

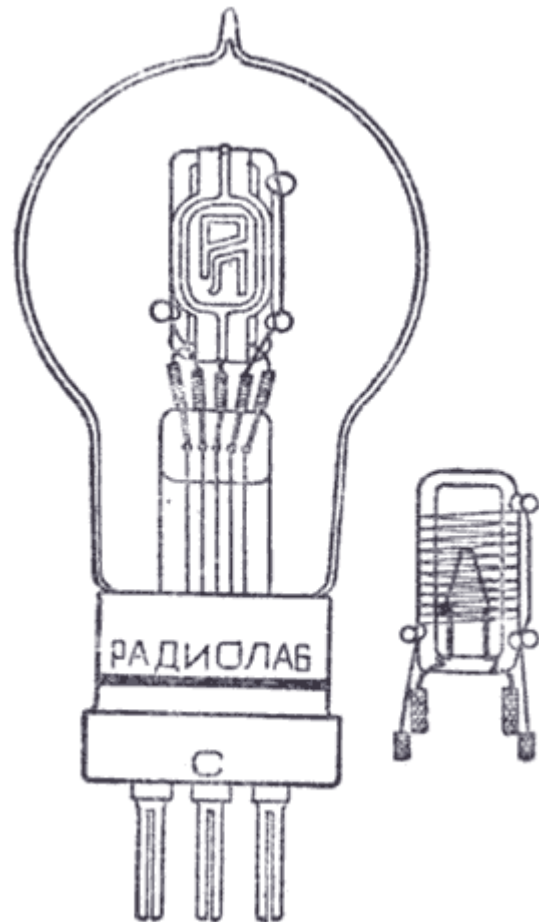
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Historical notes about development of tubes from early years to our days in the World and in Russia

<http://oldradio.onego.ru/>

For a time receiving and amplifying valves were named in this country "cathode" or "vacuum relay". The first Russian mass valve designed in 1918 at the Radio Laboratory of the town of Nizhny Novgorod under supervision of M.A.Bonch-Brouyevich (on the basis of the first model - "Babushka" tube) was named **PR-1** ("vacuum relay, model no.1"). The name of the **R-5** valve produced in 1922 by the Petrograd Electro-Vacuum Works meant: "relay, model no.5. A new valve with thoriated cathode produced in 1923 consuming a ten times less

PR-1



- 1. R5
- 2. Micro
- 3. MDS

denominated K2-T ("rectifier with two anodes and thoriated cathode").

heating current than the "R-5", was named the "**Micro**". Equally economical of heating a two-grid valve with "cathode grid" was named "**MDS**" ("micro, two-grid"). The first low-powered vacuum rectifier was

By 1929 the number of models of radio valves increased very much, which caused the necessity of the introduction of a new integral system of their denomination. A 'letter and figure' system of marking was introduced, which remained till early 1940's. The first letter in the valve marking shows it's category: "P" - receiving, "U" - amplifying, "S" - special, "V" - rectifying, "T" - broadcasting, "N" - low-frequency. The second letter described the cathode - "T" - thoriated, "K" - carbonized, "B" - bariated, "O" - oxide. The figure included

in the marking, which was usually a factory number of design, served for division of the valves of the same category. According to this system the valves models R-5, "Micro", MDS, PT-19, KT-2 were renominated as P-7, PT-2, ST-6, ST-19 and VT-14 (in Russian transcription).

In early 1930's a series of economical glass valves

of 2 and 4V direct heating appeared (UB-107, [UB-110](#), SB-154 etc.). The receivers using such valves were battery-supplied. From 1935 the so-called [4-V "super"-series](#) of glass valves with indirect heating appeared, which was installed in the AC-supply direct-amplification radios (E4S, [EKL](#)) and in the first Soviet superheterodynes (TsRL). In 1931 the first home penthode SO-113 of this series was produced.



VO-166

SO-124

UB-110

The main drawback of this marking system was that it defined the valves rather approximately. For instance, one and the same valve could be referred to the category of both receiving and amplifying valves. From the other side, the valves that strongly differ from one another, such as triodes, tetrodes with "cathode grid", tetrodes with a screening grid, AF penthodes and both kinds of RF penthodes ("varimu" and with short characteristics) were put into the same category ("C") of special valves. Produced in 1937 penthode model SO-183 and a double diode-penthode SO-193 were also included in the same category. Besides, the existing system of marking did not make it possible to define if a given valve was used in a battery radio or it had an indirect heating cathode.

In 1937 our electro-vacuum industry started mass production of quite a new type of valves. There were the tubes in metallic cases - 6A8, 6G7, 6J7, 6K7, 6L7, 6F5, 6F6, 6S5, 6X6, 5C4 (in Russian transcription) and also the glass electronic optical tuning indicator 6E5 - similar to the contemporary American tubes (6A8, 6Q7, 6J7, 6K7, 6L7, 6F5, 6F6, 6C5, 6H6, 5Z4, 6E5). The metallic valve 6L6 (Russian AF power tetrode) and the glass versions of the 5Z4 and 6L6 tubes were produced somewhat later and still later the cheaper glass analogues of many other metallic valves appeared. The marking system of all those valves was more precise than that of 1929. The name of the valve was shorter and its purpose and properties were defined more exactly.

EKL - 34

The 5-tube R-set of direct amplification "EKL-34" was produced by Leningrad Kozitsky Works (earlier spelled "Kazitsky") from 1934 and was an improved version of the "EKL-4" set. The difference was a better technology and characteristics. In the author's collection the set has the serial number 3903. BASIC TECHNICAL DATA.

Set of tubes: SO-124, SO-118, SO-118, UO-104, VO-166

Tuning range:

MW 225-720 m; LW 680-2000 m

Sensitivity - 40-300 mcV/m

Power output 0.8 W

Power consumption 65 W

Dimensions 520x420x260 mm

The AC-switch of lever-type is placed on the left side of the base. The vertical moving dial of 20x25 mm has a pointing in fixed units, a light, a wire pointer. Beside the dial there is the control handle of the 3-section tuning capacitor. The two knobs on the base control volume and positive feedback. Wire potentiometers wound on wooden rings are used for control. In the center a small lever with horizontal move is the band selector. The two levers to the left serve for fine tuning of RF coils for maximum sensitivity during listening. The set has a couple of adapter terminals to connect with a gramophone. The switching of the AC voltage of 110-127-220 V is made by resetting of the jumpers

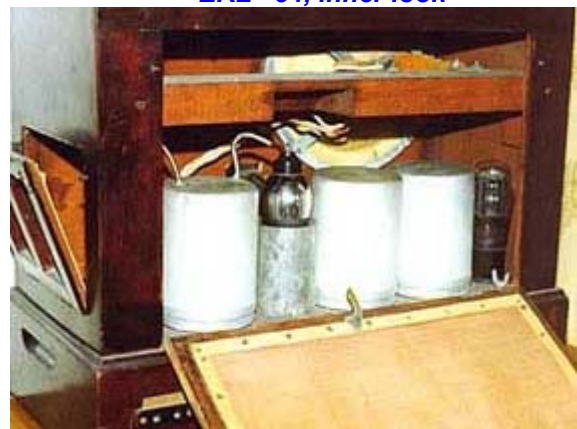
on the net transformer. The loudspeaker has a 3-section field coil. The outer side of the glued paper cone is made of natural leather.

The R-set is built according to the structure of direct amplification 1-V-2 with controlled positive feedback using tubes of the indirect 4-volts heating. The RF amplifier on a tetrode SO-124 has the cap coupling

EKL -34

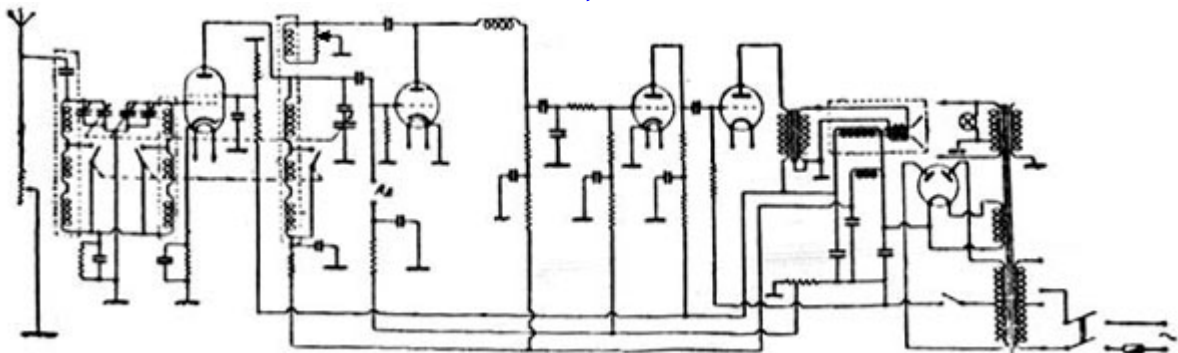


EKL -34, inner look



with the aerial. A SO-118 tube works as the detector. The first AF step is built on a similar tube. The output audio step is working on a direct heating triode UO-104. The scheme is sourced on a rectifier VO-116. All the resistors are carbonic ("Kaminsky" type). The filter caps are paper-made (Leningrad "Krasnaya Zarya" Works), the rest are of open construction made of mica.

EKL -34, the schematic



We should note, that even the latter system of marking was not quite consistent. For instance, one and the same letter "F" was used to denominate a high-gain triode and an output AF penthode (6F5 and 6F6). Initially the figure taking the third place in the

marking showed the number of outer terminals (including the filament and the outlet of the metallic case). That hindered denomination of new valves similar to the earlier produced ones with the same number of

electrodes. And in 1940 a new project of marking of radio valves was worked out , which eliminated this drawback. The most parameters of the system were close to the international one. The first figure approximately showed the heating voltage, the letter in the second place described the basic purpose of the valve or its construction. The figure in the third place did not have a special meaning and then served for division of the valves of the same purpose and construction. For description of the valves' outer design (except the usual metallic ones) another letter was added: "C" - [a glass valve of usual size](#), "M" - [glass, mini-sized](#), "J" - glass, of "acorn" type, etc.

Soviet mini-sized valves of the battery series. 2V direct heating, an octal base. Early 1940's. The outer conducting coating serves as a screen. Photo shows valves 2G2M, SO-243, 2K2M, SB-243. See ["Rodina-47"](#).



In accordance with the new marking system some valves (in particular, the glass mini-sized ones worked out in 1938) got a new marking. For instance, the valve model SB-242 should be marked 2A1M, the SO-241 - as 2K1M etc. But the new marking was not generally accepted because the radio works continued production of valves with the old marking. Only mini-sized valves of a later design ([2K2M](#), [2J2M](#)) were marked in a new way.

Because by the time there were still many radios in operation using valves of the old 4-Volt glass series our industry produced for some time valves substituting the former types. The names of substituting valves are the following: 4N4S (for SO-118), 4F5S (for SO-122), 4J5S (for SO-124). The inner framework of the tubes

The European valves with a "spider" base. 4V indirect heating. End 1930's. Photo shows valves: AK2, AL4, AF3, ABC1, AZ1 made by the "Valvo" and "Telefunken.". It is interesting to note the screening caps used for such valves (["Tefag" chassis](#)).



The radiotrons made by the American "RCA" corporation. Most of them had 6,3V indirect heating. Produced in 1930's. Photo shows tubes: 6A7, 75, 80, 6D6 from ["RCA Victor 5T4"](#) receiver. The valve 7G12S of a similar design was produced in the USSR.



The valves with a T-type base (8 pins). Left - the metallic valve EF14 made by "Telefunken G.m.b.H." for military purposes (WWII) with the inscription "Wehrmacht". Then follow the UCL11, EYY13 and the vacuum impulses counter N3 made by the "Dressler"



6N7S (one triode), 6F6, 6J7 and 6K7 was used in the substitutes. The electric data (except heating voltage) and the base were the same as in old valves. Such valves are very rare now.

In 1946/47 the "metallic" series was extended by quite a number of new valves. In particular, the newly produced so called "single-base valves" appeared, which were similar to the American 6SA7, 6SK7, 6SQ7 and later - the 6SR7 and 6SJ7. They did not have a control grid terminal in the upper cap any more, but due to a special construction of the base the inter-electrode capacity did not increase at that. The letter "S" in the second position of the marking stands for "single-base". During the first years the valves were produced under their "native" marking, but later they were designated as 6A7, 6K3, 6G2, 6J8 (in Russian transcription). In the author's collection there are such valves with a Latin marking produced in late

1940's and a Soviet valve of the same period 6V6-GT - the ancestor of the well-known AF output tetrode [6P6S](#) (in Russian). The "legendary" 6P3S valve had also undergone several modifications. Its history begins with the metallic 6L6 valve (Russian) of 1937 make. The first version of the home "in glass" 6L6 was no good because of overheating of the under-sized case. The valve [6P3](#) (Russian, made of glass, though not having the "S" at the end of the marking) produced in early 1950's did not show the required quality. Only in mid-1950's its construction was improved. That was the "classical" 6P3S already. It is produced even now with slight improvements and bears the marking of 6P3S-E and is a valve highly thought of among the audiophiles.

The two-anode direct heating [5C3S](#) kenotrone has also a long history. Among its predecessors there are both the old German valve of the "numeral" series [RGN1064](#) and our [VO-166](#). Similar valves existed in the European "A"-series ([AZ1](#)), and also in the US ([5U4G](#), [RCA80](#)).

Octal (8 pins) valves of the metallic series. They have a directing spigot on the base. In the USSR their production started in 1937. Valves with 6,3V indirect heating were most widely used. Photo shows Soviet valves 6F6, 6A7, 6K3, 6G7, 6X6, 6L7. They were popular in the USSR till end 1950's.



Soviet octal valves in the bottles. 6,3 (12,6)V indirect heating. Enjoyed a wide spread in the USSR somewhat later than metallic ones, often being their cheaper equivalents. Among them we can point out a group of valves with a high heating tension for series connection of the filaments in transformerless shemes (see ["Rekord-47"](#)). Photo shows valves 6P3, 6N7S, 5C3S, 6P6S, 6F5M, 6F6S, 6E5, horizontally - 30C6S.



Home-produced valves of higher durability with metallic rings over the bases:
30P1S, 6G7S, 6X6S, 6A10S, 6S2S, 6N8S,



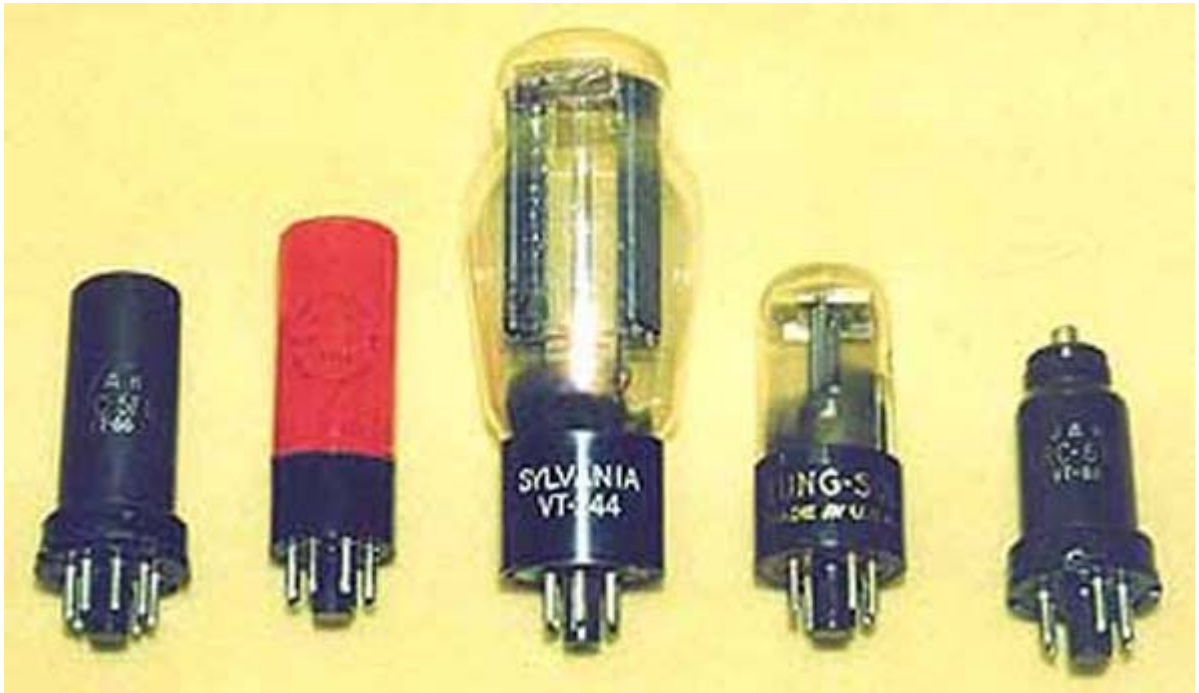
5Z4S.

When the standard GOST-5461-50 was introduced in this country, the system of marking of radio valves was put in order. The principles of classification mostly remained the same. The marking of new types of valves ("finger-shape" etc.) were already envisaged in the above-mentioned standard.

Made in the USSR



The valves produced abroad. Photo shows valves: 6F6 by the "Kentucky Radiotrones", EM34 by the "Philips" (a tuning indicator with two diametrically set sectors), 5U4G by the "Sylvania Thorn Colour Television Laboratories Ltd.", 6X5 by the "Tung-Sol Electric Inc.", 6K7 by the "Kentucky Radiotrones", RGN1064 by the "Telefunken".



In mid 1950's the construction of the octal valves was modernized. With no more fastening of the holders of electrodes on the so-called "crest-pod" (left) a considerable decrease of the valves sizes was made possible (right). On the photo: two different versions of the 5691 tube made by the RCA.

The glass analogs of the European metallic valves with outer screening coating. On the photo: 6SQ7 и 6SJ7.



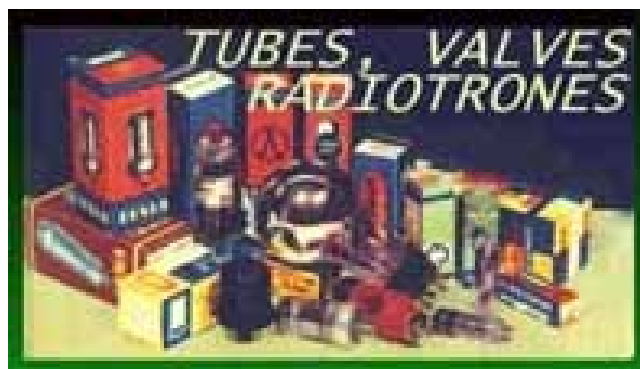
Glass valves with Loctal base - 9 pins having a lock in a metallic spigot. 1940-50's. Photo shows the Soviet 4P1L valve (in the center). In particular, such valves were used in the ["Philips 208U"](#) radio.



Glass valves with the "Rimlock" base. 8 pins, diameter 18 mm. On the tube's glass base there is a direction "nose". Photo shows 6,3 V valves of indirect heating produced by the "Philips" taken from a ["Philips 320A"](#) receiver: ECH42, EBC41, EAF42, EL41, AZ41. Valves of such a design were not made in the USSR.



Valves with the Noval base with 9 or 7 (Heptal) pins, known in the USSR as "finger-shape" valves. Diameter 18 and 16 mm. A gap in the pins located by circumference served for direction while setting the tube. They gained a wide spread in the USSR from late 1950's as substitutes for octal valves and became the last series of tubes used in home radio devices.



Battery valves with the Heptal base. Have 1,1 (2,2) V direct heating. Home produced tubes are known from end 1940's and were installed both in table-top (the "Rodina-52") and portable battery powered radios. Photo shows valves: 2P1P, 1A2P, 1B2P, 1K1P, 2P2P.



FROM THE AUTHOR

We have seen with our own eyes the eclipse of the whole epoch - the epoch of the Soviet Union. And somehow imperceptibly the things of our common surrounding became pieces of antique. It seems quite recently that we tried persistently to get rid of bulky valve radio receivers and buy light and portable "transistors" instead. Generations change in technology but even now who of the people over 35 does not feel nostalgic of the scale and the "green eye" of an old radio gleaming in the darkness...

I have a feeling I was interested in old radios through all my life. May be it is genetic memory? My grandfather, a journalist by education, took a great interest in radio broadcasting in 1930's. He was also an active listener. I remember him sitting at the radio set trying to tune in some DX station through the mess of statics. It was my grandad who gave me my first radio set as a present in early 70's. It was a big and heavy multi-band set trying to tune in some DX station through the mess of statics. It was my grandad who gave me my first radio set as a present in early 70's. It was a big and heavy multi-band set in a wooden cabinet model "October". Frankly, I was only 7 then and it did not become the first piece of my collection - after some time it was lost. My present collection is about 3 years old. A receiver of the same model as my very first one is most precious to me. Besides some radios made in this country in 1930-50's I also have some R-sets produced by Phillips, Mende, Tefag, RCA. A radio of direct amplification "EKL-34" made in Leningrad in 1934 is the oldest of them all.

The home-produced TV valves with the Magnoval base. Not used in R-sets. On the photo: 6D22S, 6P41S, GP-5, 6P45S, 6P42S.



Unfortunately it does not work now because of wasting of the materials, of which resistors and caps are made. In case of need I reconstruct my radios carefully. Fortunately, we can still find here old spare parts and materials to use them for restoring. Working with my collection brings me a kind of energy. Every R-set was some time "a favourite of the family" and the spirit of old times hides under every chassis and revives in the soft radiation of the tubes.

The idea of making a homepage reflecting my collection has come to me in the summer of 1998. And since then the volume of information on the site has been increasing and the design of the pages has changed not once (for the better, I presume). For over a year I have attained a kind of an "intermediate finish": now on the pages those interested can find not only the photos but also the diagrams and technical data of all the radios included in the site. In the halls of the virtual gallery the music of those half-forgotten years can now be listened to. "The Tube Souls" forum is open on the site that (I hope) will become a place of contacts between valve radio fans and collectors. Marking the virtual museum with a special award of the biggest Russian site on museums www.museum.ru was a pleasant result.

During 1998 my collection was enlarged by some rare exhibits owing to information in the World Wide Web. But the contents of the site have gone beyond the limits of the exhibition. The growing interest of Russian and foreign visitors of the virtual gallery for the history of this country's radio industry, the attention of the

press have confirmed my intension to convert the site into a complete database on all the models of tube home radios produced in this country which include not only the technical characteristics but also a description

of the exhibits, so to say, from the first hands. The volume of material piled up during the work on the collection makes this project quite realistic.

In conclusion the author calls for the visitors of the virtual museum to express their opinions and remarks. Welcoming every criticism, I hope that the intercourse with the visitors will enable me to upkeep my virtual gallery as a constantly attractive resource in the Russian section of the Web.

Yours sincerely,
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"Volna-T" broadcasting receiver. 1970's.



"PTS-47". Built-in broadcasting receiver. Model 1947.



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