friends in life, Ibuka-san (Fig.17) and Morita-san (Fig.18), together with other entrepreneurs (among them Konosuke Matsushita, the wise and great old man of

the Japanese electronic sindustry), gave a great boost to the economic development of post-war Japan and their reliable and high-tech products radically changed the image of **"Made in Japan"** shipped abroad where, in the United States and Europe, before the war, people associated the Land of the Rising Sun only with paper umbrellas, kimonos, toys and cheap trinkets.
My article stops here whileSony's success did not stop in 1958 but continued worldwide over the decades leading the company to become a global giant in consumer electronics. The success that continues to this days (2024) has been due to the fact that Sony has always remained faithful to its basic principles written in the Founding Prospectus of Ibuka, the mainfounding father. If this year the Regency TR-1 celebrated its 70th anniversary in October/November, next year, 2025, will be Sony's turn, which is still alive and splendid, to celebrate the 70th anniversary of its first transistor radio, their first product that together with the manufacturing of the transistors themselves marked a significant turning point in the future life of the company and Japan.

(The End)

Credits, acknowledgments, notes

- Made in Japan, AkioMorita and Sony, first edition, 1986 by E.P. Dutton, a division of New American Library, New York
- Made in Japan, Autobiografia del presidente della Sony, I edizione maggio 1987 Edizioni di Comunità, Milano
- Sony's official website at: https://www.sony.com/en/SonyInfo/CorporateInfo/History/ The story told on the Sony site is an abbreviated version of the book "Genryu" (Japanese word translatable as "Origins"), published in 1996 to commemorate 50 years of Sony, from itsorigins (1946) to 1996.
- The Magic of Sony (for historians and collectors), by Enrico Tedeschi, first edition March 1999, third printing April 1999, pubblished by Hove Books, Brighton, UK
- Radiomuseum: https://www.radiomuseum.org
-The Portable Radio in American Life, by Michael Brian Schiffer, 1991 The University of Arizona Press
- The Commercialization of the Transistor Radio in Japan: The Functioning of an Innovation Community by Leonard H. Lynn all'url: https://www.researchgate.net/publication/3076554_The_commercialization_of_the_transistor_radio_in_Japan
-In memory of Enrico Tedeschi: https://vocal.media/history/history-of-technology-how-enrico-tedeschi- saved-the-guglielmo-marconi-collection
- https://www.ilpiera.it/radio/ del collezionista bolognese Davide Pierantoni
- Participants in the Face Book group *"Vintage Transistor Radios": https://www.facebook.com/groups/transistorradios?locale=it_IT*
- The panoramic photo of Japan is from https://www.pxfuel.com/en/desktop-wallpaper-vsgrx (the first one) and from wallpaper.androlib.com the second one
-- The opening photo (Fig.1) is from: https://it.pinterest.com/pin/57280226505117542/ by "Transistorized Japan"
- the photo of Fig.2 is from the FB group "Sony Australia": https://www.facebook.com/photo/?fbid=10157403767094641&set=a.
- the photo of Fig.3 is part of the eBay listing n. 322532431150 active for manymonths
- the photo of Fig.4 (TR-52) comes from: https://it.pinterest.com/pin/506303183114453939/
- the photo of Fig.16 Ibuka together with his "pearls", is taken from the site: https://www.sbbit.jp/article/cont1/36138#&gid=null&pid=1 in an article by KoyaKuwabara
- Russ Abrams provided all the photos of the TR-55 and TR-5 modes, except the one in Fig.7. Thank you Russ for your much appreciated contribution!

~ A dutiful thanks goes to all these people, including those I was unable to contact directly ~

This article is the result of human intelligence and, except for the limited use of some online translators (Google translator and DeepLTranslate), does not come from artificial intelligence software. I have tried to give as much as possible an orderly exposition of the events respecting their chronology and for this I have based my self mainly on the autobiographical book by AkioMorita "Made in Japan" and on the information available on the Sony website and accessible to all. Other very useful information comes from other websites and publications on the subject that I have consulted and dutifully mentioned throughout the article or in the notes. The article wants to be my small contribution intended for the passionate collector of Sony transistor radios in particular and of all other brands in general and for anyone interested in the history of the radio and the transistor. You can draw freely from this article and in exchange I only ask for the good manners of citing the author (Lello Salvatore) and the editor of the translation into English, Bob Davidson, for the commitment and work done. Thank you very much!

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42° 15' (Termoli) ITALY, December 21, 2024

[1] *https://www.storiauniversale.it/96-LA-RESA-DEL-GIAPPONE.htm* (Japan'ssurrender)
[2] The specter of a global conflict with the use of nuclear weapons has returned to hover in recent times as it has not happened since the Cold War and precisely to launch a warning to the international community, on October 11th the 2024 Nobel Peace Prize was awarded to NihonHidankyo, the association of survivors of the atomic bombs of Hiroshima and Nagasaki, also known as Hibakusha. Available at the url: *https://www.ilfattoquotidiano.it/2024/10/11/nobel-per-la-pace-2024-nihon-hidankyo-organizzazione-dei-sopravvissuti-di-hiroshima-e-nagasaki/7726821/*
[3] Japan Rises From the Ashes: *https://theolympians.co/2018/06/19/japan-rising-from-the-ashes-part-2-kyodatsu-and-the-desperate-times-of-post-war-japan/*
[4] The Shirokiya Department Store building had been a military target because it housed a vacuum tube factory in its basement. Before the war, Ibukas' old factory, NihonSokuteiki (Nissoku), was in Tokyo, but due to the intensification of the war bombings, it was closed to continue production in Nagano, several hours by train northeast of Tokyo. When the war ended, Ibukaleft Nagano to return to the capital, followed by a small group of seven employees from the old Tokyo factory, and there he opened his new company, Totsuken: https://www.oldtokyo.com/shirokiya-department-store/
[5] The ricecooker, and other early Sony artifacts, can be admired inside the Sony Archives, in a short virtual tour with "texlad" whom we thank for giving us this opportunity, at the following link:
https://www.flickr.com/photos/textlad/albums/72157634360289051/
[6]SinceAkioMoritais the firstborn and fifteenth generation heir of one of the best and oldest families of sake producers, the Japanese alcoholic beverage made from rice, according to Japanese tradition he had the duty to take over from his father in the management of the family business. Helped by Ibuka and his father-in-law, Tamon Maeda, former Minister of Education, Akio Morita obtained the approval of his father Hikotaro Kyuzaemon Morita to abandon the family business and dedicate himself to his own business. Furthermore, eager as he was to work full-time for the new company, Morita, after saying goodbye to Professor Gakujun Hattori, his university colleague and mentor in high school, left teaching.
[7] To learn more, please read this Prospectus on the Sony website at:
https://www.sony.com/en/SonyInfo/CorporateInfo/History/prospectus.html
[8]Gotenyama was the historic headquarters of Sony for 60 years, until 2006. As the company took off, a new wooden factory was built in 1949, and in 1951, adjacent land was purchased and the three-story wooden building wasconvertedinto an office/factory. The photo in figure 2 shows the signat the entrance of the 1951 building, and is a symbol of the company's success. The building was demolished in the 1960s. The current building (the former headquarters until 2006) housed until 2018, and probably still houses, a small museum, the Sony Archives: *https://igsforum.com/2016/08/26/visit-sony-archives-in-tokyo/*
[9] Nippon Hoso Kyokay (NHK), Japan Broadcasting Corporation, was formed in August 1926 through the merger of the Tokyo, Osaka, and Nagoya broadcasting stations. At the time, NHK wa sheadquartered in central Tokyo, a half-mile from the General Headquarters (GHQ) of the occupation forces that had taken control of the city, commanded by American General Douglas MacArthur. Website: *https://villagehiker.com/travel/travel-japan/macarthur-headquarters-building-in-tokyo-vh-jn-03.html*
NHK was reestablishedas a public broadcaster in June 1950 with the introduction of the Broadcasting Act. Web address: *https://www.nhk.or.jp/corporateinfo/about/history.html ://villagehiker.com/travel/travel-japan/macarthur-headquarters-building-in-tokyo-vh-jn-03.html*
[10] Nippon Electric Company Ltd. was the first Japanese company affiliated abroad, founded on July 17, 1899 with the participation of the Western Electric Company of Illinois (WE). Initially, itdealt with telephones, switches and automatic switching systems. At the url: https://www.nec.com/en/global/about/history.html
[11]Japanese electric company founded on March 7, 1918 by Konosuke Matsushita and which would later become Panasonic. At the url: *https://holdings.panasonic/global/corporate/about/history/chronicle.html.* See also on my article on Sanyo Radios in ARM N° 138 (July-August 2017).
[12] From April 21 to 29, 1952, Bell Labs held its second symposium on transistor technology, attended by twenty-six U.S. companies and fourteenforeign companies, all from NATO countries, none from Japan. Sony participated in the third symposium, which was held in January 1956. Source: "Crystal Fire" by M. Riordan and L. Hoddeson, 1997, W.W.Norton& Company
[13] See on my article "History of the Transistor", part 3, in ARM N° 84, May-June 2008.
[14] One and the first of these was Sonotone which in late 1952 introduced the model 1010 which used a transistor as the audio power amplifier alongside two sub-miniature vacuum tubes as preamplifiers. See myarticle in ARM No. 79 (July-August 2007).
[15] from "The commercialization of the transistor radio in Japan" by Leonhard H. Lynn at the web address:
https://www.researchgate.net/publication/3076554_The_commercialization_of_the_transistor_radio_in_Japan
[16] At the web page: *https://spectrum.ieee.org/transistor-radio-invented*
[17]Visible at web address: *https://it.wikipedia.org/wiki/Ufficio_delle_Nazioni_Unite_a_New_York#/media/File:UN_HQ_2724390955_bfc562c6a9_(cropped).jpg*

[18]*https://www.shmj.or.jp/shimura/shimura_E/ssis_shimura1_19E.html#:~:text=It%20was%20in%20August%2C%201955,the%20price%20was%2018%2C900%20yen.https://www.shmj.or.jp/shimura/shimura_E/ssis_shimura1_19E.html#:~:text=It%20was%20in%20August%2C%201955,the%20price%20was%2018%2C900%20yen.*

[19] These radios needed two batteries to work, the so-called "A" type for the tube filaments and the "B" for the anode voltage of the tubes. Some of these radios are shown by collector friend Robert Davidson on his beautiful site, one of the longest-running and exhaustive on the web, at the URL: *https://www.abetterpage.com/transistors/trans/JapanTube/1JapanTube.html*. As Bob says, these radios are damn nice and seem to be made to compete with the transistor radios that were coming onto the market.

[20] The web site of the Japanese collector Kuro Kuro showed firstly and, at this time, only one on the web, a completely disassembled TR-55 at the URL *https://kuromonokaden.com/2019/02/23/sony-tr-55/*

[21] From Photofact (PF) REPORTER, January 1955, page 57

[22] Through the Wayback Machine you can also find, among others, Enrico's website at the URL: *https://web.archive.org/web/20070423195648/http://www.etedeschi.ndirect.co.uk/ sony/index.htm*

[23]During the period of the American occupation of Japan, at the official exchange rate one dollar was worth threehundred and sixty new yen. (from the book Made in Japan, Italian edition, page 74).

[24]As reported by the Canadian company Gendis in its announcement in 1971. Info taken from the following web address: *https://www.flickr.com/photos/transistor_radios/2380142193/in/photolist-ec2sHX-4CjRmn-ec2s8r-ec2tmH-ec8943-ec88VE-ec2sn8-2pXMud7-2pXMudc-2pXSjMT-2pXMKdT-eKZsuV-eLbRGN-eKZshK-BkmnSY-6HXoqQ-4ramKb-7 6Y9Vk-4mPJgD-73jySz-6HTh6g-73jydr-gN7T7W-gN7LwH-6HTdNk-6uvQLV-6LV8UC-9QqEZ9-2mcfmw4-4fZY4t-zFvZ8q-9RB7Sf-6uA1hA-2iPJh2V-2q1c3v6-5AufKy-2mcfmgu-2mcfmrV-2mcbz3v-2mcj2j6-2mcbyTn-2qsyh6s-2pZHZ4x-npdjT4*

[25] From Leonard H. Lynn at URL: *https://www.researchgate.net/publication/3076554_The_commercialization_of_the_transistor_radio_in_Jap*

[26] At that time, transistors were produced in the headquarters factory in Gotenyama (Shinagawa-ku, Tokyo), which soon became too small. In 1960, Sony opened a modern large-scale semiconductor manufacturing plant in Atsugi (Kanagawa Prefecture), which expanded to a monthly production of 1 million units.

Cherry blossoms (sakura in Japanese) with a view of Chureito Pagoda and the snow-covered Fuji volcano in the background.