~ The first RADIOMARELLI transistor radio and RCA ~

by Lello Salvatore *

FIVRE, from tubes to transistors

The invention of the point contact transistor occurred in December 1947 in the Bell Laboratories (Murray Hill, New Jersey, USA), and more particularly the junction one in April 1950[1], marked an important turning point in the miniaturization of electronic circuits and in their assembly. The first transistors were used in Bell telephone systems (in the card translator[2]) and in military equipment (in the Air Force's radar system and computers TRA.DI.C) and immediately after in commercial products such as hearing aids (late 1952/early 1953) and pocket radios (December 1954). The impact that the transistor had on industry, commerce and military institutions was enormous; just think that between 1954 and 1956 about 28 million transistors were sold in the United States, of which 17 million germanium and 11 million silicon for a total value of about 55 million Dollars[3].

If in Europe, big companies such as Philips, Siemens and Halske, Telefunken, British Thomson-Houston Company and so on already in 1952 they had purchased the license to build transistors from Western Elctric[4] for 25,000 dollars, in Italy the dawn of semiconductor research was not yet seen. Taking the first steps in Italy was the brilliant engineer from Treviso Virgilio Floriani (1906, Cison di Valmarino - 2000, Cernusco Lombardone) who was anxious to get his hands on those new electronic things that amplified electrical signals, created the Semiconductor Laboratory in 1955 in the company he founded in October 1946, TELETTRA, which stands for TELefonia, ELETTronica and RAdio. Just in the period in which Floriani started dealing with semiconductors, the Bell Laboratories held their third symposium[5] on transistor technology in Murray Hill: it was January 1956 and the Italian enterprising Engineer took part in it (from "Memories of my life" by V Floriani, memoirs traceable to the web address: *http://ingegneria.sba.unibo.it/risorse/files/relazioni-delle-conferenze-della-scuola-di-ingegneria-e-architecture/presentation-vannucchi).* The following year, the engineer Floriani and the engineer from Ivrea, Adriano Olivetti, innovative entrepreneur and visionary man and philanthropist, joined forces and together they decided to create the first Italian industry expressly created for research, study and the manufacture of diodes and transistors: on 16 October 1957 the Società Generale Semiconduttori, SpA was officially born (SGS)! In the early days, SGS made use of the collaboration, the patents of an American electronics giant, General Electric Compnay (GE) which, as is known, thanks to Dr. John Saby, in 1951 and 1952 developed in its research laboratories, autonomously by Bell Laboratories, the technique of construction of junctions by alloy.

In the several Italian radio magazines of the time, the ad of the new SGS transistors (marked with their characteristic initial acronym 2G...) was found everywhere and clearly bore the words "general

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[1] *On the issues N.82, 83, 84 and 85 of the Italian vintage radios journal Antique Radio Magazine (ARM) are available my articles on the "History of the Transistor".*

[2] *It was a sort of electromechanical switch used to search for available lines and quickly and automatically route long distance telephone calls through them.*

[3] *From "Revolution in miniature", on page 60, by Ernest Braun e Stuart Macdonald, 2nd edition 1982, Cambridge Univeristy Press.*

[4] *Western Electric Western Electric was an electrical engineering company, the manufacturing branch of the AT&T Company (American Telegraph and Telephone Company) founded in 1885. From January 1, 1925, Western Electric's research center became "Bell Laboratories", the largest organization private of scientific and technological research to the world of those times.*

[5] *In this symposium the licensee were instructed on the latest techniques developed in the manufacture of transistors, those of diffusion. The previous symposium on transistors, the first one open to foreign companies all from NATO countries, took place from 21 to 28 April 1952 while the first symposium on transistors was entirely American, held for five days from 17 September 1951 and brought together to Murray Hill more than three hundred scientists, engineers, officers of the Armed Forces and bureaucrats of the American government.*

electric co. USA license": one of these ads is published on page 32 of N.1/ 1960 issue of "Selezione di Tecnica Radio-TV".
Like SGS and at the same time, also a giant of the Italian electrical and electronic industry of the time, the Magneti Marelli group, through its FIVRE[6], had started the production of transistors using this time also the patents of the General Electric. In an article dedicated to the 25th anniversary of the founding of FIVRE, published on page 52 of Radioindustra issue No.218/October 1957, we learn that among the scientific laboratories of the FIVRE plant in Pavia there is also (and finally !A/N) the semiconductor laboratory and that ..... *"Further extensions are already being implemented to enhance the production possibilities of the plant, especially as regards the production sectors of piezoelectric quartz and also semiconductors, power rectifier diodes and transistors, Ge and Si types". This article also states that .... "In the post-war period, technical exchange agreements were concluded with General Electric C. (also replacing previous agreements with other American companies) in order to have at its disposal the most advanced technical world available especially for valves having application in the radioprofessional field ".*
Therefore, FIVRE built only germanium transistors (in Fig. 1 some FIVRE transistors from the author's collection) using GE license applying the early technique of this American company, that for alloy but also that of the rate grown of the germanium crystal, techniques which, however, as seen from the third symposium on transistors, were already obsolete in 1957. A **September 1956** four-page publication (including the cover) of FIVRE production contains the characteristics of twenty-five transistors. Most of the indicated transistors are pnp type and only five npn; among them are two types for use as an electronic switch and the whole series for the complete transistorisation of the LF and HF stages of the radio receivers. A succinct description of the FIVRE transistors suitable for use in portable receivers operating from 3 to 12 volts, can also be found on page 125 of the March 1957 issue of the magazine "l'antenna" as well as on page 59 of N.212 of the April 1957, of Radio Industria. The very few types of transistors produced by FIVRE are easily recognizable for having the particular top hat shape with (but also without) the pinched top of the metal case, an hermetic case design created by the engineer of the General Electric Conrad Zierdt[7]. Very little is the publicity of the FIVRE transistors available on the Italian radio magazines of those years! A first ad emerges on page 14 of Radio Industria N.212 of April 1957 (Fig. 2) and another, perhaps the last, is still (and I would say, strangely!) traceable on the cover's second page of the N.6 of July 1960 of "the antenna". In these ads, where the name of General Electric never appears as it does in SGS, the following transistors to be used in radio receivers are indicated among the types in impulse mode (usable as electronic switches): 2N168A-2N168-2N169A- 2N169 (grown junction) and 2N19F-2N18FA-2N18F (alloy junction).

Fig. 1

The efforts of FIVRE to set up its own transistor industry in Italy, unlike what had happened with the thermionic valves twenty five years earlier, were unfortunately not successful and the collaboration with GE in a constantly evolving technological sector such as that of semiconductors evidently ceased in a few years. The production of transistors was therefore limited to minimum quantities and very few types, such as those above, marked with the initial lettering 2N ..., typical of

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[6] *FIVRE stands for "Fabbrica Italiana Valvole Radio Elettriche". This Italian radio valves factory was created in 1932 to fully meet the needs of Radiomarelli, the company that F.I. Magneti Marelli had started two years earlier (1930) to manufacture and market radio sets. In just five years after the effective start of the production of thermionic valves (which can be placed in the year 1933), FIVRE could boast of having acquired knowledge and experience to independently build not only the valves necessary to operate radio equipment. produced by the subsidiary company, but also the machinery for making these valves (from "the antenna" No. 21 / November 1938, page 626). All this had been possible by virtue of an agreement established in 1934 with R.C.A. (Radio Corporation of America) for which Magneti Marelli could have all the enormous amount of patents and technical experience available to this colossal industrial group. The news of this agreement is reported on page 50 Issue 1/1937 of "Sprazzi e Bagliori", the corporate magazine of Radiomarelli founded in 1924 by Noël Caterino Giulio Quintavalle and published until 1942.*

[7] *For further information, see this monumental website dedicated to transistors: http://www.semiconductormuseum.com/Transistors/GE/OralHistories/Saby/Saby_Page3.htm*

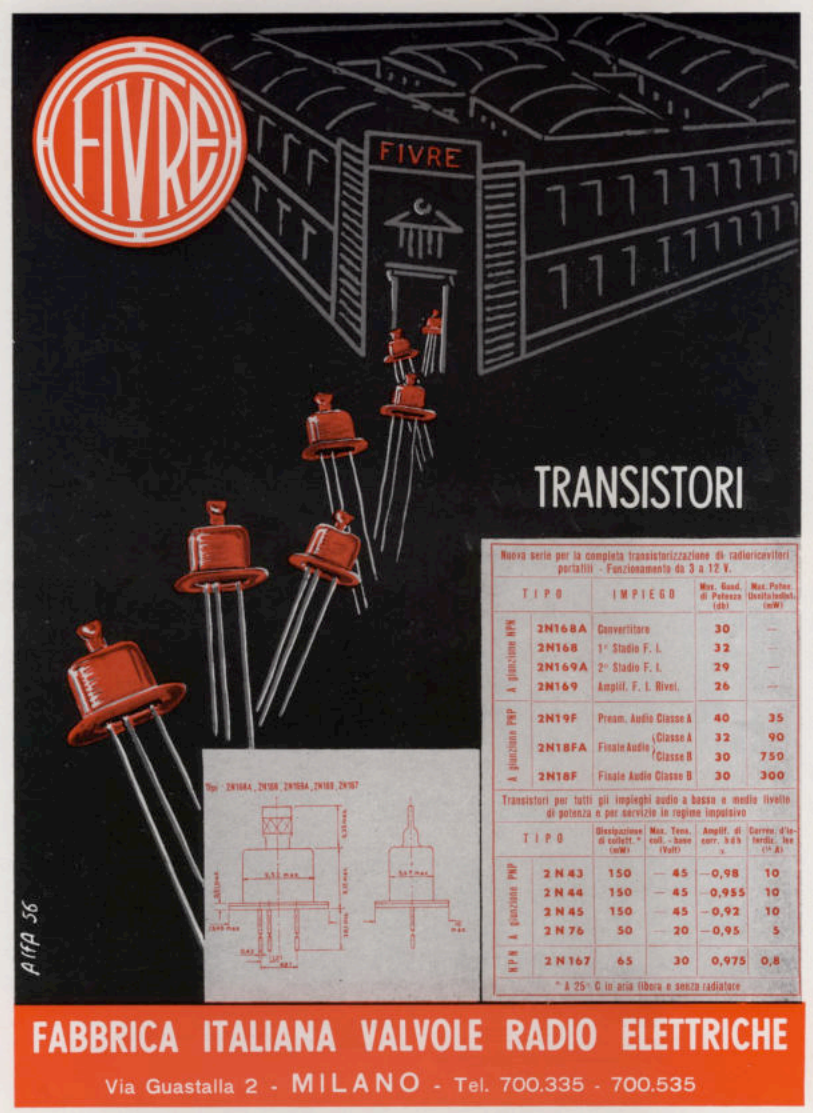


Fig. 2. Fivre ad on page 14 of Radio Industria N.212 of April 1957

the American classification standard. For the aforementioned reasons, FIVRE transistors are very rare to find today, like the radio receivers that incorporated them, such as the SM3375 model (for which I refer to my article on ARM N.100 / 2011) and Kent (on ARM N.118 / 2014), both sold / produced by the GBC note: these two sets, together with some Phonola models (the T 701 and T 702, known to me) are among those very few to mount FIVRE transistors together with three others bearing the name FIVRE, with 4, 5 and 6 transistors represented, only schematically, on pages 93 to 96 of the CELI schematics, volume I.
The first transistor radio with the Radiomarelli brand was the RD 169 "Joy" model from 1956 (on ANIE N.2/1956-57) which, as Antonio Maida recalled in an article of his several years ago (on ARM N.61/2004), used a hybrid circuit made with mixed active components: three subminiature valves (type 1V6-1AH4 and 1AJ5), a detector diode OA81 and only two transistors with the initials OC72 in the output stage which were not FIVRE-manufactured nor of General Electric as might have been expected. After the Joy, it will be necessary to wait a few more years, before Radiomarelli places fully transistor-operated radio receivers on the market, such as those which proudly bore the word "TRANSISTOR" or "ALL TRANSISTOR" and which, starting from the late 1950s, always arrived more numerous on the Italian market and, in large part, from very distant countries such as Japan.

RADIOMARELLI modello 301, 302 e 303

Radiomarelli's first all transistor radios are reviewed for the first time in the ANIE N.6 catalog of the 1960/61 biennium, obviously grouped under the name of the company Magneti Marelli F.I. S.p.A. and marked by three different brands: Radiomarelli, West and Imcaradio. There are only three models and always the same but, depending on the brand they carry, they are identified with lettering that are not very different from each other.
The sets sold under the RADIOMARELLI brand bear the initials RD 301, RD 302 and RD 303 while those with the WEST brand become DS 301, DS 302 and DS 303. WEST was in fact a company based in Corso Venezia 53, Milan, a commercial brand created by Magneti Marelli in the late 1950s to increase the sale of radios, televisions and household appliances (one of the first ads under the WEST brand relates to televisions, radios and household appliances and can be found on page 78 of issue No. 236/April 1959, of "Radioindustria"). These sets were all advertised in the most well-known Italian radio magazines of that time. Sifting through the painstaking patience of the researcher, page by page, the full 1960 year issues of the magazine "the antenna", we'll find for

the first time the RD 301 model in the September issue while the RD 302 model is in the December issue. To find the RD 303 model you need to get to the February release of the 1961 year's issues while all three models appear together and with the WEST brand in the January 1961 issue of this magazine! Being able to find a specimen of these models with the inscription Imcaradio or even simply an ad would be a nice find, not only for the collector but also for those few enthusiasts of radio history who, like me, are often looking for news, curiosities and insights. The aforementioned Anie catalog shows that the Imcaradio models signed RID 1301, RID 1302 and RID 1303 all have the same technical and construction features as the aforementioned Radiomarelli and West models and despite the lack of a photographic image of the same, it is not difficult to deduce that we are always talking about the same three radios! As is known, Imcaradio, a considerable and innovative radio company from Alessandria born before the Second World War, had been acquired by Radiomarelli in 1960 (https://www.leradiodisophie.it/Download-new/Storia-IMCA-RADIO .pdf) when the latter made its debut with "its" very first transistor radios. I must also add that the collector and the devotee of Radiomarelli sets (*radiomarellisti)* as well as the repairman of vintage radios could well come across other radios (and certainly not only transistors!) that the company produced using the brands MABO[8] and also MABOLUX.

Fig. 3. Radiomarelli RD 301

But let's take a closer look at these very first Marelli transistor radios. Model **301** (Fig. 3) is illustrated in the "Information Bulletin of the Radiomarelli Technical Sales Service No. R / 157" which is reported in full in the December 1996 / No. 16 issue of Antique Radio Magazine (ARM); the same bulletin is reproduced, as it is, also in volume I with the RADIOMARELLI trademark (abbreviation RD) and in volume III with the WEST trademark (abbreviation DS) of the "Schematics of transistor sets" by Romano Rosati edited by the C.E.L.I. of Bologna in the mid-1960s. This set is the smallest of the triplet, it is vertical and despite its dimensions of 17.5 cm in height (H) x 10 in width (L) and 5.4 in depth (P) as well as its 700 grams of weight, although being a *"cascettone"* as it is used to say in my region of origin

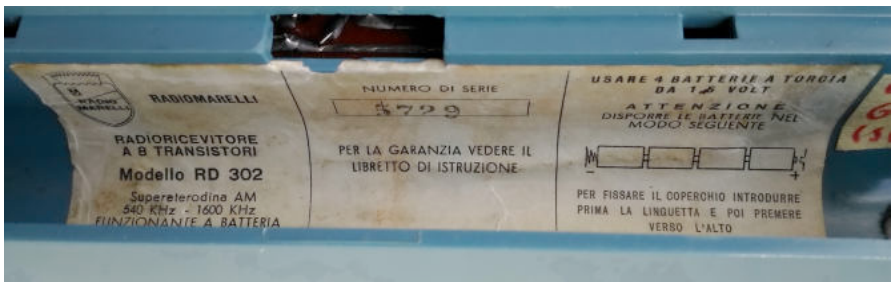
Fig.4 Radiomarelli RD 302

[8] *I recall that MABO, Soc. An. was also, in chronological order, the third sister company of Magneti Marelli. It was established in 1935 with Bosch in Stuttgart (D) for the sale of electrical accessories for cars and motorcycles built by the two companies (from Sprazzi and Bagliori N.1 / 1937). The first transistor radio receiver with the MABO brand is reviewed in the Anie catalog n.7-1961-'62 with RMB 305, equipped with two wave bands, Medium Wave and FM. Strangely, the MABOLUX RMB 304 model does not appear in this catalog. RMB 304 is completely the same in electronics as the other 304s and only slightly different aesthetically. The image and the wiring diagram of the MABOLUX RMB 304 are available on page 153 of volume III of the "Schemari CELI".*

(Apulia, in Southeast of Italy) to indicate a rather bulky object, it is defined as pocket-sized in the technical bulletin of the same house. The model **302** ***(Fig. 4)***, dimensions: cm 16 (H) x 25 (L) x 7,5 (D) and the model **303** (Fig. 5), dimensions: cm 12 (H) x 24 (L) x 6.5 (P) are horizontal, equipped with a handle and the first is distinctly portable, while for table-top use the second type as a decorative object. Also for these last two models, the schematic diagrams reported on the CELI volumes are taken equal by the respective technical bulletins of the company: the 302 is on the vol. I with the abbreviation RD and on vol. III with the initials DS while the 303 model appears only on vol. I with the abbreviation RD and is not present with the West (DS) mark.

Fig. 5. Radiomarelli RD 303

The thing that amazes those who open one of these three radios for repair, cleaning the cabinet or simply curiosity is the use of the printed circuit board in each model, of electronic components all being (except someone) of American construction: not only there are RCA transistors but also all the other main components used (printed circuit board, tuning capacitor and fixed capacitors, the transformers, both medium frequency and the only one with audio frequency, the volume/on-off control, etc.) come from the United States and, if it were not for the Italian letterings engraved on the plastic case or printed in ink on the paper labels ***(Fig. 6, see below)***, in short, one has the impression of having in ones hands American radios, certainly not Italian! Figures 7, 8 and 9 show the chassis seen from the component side, respectively of the model RD 301, 302 and 303 (the latter is equipped with two speakers!). Some components of these radios are shown below: the driver transformer with the lettering "RCA" (Fig. 10), an electrolytic capacitor with the words "Made in USA" (Fig. 11) and the Mallory volume potentiometer (Fig. 12) of model 302; the CTS potentiometer (of Chicago Telephone Supply, 1896) (Fig. 13) of the 303 model also mounted on the 301 model of figure 3. In the RD 302 model that I have had the opportunity to disassemble several times for repair [the turquoise specimen of Fig. 4, of my collection, bearing the serial number *5729*; the amaranth red of Fig. 8, from the collection of Massimo Galleano, with serial number *4730* as well as another of olive green (Wolfgang Gebert's collection) with serial number *3507*], is printed in relief on the the interior of the plastic cabinet the inscription "Concesio ALBA (Brescia)" (Fig. 14) which unequivocally indicates the place and name of the Italian manufacturer. No indication of the manufacturer of the plastic cabinet is found in the other two



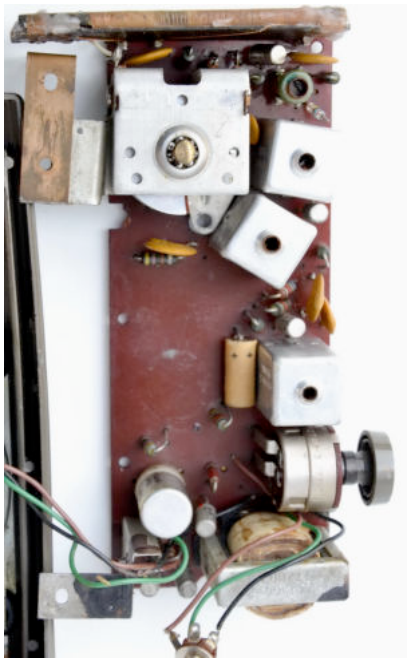


Fig. 7. Radiomarelli RD 301 chassis

models I have in my collection and shown in the photos. The use of American electrical and electronic components in these three sets and the name of the Italian company imprinted on the plastic case of one of them (302), take us back in time to the beginnings of Radiomarelli's history (1930) when it assembled its very first sets such as the Musagete, importing the chassis from the American Bosch, chassis that were then mounted in elegant cabinests built in Italy (Marco Manfredini on ARM N.85 / 2008) or when the company made its radio using RCA patents and RCA Radiotron branded valves. In short, in Marelli, that is to say in Radiomarelli, was repeat in with transistor radios what happened in the past with their very first tube radios! Evidently the company could not yet wait to enter the market with its all transistor sets and, although it had stopped collaborating with General Electric and abandoned the production of transistors by its FIVRE, in order to secure a slice of the Italian market in this sector, turned to the old, historical and trusted partner, RCA, using this firm's complete radio chassis. On the other hand, other big Italian historical companies that built radios and TVs such as Radio

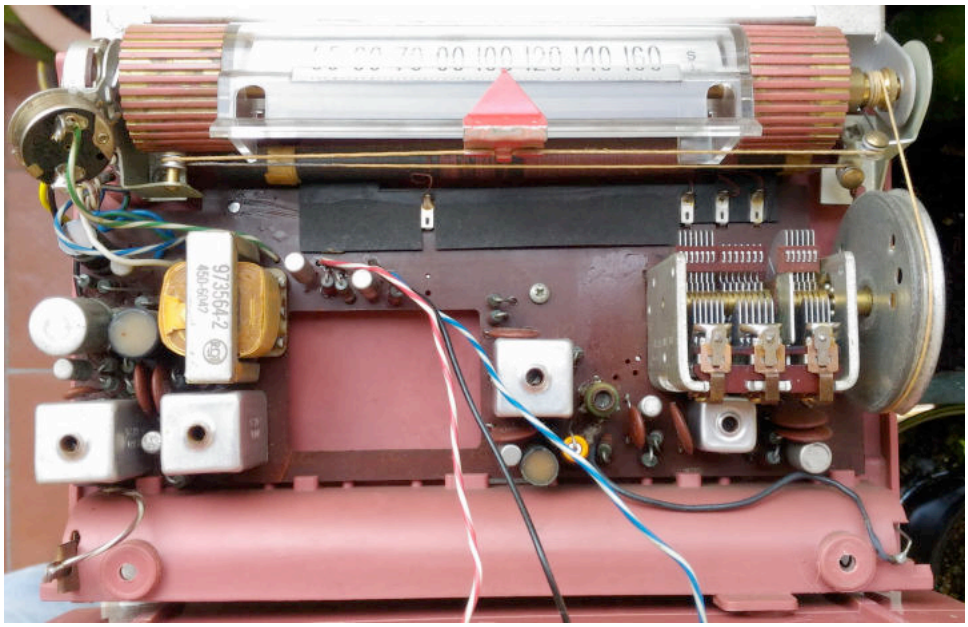


Fig. 8. Radiomarelli RD 302 chassis

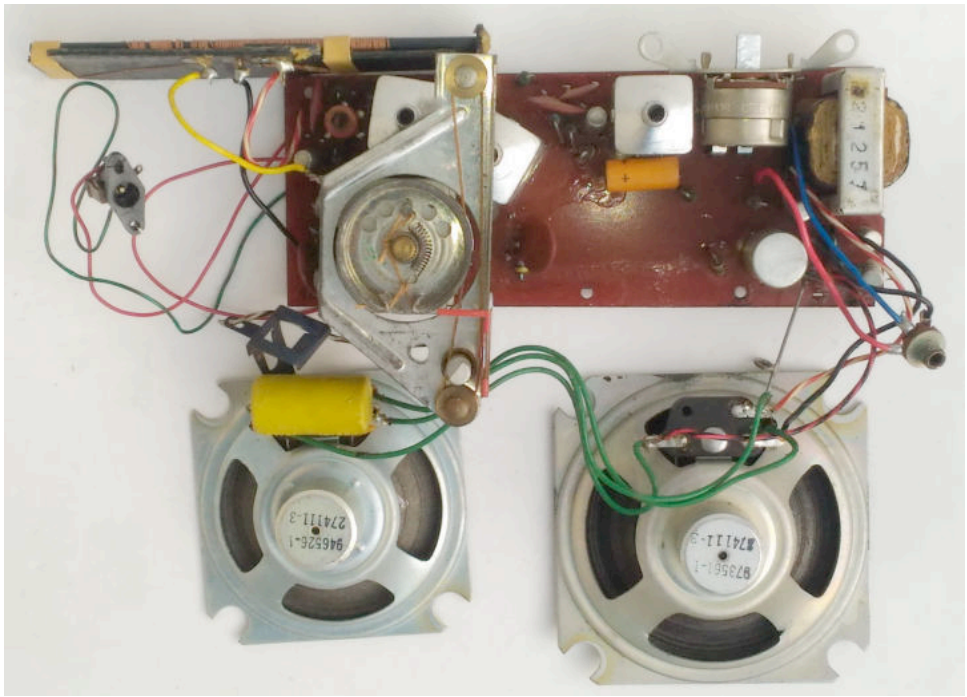


Fig. 9. Radiomarelli RD 303 chassis

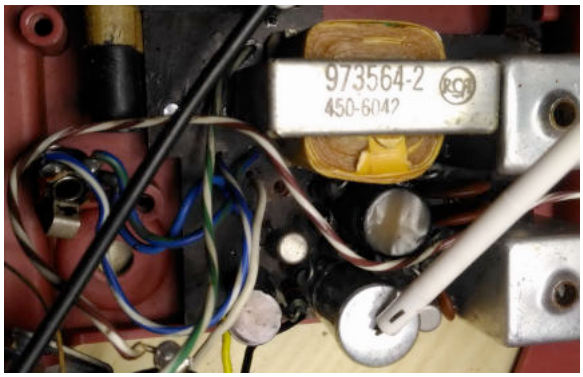


Fig. 10. Driver transformer with RCA lettering

Fig.11. Electrolytic capacitor with "Made in USA" words

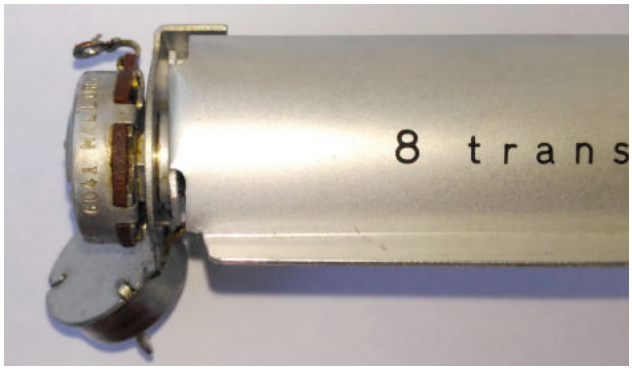


Fig 12. Mallory on/-off-volume potentiometer

Fig.13. CTS on/off-volume potentiometer

Allocchio Bacchini and WATT RADIO but also those that were still small and young, as were the Roman Voxson and Autovox at the time, were already successfully selling all pocket transistor radios and however portable of their conception and construction, while the well-known and affirmed Radiomarelli could not continue to set the pace yet.

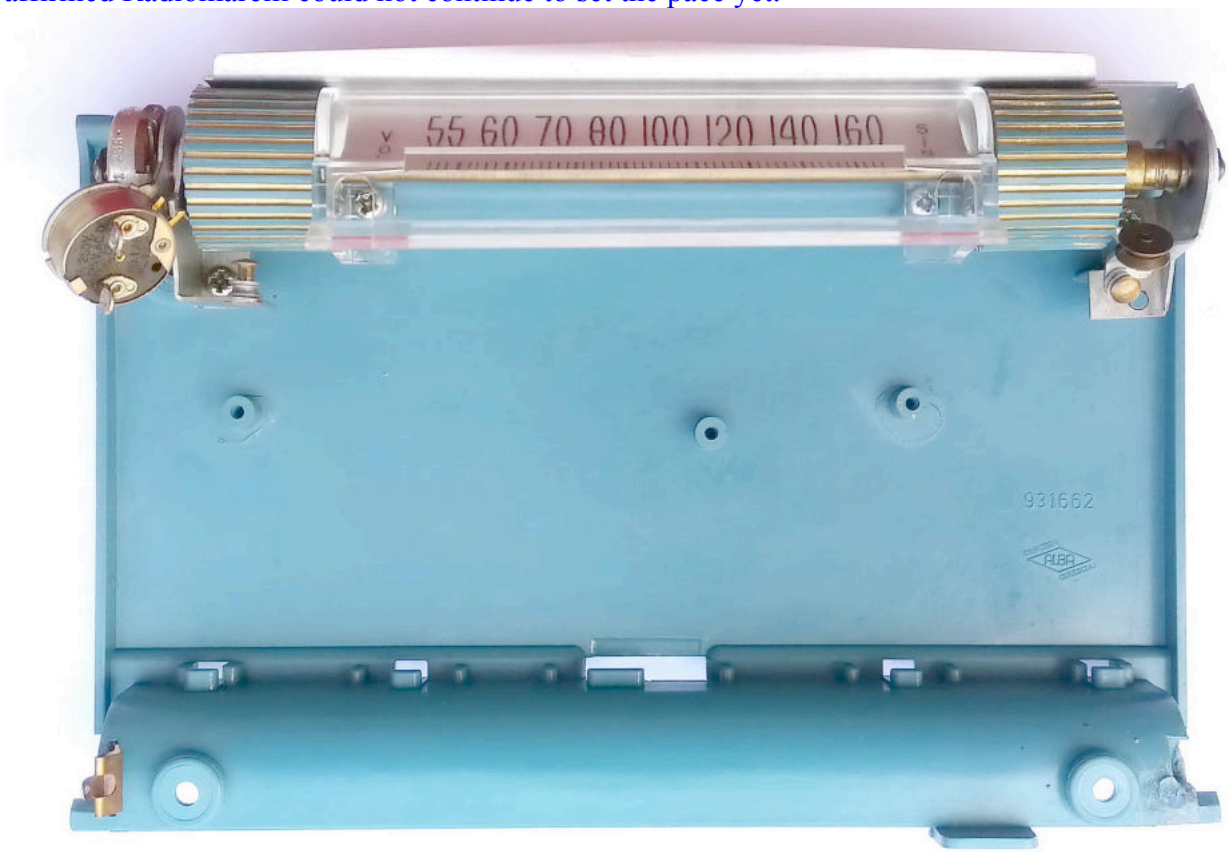


Fig.14. Interior of the rear plastic lid witht the inscription "Concesio ALBA (Brescia)"

My historical researches on transistor radios that I have been collecting for a quarter of a century have led me to know details about certain models that to date (A.D. 2019!) are not yet known even on Radiomuseum.org where I will soon publish them. On this site the model 302 is defined similar to the RCA 1-T-5J model, without any particular specification. Now, on the other hand, with full knowledge of the facts, I can add that not only the 302 but also the 301 and 303 models of the aforementioned trio of first Radiomarelli transistor radios, having, removed the letterings on the cabinets, resemble or rather are the same, both in their external and internal appearance, to three overseas radios. We can define these three Marelli sets as the twin sisters of three radios, to be precise of three series of radios built in the USA by RCA all in the year 1959. In particular, the 301 model is the equivalent of the JE models, EN and EH of the **T-1 series, the "RIO"**; the 302 model is equivalent to the L and J models of the **1-T-5 series**, **the "New Globe Trotter"** while the 303 model is the copy of the K, HE and JE models of **the TX-1 series**, **the "Scepter"**. These names have been taken by me from a primary source of information (you can't do better!) that is from the title page of the original technical bulletins, the "SERVICE DATA" of the RCA VICTOR[9], which, in view of the preparation of this article, I fortunately purchased directly on eBay-USA at the beginning of the year 2019 and for the benefit of the readers, I report in Figures 15, 16 and 17. Each bulletin shows the image of the radio and bears its detailed description. The different letters used to indicate the various models serve only and exclusively to distinguish the colors of the cabinet in which the same device of the TX-1 series was available or a different combination of the two colors in the other two series. Figures 18, 19 and 20 show some models of the triad, respectively the T-1EN models ("RIO" series, Monterey red and champagne white), 1-T-5J ("New Globe Trotter" series, charcoal colored) and TX-1HE ("Scepter" series, two-tone turquoise-green and champagne-white).

RCA VICTOR

Battery-Operated Personal Radio

T-1 SERIES

Chassis No. RC-1189

SERVICE DATA

— 1959 No. 5 —

PREPARED BY COMMERCIAL SERVICE
RCA SERVICE COMPANY
CAMDEN 8, N. J.

FOR

RADIO CORPORATION OF AMERICA
RCA VICTOR RADIO AND "VICTROLA" DIVISION

T-1 Series—The "RIO"
Model T-1JE—Charcoal and Champagne White
Model T-1EN—Champagne White and Monterey Red
Model T-1EH—Champagne White and Bermuda Turquoise

SPECIFICATIONS

TUNING RANGE ..... 540–1,600 kc
INTERMEDIATE FREQUENCY ..... 455 kc
TRANSISTOR COMPLEMENT
(1) Type 2N412 ..... Converter
(2) Type 2N410 ..... 1st I-F Amp.
(3) Type 2N410 ..... 2nd I-F Amp.
(4) Type 2N408 ..... Audio Driver
(5) Type 2N408 ..... Push-pull Output
(6) Type 2N408 ..... Push-pull Output
A crystal diode is used as 2nd detector.
A crystal diode is used as overload diode.
BATTERY
Three type No. VS-035 ..... 1½ volts each
Current consumption (with no signal) ..... Approx. 8 ma
Useful life (intermittent service) ..... Approx. 100 hours

LOUDSPEAKER
Size and type ..... 3½" P.M.
Voice coil impedance ..... 130 ohm center-tapped
Provision is made for connection of a 2000 ohm impedance earphone if desired. RCA earphone accessory Number RK-219A is recommended.
POWER OUTPUT
Undistorted ..... 150 milliwatts
Maximum ..... 225 milliwatts
DIMENSIONS
Height 6 15/16" Width 4 1/16" Depth 2 1/8"
WEIGHT
Approximately 1½ pounds including batteries.

Fig.15. T-1 Series "Service Data" (First Edition-First Printing-1-15-59)

RCA VICTOR

Transistorized Portable Radio

MODEL 1-T-5 SERIES

Chassis No. RC-1195
Circuit Board No. 931650-1

SERVICE DATA

— 1959 No. 30 —

PREPARED BY COMMERCIAL SERVICE
RCA SERVICE COMPANY
A DIVISION OF
RADIO CORPORATION OF AMERICA
CAMDEN 8, N. J.

1-T-5 Series
The "New Globe Trotter"
Model 1-T-5L — Aqua and Satin Aluminum
Model 1-T-5J — Charcoal and Satin Aluminum

SPECIFICATIONS

TUNING RANGE ..... 540–1600 kc
INTERMEDIATE FREQUENCY ..... 455 kc
TRANSISTOR COMPLEMENT
(1) RCA 2N544 ..... R.F. Amplifier
(2) RCA 2N412 ..... Converter
(3) RCA 2N410 ..... 1st I.F. Amplifier
(4) RCA 2N410 ..... 2nd I.F. Amplifier
(5) RCA 2N408 ..... Audio Ampl. and AGC
(6) RCA 2N408 ..... Audio Driver
(7) RCA 2N408 }
(8) RCA 2N408 } ..... Push-pull Output
A crystal diode is used as second detector.
TUNING DRIVE RATIO ..... 6½:1 (3¼ turns of knob)

LOUDSPEAKER
Size and Type ..... 4" x 6" PM
Voice coil impedance ..... 130 ohms at 400 cycles
BATTERY
Four RCA Type No. VS 035 ..... 1½ volts each
Current consumption (with no signal) ..... Approx. 10 ma.
Approx. useful life ..... 100 hours at 2 hrs. per day
POWER OUTPUT
Undistorted ..... 290 milliwatts
Maximum ..... 500 milliwatts
DIMENSIONS
Height 6¼" Width 9⅜" Depth 2¾"
WEIGHT ..... Approximately 3½ pounds including batteries

Fig.16. 1-T-5 Series "Service Data" (First Edition-First Printing-10-28-59)

The availability of the precious technical bulletins, now finally also the American ones (!), as well as some specimens of the above radios, allowed me to cross-check both sides of the printed circuit

[9] *VICTOR is the name (preceded by RCA) that appears, often together with the RCA logo, both on the cabinet of all RCA vintage radios and always, on all the paper labels glued inside or on the bottom of the cabinet of each model and bearing the model name and serial number of the same. As we read in the "Service Data", RCA VICTOR was a division of the Radio Corporation of America. The prestigious name VICTOR was added after that in 1929 RCA bought the Victor Talking Machine Company, then the largest phonograph and record-making company in the world.*

RCA VICTOR

Transistor Dual-Speaker Radio

TX-1 SERIES

Chassis No. RC-1196A

SERVICE DATA

— 1959 No. 29 —

PREPARED BY COMMERCIAL SERVICE
RCA SERVICE COMPANY
A DIVISION OF
RADIO CORPORATION OF AMERICA
CAMDEN 8, N. J.

TX-1 Series—The "Scepter"
Model TX-1K—Driftwood Beige and Buff
Model TX-1HE—Turquoise and Champagne White
Model TX-1JE—Charcoal and Champagne White

SPECIFICATIONS

TUNING RANGE ... 540–1,600 kc
Conelrad frequencies marked
INTERMEDIATE FREQUENCY ... 455 kc
TRANSISTOR COMPLEMENT
(1) RCA 2N412 ... Converter
(2) RCA 2N410 ... 1st I-F Amp.
(3) RCA 2N410 ... 2nd I-F Amp.
(4) RCA 2N408 ... Audio Driver
(5) RCA 2N408 ... Push-pull Output
(6) RCA 2N408 ... Push-pull Output
Type 1N60 Crystal Diode ... 2nd Detector
Type 1N60 Crystal Diode ... Overload Diode
BATTERY
Three "C" size cells ... Long Life RCA Type VS335 or Standard RCA Type VS035
Current consumption (no signal) ... Approx. 9 ma.
Useful life (intermittent service—VS035) ... Approx. 100 hours

LOUDSPEAKER
Size and type ... One 3" P.M. and one 3½" P.M.
Voice coil impedance ... 130 ohm center-tapped
Provision is made for connection of a 2000 ohm impedance earphone. RCA accessory earphone RK-219A is recommended.
TUNING DRIVE RATIO ... Approx. 6:1 (3 turns of knob)
POWER OUTPUT
Undistorted ... 300 milliwatts
Maximum ... 490 milliwatts
DIMENSIONS
Height ... 4¾" Width ... 9 15/16" Depth ... 2 11/16"
WEIGHT
Approximately 2½ pounds including batteries.

Fig.17. TX-1 Series "Service Data" (First Edition-First Printing-6-29-59)

boards (which on the soldered side bear printed for each model the same number!) as well as the wiring diagrams of the circuits of all these radios: at the end of the comparison I had unequivocal proof of being in the presence of twin radio sets. And not only this! From the comparison of the printed circuit boards (chassis) of the 301 (Fig.7) and 303 (Fig.9) models and of the equivalent American models, it emerged that these two chassis are practically the same, having the same design as the printed tracks and therefore identified by the same number 931489-1 (2) as shown in the Figures 21 and 22. From an electrical point of view these are three radio receivers capable of receiving only the Medium Wave (BC) band from 540 to 1,600 kHz which use a conventional superheterodyne circuit consisting of a converter stage, two amplifier stages tuned to the intermediate frequency (FI) of 455 kHz , a detector diode, a CAG (Automatic Gain Control) circuit, an audio drive stage and a class B push-pull output stage. Models 301 and 303 employ six transistors while model 302 (the top of the triad) is for eight transistors with two extra stages, one tuned to radio frequency (RF) to obtain a high sensitivity and the other low frequency preamplifier (AF) which allows to have a high output performance even in the presence of weak signals.

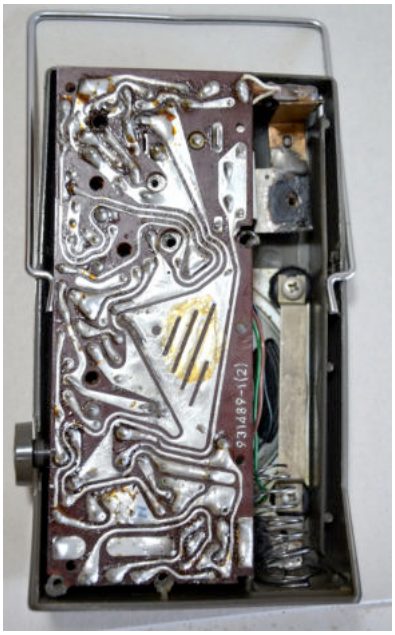
For obvious reasons (the most difficult availability, the similarity of the wiring diagrams and the space requirements in the magazine), only the schematic diagram prepared for the American models 1-T-5L and 1-T-5J is shown in Fig.23. This schematic is drawn from the RCA "Service Data" obviously identical (except for the different linguistic notes) to the scheme of the model 302[10] present, with initials RD, in vol. I of the CELI schematics. In addition to the presence, as mentioned, of two more transistors, the diagram shows the lack of the damping diode present instead in models 301 and 303 and the peculiarity of the CAG circuit that is inserted in this model (and not in the others!) in the emitter circuit of the audio preamp transistor (indicated with Q5 which is a 2N408) and so as to control not only the first IF transistor (intermediate frequency) but also the RF transistor (Q1, a 2N554 shown in Fig. 24). In all models there is an earphone socket inserted in the collector circuit of the driver transistor (Q6 in the schematic diagram: another 2N408) which allows for bypassing the generous oval speaker (in 301 the speaker is circular in shape while the 303 has two circular speakers) and listen to the radio with a high impedance hearphone (2,000 Ω) without disturbing someone nearby.

Fig. 18. RCA Victor T-1EN

[10] *The technical bulletin of the models 302 and 303 (and not that of the 301!) lists in the summury of transistors, two Fivre types in substitution of the RCA 2N408: the 2N19F4 as a driver and the 2N18FA4 for the matched pair of the output stages. While the only letter "F" or the group of letters "FA" are normally found in the abbreviation of some Fivre transistors, not so for the number "4" present at the end of the abbreviation and which presumably indicates that these are transistors selected for the specific use.*

Fig. 19. RCA Victor 1-T-5J

Fig.20. RCA Victor TX-1HE



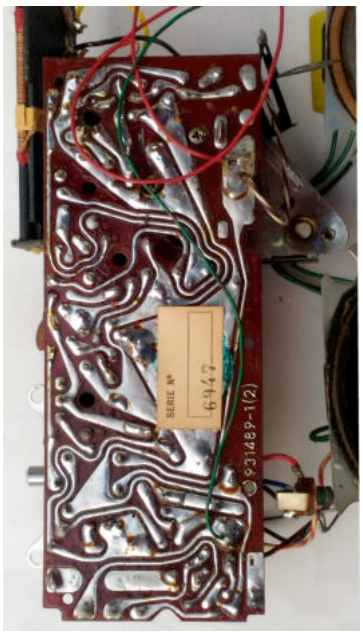


Fig.21 and 22. Chassis, viewed on soldering side, of the Radiomarelli models 301(on left) and 303 (on right). The same chassis is used for both models RCA Victor T-1 series and TX-1 Series. The chassis number is 931489-1 (2).

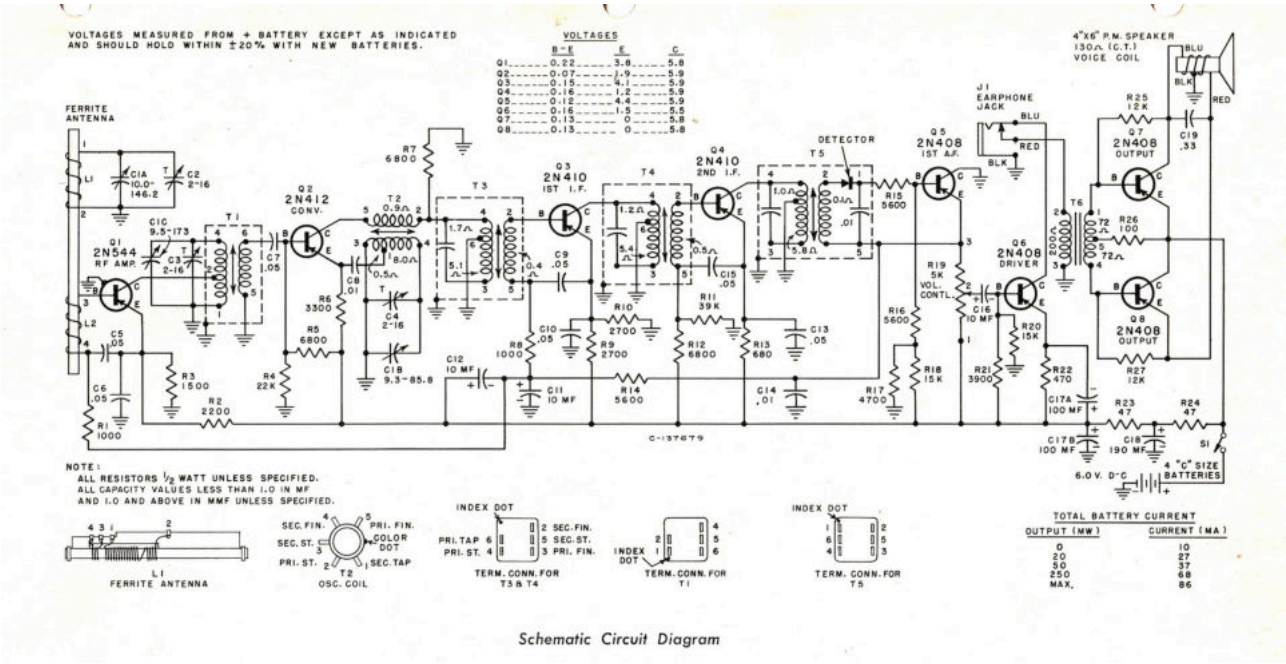


Fig.23. Schematic Circuit Diagram for RCA Victor 1-T-5 Series

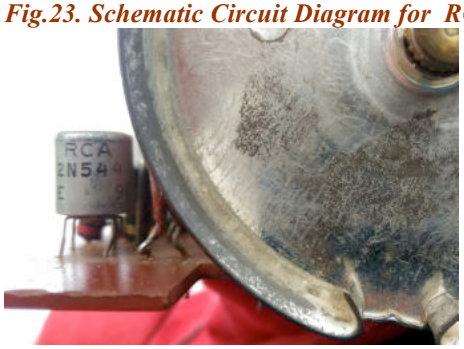


Fig.24. 2N544 RCA R.F. transistor

Collectibles and market

The first three all transistor radios by Radiomarelli, like all vintage radios, are becoming increasingly difficult to find, both in the various online sale and purchase sites of used items and in electronics flea markets. If, however, it is more likely to come across models 302 and 303, it becomes more difficult to find the model 301 which already in the ANIE catalog No. 7 of the two-year period 1961/62 is replaced by the model 304 (both with the initials RD and DS) often confused with its predecessor 301.

The 304 (in Fig.25 is shown this model with the WEST brand) model tends to detach itself from the 301 and the American "RIO" series twins because despite having the exact same cabinet as the 301, it has a tuning dial with a somewhat different numbering scheme and the tuning knob, although having the same diameter of 56 mm, lacks the star on the central knob which gives it an extra touch of beauty. Opening the model 304, it turns out that also its printed circuit board has a different design as well as the transistors used are the European types AF-- and OC., and no longer the Americans 2N--. Furthermore, although these models are the same from a circuit point of view, the 304 has the intermediate frequency transformers tuned to 460 kHz while

Fig. 25. West DS 304

those of 301 oscillate as the American equivalent at 455 kHz. And I would also add that while the 301 model and the American twins have a bandwidth from 540 to 1,600 kcycles, the 304 has a bit larger extension bandwidth, from 525 to 1,640 kHz.

The twin RCA models of the 301, 302 and 303 I have never found in the second-hand markets in Italy and if among the readers of ARM there is some collector who owns one, it is undoubtedly an example brought in modern times in the USA or belonged to one of our compatriots who then took it from America. In "Transistor Radios Practical Guide" of the the Italian ARM journal are shown the photos of the Radiomarelli 302 and 303 models, while the 301 model is missing (but on the other hand there is on page 148 the 304) and the RCA equivalents are also missing. The latter are reported in almost all transistor radio guides of American authors, also dated by now like the Italian guide, and in which no Italian model is ever mentioned. In Norman Smith's beautiful book "Transistor Radios 1954-1968" (published in 1998 by Schiffer Publishing, Ltd.) only the VICTOR 1-T-5L RCA model is shown but the other RCA models seen above are not even mentioned. Perhaps because they are not very attractive and also rather cumbersome to work, like all the first transistor radios, only on a single wave range (BC = Medium Wave), these radios, both the Radiomarelli and the RCA, are little sought after by the close circle of transistor radio collectors, both in Italy and in the rest of the world. In fact, those few times that I have seen them and I still see them in online advertisements or auctions, although in good condition, these radios always receive low prices (no more than €40 for Marelli and around $50 for US RCA) and remain unsold for a long time. Although they are well-built and historically important, these are sets intendend only for collectors because, as is already the case in almost all Europe, they can only be heard in the evening when the Medium Waves, thanks to the "ionospheric mirror", cross national borders.

Sarnoff and Marconi, on the same wavelength

The decades-long and close collaboration between the now no longer existing Italian Magneti Marelli [11] and RCA, also for a long time (1986) dismembered and changed hands, suggests that the basis of the excellent technical-scientific and economic exchanges, certainly important for the work and the wealth they bring, there must also have been good human relationships and friendships consolidated over time between the top managers of the two big electrical companies, thus geographically distant but close to each other. Although there is no news on the subject, however, not only are personal biographies well known but also the relationship of true friendship between David Sarnoff, president of RCA for decades, and the father of wireless telegraphy, Guglielmo Marconi. For those who still don't know, Marconi was a native English speaker (in fact his mother, Annie Jameson was Irish!) and the mastery of this language undoubtedly facilitated the presentation, development and affirmation of his invention as well as his personal one in the Anglo-Saxon world. David Sarnoff, son of Belarusian immigrants of Jewish origin, fatherless, from September 30, 1906, at the age of 15, began working in the Marconi Wireless Telegraph Company of America (commonly called American Marconi, a company founded in 1899 as a subsidiary of the Marconi's Wireless Telegraph Company Lt.) first as a simple office boy and then became an expert radiotelegraphist both on onshore stations and offshore on ships as well as Marconi's pupil and friend: perhaps the scientist recognized in the young Sarnoff something familiar, his youthful years spent experimenting on electromagnetism in the parental estate near Bologna. A great leap forward in his shining career, Sarnoff did so when shortly after midnight on April 14, 1912, on duty at the radio telegraph station installed atop the Wanamaker department stores in Manhattan in New York, he received messages from the ships that were saving the survivors of the Titanic. According to what was reported in the press and by Sarnoff himself it seems that he remained glued to the Morse key

[11] *The news of the official passage, of the completion of the sale by the FCA Group (Fiat Chrysler Automobiles), owner of the well-known company Magneti Marelli, manufacturer of automotive components, to the Holding of Calsonic Kansei Corporation, the Japanese supplier of components for vehicles. If the news saddened many Italians, instead the FCA shareholders rejoiced, which collected 5.8 billion Euros in the year in which Magneti Marelli celebrated its 100 years of life! Below is the web page that recalls this prestigious Italian company which was an important piece of national history: https://magnetimarelli100.com/it/sparkles/radiomarelli*

and with headphones on his ears for seventy-two hours, from the first message received and until he managed to communicate to the press the names of all the survivors. In retrospect, some historians questioned Sarnoff's claims. The fact is that after the disaster of the Titanic he was awarded by American Marconi becoming radio inspector for ships in the port of New York and a few months later for all the United States and he was also entrusted with the Marconi Institute, the company's radiotelegraphist school. In 1915 Sarnoff wrote a memo to the vice-president of Marconi, a note that has now become famous, in which he proposed his idea of developing a "Radio Music Box" (these are the words he used), that is, a "radio receiver enclosed inside of a box ", a portable radio in essence, to be marketed for home use. This idea of his managed to materialize only a few years later, in the early 1920s, after the General Electric Company (GE), pushed by the Navy and the American government, bought all the assets of American Marconi by creating (in October 1919) a new company, RCA, of which Sarnoff in 1922 had already become general manager and then reached the position of president in 1930, at the age of 38. In 1949 he became chairman of the board and retired only in 1970, a year before death caught him. In a passage from Kenneth Bilby's biography on Sarnoff (The General: David Sarnoff and the Rise of the Communications Industry, NY, Harper & Row, 1986) we read that ..... in 1928, when he was already general manager and no longer in Marconi's company for some time, Sarnoff and his wife Lizette spent their holidays in Italy with the Marconis and the two men spent many nights together discussing the future of electronics and the possibility of creating new collaborations between the two companies (joint ventures). There are no photos of this holiday in the "David Sarnoff Library" collection but there is a photo album from Sarnoff's personal collection which begins in 1922 and is titled "Marconi".

In it there are photos from 1933, one depicting the two famous characters visiting the imposing RCA radio broadcast complex, "Radio Central" at Rocky Point (Fig. 26) in New York and another with four spouses posing together in front of the Niagara Falls. Further on the album there are photos signed by Elettra, daughter of Guglielmo and Maria Cristina his wife, which portray Elettra as a girl in 1939 and a few years later as a young woman. The album ends with a photo from 1958 showing Sarnoff carrying his homages to Marconi's grave. On YouTube, at: https://www.youtube.com/watch?v=Ukk6_OF0UPU&t=5s there is a video where Sarnoff welcomes the Marconi couple to aboard the ship that in 1933 brought them to America. Another nice video is here: https://www.youtube.com/watch?v=HN-RdFjzdQI

Fig. 26. Sarnoff and Marconi visiting Rocky Point, New York 1933

From his friendship with Marconi, David Sarnoff obtained many things: his dedication to radio transmissions, advanced training on electrical materials, administrative responsibilities and the inexhaustible ability to recognize and make friends with brilliant people wherever he found them. And even a genius like Marconi who was capable of marveling like a child before the mysteries of physics, one day talking about his invention with his friend David, it seems that he had to confess to him: "There is one thing I would like to know before I die , why does this thing work? "

(The End)

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Thankswords and Notes

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The radio images shown in Fig. 18, 19 and 20 come from ads on eBay-USA while Fig. 26 from the Hagley online library and museum at the web address: https://www.hagley.org/librarynews/sarnoff/marconi-and-sarnoff-same-wavelength
All the other photos belong to models from my collection or from collections of other collector friends just mentioned.

A special Thanks to my radio friend Bob Davidson for his editing work on this article.

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