ГОСУДАРСТВЕННОЕ БЮДЖЕТНОЕ ОБРАЗОВАТЕЛЬНОЕ
УЧРЕЖДЕНИЕ СРЕДНЕГО ПРОФЕССИОНАЛЬНОГО ОБРАЗОВАНИЯ
«НОВОРОССИЙСКОГО КОЛЛЕДЖА РАДИОЭЛЕКТРОННОГО
ПРИБОРОСТРОЕНИЯ»

МЕТОДИЧЕСКОЕ ПОСОБИЕ

по дисциплине «Иностранный язык»
(английский язык)
для студентов 3 курса
специальности 210721 Радиосвязь, радиовещание и телевидение

Автор: Марарь Марина Александровна

Новороссийск
2014

МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ КРАСНОДАРСКОГО КРАЯ

ГОСУДАРСТВЕННОЕ БЮДЖЕТНОЕ ОБРАЗОВАТЕЛЬНОЕ УЧРЕЖДЕНИЕ СРЕДНЕГО ПРОФЕССИОНАЛЬНОГО ОБРАЗОВАНИЯ

«НОВОРОССИЙСКИЙ КОЛЛЕДЖ РАДИОЭЛЕКТРОННОГО ПРИБОРОСТРОЕНИЯ»

КРАСНОДАРСКОГО КРАЯ

Методическое пособие

по дисциплине «**Иностранный язык»**

(английский)

по теме «Телевидение. Телевизионный передатчик»
для студентов 3 курса специальности 210721

Новороссийск
2014

Одобрена
предметной комиссией
Председатель ПК
_____ Грушина И.Ю.
«_____» 2014 г.

Утверждаю
Зам. директора по НМР
_____ Заслонова Е.В.
«_____» 2014 г.

Автор: Марарь М.А.- преподаватель ГБОУ СПО «Новороссийский колледж радиоэлектронного приборостроения»

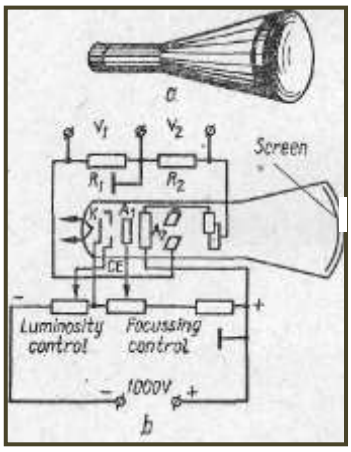
Рецензент:

С.П. Тихонова – преподаватель первой категории ГБОУ СПО Новороссийского колледжа радиоэлектронного приборостроения КК

Cathode-Ray Tubes

Cathode-ray tubes are widely used in various branches of radio engineering such as oscillography, radiolocation, television, etc. In the narrow part of the tube the cathode K, focussing system and beam-deflecting system are mounted. Deposited on the inner surface of the glass face-plate is a luminescent screen S. The cathode is of the indirectly heated oxide-coated type. It is fabricated m the form of a cylinder with the oxide coating on its end cap. The cathode is mounted inside a control electrode (modulator) CE in which an aperture is provided. The brightness of the spot on the tube screen can be varied by changing the negative potential on the control electrode, with respect to the cathode thus changing the electron-beam current.

Moving along the tube axis after passing the control electrode is the electron stream which encounters two anodes' A_1 and A_2, both of which are cylindrical in shape. The accelerating field provided by the two anodes ensures the motion of electrons towards the screen and simultaneously focusses the stream into a narrow beam.



Electron beam focusing can be accomplished with the aid of either an electric or magnetic field. In the first case focusing is termed electrostatic and takes place in the electric field between A_1 and A_2. An electron E moving at some angle to the device axis is deflected by the electric field set up between the anodes. Proper selection of the voltage difference on these electrodes ensures focusing of the beam on one spot on the tube screen. Magnetic beam focusing is achieved by a focusing coil mounted onto the tube neck. Deflection of the electron beam is accompanied in the same manner as focusing that is either by an electric field or by a magnetic field. The electrostatic system of beam deflection consists of two pairs of vertical and horizontal deflecting plates. An electron passing between two parallel plates to which a certain voltage is applied, it will be deflected towards the positively charged plate. There being two pairs of mutually normal plates, the electron beam can be deflected in horizontal and vertical planes.

Magnetic field deflection is accomplished by two pairs of deflecting coils mounted onto the tube neck at right angles to each other. The greater the magnetic-field intensity H and the lower the voltage V which accelerates the electrons, the greater is the beam deflection.

The tube screen is a semitransparent thin layer of a luminous substance.

Most cathode-ray tubes are oscilloscopes used to display rapidly changing voltages and currents.

EXERCISES

I. Find in the text synonyms for the following words:

Different, to produce, to supply, relative to, at once, to occur, to get, speed, to use.

II. Give the words of the same stem:

To vary, part, indirectly, to pass, acceleration, to deflect, to increase.

III. Translate the following expressions. Use them in sentences of your own:

With respect to, either … or, in the same manner, at right angles, simultaneously.

IV. Translate the following terms:

Cathode-ray tubes, the focusing system, beam-deflecting systems, luminescent screens, the control electrode, the electron beam current, the electron stream, the electron beam focusing, the magnetic beam focusing, the magnetic field deflection, the magnetic field intensity, the beam deflection, the horizontal deflecting plates.

V. Translate into English:

Электронно-лучевые трубки широко используются в различных отраслях радиотехники. По своей конструкции ЭЛТ состоит из катода К, системы фокусировки электронного потока и отклоняющей системы. Изменяя отрицательный потенциал управляющего электрода относительно катода, можно

регулировать величину электронного потока и, таким образом, менять яркость светового пятна на экране. Фокусирование электронного потока в узкий луч осуществляется с помощью электрического или магнитного поля.

VI. Put questions to the text.

VII. Retell the text according to the following plan:

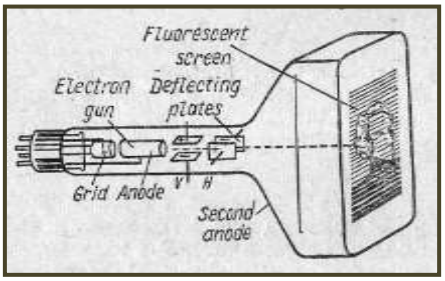
a) The CRT, its construction and application; b) The adjustment of the electron stream; c) Electron stream focussing into a narrow beam; d) Magnetic and electrostatic beam deflection.

VIII. Explain the principle of a cathode-ray tube operation according to the figure. Speak about the design and circuit arrangement.

IX. Write a summary of the text.

The Television

The most important element in any television transmitter is the “televisor” or "pick-up-tube", an instrument used in the broadcasting studio or in the field to convert light images into electric currents. Although many televising systems involving numerous principles have been devised, nearly all of them are to be classified as either mechanical or electronic in nature. Because mechanical systems have proved to be more cumbersome, electronic systems are now used almost exclusively.



The Scanning Process in Television. For years the sending of pictures by wire or radio has been everyday occurrence. The fundamental principle, involved in this process, is known as ***scanning***. Every picture to be transmitted is scanned by an exploring spot which, starting at the top, moves in straight lines over the entire picture.

The exploring spot in any ***scanning device*** is so constructed that it generates an electric current proportional to the brightness of its instantaneous position. Such a pulsating current, referred to as the video signal, is transmitted over wires or radio waves to the receiving station. There in a specially designed instrument a reproducing spot, whose brightness is proportional to the video signal amplitude, moves over a viewing screen in a path similar to that of the exploring spot. In this way the reproducing spot reconstructs the original picture.

It will be realized that the smaller the scanning and reproducing spots and the greater the number of lines the better will be the details of the scanned picture being reproduced at the receiving end.

If a single picture is sent by wire, as is generally the case in the telephotographic newspaper service, the scanning process requires from 10 to 20 min. In television, however, it is a matter of standard practice to scan and transmit thirty distinct and separate pictures every second of time. At the receiving station these pictures are rapidly flashed one after the other upon a viewing screen. All are still pictures differing progressively one from the next so that, due to persistence of vision, the motions seem to be smooth "and continuous, just as with moving pictures.

To avoid spurious shadows and images, the process of interlacing is employed. By this process each picture is scanned twice, first by running the exploring spot over the odd numbered lines 1,3,5,7 etc., and then over the even numbered lines 2, 4, 6, 8, etc.

In many respects the apparatus used in television differs very little from that used in radio broadcasting. The varying current from the exploring element of a scanning device, called a televisor, takes the place of the voice currents from a microphone. In other words, instead of modulating the carrier wave of a radio transmitter with the voice currents due to sound waves it is modulated with the video current from the light of a picture image in a televisor. Except for the televisor tube used in the transmitter, and a similar device known as a kinescope used in the receiver, television equipment consists of numerous electrical circuits containing radio tubes similar to those in any radio receiving set.

The Kinescope. In many respects the construction of a television receiver and its operation is similar to an ordinary radio receiver. The carrier wave from a nearby transmitter after being tuned in, detected, and amplified with conventional radio tube circuits, is fed as a video signal into a kinescope in

place of a loud-speaker. A kinescope is a large vacuum tube used for scanning and viewing the transmitted pictures.

A kinescope using electrostatic deflection plates for scanning is shown in the picture. Electrons from an electron gun at the left travel down the length of the tube to where, impinging upon a fluorescent screen, they produce a bright luminescent spot S. The purpose of the deflecting plates V and H is to deflect the electron beam with the identical frequency and scanning motion of the transmitting station. Two special oscillator tubes and circuits in the receiver supply saw-tooth potentials to these plates, the high-frequency potentials to the H-plates for horizontal scanning and the lower frequency potentials to the V-plates for vertical scanning.

The proper fluctuations in the intensity of the luminescent spot are brought about by applying the video signal to the grid of the electron gun. This grid controls the flow of electrons through to the anode in the same way that the grid controls the current to the plate in an ordinary three-element radio tube:

For a small fraction of a second, between successive pictures being scanned for transmission, current pulses of a certain type and frequency are sent out from the sending station as part of video signal. These, picked up by the receiver, act as a trigger-like mechanism to bring the reproducing spot to the top left of the screen at the proper time to start the next picture. In other words, the transmitter sends out signals that enable, the receiver to automatically keep "in step" with the pictures as they are sent.

EXERCISES

I. Read the following words:

a) with the stress on the first syllable:

To televise, to broadcast, image, to classify, cumbersome, amplitude, similar, realize, detail;

b) with the stress on the second syllable:

To devise, to occur, to explore, proportional, progressive, persistence;

c) with the main stress on the third syllable:

Fundamental, reproduce, instantaneous, interlace.

II. Translate and memorize the following word combinations; illustrate their use in sentences:

Except for, due to, it is a matter of common practice, it is a matter of common observation; it is a matter of common knowledge; as is generally the case, just as, to take place, to take the place, in place of; with respect to, with regard to, without regard to, irrespective of, irrespectively, regardless of.

III. Find in the text synonyms for the following words and word combinations:

Significant, though, almost, to be called, particularly, to understand, to be made up of, standard, initial, minute, movement, to give rise to, in the same manner.

IV. Find in the text antonyms for the following words:

Bottom, to receive, similar, odd, rough, much, dull, right, to disable.

V. Make nouns from the following words:

Important, to know, to explore, to occur, bright, to require, to differ, certain, similar.

VI. Translate the following sentences, paying attention to the different meanings of the words in italics:

1. The theory ***involved*** in the operation of the wattmeter is explained in any text on alternating current measurements. 2. When distorted voltages and currents ***are involved*** the power factor must be thought of as simply the ratio of the wattmeter reading to the product of the voltmeter and ammeter reading. 3. The problem ***being*** rather ***involved,*** a thorough research has been made in order to solve ***it,*** 4. Theoretical explanations and examples are given to illustrate the principles ***involved.*** *4.* In analog computers measurement is always ***involved.*** 5. That type of construction requires a minimum floor space in proportion to the amount of apparatus ***involved.***

VII. Translate and memorize the following terms:

Scanning, video-signal amplitude, viewing screen, exploring spot, interlacing, deflection plates, saw-tooth potential.

VIII. Answer the following questions:

1. What is the most important element in any television transmitter? 2. How can all the televising systems be classified? 3. What is the fundamental principle of sending pictures by wire or radio? 4. What do you know about the scanning and reproducing spots? 5. What is the process of

interlacing employed for? 6. What is the difference between the apparatus used in television and that used in radiobroadcasting? 7. What special kinds of equipment does a televisor consist of?

IX. Describe the diagram of a kinescope.

X. Translate into English:

Самой важной частью телевизионного передатчика является телевизионная камера. Этот прибор служит для преобразования световых изображений в электрические токи. Основным принципом процесса передачи изображений по радио является развёртка. Видеосигнал передаётся на приёмную станцию. В телевидении каждую секунду развертывают и передают тридцать отдельных изображений. Чтобы избежать паразитных изображений используют процесс чередования. Во многих отношениях аппаратура, используемая в телевидении, мало отличается от аппаратуры, применяемой в радиовещании.

Television in Full Color

To produce television pictures in full color the additive method of color mixing is employed.

Several all-electronic color television receivers have been invented in recent years. Instead of the fluorescent screen being coated with one fluorescent pigment as in the black and white tubes, a. separate flat glass plate just inside the large end of the tube becomes the screen and is coated with three fluorescent pigments. These three pigments R, G and B, under electron bombardment fluoresce with the additive primary colors: red, green, and blue, respectively. These fluors are painted on the glass in the form of hundreds of narrow vertical ribbons.

About one quarter of an inch beyond the fluorescent screen, and electrically insulated- from it, are about 400 fine equally spaced wires mounted parallel to and with twice the spacing as the color fluor lines. With alternate wires at about +4200 and +4800 volts respectively, and the screen at about 18,000 volts, the narrow incoming beam is brought to a focus.

The beam from the single electron gun sweeping across the screen several hundred times in a fraction of a second, scans and produces a green picture. The wire potentials being reversed, the electron beam sweeping across the screen is brought to focus on only the blue fluor stripes and produces an all blue picture. When the wires are all automatically switched to the same potential (+4500 volts) the electrons are brought to a focus on the red stripes midway between the wires, and the beam "paints" an all red picture. By controlling the electron beam intensity from the gun all colors can be produced. A yellow object being televised, for example, will appear in both red and green pictures but not in the blue picture. A short distance away the eye blends the additive mixture as yellow.

The scanning method of presenting a complete blue picture, followed by a complete green picture, and then a complete red picture, is called field-sequential-scanning. This is to be distinguished from a line-sequential-scanning process in which first a blue line, then a green line, and then a red line are presented at the top of the picture, followed by another blue, then a green, and another red line, and so on down the screen.

The "chromator" is also capable of dot-sequential scanning, a process in which sequences of dots are presented in rapid succession; a blue dot, then a green dot, then a red dot, then a blue, then a green, then a red, etc., filling up each line in turn and each entire picture frame with colored dots.

EXERCISES

I. Memorize the following terms:

Spacing — интервал, расстояние, разнос; intensity — напряженность; field-sequential scanning — с последовательным чередованием полей ; line-sequential scanning — с последовательным чередованием строк; dot-sequential scanning — с последовательным чередованием точек.

II. Analyze the Present Participles in the text and translate them properly.

III. Make up a plan of the text.

IV. Retell the text according to your plan.

V. Make a short report about the principle of colored television and its development.

VI. Write a summary of the text.

Television

Transmission and reception of still or moving images by means of electrical signals, especially by means of **electromagnetic radiation** using the techniques of **radio** and by fiber optic and coaxial cables. Television has become a major industry, especially in the industrialized nations, and a major medium of communication and source of home entertainment. Television is put to varied use in industry, e.g., for surveillance in places inaccessible to or dangerous for human beings; in science, e.g., in tissue microscopy (see microscope); and in education.

Evolution of the Scanning Process

The idea of "seeing by telegraph" engrossed many inventors after the discovery in 1873 of variation in the electrical conductivity of selenium when exposed to light. Selenium cells were used in early television devices; the results were unsatisfactory, however, chiefly because the response of selenium to light-intensity variations was not rapid enough. Moreover, until the development of the electron there was no way of sufficiently amplifying the weak output signals. These limitations precluded the success of a television method for which Paul Nipkow in Germany received (1884) a patent.

His system employed a selenium photocell and a scanning disk; it embodied the essential features of later successful devices. A scanning disk has a single row of holes arranged so that they spiral inward toward the center from a point near the edge. The disk revolves in front of a light-sensitive plate on which a lens forms an image; each hole passes across, or "scans," a narrow, ring-shaped sector of the image. Thus the holes trace contiguous concentric sectors, so that in one revolution of the disk the entire image is scanned. When the light-sensitive cell is connected in an electric circuit, the variations in light cause corresponding fluctuations in the electric current. The image can be reproduced by a receiver whose luminous area is scanned by a similar disk synchronized with the disk of the transmitter.

Although selenium cells proved inadequate, the development of the phototube made the mechanical disk-scanning method practicable. In 1926, J. L. Baird in England and C. F. Jenkins in the United States successfully demonstrated television systems using mechanical scanning disks. While research remained at producing pictures made up of 60 to 100 scanned lines, mechanical systems were competitive. These were soon superseded, however, by electronic scanning methods; a television system employing electronic scanning was patented by V. K. Zworykin in 1928. The 1930s saw the laboratory perfection of television equipment that began to reach the market in 1945 after World War II.

The modern scanning process, which is the essence of television accomplishment, operates as do the eyes in reading a page of printed matter, i.e., line by line. A complex circuit of horizontal and vertical deflection coils controls this movement and causes the electronic beam to scan the back of a mosaic of photoelectric cells in a 525-line zigzag 30 times each second. (The 525-line 30-frame-per-second system is used in the United States, Japan, and elsewhere; many other countries use similar but incompatible systems.) Because of persistence of vision only about 30 pictures need be transmitted each second to give the effect of motion. The development of interlaced scanning results in alternate lines being scanned each 1/60 sec, the remaining lines being covered in the next 1/60 sec.

Development of the Television Camera and Receiver

V. K. Zworykin's iconoscope (1923) was the first successful camera tube in wide use. Its functioning involved many fundamental principles common to all television image pickup devices. The face of the iconoscope consisted of a thin sheet of mica upon which thousands of microscopic globules of a photosensitive silver-cesium compound had been deposited. Backed with a metallic conductor, this expanse of mica became a mosaic of tiny photoelectric cells and capacitors. The differing light

intensities of various points of a scene caused the cells of the mosaic to emit varying quantities of electrons, leaving the cells with positive charges proportionate to the number of electrons lost. An electron gun, or "scanner," passed its beam across the cells. As it did so, the charge was released, causing an electrical signal to appear on the back of the mosaic, which was connected externally to an amplifier. The strength of the signal was proportional to the amount of charge released. The iconoscope provided good resolution, but required very high light levels and needed constant manual correction.

The orthicon and image-orthicon camera tubes improved on the iconoscope. They used light-sensitive granules deposited on an insulator and low-velocity scanning. These could be used with lower light levels than required by the iconoscope, and did not require the constant manual manipulation. The vidicon was the first successful television camera tube to use a photoconductive surface to derive a video signal.

Solid state imaging devices were first demonstrated in the 1960s. Today's solid-state television cameras use semiconductor charge-coupled devices or CCDs. Each element in a CCD stores a charge that is determined by the illumination incident on it. At the end of the exposure interval, the charge is transferred to a storage register and the CCD is freed up for the next exposure. The charges in the storage register are transferred to the output stage serially during that time. Although almost all consumer video cameras and camcorders use CCD imagers, camera tubes are still common in professional applications.

In the television receiver, the original image is reconstructed essentially by reversing the operation of the video camera. The final image is typically displayed on the face of **a cathode-ray tube**, where an electron beam scans the fluorescent face, called the "screen," line for line with the pickup scanning. The fluorescent deposit on the tube's inside face glows when hit by the electrons, and the visual image is reproduced. Liquid crystal displays have also been used, mainly on small, portable sets; they are also finding increasing use as light valves on large-screen projectors. Although LCD technology is advancing rapidly, video projectors that use electron tubes can still produce better pictures. Other devices in the receiver extract the crucial synchronization information from the signal and demodulate (separate the information signal from the carrier wave) it.

Development of Color Television

Several systems of color television have been developed. In the first color system approved by the Federal Communications Commission (FCC), a motor-driven disk with segments in three primary colors–red, blue, and green–rotated behind the camera lens, filtering the light from the subject so that the colors could pass through in succession. The receiving unit of this system formed monochrome (black-and-white) images through the usual cathode-ray tube, but a color wheel, identical with that affixed to the camera and synchronized with it, transformed the images back to their original appearance. This method is said to be "field-sequential" because the monochrome image is "painted" first in one color, then another, and finally in the third, in rapid enough succession so that the individual colors are blended by the retentive capacities of the eye, giving the viewer the impression of a full colored image. This system, developed by the Columbia Broadcasting System (CBS), was established in 1950 as standard for the United States by the FCC. However, it was not "compatible," i.e., from the same signal a good picture could not be obtained on standard black-and-white sets, so it found scant public acceptance.

Another system, a simultaneous compatible system, was developed by the Radio Corporation of America (RCA). In 1953 the FCC reversed its 1950 ruling and revised the standards for acceptable color television systems. The RCA system met the new standards (the CBS system did not) and was well received by the public. This system is based on an "element-sequential" system. Light from the subject is broken up into its three color components, which are simultaneously scanned by three pickups. However, the signals corresponding to the red, green, and blue portions of the scanned elements are combined electronically so that the required 4.1-MHz bandwidth can be used. In the receiver the three color signals are separated for display. The elements, or dots, on the picture tube screen are each subdivided into areas of red, green, and blue phosphor. Beams from three electron

guns, modulated by the three color signals, scan the elements together in such a way that the beam from the gun using a given color signal strikes the phosphor of the same color. Provision is made electronically for forming proper gray tones in black-and-white receivers. The FCC allowed stereo audio for television in 1984.

Broadcast, Cable, and Satellite Television Transmission

Television programs may be transmitted either "live" or from a recording. The principle means of recording television programs for future use is videotape recording. Videotape recording is similar to conventional tape recording except that, because of the wide frequency range–4.2 megahertz (MHz) –occupied by a video signal, the effective speed at which the tape passes the head is kept very high. The sound is recorded along with the video signal on the same tape.

When a television program is broadcast, the varying electrical signals are then amplified and used to modulate a carrier wave (see modulation); the modulated carrier is usually fed to an antenna, where it is converted to electromagnetic waves and broadcast over a large region. The waves are sensed by antennas connected to television receivers. The range of waves suitable for radio and television transmission is divided into channels, which are assigned to broadcast companies or services. In the United States the Federal Communications Commission (FCC) has assigned 12 television channels between 54 and 216 MHz in the very-high-frequency (VHF) range and 56 channels between 470 and 806 MHz in the ultra-high-frequency (UHF) range.

Most television viewers in the United States no longer receive signals by using antennas; instead, they receive programming via cable television. Cable delivery of television started as a way to improve reception. A single, well-placed community antenna received the broadcast signals and distributed them over coaxial or fiber-optic cables to areas that otherwise would not be able to receive them. Today, cable television is popular because of the wide variety of programming it can deliver. Many systems now provide more than 100 channels of programming. Typically, a cable television company receives signals relayed from **a communications satellite** and sends those signals to its subscribers. The first transatlantic television broadcast was accomplished by such a satellite, called Telstar, on July 10, 1962. Some television viewers use small satellite dishes to receive signals directly from satellites. Most satellite-delivered signals are scrambled and require a special decoder to receive them clearly.

Television Technology Innovations

The next great advance in television will be the adoption of a high-definition television (HDTV) system. Non-experimental analog HDTV broadcasting began in Japan in 1991. In 1994 the FCC approved a U.S. standard for an all-digital system, to be used by all commercial broadcast stations by mid-2002. Although it was hoped that the transition to digital broadcasting would be largely completed by 2006, less than a third of all stations had begun transmitting digital signals by the mid-2002 deadline.

The most noticeable difference between the current system and the HDTV system is the aspect ratio of the picture. While the ratio of the width of a current TV picture to its height is 4:3, the HDTV system has a ratio of 16:9, about the same as the screen used in a typical motion-picture theater. HDTV also provides higher picture resolution and high quality audio. Each frame of video consists of 720 or 1,125 horizontally scanned lines instead of the current 525. Furthermore, the lines are scanned sequentially, not interlaced as they are now.

The wide availability of television has raised concerns about the amount of time children spend watching TV, as well as the increasingly violent and graphic sexual content of TV programming. Starting in 1999 the FCC required TV set manufacturers to install "V-Chip" technology that allows parents to block the viewing of specific programs; that same year the television industry adopted a voluntary ratings system to indicate the content of each program.

Various interactive television systems have been tested or proposed. An interactive system could be used for instant public-opinion polls or for home shopping. Many cable television systems use an interactive system for instant ordering of "pay-per-view" programming. Others systems poll their subscribers' equipment to compile information on program preferences. Several competing

commercial systems have connected televisions to the **Internet**.

The Basic Television System and Scanning Principles

Image continuity:

While television elements of the frame by means of the scanning process, it is necessary to present the picture to the eye in such a way that an illusion of continuity and any motion of the scene appears on the picture tube screen as a smooth and continuous change. To achieve this, advantage is taken of persistence of vision (1/16 second) or storage characteristics of human eye. Thus if scanning rate per second is made greater than sixteen , or the number of picture shown per second is more than sixteen, the eye is able to integrate the changing levels of brightness in the scene. So when the picture elements are scanned rapidly enough, they appear to eye as a complete picture unit, with none of the individual elements visible separately.

Scanning:

A similar process is carried out in the television system. The scene is scanned rapidly both in the horizontal and vertical directions simultaneously to provide sufficient number of complete pictures or frames per second to give the illusion of continuous motion. Instead of the 24 as in commercial motion picture practice, the frame repetition rate is 25 per second in most television systems.

Interlaced scanning

From consideration of flicker, it has been found that 50 picture frames per second is the minimum requirement in television scanning. For a 625-line system, this means that the horizontal line scanning frequency should be 31,250 Hz, with the line period of 32μs. For a desired resolution of 546/2 alterations in the horizontal line, this leads to a very high bandwidth requirement, viz. ((546/20)*1/ (32-6) =) 10MHz, if the line scanning is the simple sequential way. An ingenious method of reducing the bandwidth requirement, while still maintaining an effective vertical picture scan rate of 50 Hz is to employ 'interlaced scanning ', rather than the simple sequential raster . In interlaced scanning, the picture is divided into two more sets of fields each containing half or other fractional number of interlaced lines and the fields are scanned sequentially. In 2:1 interlace, the 625 lines are divided into two sets of 312.5 lines each. The first sets of 312.5 odd numbers of lines in the 625 lines, called the first field or the odd field, are first scanned sequentially. halfway through the 313th line, the spot is returned on the top of the scene and remaining 312.5 even number lines, called the second field or the even field are then traced interleaved between the lines of the first set as shown in figure 2.0This is done by operating the vertical field scan at 50 Hz so that the two successive interlaced scans, each at a 25 Hz rate, make up the complete picture frame. This keeps the line scanning speed down, as only 312.5 lines are scanned in 1/50 second. The 625 lines of the full picture are scanned in 1/25 second, thus keeping down the bandwidth requirement. Here, through the picture is scanned25 times per second, the area of the screen is converted in an interlaced fashion at twice the rate, viz. 50 times per second. A closed examination may reveal the small area' interlaced flicker', as actually each individual line repeats only 25 times per second. But this is tolerable and the overall effect is closer to that of a 50 Hz scanning. The flicker becomes noticeable at high brightness only. In practice, the fly back from the bottom to the top is not instantaneous and takes a finite time equal to several line periods. Up to 20 lines are allowed for vertical fly back after each of the two fields that make a complete picture. This means that out of 625 lines, only (625-40=) 585 lines actually bear picture information. These are called the active lines.

Television (1, 2)

1. Television broadcasting is similar to radio broadcasting except that it is considerably more complex than the radio-sound broadcasting system. The cause of it is that much more signal space – bandwidth – is necessary to carry the complex video signal together with the audio signal.

In a typical television system two separate transmitters are employed – one for the sound channel and the other for the picture channel. The sound transmitter is frequency modulated. It simultaneously transmits the sound and the image. The image is accompanied by the sound in the process of broadcasting and each of the transmitters is supplied with its own aerial. The image being televised is received by the television camera, which converts the optical image into electrical impulses. The camera includes an optical lens system similar to that used in a photographic camera, the image from which is projected into a camera tube. The camera tube includes photosensitive mosaic which is scanned by an electron beam. The beam, in its turn, is housed in an evacuated glass tube. Usually the output signals of the camera tube are preamplified within the camera itself by the video or picture amplifier. After proper amplification, the video signal modulates the high-frequency carrier of the television transmitter and is radiated into space by the aerial. As for the picture carrier, it is amplitude-modulated.

2. Special signals are sent out by the television transmitter in addition to the picture impulses. These special signals have the purpose of synchronizing the picture at the receiver with that being picked up by the camera.

At the television receiver, the picture and audio signals are picked up simultaneously by a single antenna. The voltages induced in the receiving antenna are fed into the radio-frequency stage of the receiver; and the picture carrier and the sound carrier are converted by super heterodyne conversion method into two separate intermediate frequency signals. One signal corresponds to the sound carrier and the other – to the video or picture carrier. Two separate intermediate frequency amplifier channels are employed, one for the picture signal and the other for the sound signal. The sound intermediate frequency signal is demodulated by a detector. After proper amplification by the audio amplifier, the sound signal is reproduced by the loud-speaker in the usual way.

The picture intermediate frequency signal is amplified by several stages having wide-band characteristics and is then fed into the video (picture) detector, where the intermediate frequency signal is then demodulated in the same way as in an ordinary sound receiver. The video (picture) signal which appears in the output of the detector is then amplified in a video amplifier, which

corresponds to the audio amplifier in a sound receiver, except that it must pass a much wider range of frequencies.

In place of the loud-speaker used in the sound system, a device is used which converts the varying amplitude of the video signals into corresponding variations of light.

Television (1, 2)

I. Look through the text. Be ready to read and translate it.

II. Divide the text 1 into parts and entitle each of them.

III. Make up the detailed plan of the text 2 and retell it.

IV. Find the following words and word combinations in the text. Give their equivalents in English and in Russian accordingly.

1. to accompany;
2. to house;
3. to evacuate;
4. mosaic;
5. photo;
6. projection;
7. separate;
8. to modulate;
9. achievement;
10. bandwidth;
11.полоса; связь;
12.надлежащий;
13.подобный, похожий;
14.ленточный фильтр;
15.надлежащее усиление;
16.разреженное пространство;
17.домовая проводка;
18.полоса частот;
19.подобные свойства;
20.ненадлежащее сопровождение.

V. Read the following questions. Find answers in the given text.

1) Why is television broadcasting more complex than radio-sound one?

2) How many transmitters are employed in a typical television system?

3) Is there any difference between these transmitters?

4) What part of a television system converts optical images into electrical impulses?

5) What is a typical television camera similar to?

6) By what element are the output signals preamplified?

7) What element of the system radiates the video signals into space?

8) By what means is the sound signal amplified?

9) In what part of a TV set does the video picture appear?

VI. a) Correlate questions and answers in a right way.

b) Fill in the English words instead of the Russian ones.

1. What impulses are sent out by the television transmitter?

2. What is the purpose of the special signals?

3. By what means are the picture and audio signals picked up?

4. On what part of the television system do picture images appear?

5. What is the size of the ordinary cathode-ray tubes?

6. What is the picture reproducing cathode-ray similar to?

7. To what kind of amplifier does a video amplifier correspond?

---

1. They (принимаются)... ... ... (одновременно)... by a single aerial.

2. It is similar to (обычный) ... cathode-ray tube.

3. Picture impulses (в добавление к) ... special signals are being sent out.

4. They (служат) ... the purpose of (синхронизации) ... the picture.

5. With some (исключения) ... it corresponds to an audio amplifier.

6. Ordinary cathode-ray tubes range from 10 to 25 (дюймы) ... .

7. They (появляются) ... on the (экран) ... .

VII. Put down the missing words. Follow the model and translate the words:

a)	**action**	**process**	**doer**
Model:	to project	projection	projector
	to evacuate	_____	_____
	to separate	_____	_____
	to modulate	_____	_____
b)	**process**	**action**	

Model: employment to employ

achievement to_____

accompaniment to_____

VIII. Translate into Russian: a) the words; b) the combinations; c) the sentences.

a) prehistoric_____;

to pre-plan_____;

ordinary_____;

synchronize_____;

b) picture carrier_____;

proper employment_____;

the area of the picture-tube screen_____;

picture impulses in addition to the special signals;

several separate intermediate frequency channels;

picture intermediate frequency amplifier;

c) Picture signals appear in the output of the detector.

Picture impulses in addition to the special signals are sent out.

With several exceptions a video amplifier corresponds to an audio amplifier.

Picture impulses which serve the purpose of synchronizing the pictures are picked up simultaneously by a single aerial.

Ordinary cathode-ray tube is similar to the picture reproducing cathode-ray tube.

IX. Choose the proper word and put it into the blank space.

1. One transmitter is … for the image channel, the other - for the sound channel (employed, modulated).

2. The sound transmitter is … (amplitude-modulated, frequency- modulated).

3. The sound transmitter transmits the sound which … the image (converts, accompanies).

4. The picture carrier is … (frequency- modulated, amplitude-modulated).

X. Supply the missing words. Follow the model and translate the words:

Model: appearance, to appear – появляться

dependence, to_____- _____

attendance, to_____ - _____

disappearance, to_____ - _____

XI. Put down the words with the opposite meaning and translate them.

to degas_____

to decentralize_____

to disappear_____

to decode_____

disadvantage_____

disbalance_____

disappearance_____

XII. Put down the nouns.

Model: to screen – демонстрировать на экране; screen – экран

to image - _____ ; _____ - _____

to size - _____ ; _____ - _____

to house - _____ ; _____ - _____

XIII. Supply the missing words. Follow the model and translate the words:

Model:	addition	additional	to add
	exception	_____	to_____
	preoccupation	_____	to_____

Translate: Exception proves the rule.

XIV. Translate the Russian variants back into English.

1. катушка связи

2. простая связь

3. единичная ступень

4. исчезновение сигналов

5. экранирующее действие

6. искажение изображения

7. добавлять

8. появляться

9. принимать, улавливать

10. единичный, один

11. экран

12. размер

13. в добавление к …

14. дюйм

15. исследовать заранее

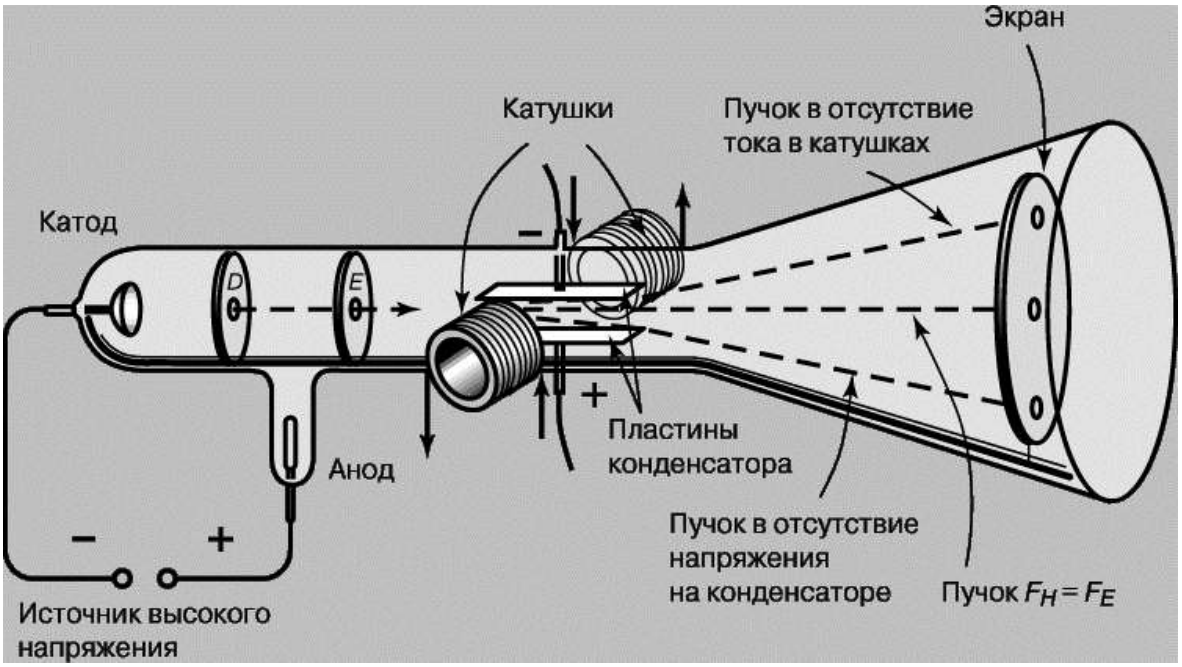
16. предварительно нагревать

Picture-reproducing Part

The picture-reproducing device is a cathode-ray tube, similar to the ordinary cathode-ray tube used in oscilloscopes. The cathode-ray tube may be called a picture tube, because the pictures are reproduced on the face of this tube.

The tube consists of a glass envelope, a source of electrons, which are formed into a beam, a control grid for varying the intensity of the electron beam, a deflection system for deflecting the beam, and a screen. The screen is covered with a fluorescent material that emits light upon impact by the electron beam. The fundamental action of the cathode-ray tube in reproducing a picture consists in the electron beam's moving horizontally and vertically simultaneously so as to cover the whole area of the picture-tube screen.

The control grid of the picture tube controls the intensity of the beam which strikes the screen in the same way as the control grid of an amplifier tube controls the plate current. In this way, each portion of the picture tube has the proper degree of light or shade to reproduce the original image.



Picture-reproducing Part

I. Read and translate the text. Find answers to the following questions in the text.

- Why may the cathode-ray tube be called a picture tube?
- What are the main parts of the cathode tube?

II. Find the following words and word combinations in the text. Give their equivalents in English and in Russian accordingly.

1. to deflect

2. to strike

11.плоский анод, плита

12.скорость при ударе

3. to reproduce	**13.**излученная волна
4. to emit	**14.**отклоняющая волна
5. to impact	**15.**испытание на удар
6. oscilloscope	**16.**оболочка
7. portion	**17.**сетка
8. fluorescent	**18.**степень, градус
9. fundamental	**19.** тень
10. source	**20.** поверхность

III. Supply the missing words. Follow the model. Translate the Russian variants back into English.

Model: to emit - излучать

emission - излучение

emitter – излучатель

to deflect - _____

_____ - _____

_____ - _____

to reproduce - _____

_____ - _____

_____ - _____

IV. Correlate English equivalents with Russian ones:

A degree of accuracy	a) экранирующая сетка
B plate voltage	b) эмиссия сетки
C grid emission	c) степень точности
D screen grid	d) анодное напряжение

V. Complete the questions. Read the answers. Reply the questions.

1. On what part …?	**1)** The pictures are reproduced on the face of the tube.
2. With what material …?	**2)** The screen is covered with a fluorescent material.
3. In what directions …?	**3)** The electron beam moves horizontally and vertically simultaneously.
4. By what grid …?	

4) The intensity of the beam is controlled by

the control grid.

VI. Translate into Russian.

envelope_____

grid_____

face_____

plate_____

shade_____

glass envelope_____

plate current_____

picture-tube screen_____

ordinary cathode-ray tube_____

Answer the questions dealing with the "Television. Picture-reproducing Part":

- ❖ What broadcast is television broadcast similar to?
- ❖ What is the function of the sound transmitter?
- ❖ How many aerials does the transmitter have?
- ❖ In what element of the system is the electron beam housed?
- ❖ By what part of the system is the video signal radiated into space?
- ❖ For what purpose are the special signals sent out by the television transmitter?
- ❖ What is the function of the loud-speaker?
- ❖ Why may the cathode-ray tube be called a picture tube?
- ❖ What is its fundamental action?

FROM THE HISTORY OF TELEVISION

Unlike digital computers – which started out as mechanical devices and then went through a brief electromechanical period during the 1930s, finally becoming electronic only in the 1940s – television was an electrical medium from the very beginnings.

Attempts to send images over distances with the use of electricity date to 1876, the year Alexander Graham Bell invented the telephone.

The first television invention that had practical consequences was the "electrical telescope", patented by Paul Nipkow in 1884. At the heart of his camera was the now famous Nipkow disk. It had 24 holes equally spaced along a spiral near the periphery of the disk. The image to be transmitted was focused on a small region at the disk's periphery, and the disk was made to spin at 600 revolutions per minute. As the disk rotated, the sequence of holes scanned the image in a straight line. A lens behind the image region collected the sequential light samples and focused them on a single selenium cell. The cell would then produce a succession of currents, each proportional to the intensity of the light on a different element of the image.

At the receiving end, Nipkow proposed using a magneto-optic (Faraday-effect) light modulator to vary the intensity of the reconstructed image. To form the image, a second disk, identical to and rotating synchronously with the one at the transmitter, would be needed.

One step closer to reality was Boris Rosing of the Technological Institute of St. Petersburg University in Russia, who in 1907 developed a TV system that used mechanical scanning on the transmitting end and the Braun CRT as a receiver.

Zworykin's most critical invention was the first iconoscope camera tube, which he patented in 1923. The key to its success was the fact that its silvered-mica photo cathodes stored the charges induced by the image that was focused on them until the scanning electron beam simultaneously neutralized the charges and modulated itself.

A year after he invented the iconoscope, Zworykin invented the kinescope – a TV picture tube – thus becoming responsible for both the key transmitting and receiving elements of electronic television.

Note:

Paul Nipkow – Пауль Нипков, немецкий инженер.

I. Read the text and then tell about what stages of television development it is told.

II. Write out the figures and proper names from the text. Give the connected with them information with key words or fragments.

III. Divide the text into parts and entitle each of them.

IV. Make up the detailed plan of the text and retell it.

POCKET-SIZE TV CAMERA

A solid-state television camera that can be made so small it fits into the palm of a hand is available at present.

At the heart of this camera is a light-sensitive semiconductor "chip"- half the size of a postage stamp. It receives and transmits images coming through the lens in much the same way that a 5-inch long (12.5 cm) tube does in today's cameras. The device, though complex in principle, promises to simplify the basic television camera so that low-cost, live TV should some day be common in industry and the home.

These experimental cameras can also be powered by flash-light batteries and can capture sharp images without the bright lights required with today's equipment.

The most obvious application should eventually be commercial television, allowing live coverage of news and sports events without forcing cameramen to carry bulky equipment with them. The camera's ability to transmit bright pictures to a monitor with minimal room lighting makes it a potential tool for night security work, watching patients in dark hospital rooms, and in military applications.

DO YOU KNOW THAT … …

For television fans who can't make up their minds* about which station to watch, a Taiwanese manufacturer has come up with a solution. The firm has introduced a three-screen television set. The unit features a 19-inch (47.5 cm), colour screen flanked** on one side by a pair of 5-inch (12.5 cm), black-and-white screens mounted*** one above the other. Three channels can be watched at once, and using a remote control a viewer can rotate simultaneous broadcasts from one screen to another simply by pressing a button. One or both of the similar screens can also be hooked**** up to a closed-circuit camera, thus functioning as a security-surveillance monitor. *****

Notes:

* to make up one’s mind – решить

** to flank – располагаться с боку

*** to mount – монтировать, крепить

**** to hook – зацеплять, сцеплять

***** a security-surveillance monitor – телевизор-монитор для наблюдения за порядком (в банке, магазине)

DIGITAL TELEVISION

The so-called analogue systems of television are to be superseded by digital systems in the near future. Using this new system, Soviet experts have managed to encode and compress flows of visual information to the extent that the requirement in the carrying capacity of communication channels has been cut by nearly 86 per cent.

The advantages of digital techniques over analogue electronic systems have demanded that they be used in television. These advantages improve the quality of the picture. While in the analogue system of recording signals noises and errors invariably accumulate at every stage of their transmission or copying, digital recording is almost free of signal errors.

How does digital television work? Basically it performs by splitting the continuous analogue signal into a series of separate pulses. A continuously varying electric signal generated by a usual broadcasting camera is fed into an electronic device which converts it into pulses. These pulses represent binary recordings of the signal's values at any given moment. At the receiving end of the circuit, the digital signal of binary pulses can be unscrambled back into the analogue signal which is then fed into ordinary TV sets. But the advantages of digital techniques can themselves be used in TV sets in order to improve their reception qualities considerably.

Digital TV, however, has its disadvantages. The main one lies in the tremendous scope of information to be transmitted. And it must be done at the rate of 216 million pulses per second. This great flow of

information is rather difficult and extremely expensive to transmit over great distances by the technical means available today.

Soviet researches studying this problem have found help in the principles they observed in living nature. And the efforts of Soviet researches in this field are internationally recognized.

I. Read and translate the next word combinations:

Digital television, analogue systems of television, digital systems, flows of visual information, communication channels, video and audio signals, electric signal.

II. Read the text and tell about advantages and disadvantages of the digital television.

III. Find in the text the paragraph about the principles of digital television working. Translate it verbally.

IV. Translate the next sentences. Prove your translation's regularity on the base of the sentences' analysis:

1. This device was invented in 1948. **2.** The device invented in 1948 is widely used now. **3.** We still use the device invented in 1948. **4.** The device they fabricated is widely used. **5.** Using this device we can carry out next experiments. **6.** The device is to be used in our laboratory. **7.** Having invented the device he used it in our laboratory. **8.** In order to use this device we must know its principles of operation.

V. Read and translate next word combinations, paying attention to the adjectives and their ways of expression:

a) in the **near** future; at **every** stage of **their** transmission; **these** advantages; **usual broadcasting** camera; **binary** recordings; **all** stages;

b) **reception** qualities; the **TV** tube; **communication** channels;

c) **continuous** analogue signals; **technical** means available today;

d) continuously **varying** electric signal; at the **receiving** end of the circuit; the researches **studying** this problem;

e) at any **given** moment; signals **generated** by a camera;

f) information **to be transmitted**; data **to be received**; TV set **to be repaired**; the text **to be read**.

COLOUR TELEVISION

The technical problems of colour television have been solved long ago – a German patent for the transmission in colour was taken out by the physicist, Otto von Bronk, as far back as 1902 – but the high cost of the equipment, especially receivers, has held up* its general introduction. In America, television programs in colour have been transmitted since the early 1950's to a limited number of viewers who can afford** the extra cost and an experimental service began in Britain in 1955. Japan started its regular colour service in the autumn of 1960: a year later there were already 15,000 receiving sets in operation, although the price of a colour set was still eight times as much as that of a black-and-white receiver. Then the Soviet Union, too, has produced a colour television service.

No doubt colour television will eventually supersede*** black-and-white transmissions. But there are other revolutionary developments to come, such the flat**** screen – it will replace the conventional receiver box with its cathode-ray tube. The first screen, which can be hung on the wall like a picture, may be no more than 2 to 3 inches thick. It has a fluorescent coating like conventional tubes, but the electrons from the cathode move almost parallel with it instead of striking it at a right angle. They start their journey from an electronic gun***** at the top behind the screen, shooting downwards; at the bottom they are reflected by a reversing lens****** to travel vertically upwards along the screen which they eventually hit by the influence of a grid******* of conductors which accumulate electric charges from the electron beam and give them off to the screen. The flat screen will be especially suitable for colour reception.

Notes:

* to hold up – останавливать, задерживать

** to afford – позволять себе

*** to supersede – вытеснять

**** flat – плоский

***** electronic gun – электронная пушка

****** reversing lens – реверсирующая линза

******* grid – сетка, решетка

I. Read the text and complete the sentences according to the point of the text.

1. The technical problems of colour television have been solved …

a) early in the 20th century; b) late in the 19th century.

2. The general introduction of colour television was held up by the high cost of …

a) receivers; b) transmitters.

3. Colour TV service was first introduced … .

a) in the USA; b) in Japan.

COLOUR TELEVISION

I

Colour television is the transmission and reception of images in full colour. The colour television system can produce programs both in colour on colour receivers and in black-and-white on monochrome receivers. Also colour receivers receive monochrome pictures when they are being transmitted. Colour transmission contains two basic components – brightness information and colour information. Red, green, and blue are the colours that are chosen for colour television.

Colour cameras. In a colour camera an optical system separates the red, green, and blue image components of a picture and concentrates these three in separate but identical colour camera tubes. Thus, the output of one tube reacts to the red light image; another – to the green, and another – to the blue light image.

Colour kinescope. In a monochrome kinescope a single electron gun produces an electron beam. The brightness is controlled by an electron grid, which changes the electron beam density.

In a colour kinescope three electron guns produce three electron beams which are synchronized. The intensities of beam are controlled by the voltage corresponding to the green, red, and blue components respectively of the colour picture.

Read and translate the questions. Find answers in the text.

1. What basic components does colour transmission contain? **2.**What images does a monochrome receiver receive? **3.** What images does a colour receiver receive? **4.** How many components does an optical system concentrate? **5.** What are they? **6.** What component changes the electron beam density?

COLOUR TELEVISION

II

Colour television signals can be transmitted over the same distance as monochrome television signals since the radio-frequency carrier frequencies in colour television transmission are the same as in black-and-white transmission. Colour video information in the signal being transmitted does not change the operational characteristics of the television receiver.

The structure of a colour television receiver is far more complex than that of a monochrome one. Naturally, it requires more servicing than a monochrome receiver.

As to the power consumption, the colour television receiver consumes more power than the black-and-white receiver. To be exact, it consumes about one and one-half times as much power. It is natural that it should consume more power because it contains more receiving tubes and circuits. The total power consumption of a colour television receiver is between 300 and 400 watts while that of a black-and-white – from 150 to 250 watts. It is practically impossible to convert a black-and-white receiver to receive colour broadcasts. To do it would require a great deal of special components since the colour tube and its auxiliary parts are very special. At the same time a colour television receiver does not require any special antenna or other components as a part of

installation. The antennas now in common use with a monochrome television receiver will be usable with the colour receiver provided that the station or stations transmitting colour programs are the same as those transmitting monochrome pictures. Thus, there is no need to produce special antennas for colour television reception.

Provided that the colour television receiver is tuned to the frequency of the monochrome transmitter, it reproduces monochrome transmissions.

I. Read and translate the questions. Find answers in the text.

1. Why can colour television signals be transmitted over the same distance as monochrome television signals? **2.** Why does a colour television receiver require more servicing than a monochrome receiver? **3.** Is it possible to convert a black-and-white receiver to receiver colour broadcasts?

II. Compare a colour television receiver with a black-and-white one. What are their common features? What are the main differences?

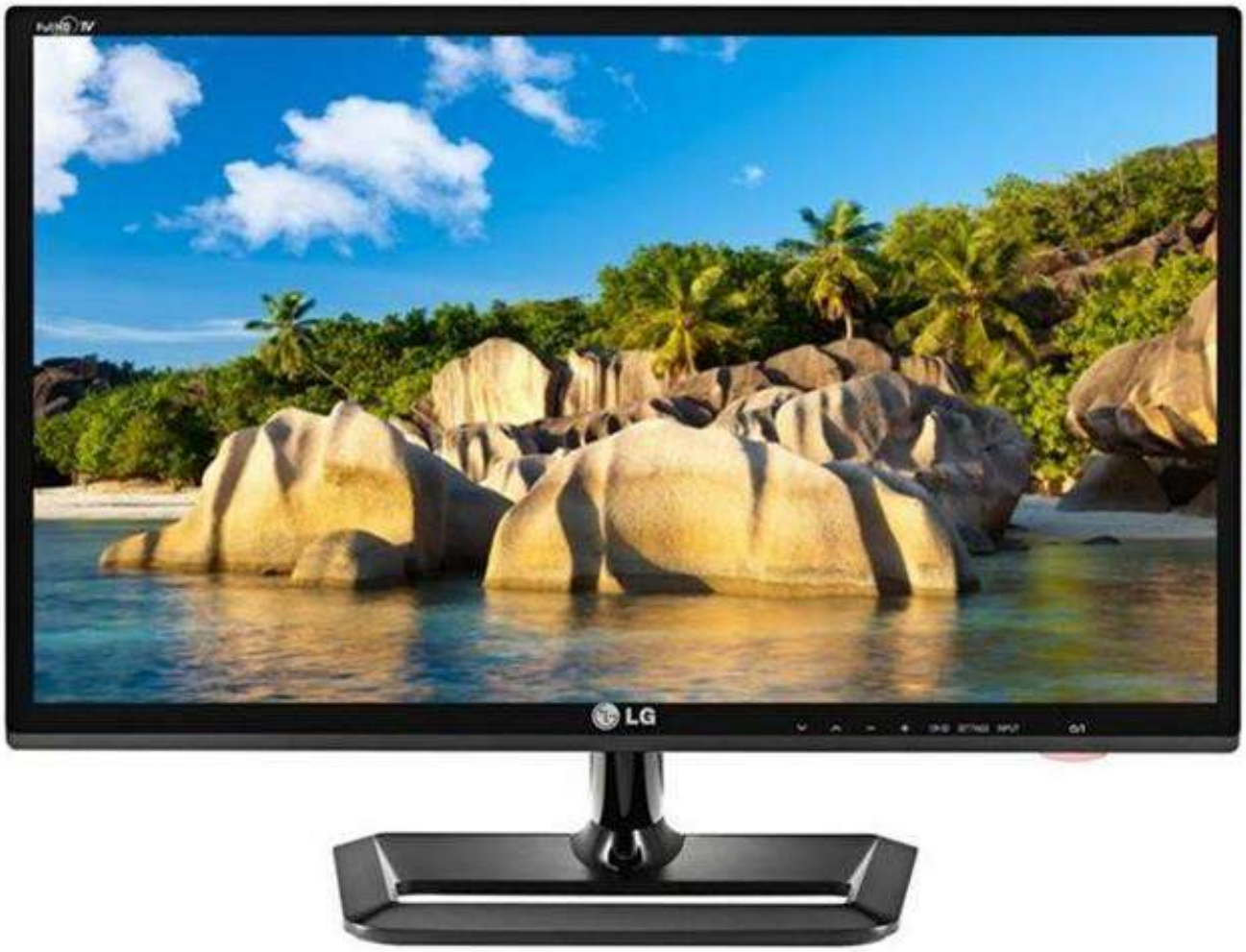
Список литературы:

Основная:

1. А.Л. Луговая «Современные средства связи». Учебное пособие по английскому языку. – М.: Высшая школа, 2004.
2. И.В. Орловская, Л.С. Самсонова, А.И. Скубриева «Учебник английского языка для технических университетов и вузов». Изд-во МГТУ им. Баумана, 2002.

Дополнительная:

3. А.В. Парахина, А.Е. Чернухин «Учебник английского языка для техникумов». – М.: Высшая школа, 1985.
4. Л.П. Зайцева «Рассказы об электронике» Пособие для студентов техникумов. – М.: Высшая школа, 1989.
5. D. G. Fink and D. M. Lutyens, *The Physics of Television* (1960);
6. M. S. Kiver, *Television Simplified* (7th ed. 1973);
7. R. Armes, *On Video* (1988);
8. K. B. Benson and J. C. Whitaker, *Television and Audio Handbook* (1990);
9. K. B. Benson, *Television Engineering Handbook* (1992);
10. D. E. Fisher and M. J. Fisher, *Tube* (1996).


LG