**Radio components.**

**The emergence of the term "radio components".**

The radio components are the electronic components, which are the constituent parts of the electronic circuit.

Nowadays, electronic components are widely used in all devices. Many radio components (transistors, resistors, diodes, capacitors) began to be assembled as a single electrical microcircuit, which looks like a complete device of the LIC type (large integrated circuit).

**Classification of electronic components, which are used in radio circuits.**

**Passive Radio Сomponents.**

**Resistors.**

Resistors, with a nominal dissipation power from 0.063 to 10 W, can be divided into constant, variable, trim. The power of permanent water-cooled resistors can reach 200 watts. This type of resistor is used to measure the current that passes through the ground bus.

**Condensers (Capacitors).**

All types of capacitors are designed for the accumulation and release of electric charges. The capacitor cannot be used as a direct current conductor. Farad is a SI unit of electrical capacitance, equal to the capacitance of a capacitor in which one coulomb of charge causes a potential difference of one volt It is used to smooth ripple in a DC / AC source; serves as a buffer, in order to facilitate the operation of various rectifiers; reduces the impulse noise that can affect high-sensitivity elements and their operation.

**Inductors.**

Such radio components as inductor (coil), throttle (choke), transformer are used to adjust the oscillatory circuits, change the value of voltage, current, smooth out, etc. In the 20th century, the use of transformers in the source of electrical power was widespread. Now, the classic power supply is replaced by a pulsed power supply.

**Active radio components.**

**Transistor.**

Electrolamps were replaced by transistors, which are much smaller in size and more economical in electricity consumption. The main replacement factor is the size. And no wander, because a microprocessor consisting of millions of transistors, is much smaller than an electric lamp. Transistors operate on the principle of "conductivity of P / N transitions".

Transistors can be composite, bipolar, planar, field (unipolar), and thin-film.

**Diode.**

Diodes are semiconductors, which conduct current only in one direction. They are used in the AC rectifier, as well as in the diode bridge and functionate as protector against such phenomena as reverse polarity. Silicon is used for the production of diodes, although germanium was used not so long ago. Diodes made of different materials have different voltage drops. The germanium diode has a voltage drop in the range 0.2 - 0.5 Volts, silicon: 0.7 - 0.8 V. From these figures depends the heating of the diode. This fact is taken into account when designing electric power sources.

**Chip (Microcircuit)**.

The chip is an electronic component consisting of transistors, resistors, capacitors and other parts. It can be semiconductor, film, hybrid. The microcircuits are producedin various ways: by spraying, ion doping, etching, etc. Nowadays, microcircuits are the most common form of an electronic component.

**Microcircuits (chips).**

**History of the creation of the microcircuit.**

Just a quarter of a century ago, radio amateurs and electronics specialists had difficulty refusing to use electronic tubes in favor of new semiconductor parts called transistors. And today, transistors make a way to semiconductors of the newest generation - IMC (integrated circuits).

Microcircuits can be called as a miniature electronic unit. Such electronic component as transistors, resistors, diodes and other active / passive electronic components are situated in one general shell. The number of these radio components in one increases several thousand. One single modern microcircuit is able to replace a large radio block of any electronic equipment (a calculation device, a computer, a phone and even a wristwatch). Modern microcircuits are widely used in various fields of the electronic industry, medical equipment, aircraft construction and, naturally, in the military sphere.

Microcircuits can be in plastic, metal, ceramic case. This also determines the price at which we buy used ICs. Also the price directly depends on the functional value, which is determined by the marking on the case.

Although widespread use of microcircuits began relatively recently, but the development of this unique radio component began more than fifty years ago, when the American engineer Jack Kilby introduced his boss the first working prototype in 1958.

**According to the way of production technology, the chips are divided into:**

- integral; - film; - hybrid; - mixed.

**By the type of signal that process the device data**

**Analog** – current and voltage stabilizer, MC for controlling the impulse power supply, comprestor, signal generator, signal converter, analog multiplier, sensor.

**Digital** - MCU, microprocessor, MC memory, FPGA, ALU, trigger, register, encoder, multiplexer, adder and others.

**Analog-digital** - digital analog converter, transceiver, interface converter, switch, modulator, demodulator and others.

**Precious metals in radio components.**

**Radio components and precious metals in them. Refining of precious metals from REC.**

If you have no idea where to put the old parts and radio components and think about throwing them away, think twice before doing this! Firstly, they can harm the environment. Metals in radio components decompose and release harmful substances into the soil under the influence of chemical reactions. Sometimes it causes irreparable harm to the environment. Well, and secondly, you can sell them profitably to our company, at very favorable prices for you. Double effect from old parts.

There are several kinds of metals in the radio components, such as: stainless steel, aluminum, copper (and their alloys), as well as gold, silver, platinum group metals, rhodium, and tantalum.

Today, the most of the precious metals could be found in the old Soviet equipment: in the electronic computers of the last century, in old computers. As well as in control units installed earlier on military equipment, radio engineering devices, old telecommunication equipment.

**Which products contain precious metals?**

**Chip.**

The chip contains mainly gold. It is on gilded terminals, pressed into a plastic or ceramic case. Gold is applied to terminals in the amount of 1-10% by a galvanic method. The share of gold-plated pins in the overall weight of the chip is 30%. Plastic chip contains 0.2 - 1% of gold, ceramic 1 - 5%.

**Radiolamp.**

Previously, in old technology lamps, gold was applied to a grid in the immediate vicinity of the cathode. The gold coating was necessary so that the cathode heated by the cathode could not become the source of the appearance of electrons. Also, there are very old lamps, in which even the feet are covered with gold, to increase the service life and for reliability. Basically, such radio tubes were used in military equipment.

**Transistor.**

The transistors contain gold as a substrate under the conductor. The content of a noble metal depends on the type of transistor and varies in measure 0.3 - 2%.

**Condensers.**

This type of electronic components is extremely diverse in form, size, and composition. The condensers used in military radio stations are the least frequent. In them, the greatest content of gold is 7.7 grams, silver - 50 grams.

***In addition to gold, other precious metals are contained in radio components***.

**Silver.**

This is the most common metal in electronic components. But most often it is used for smearing with micron layer connectors, chips, transistors, diodes, relays, capacitors. Silver technical is present in its pure form on the relay contacts.

**Platinum.**

It is used in the production of contacts in communications equipment, in electrical resistances, as well as in cathodes in X-ray apparatuses and in thermocouples.

**Tantalum.**

This rare metal is contained in electrolytic capacitors of high capacity

It should be separately noted that the high content of this precious metal can be found only in Soviet-made radio components, as it was used to create reliable parts of high-quality.

**Connectors.**

**Connector. General information about electrical connectors.**

Connector, or, as it is also called in the specialized literature, an electrical connector is an article by means of which an electromechanical connection of one or more conductors is performed. At the same time, the electrical circuits must be de-energized. The most familiar option is the socket and the plug. The number of contacts is unlimited.

Today, contacts are made of inexpensive metals with good electrical conductivity (composites, aluminum or copper and their alloys). Often they are covered with precious metals (platinum group metals, gold, silver) for better current conductivity. In the Soviet era, such components were made of gold, silver, and platinum in order to improve the quality of signal transmission, especially in electrical connectors intended for the military industry. Now they (connectors) are just sprayed, to prevent contacts from oxidation.

**Application.**

1. Automated, robotic production processes. 2. Video and audio equipment. 3. The military industry. 4. Space, deep-water vehicles. 5. Equipment for medicine. 6. Research laboratories for various purposes. 7. Radars. 8. Telecommunication systems. 9. The nuclear industry. 10. Experimental physics and many other spheres, including home and life.

In all species contact groups consist of always round (almost always) pin (metal) and an elastic plate. Many professionals call this group "dad" (pin) and "mother" (plate). In order to connect / output an electro signal, almost to all connectors there are cables that are inserted into the connectors through the cable entry, which is a special input. In order to prevent undesirable bends and wire breaks, many types have special cushioning tubes.

The connectors are equipped with a special "key" - a groove that will help prevent the wrong connection of different parts, showing the only correct connection.

**Separation by types according to several parameters.**

**Voltage.**

High-voltage connector (more than 50 volts).

Low-voltage connector (less than 50 volts).

**Application.**

- Feeding. - Video / audio. - Signal connector. - Computer. - Others.

**Frequency range.**

High-frequency. Low-frequency.

Type of installation.

- The wire. - Panel. - The chassis.

**Current strength.**

High-current. Low-current. Electrical connection to the terminals. By soldering. Crimping. The terminal screw.

**General characteristics.**

Allowable voltage, current. Number of contacts. Contact resistance. Pressure contact. Electroconductivity. Operating frequency range. Insulation resistance.

Dimensions. Number of connection / disconnect cycles. Operational conditions, mechanical, climatic.

**Transistor. General information**

A transistor is a resistance converter, a semiconductor, which is necessary to amplify, convert and generate electrical oscillations. The transistor is a crystal, which is placed in a special plastic or metal case, and has three terminals. Crystals of the transistor are made of semiconductor materials.

**History of the invention.**

The invention of a transistor is rightfully considered one of the most significant. Transistors have replaced electronic lamps, which for a long time were the only active components for all devices in radio electronics.

The first working transistor was introduced in 1947 by employees of one of the American companies - Bell Telephone Laboratories, in 1956. The transistors didn’t become wide-spread at once. Manufacturers of electronics were skeptical about this little device, and for almost 30 years manufacturers of electric lamps did not notice the competitor. At the very beginning of its "life" the transistor was manufactured using Germanium, as a semiconductor, and then silicon was used to reduce the cost, which is more common in nature.

Today widely used bipolar and field transistors.

**Bipolar.**

This type of radio components is called “bipolar “because the electric current is formed in them. by an electric charge of double polarity - positive / negative. A carrier of a positive charge is called a "hole"; a negative charge is transferred by means of electrons. In bipolar transistors, crystals are used as semiconductors both from germanium and from silicon. Both versions of the transistor have different characteristics, which must be taken into account when creating devices.

**Field.**

It is a semiconductor radio component in which the current formed by the motion of holes and electrons between two electrodes. One more functional part is an electric field created by the voltage of the third electrode. Two electrodes, between which there is a controlled electric current, are the source / drain. The source is the electrode that gives out the charge. The control electrode (third) is the gate.

**Application.**

Today, a bipolar transistor is widely used in the creation of analog electronic devices, as an amplifier in a discrete circuit.

Field transistors are used in digital electronics: processors, computer memory; play the role of an electronic switch.

**Condensers.**

**Condensers. General information.**

All radio engineering and electronic devices, except for microcircuits and transistors, necessarily have capacitors in their composition. Without capacitors, there is no circuit. Condensers perform a variety of tasks.

**From the history of creation.**

The Leyden jar can be considered as a prototype of the condenser, which was invented by Ewald Jürgen von Kleist from the city of Leiden (Germany) and Peter van Muschenbrook physicist from Holland independently from each other in 1745. But the very first kind of capacitors, which consisted of a pair of conductors separated by a dielectric, is a capacitor or an electric sheet of the Epinus, which was used before the Leyden jar. By the way, the Leyden bank really consisted of an ordinary bank, but glued on the outside and inside with a sheet of tin and covered with a lid of wood. A metal rod was inserted into the lid.

**Classification.**

Condensers are classified by several parameters: dielectric type, resistance, insulation, capacitance, magnitude of losses.

**By type of dielectric.**

1. Vacuum (between the plates vacuum). 2. Gaseous dielectric. 3. Liquid dielectric. 4. Solid inorganic dielectric (glass, mica, ceramic, film). 5. Solid organic dielectric (paper, metallized-paper). 6. Electrolytic, oxide-semiconductor. 7. Solid-state capacitor.

**By capacity.**

- Constant. - Variables. - Trimmers.

Capacitors also can have cylindrical, spherical, flat form, etc.

Nowadays, tantalum capacitors have been widely used in DC electric circuits; they are used in modern computers, tablet PCs, cell phones, high-speed portable radio transmitters.

Absolutely new kind of capacitors is an ionistor, which is a component for long-term conservation of charge. Such capacitors have a much longer life, an infinite number of charge cycles. It is used for backup power supply of memory circuits of electrical devices.

**Contactors.**

**Contactors. General information.**

The contactor (from Latin - adjoining) is a two-position electromagnetic device that is designed for frequent remote on / off switching in the normal operating mode of the electrical circuit. The contactor is a kind of electromagnetic relay. The most common one and two-pole contactors for circuits with direct current and three-pole for circuits with alternating current. Since the switching frequency (on / off periods) often varies from 40 to> 3500 times / hour, the devices are subject to high demands for mechanical and electrical resistance.

**According to the drive of contact systems, it can be:**

Electromagnetic. Pneumatic. Hydraulic.

**Elements of electromagnetic contactors.**

The system is electromagnetic. The main power contact. Block contact. The device is arc extinguishing. Reel coil.

**Characteristics.**

The main characteristics of the device include:

1.Type of control circuit electric current, main circuit of the device. 2. The number of main poles. 3. Nominal current in the main circuit. 4. Nominal voltage in the main circuit. 5. Rated voltage of the switching coil. 6. Presence of auxiliary contacts. 7. Type of installation. 8. How the conductor is connected in the control circuit and in the main circuit. 9. How contactors are connected. 10. The presence of an external conductor.

**Operating principle.**

The contactor consists of a coil of wires. Inside the coil there is a core mechanically connected to the closing / opening electrical contacts. The closing contact is designed to close the circuit through which an electrical current is flowing, the open contact opens the circuit and stops the current. The frame, designed to ensure the strength of the coil and cool the elements of the device, is copper or steel.

The coil of the electromagnet receives voltage; the core, on which acts the magnetic field, moves upward, which is why the circuit closes and the current appears. Than an electric motor or other equipment turns on. After the electric power is turned off, the core is returned back, the circuit is disconnected, and the equipment is switched off. The contactor is switched on / off by means of a special device having the Start / Stop buttons.

**They are applied in those cases when it is necessary to:**

Operate powerful electric motors (electric locomotives, diesel locomotives, electric trains, trams, trolley buses, lifts).

For switching compensating circuits for reactive power.

For switching a significant direct current.

It is necessary to say that it is possible to install additional modules on the contactors: thermal relays, time consoles, interlocks. Combination of the contactor and additional objects receives a more perfect instrument.

Contactors are not permanent. They have a certain period of operation, after which the device must be replaced, and the old one must be disposed of correctly.

**Electric motors ДПM.**

**Electric motors of type ДПM.**

Electric motors ДПM are machines that convert electrical energy into mechanical energy by means of rotational movements of the shaft. They consist of a rotor, an anchor winding, a stator, a brush assembly. Another ability of this motor is to convert mechanical energy into an electric current, i.e. Performs the function of a generator. Electric motors ДМ can be of various sizes.

The stator is a stationary part of the electric motor, which consists of a number of coils. The more coils are inserted the better interaction of the stator and the rotor will be. The electric motor ДПM can be waterproof; such engine is used in difficult conditions, under heavy loads. They are produced with electromagnetic brakes attached to the device, but can also be without them.

**Constructional design.**

Electric motors of small size have the following features in the design:

The presence of one end of the output shaft.

The presence of two ends of the output shaft.

The presence of one end of the output shaft, with built-in centrifugal contact stabilizers of rotational speed.

Each of the electric motors has different rotational speed, voltage, different load. Often, the electric motor is used in automation systems, in service devices. The engine with a high heat capacity can provide long-time resistance to large overloads.

**Electric motor. Application and features.**

Electric motors ДПМ are widely used in many spheres of industry and human activity.

The main areas are:

Transport industry uses the engines of high power. They are installed on electric locomotives, diesel locomotives, motor ships and other kinds of heavy equipment.

Many cars are equipped with DC motors, like starters, with two pairs of poles (4 brushes). In this case, the motor runs in a short time.

Industry. There the dmm engines are successfully used for any kind of drives requiring significant speed control. For example, they are installed on metalworking machines, on various hydraulic and pneumatic systems in order to manage their nodes.

**Advantages and disadvantages of the engines.**

The main positive properties of electric motors include ease of use, the ability to smoothly change the speed, excellent starting properties; it is possible to use an electric motor as a generator.

There are not so many shortcomings; they include some maintenance problems related to wear and tear, as well as a fairly high price for the ПДМ electric motor.

**Industrial catalysts, gas mask filters.**

**Industrial catalysts.**

The catalyst, as a chemical element, participates in the chemical reactions, but is never presented in the final products of the chemical process. It is used to speed up the reaction, forcing all processes to proceed much faster and more efficiently.

**Classification by field of application**.

The purpose and scope of their use are as diverse as the industries in which they are used.

**According to the field of application the catalysts can be divided into:**

**Reforming** - used in chemical reactions to produce aromatic carbohydrates and high-quality gasolines from mineral oil and petrol fractions of petroleum.

**Isomerization** - used to obtain isomers from oil, i.e. for the decomposition of oil into high-octane gasoline components and low-octane oil fractions.

**Purification** - successfully used to purify exhaust gases and gases emitted into the atmosphere.

**Hydrocracking** - used in the chemical industry to produce diesel and jet fuel, gasoline from fuel oil, gas oil, high-boiling petroleum fractions and asphalt-free oil.

**Selective hydrogenation** - used to produce acetylene and acetylenic carbohydrates.

**Aromising** - used to produce aromatic carbohydrates.

**Oxidation** - respectively used in the reactions of oxidation of chemical reagents in the reaction of deep and incomplete (partial) oxidation.

**Petrochemicals** are actively used in the petrochemical industry.

Catalysts of filters **in gas masks** - in the same way there are catalysts involved in the filtration of carbon monoxide and harmful impurities.

**The maintenance of precious metals.**

All industrial catalysts, regardless of the scope of their use, contain precious and non-ferrous metals. The catalysts contain aluminum, chromium, platinum, iron, vanadium, nickel, bismuth, cobalt, gold, silver, etc.

**Printed circuit boards.**

**Printed circuit boards. General information.**

Printed circuit boards, this is the right way to refer to these details, today enter into any electronic devices, ranging from mobile phones, computers, tablets, ending with serious modern military equipment. This small device appeared more than a hundred years ago, marking a significant breakthrough in the development of radio electronics.

**From the history of the appearance of motherboards.**

It is considered that the prototype of the printed circuit board was the device created by the German engineer Albert Hanson. In the beginning of the 20th century,(1902) they were offered the formation of a certain drawing of a copper foil plate with the help of cutting or stamping. The picture was attached to the dielectric from the paraffinic paper. Industrial production of printed circuit boards began in 1920. They were made of Bakelite, mezzanine, laminated cardboard, wooden boards. The process was as follows: small holes were drilled in the substrate material, where thin, brass "wires" had been put through, and then they were fixed to the board. Sometimes small bolts and nuts were used for this purpose. It was these products that were used to assemble gramophones and radios.

**Where did the name of printed circuit boards come from?**

Its modern appearance was due to the use of technology used in printing industry. And the name went also from polygraphy . In English its name sounds “a printing plate”. The idea of using polygraphy for mass production of PP first came from an Austrian engineer Paul Eisler. By the 40th years of the 20th century printed circuit boards had already became extremely popular when creating radio equipment for military purposes and aviation. After the war, in the 50-ies the board becomes the basis for the production of not only military equipment, but also household appliances and electronics. Of course, in those days the size of the printed circuit boards was quite large, in contrast to modern models. The first use of motherboards was in the "Dorozhny" receiver; it was not very large - just as a small suitcase with one printed circuit board.

The modern board is made with a base of fiberglass, turbonit, and ceramics. The metal plates covered with a dielectric, on top of which are traces of copper foil serve as a base. A separate group of modern PP can include metal products made of aluminum. The main advantage of which is the possibility of remelting and reusing aluminum. They also contain some precious metals.

**Silver-plated details.**

**Silver-plated details and products.**

The radio components and boards are exposed to silver plating, and they become more resistant to corrosive processes and can conduct electricity better. Also, in the electrical industry, silver-plated or fully silver contacts are used. Silver-zinc, silver-cadmium batteries have electrodes produced with the use of this metal.

Widespread use of silver was also received in the medical field for the manufacture of prostheses, along with other, more robust metals, for the manufacture of medical devices.

**What is silver and how to extract it.**

Since the beginning of the 20th century, silver has been actively used in many areas, especially in the military and electrotechnical. Silvered details became the basis of modern computers. Silver can also be in some devices in its pure form.

Desolation of this noble metal can be made only in an acid having strong oxidizing properties, for example, in nitric or sulfuric. There are two main methods for extracting the silver component from the instruments. Silver-plated products are processed by heating to 80 degrees with a solution of nitric and hydrochloric acids, and then silver is restored using zinc dust. The second method: the oxidation of silver with hydrochloric acid. Silver-plated component in some details can be extracted by simply separating silver contacts with the help of wire cutters.

**Lamps (EVD).**

**Radio tubes (electrovacuum devices).**

**What is this?**

The radio lamp is an electronic vacuum device that uses the principle of acceleration / deceleration of electrons in a vacuum (in a space that does not have air or space filled with an inert gas).

At the beginning of the last century, vacuum electric lamps were used in almost all radio electrical appliances. They can be in different shell: glass, silver. Any such device has in its composition some amount of precious metals: gold, platinum, palladium. These metals cover the tube grid (for incandescence), anodes, and cathodes.

They called this EVD so, thanks to some similarity to the usual light bulb we know. Electrovacuum lamp differs in its purpose and functionality.

**Application.**

Today diodes and transistors are used in radio electronics circuits. Even microwave ovens and tube amplifiers can contain such lamps to radiate high frequencies.

**According to the purpose of the EVD, they are classified into:**

Generator EVD, Convertive EVD, Amplifying EVD, Indicator EVD, Modulating Evolution, Rectifying EVD, Measuring EVD, On a working mode,Continuous, Pulse, Ultra-high frequency, High-frequency, Low-frequency.

**Some types of electrovacuum products:**
ГУ-34Б-1, ГУ-43А, ГУ-70Б, ГУ-71Б, ГУ-72, ГУ-73Б (П), ГУ-74Б, ГУ-78Б, ГУ-84Б; ГМИ-2Б, ГМИ-4Б, ГМИ-5, ГМИ-6, ГМИ-7 (7-1), ГМИ-10, ГМИ-11, ГМИ-14Б, ГМИ-19Б, ГМИ-21-1, ГМИ-24Б, ГМИ-26Б, ГМИ-27А (Б); ГМИ-32Б (Б1), ГМИ-42Б, ГМИ-83 (Б), ГМИ-89, ГМИ-90; ГС-23Б, ГС.

**We buy relays!**

When dismantling, disassembly of any equipment, there are various RECs and parts that are not necessary, illiquid, which cannot be used in other equipment. Thinking of releasing a warehouse, a garage from them, just taking them to the dump? And you did not think that you can get money for such details? Turning to us, you will get a significant benefit from the old parts.

**What is relay?**

The relay is a part used in radio electrical appliances for opening or closing in the circuit of an electrical circuit. It is an aluminum box with contacts inside it. This element has been widely used in instruments and equipment since the 1950s in various countries, including the USSR. It was in the Soviet Union that contacts were made only of pure precious metals, and also of rare metals. Silver, gold, iridium, platinum, palladium were used. In those days, these parts were completely made of such metals; more modern parts are only covered with precious metals. Since the nineties, they have been replaced with microcontrollers.

Our firm acquires at a high price various types of radio parts of the production of the Soviet Union, although you can offer us the details of other manufacturers. We will consider your offer. The greatest cost for parts which contacts were created from the iridium / platinum alloy. These metals are always in demand, their cost increases. The products are evaluated according to the exchange rate of the relevant exchange (London) on the day of payment to the client.

It should be noted that the amount of precious metals is directly dependent on the types of relays.

**Types of relays.**

We buy new and used RECs (parts). The most valuable are those produced in the Soviet Union, when contacts were made from the rarest and valuable metals, for example, palladium. Products produced before the seventies, were made from a large number of rare-earth and expensive metals (platinum, rhodium). In later years, these radio components contained silver in large quantities. We get them in assembled form, scrap, parts of the relay. Contact us for clarification whether your product is suitable for further processing. We buy a relay large and small in bulk, in small quantities, one-piece and also groups of contacts in the collection, disassembled, broken (buy on weight).