

RADIO SETS

TYPES

P-105M, P-108M, P-109M

TECHNICAL DESCRIPTION  
AND  
OPERATING INSTRUCTIONS



## C O N T E N T S

	Page
INTRODUCTION .....	2
1. BASIC SPECIFICATIONS .....	3
Electrical Characteristics of the Receiver- Transmitter .....	6
2. STANDARD EQUIPMENT .....	10
3. DESIGN AND OPERATING PRINCIPLE .....	11
Receiver-Transmitter Block Diagram .....	11
Purpose of Radio Set Components .....	13
Operation of Radio Set in Transmission .....	15
Operation of Radio Set in Reception .....	15
Operation of Radio Set in Remote-Control and Retransmission Modes .....	17
Operation of Radio Set in Radio and Wired- Radio Networks .....	18
4. SELECTION OF SITE AND CHOICE OF ANTENNA .....	18
Features of Radio Communication and Selection of Site for Radio Set .....	18
Choice of Antenna .....	21
5. PREPARING THE RADIO SET FOR OPERATION .....	24
Setting-Up and Dismantling the Radio Set .....	24
Checking the Radio Set Power Supply and Replacing the Storage Batteries .....	27
Checking the Radio Set for Serviceability .....	28

	Page
6. RADIO SET OPERATING PROCEDURE .....	29
Conducting the Radio Communication .....	30
Operating the Radio Set when Linked by Wire Line to Outlying Post .....	31
Conducting the Communication with Remote Control of the Radio Set from Outlying Post ..	31
Retransmission .....	32
7. MAINTENANCE OF RADIO SET (Scheduled Maintenance Operations) .....	33
8. MEASURING THE RADIO SET PARAMETERS .....	36
Measuring the Dummy-Antenna Current .....	37
Measuring the Radio-Set Current Consumption ..	37
Checking the Transmitter Modulation .....	37
Measuring the Sensitivity of Modulation Input.	38
Checking the Sensitivity and Audio Voltage at Receiver Output .....	40
Checking the Tuning Accuracy of Receiver Discriminator and Mixer Circuits .....	41
Checking the Operation of the AFC System.....	42
Checking the Dial Calibration. Frequency Correction Rules .....	43
9. STORAGE AND TRANSPORTATION RULES .....	46
SCHEMATIC DIAGRAM TO THE RADIO SET AND THE PARTS LIST TO THE SCHEMATIC DIAGRAM .....	48

---

Радиостанции  
 P-105M, P-108M, P-109M  
 Техническое описание и инструкция  
 по эксплуатации  
 (на английском языке)  
 8/89026-П80

## I N T R O D U C T I O N

This publication deals with the operating principle,, operation and maintenance of radio sets P-105M, P-108M, P-109M.

The Technical Description contains information on the performance characteristics, electrical parameters and composition of the radio set, explains the purpose of its main parts and components and gives the peculiarities of the radio set operation under various conditions.

The Instructions contain necessary information concerning the care and maintenance of the radio set during its service life and storage.



## 1. BASIC SPECIFICATIONS

The radio sets, types P-105M, P-108M and P-109M, are portable, USW, frequency-modulated, telephone, two-way sets with provision for remote control and retransmitting and are designed for fixed-wave radio communication in radio networks and in vehicular installations.

The radio sets ensure fixed-wave communication on any frequency of the working range, with the ambient temperatures of the operating radio sets differing by up to  $30^{\circ}\text{C}$ . The radio sets remain serviceable under any climatic conditions at temperatures from  $-40^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$  and at a relative air humidity of up to 98 per cent. At a temperature difference exceeding  $30^{\circ}\text{C}$  and at air temperatures below  $-10^{\circ}\text{C}$  the frequency is corrected against the built-in crystal calibrator of the radio set.

With the lids shut, the radio sets are impervious to rain and withstand short-time (up to 10 minutes) immersion in water down to a depth of 0.5 m.

The radio sets are operative under conditions of jolting during the travel of a motor vehicle over various roads and at various speeds, as well as when carried by a radio operator. They can be transported by different transportation facilities without fear of being damaged.

The radio sets withstand vibration during 3 hours within a frequency range from 10 to 70 Hz at an acceleration of not more than 6 g and impacts totalling 4000 at an acceleration of 100 g.

The P-109M radio set operates within the range of 21.5 to 28.5 MHz and has 281 operating frequencies.

The P-108M radio set operates within the range of 28.0 to 36.5 MHz and has 341 operating frequencies.

The P-105M radio set operates within the range of 36.0 to 46.1 MHz and has 405 operating frequencies. The same operating frequency is set simultaneously both for the receiver and the transmitter. The operating frequency is selected on the basis of the number of radio sets operating within the given range, the type of antennas used and the location of the operating radio sets.

The notches on the radio set dial are applied every 25 kHz, and the frequencies are numbered every 200 kHz.

The radio sets are provided with the antenna assemblies of the following types;

(a) flexible rod antenna, 1.5 m high, in conjunction with a counterpoise of three beams;

(b) combined rod antenna consisting of a flexible rod antenna and six sections (the total antenna height is 2.7 m) in conjunction with a counterpoise of three beams for operation at halts;

(c) directional beam antenna, 40 m long, suspended at a height of 1 m above the ground, to increase the communication range and to perform operation from under a shelter;

(d) beam antenna, 40 m long, raised (at the radio set) to a height of 5 - 6 m and descending gradually towards the opposite end directed towards the party, to increase the communication range and to perform operation from under a shelter;

(e) vehicle antenna, consisting of a combined rod antenna, a special bracket with a shock absorber for securing the antenna to the side of the vehicle and a connecting wire, 1 m long, for operation during the movement of the vehicle.

The radio set provides for a reliable two-way radio communication with a radio set of the same type over fairly



rough and wooded terrain at any time of the day and year, on any frequency of the range, at battery voltages of 4.4. to 5.2 V over the following distances;

(a) 6 km in operation with the rod antenna 1.5 m high with the vehicle on the move or with the same antenna and a counterpoise laid down on the ground;

(b) 10 km (8 km for P-105M) when operating at the halt with the combined antenna of 2.7 m and a counterpoise;

(c) 15 km when operating at the halt with the directional beam antenna elevated to a height of 1 m above the ground;

(d) 25 km when operating with a beam antenna elevated to a height of 5 - 6 m above the ground;

(e) 8 km (6 km for the P-105M) when operating with the vehicle antenna;

(f) not less than 10 km (for the P-105M radio set not less than 8 km) when operating from an outlying post via a type TA-57 telephone set connected to the radio set by a two-conductor field cable, up to 500 m long, into a combined antenna; at least 15 km when operating into a beam antenna suspended 1 m above the ground, and at least 25 km when operating into the same antenna elevated 5 - 6 m above the ground.

The radio set preparation time is as follows:

(a) 5 min for operation with the rod antenna;

(b) 15 min for operation with the beam antenna.

Practically, there is no mutual interference of adjacent radio sets operating on operating frequencies spaced at 100 kHz, if the radio sets are positioned not closer than 100 m to each other.

The current consumed by the radio set from the storage batteries rated for a voltage of 4.8 V does not exceed:

1.85 A in transmission;

0.85 A in reception.

When the radio set is operated in remote control and retransmission modes, the current consumed from the batteries does not exceed 2.2 A.

A set of storage batteries consisting of two series-connected 2HKП-20V2 or 2HKП-24 batteries provides for a continuous operation of the radio set during 17.5 hours (for the 2HKП-20V2 batteries) or 21.5 hours (for the 2HKП-24 batteries) at a receive-to-transmit time ratio of 3:1.

The mass of the operational radio set does not exceed 14 kg.

The mass of the packing box together with a factory outfit of the radio set does not exceed 40 kg.

The overall and installation dimensions of the radio set are given in Fig. 1.

The dimensions of the radio set including the projecting parts do not exceed: length - 310 mm; height - 325 mm; width - 170 mm.

The dimensions of the packing box do not exceed; length - 620 mm; height - 420 mm; width - 350 mm.

### Electrical Characteristics

#### of the Receiver-Transmitter

The current in the transmitter dummy antenna consisting of a 50-Ohm resistor at the rated battery voltage of 4.8 V on any operating frequency is not less than 140 mA.

The total calibration and frequency-setting error of the receiver-transmitter (with frequencies set according to the dial), at an ambient air temperature of  $+20 \pm 5^{\circ}\text{C}$ , after a 5-min (or more) warming-up period, is within  $\pm 4$  kHz.

Provision is made for checking and correcting the dial calibration against a crystal calibrator built into the radio set.

Departure of the receiver-transmitter frequency under the action of the destabilizing factors listed below does not exceed:

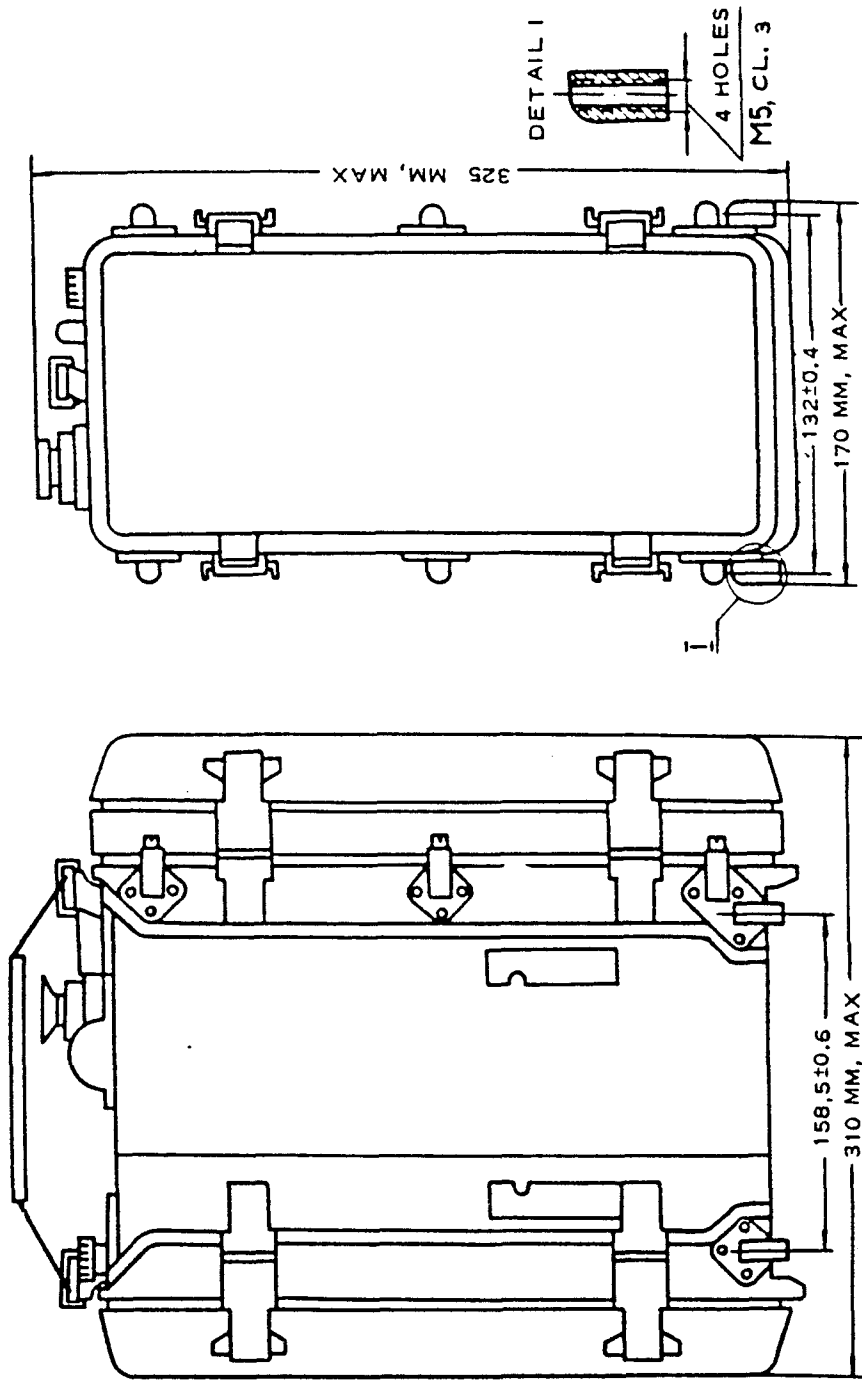


FIG. 1. RADIO SET. OVERALL AND INSTALLATION DIMENSIONS

(a) 4 kHz with variation of the battery voltage within 4.4 to 5.2 V;

(b)  $\pm 3$  kHz with the frequency drift during 15 minutes after switching-on the radio set.

The frequency deviation of the transmitter is  $\pm 5$  kHz. The sensitivity of the modulation input of the transmitter on a modulation frequency of 1000 Hz is 140  $\pm 60$  mV. The frequency deviation of the transmitter when a loud "ah" is pronounced in front of the microphone is not less than  $\pm 5$  kHz.

The sensitivity of the receiver throughout the whole range, at a 10:1 ratio of the output voltage of a modulated signal to that of an unmodulated signal, is not worse than 1.5  $\mu$ V.

With a 1.5- $\mu$ V signal voltage at the receiver input and a signal frequency deviation of  $\pm 5$  kHz, the output voltage across a pair of type TA-56M low-impedance headphones is not less than 1 V. The noise voltage at the receiver output with no signal applied does not exceed 0.75 V.

The image-channel selectivity on the highest frequency of the range is not less than 54 dB (500 times). The intermediate frequency of the receiver is 793.8  $\pm 1$  kHz. The attenuation of interference having a frequency equal to the intermediate one is not less than 80 dB (10,000 times).

The selectivity characteristic of the receiver for both radio and intermediate frequencies, with the automa-

tic frequency control switched off, ensures the following passbands:

(a) at least 14 kHz with an attenuation of 6 dB (2 times);

(b) not exceeding 45 kHz with an attenuation of 60 dB (1000 times).

The discriminator tuning resonance frequency determined by its output D.C. voltage, with the radio set crystal calibrator switched on, should differ from the rated value of the intermediate frequency by not more than  $\pm 0.5$  V. The receiver set noise voltage at the discriminator output is not more than  $\pm 2$  V.

The automatic frequency control system of the local oscillator with a receiver input signal of  $1.5 \mu\text{V}$  ensures, within an initial off-tune band of  $\pm 10$  kHz, an initial-detuning-to-the-residual-detuning ratio of at least 5.

The receiver output voltage does not vary by more than 20 per cent when the input voltage changes from 3 to  $1000 \mu\text{V}$ .

Variation of the transmitter master oscillator and receiver local oscillator frequencies with variation of temperature from  $+20$  to  $+50^\circ\text{C}$  and from  $+20$  to  $-40^\circ\text{C}$  does not exceed  $\pm 140$  Hz per degree throughout the whole frequency range of the radio set.

## 2. STANDARD EQUIPMENT

The factory outfit of the radio set is placed in a packing box.

The factory outfit includes:

- (a) working radio set;
- (b) spare parts and accessories.

The working radio set includes:

(a) the operational radio set consisting of a receiver-transmitter, two storage batteries, type 2HKП-20Y2 (or type 2HKП-24) with bunched wires and rubber caps, flexible rod antenna, shoulder straps, shock absorber, three-beam counterpoise and a headset;

(b) the radio operator's bag used for carrying the headset, beam antenna, flexible rod antenna with six sections for a combined antenna, three-beam counterpoise, larger, smaller and correcting screwdrivers, socket wrench for storage batteries and an inspection light. In addition, the radio operator's bag contains spare dial illuminating lamps, an inspection light and insulating tape, spare parts for storage batteries.

The spare parts and accessories are arranged in a packing box. Accommodated in the box are:

(a) two storage batteries, type 2HKП-20Y2 (or type 2HKП-24) installed in the left-hand compartment of the box provided with a lid;

(b) handset placed over the storage battery compartment;

(c) beam antenna with stakes and guys in a canvas case stowed between the rear wall of the packing box and the package of the working radio set;

- (d) spare rod antenna ~~and a connector~~  
in the packing box next to the battery compartment;
- (e) bracket for mounting the radio set is arranged together with the radio set in the right-hand compartment of the packing box;
- (f) bunched wires for connecting the storage batteries are packed in the radio operator's bag;
- (g) six spare sections of the rod antenna are arranged in a special recess at the left-hand wall of the packing box;
- (h) the PK-75-4-16 feeder, 10 m long;
- (i) Technical Description and Operating Instructions, and Service Log for the radio set and storage battery. The battery maintenance instructions are kept in the pocket at the right-hand wall of the packing box;
- (j) bracket for antenna fastening.

### 3. DESIGN AND OPERATING PRINCIPLE

#### Receiver-Transmitter Block Diagram (Fig. 2)

The receiver-transmitter employs a transceiver circuit with a common exciter-local oscillator which can be continuously tuned throughout the range.

The frequency is set by a common knob simultaneously for both the transmitter and the receiver, with a part of the valves and tuned circuits employed both in reception and transmission. The tuning controls of all the radio-frequency circuits of the receiver-transmitter, with the exception of the antenna circuit, are ganged. The variable gang capacitor simultaneously tunes three circuits:

- (a) the anode circuit of the first radio-frequency amplifier;
- (b) the grid circuit of the second radio-frequency amplifier;
- (c) the anode circuit of the second radio-frequency amplifier, which is simultaneously the anode circuit of the exciter-local oscillator. Its tuning is ganged with

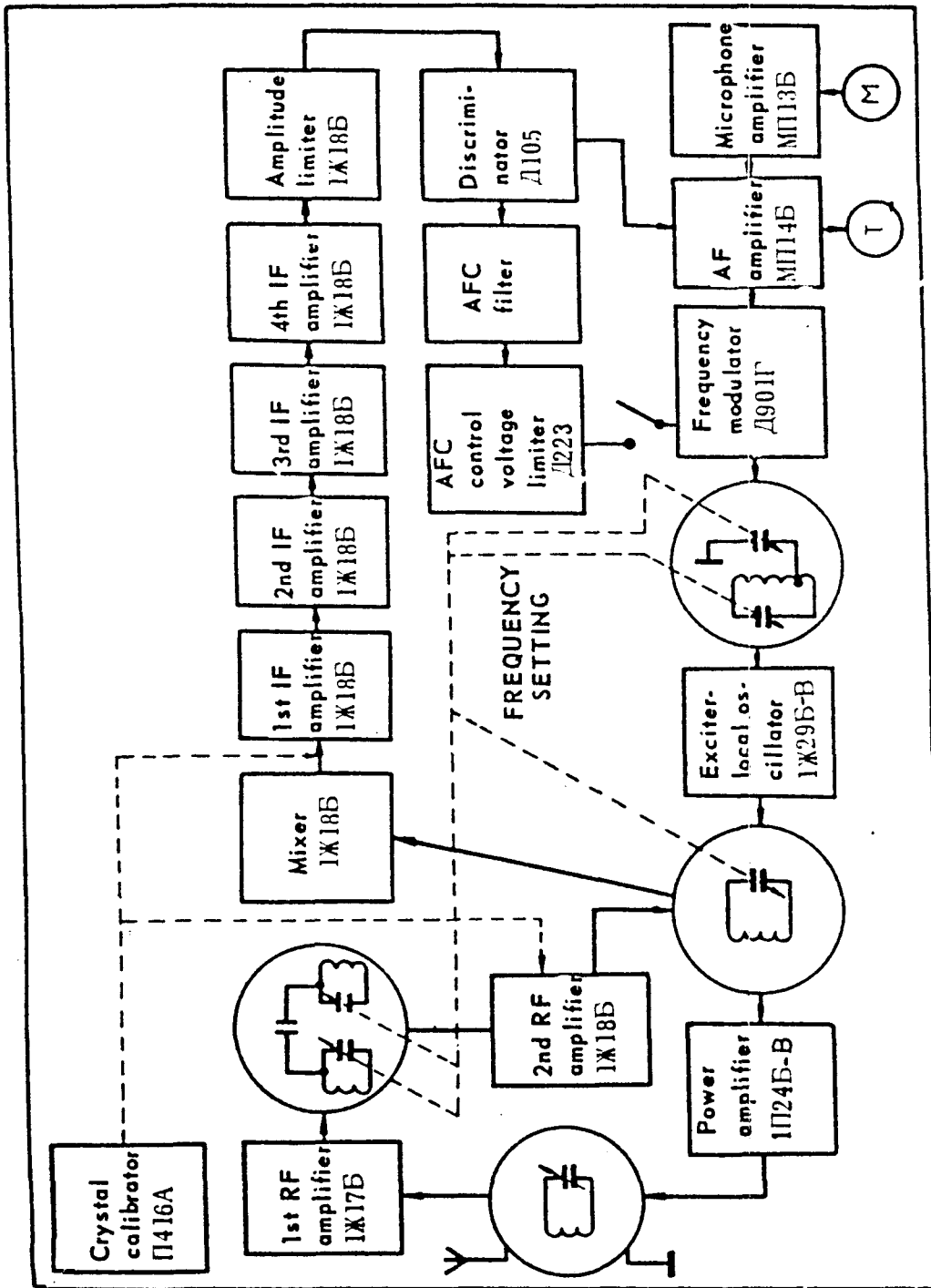


FIG. 2. RECEIVER-TRANSMITTER. BLOCK DIAGRAM



that of the grid circuit of the exciter-local oscillator through a worm-gear transmission.

The exciter-local oscillator circuit employed in the radio set has the following features:

(a) the exciter stage operates on the transmitter base frequency;

(b) the transmitter exciter is used as the local oscillator of the receiver.

The latter is achieved by means of a variable capacitor that is connected by the contacts of an RF relay to a section of the turns of the exciter circuit coil.

Switching over from reception to transmission and vice versa is performed by pressing or releasing (respectively) the push-to-talk switch on the headset or on the handset, which controls the radio set switching relay.

The radio set has provisions for:

(a) controlling the radio set through a type TA-57 telephone set from an outlying post;

(b) calling the radio and telephone operators and establishing communication between them;

(c) retransmission with the use of manual control.

#### Purpose of Radio Set Components

A two-stage radio-frequency amplifier employing valves 1X17B and 1X18B is intended for amplifying the received signal voltage and ensuring image-channel selectivity.

The mixer employing valve 1X18B is intended for converting the received frequencies into a lower intermediate frequency. The mixer employs a single-grid frequency conversion circuit.

The exciter-local oscillator employing valve 1Ж29Б-B in a circuit with electronic coupling is intended for obtaining the transmitter exciting voltage and the receiver local-oscillator voltage.

Main amplification and frequency selection of the signal occur in the four-stage intermediate-frequency amplifier. The attenuation at a detuning by  $\pm 22.5$  kHz from the centre frequency is not less than 60 dB (1000 times).

The half-amplitude passband (6-dB attenuation) of the intermediate-frequency amplifier is not less than 17.5 kHz.

The amplitude limiter employing valve 1Ж18Б is intended for reducing the signal parasitic amplitude modulation which accompanies frequency modulation.

The amplitude limiter changes the receiver output voltage by not more than 1.5 dB (1.2 times) with variation of the receiver input signal voltage by 50 dB (300 times).

The discriminator is designed for removing the desired signal from a frequency modulated signal, i.e., for removing the transmitted message.

The audio-frequency amplifier is intended for amplifying the voltage picked off the discriminator to the value necessary for the normal operation of the headphones. The band of amplified frequencies extends from 300 to 3000 Hz.

The microphone amplifier accommodated in the headset amplifies the voltage taken from the microphone to a value of about 80 - 200 mV.

The limiter in the AFC control voltage circuit reduces the destabilizing effect of inaccurate tuning of the discriminator and mixer circuits on the local-oscillator frequency. The level of limitation of the discriminator control voltage is  $\pm 2.5$  V.

The modulator employing a Д901Г varicap is intended for changing the frequency of the transmitter exciter during modulation.

When the radio set is receiving, the modulator functions as a control element in the automatic frequency control (AFC) system.

The power amplifier employing a 1Π24Б-B valve is intended for amplifying the power of the signal supplied by the exciter to obtain an output power of 1 W.

### Operation of Radio Set in Transmission

When the radio set is transmitting (the headset push-to-talk switch depressed) the valves of the exciter-local oscillator and of the power amplifier are operating. The heater voltage of the rest of the valves is cut off. Simultaneously the tracking variable capacitor in the exciter-local oscillator circuit becomes disconnected. As a result, the master oscillator generates the frequency on which the transmission is performed.

The signals of this frequency are applied from the exciter to the grid of the power amplifier valve the anode circuit of which includes the antenna circuit. Then these signals are radiated by the antenna.

Audio-frequency voltage is supplied from the microphone through the microphone amplifier to the audio-frequency amplifier of the receiver which is used in transmission as a submodulator. From the audio-frequency amplifier output the audio voltage is applied to the varicap for frequency modulation.

### Operation of Radio Set in Reception

On switching over the radio set to reception (the push-to-talk switch on the headset released), the filament voltage of all the receiver-transmitter valves except for that of the transmitter power amplifier valve, is switched on.

Simultaneously the tracking variable capacitor is connected to the exciter-local oscillator circuit, ensuring the required local oscillator frequency, which differs from the transmitter frequency by 793.8 kHz.

The signal voltage is applied from the antenna to the antenna circuit which is tuned to the signal frequency. From the antenna circuit the signal voltage is applied to the grid of the radio-frequency amplifier valve and then, to the mixer.

The local-oscillator voltage necessary for converting the signal frequency into the intermediate frequency is developed in the anode circuit of the second radio-frequency amplifier which, as was mentioned above, at the same time serves as the anode circuit of the local oscillator.

The anode circuit of the mixer includes a tuned circuit across which the IF voltage is developed. The intermediate frequency is obtained as a result of conversion of the signal frequency in the mixer. This voltage is supplied to four IF amplifier stages which provide for main amplification and signal selection. After amplification the IF signal is applied to the amplitude limiter and then, to the discriminator. The latter detects the frequency-modulated signal, as a result of which an audio-frequency voltage is developed across the discriminator load. After amplification this voltage is applied to the earphones.

The radio set frequency is checked and corrected by pressing the CALIBRATOR - LIGHT (КАЛИБРАТОР - СВЕТ) push-button. In this case the radio set should be switched to reception.

When the CALIBRATOR - LIGHT push-button is depressed, power is supplied to the crystal calibrator. The voltage from the calibrator is applied simultaneously to the input of the second radio-frequency amplifier and through the wiring capacitance, to the mixer output. As a result of the interaction of the crystal harmonics and the local-oscillator frequency, an intermediate frequency develops at the

mixer output. This frequency together with the fundamental crystal frequency produces beatings which are heard in the radio set earphones.

### Operation of Radio Set in Remote-Control and Retransmission Modes

When the radio set switch is placed in the appropriate position, the radio set can be used for communication with an outlying post (for example, with a telephone set) along a two-conductor field cable, with provision made for remote control of the radio set from the outlying post.

The telephone operator of the outlying post can be called by the radio operator by depressing the CALL (BbI30B) push-button. The line is fed with a pulsating voltage. In this case the function switch should be in the SERVICE (CMYX.) position (to prevent a change-over of the radio set to transmission, the switch breaks the supply circuit of the switching relay winding). The radio operator can be called by the telephone operator over the line by turning the magneto handle of the telephone set, which supplies an A.C. voltage to the relay winding, with the function switch in the SERVICE position, and causes the relay armature to vibrate and to create a buzzing sound which serves as a call signal.

In the remote control of the radio set from an outlying post, a D.C. voltage is fed from the radio set to the line for controlling the relay, the circuit of which is closed to the chassis when the push-to-talk switch of the telephone handset is depressed. The relay operates, and its contacts close the supply circuit of the relay which switches over the radio set to transmission.

Retransmission is effected by two radio sets which are controlled by the radio operator of one of them. In this case audio-frequency voltage from the receiver output of one of the radio sets is applied to the transmitter input of the other radio set along a two-conductor field

cable which connects the CHASSIS - LINE (КОРПУС - ЛИНИЯ) terminals of the two radio sets. One of the radio sets operates in the REC. RETR. (ПР. ПЕТР.) or TRANS. RETR. (ПЕР. ПЕТР.) mode and the second, in the RADIO (РАДИО) mode. The radio operator attends the first radio set.

#### Operation of Radio Set in Radio and Wired-Radio Networks

When using the portable USW radio sets, types P-105M, P-108M and P-109M, in conjunction with other radio equipment, it is necessary to bear in mind the following:

(a) an operating radio set should not be kept in a radio-frequency field of high intensity. Should it be necessary to operate in high-intensity field or into a single antenna with another transmitter (or with the antennas positioned close to each other), protective devices should be employed in the antenna circuit of the radio set. Voltages at the receiver input exceeding 8 to 10 V cause the first radio-frequency amplifier valve to fail, i.e. , make the receiver inoperative;

(b) the radio set should be supplied from batteries only. In case external sources are used for feeding the radio set, it is necessary to ensure symmetry of the arm voltages. The arm voltages should not differ from the rated value by more than 0.2 V at a total voltage of 4.6 to 5.0 V.

The voltages across the supply sources should be measured, with the radio set switched on.

#### 4. SELECTION OF SITE AND CHOICE OF ANTENNA

##### Features of Radio Communication and Selection of Site for Radio Set

When operating the radio set, especially over the maximum communication distances, it is necessary to bear in mind the following.

~~The site where a radio set should be~~  
be selected with allowance for the peculiarities of propagation of ultra-short radio waves. Electromagnetic waves spreading along the Earth's surface and encountering obstacles on their way, can to a lesser or greater degree circumvent them and be reflected and absorbed by them at the same time.

The degree of reflection and absorption of radio waves within the frequency range of the given radio sets is rather high but their ability to circumvent obstacles is negligible. When operating in mountainous and wooded localities and in an urban area, this should be taken into consideration. Of utmost significance are the relief of the locality and the ground features in the immediate vicinity of the radio set.

Obstacles located at distances 3 to 5 times exceeding their height have a much smaller effect on the range and reliability of radio communication .

When selecting a site for the radio set, adhere to the the following rules:

(a) do not position the radio set in the immediate vicinity of obstacles located in the direction of the communicating party, such as, for example, steep slopes, elevations, embankments, stone and reinforced-concrete buildings, metal structures, transverse power and wired-communication lines, etc;

(b) if circumstances allow, position the radio set on the slope of a hill facing the communicating party or on a side slope. If it is necessary to position the radio set on the reverse side of a steep elevation, it should be arranged as close as possible to the summit or to a side slope;

(c) if the communicating party is located in the direction of an open area, do not set up the radio set on the fringe of the forest. In this case go deeper into the woods or out into the open space. It is better to position the radio set inside a group of trees than on the border between the forest and the forest glade;

(d) when operating from inside a stone building position the radio set in a room with windows facing the direction of the communicating party;

(e) in an urban area, especially in a city, interference with ultra-short waves may occur, with the result that within a few metres of places with good audibility there are places with poor audibility or no audibility at all.

If in a large city radio communication turns to be unreliable, the radio set should be moved several metres away from the initial site to a place where communication will be reliable;

(f) when the radio set is located on a hilltop, on a high tree, or on the roof of a building, the communication range can exceed the specified range of the radio set.

It is recommended that the radio set should be operated with the automatic frequency control (AFC) system switched on. However, if there is interference from radio sets on a frequency close to the tuning frequency of the radio set, it is necessary to check the reliability of communication with the AFC system toggle switch both switched on and off. If during operation it is noticed that the tuning of the receiver jumps over to the interference frequency, and the communication with the communicating party is disturbed, the AFC system should be switched off.

To ensure fixed-wave radio communication in all cases of the radio set operation, it is necessary from time to time to check and correct the calibration against a correction point located on the dial in the upper part of the range. The calibration is corrected, with the AFC system switched off. At temperatures below  $-10^{\circ}\text{C}$  the calibration should be necessarily corrected.

Under especially severe climatic conditions the calibration should be corrected against the nearest correction point, for which purpose the second correction



When correcting the calibration against this point the accuracy of the dial calibration will be within the rated limits only in the lower part of the range.

### Choice of Antenna

The type of antenna to be used should be chosen on the basis of the following considerations:

- (a) the required communication range;
- (b) the nature of the forthcoming operation (operation of the radio set on the move, at the halt, in a radio network or in a radio link);
- (c) local conditions at the site and tactical situation.

The directivity of a rod antenna is rather low, whereas the directivity of a beam antenna, which is of the travelling wave type, is rather high.

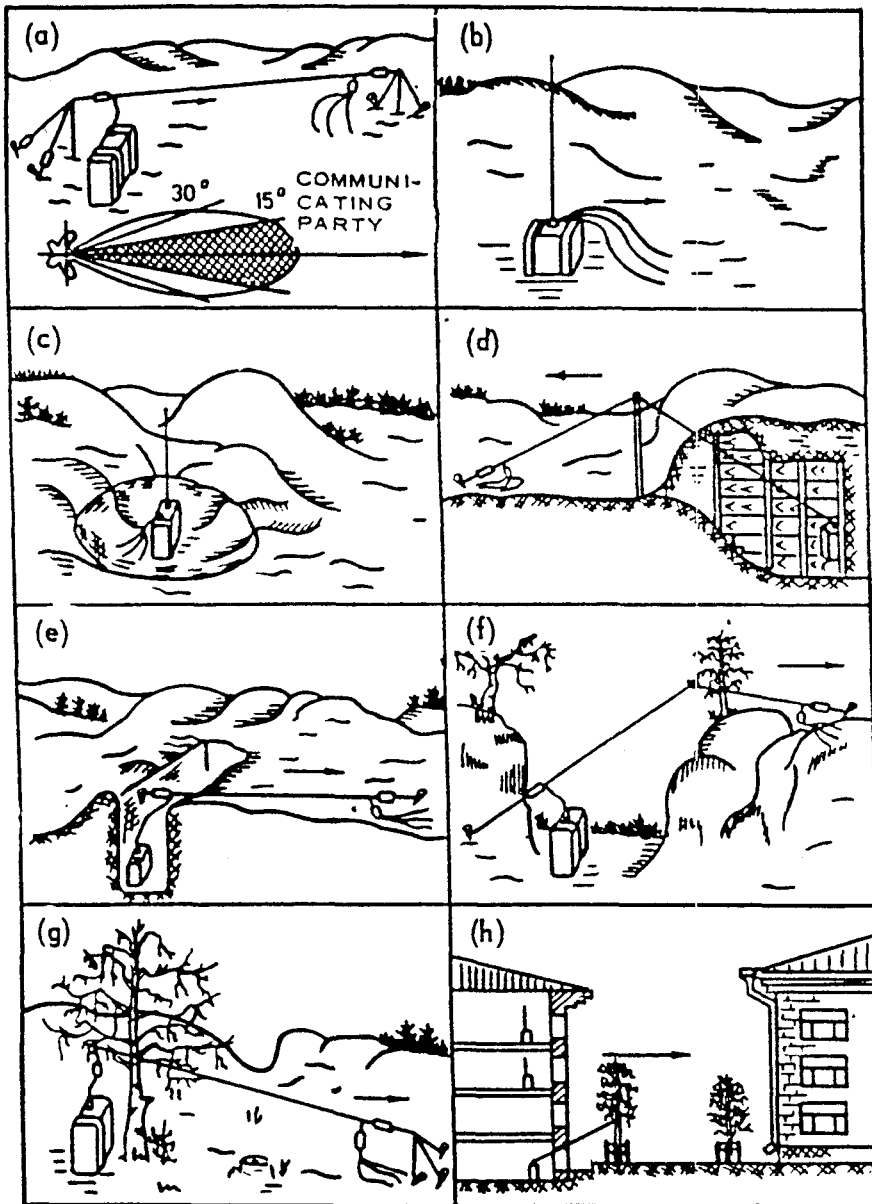
When operating in a radio network a directivity of an antenna is undesirable, as the communicating parties that have to be contacted are located, as a rule, in different directions. Therefore, a beam antenna which possesses a rather high directivity can be used for operation in a radio network only with a certain amount of care.

When operating from the shelter and from the cellars of buildings it is better to use a beam antenna. It is also used when it is necessary to communicate over the maximum distances.

It is also possible to conduct communication from the shelter by removing the antenna from the shelter and mounting it with the aid of a bracket on some local object, the antenna in this case being connected to the radio set by means of a type PK-75-4-16 feeder.

However, the communication range is reduced in this case due to losses which occur in the connecting cable.

Wooden houses with straw or tile roofs affect the range of radio communication negligibly. When operating



**FIG. 3. EXAMPLES OF SITING THE RADIO SET AND INSTALLATION OF ANTENNAS**

(a) operation with a low beam antenna (directivity pattern is shown at bottom); (b) operation on a rod antenna; (c) operation with a rod antenna out of a shell-hole; (d) operation from a dugout; (e) operation with a beam antenna from a trench; (f) operation with a beam antenna from accident in terrain; (g) operation with beam antenna elevated ; (h) operation in an urban area

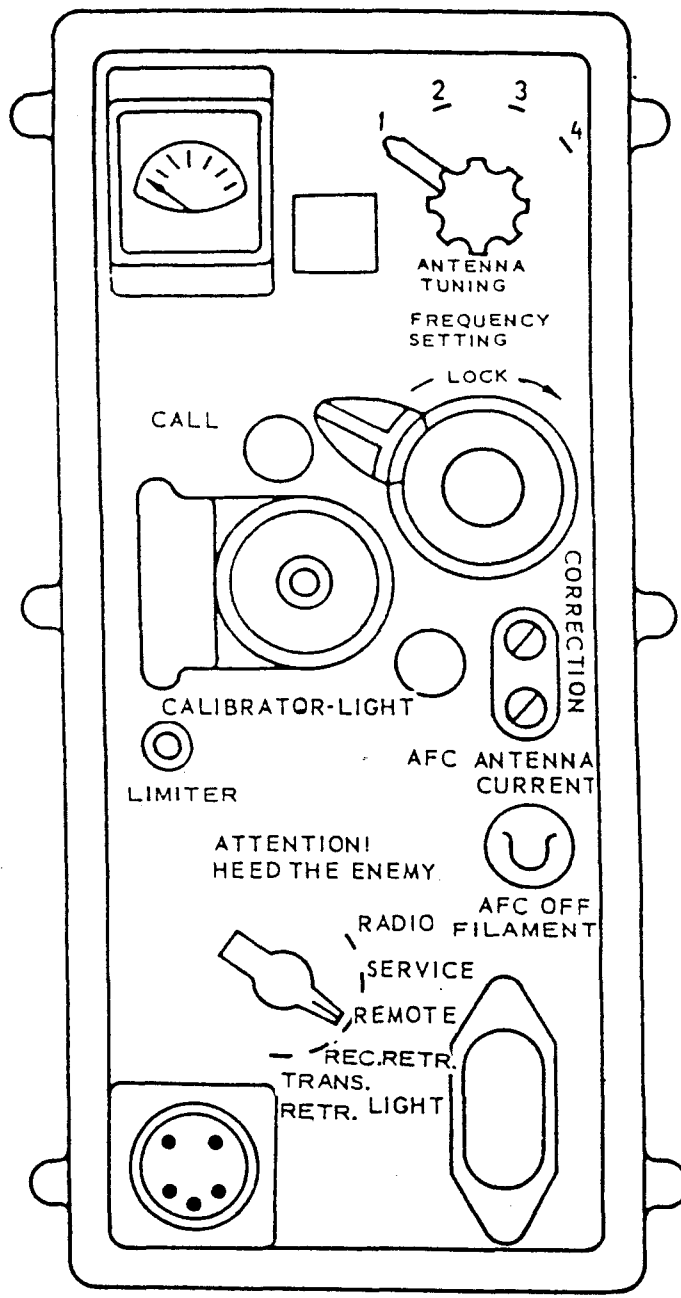


FIG. 4. RADIO SET. FRONT PANEL. LAYOUT OF CONTROLS

with a rod antenna inside a building, the radio set should be positioned on the upper floors (but not immediately under an iron roof) in the immediate vicinity of apertures (windows, doors) facing the communicating party.

Fig. 3 shows examples of how the radio set is positioned and how different antennas are used under different conditions.

One operator is required to operate the radio set.

The layout of the radio set controls is shown in Fig. 4.

## 5. PREPARING THE RADIO SET FOR OPERATION

### Setting-Up and Dismantling the Radio Set

To set up the radio set, it is necessary to:

- (a) make sure that the ON/OFF switch on the upper wall of the pack is in the OFF (OTKJ.) position;
- (b) set the function switch in the RADIO (PAJMO) position;
- (c) release four latches on the rear wall of the pack and open the rear lid;
- (d) connect the power wires with lugs to the batteries in accordance with the markings and screw the nuts tight with a socket wrench;
- (e) install the batteries inside the battery compartment. Shut the rear lid;
- (f) when operating with a rod antenna extend it, insert it into the jack of the antenna insulator and secure it.

To mount the antenna on the radio set, take it by the base and move its sections upwards along the cable. This done, "erect" the antenna. To erect the antenna, grasp it by the levers with both hands and then press sharply with the thumbs on the latch levers from the outside at the joint. Insert the erected antenna with its base into the antenna insulator and, having turned it counter-clock-

wise as far as it will go, tighten it up with a winged nut.

Do not use excessive force when erecting and lowering the antenna to avoid breaking the levers and other parts and do not bend the erected antenna sharply (by more than a  $90^{\circ}$  angle between the ends of the antenna);

(g) take out the counterpoise and extend it in the direction of the communicating party having secured the counterpoise lug in the pack terminal marked CHASSIS (КОРПУС);

(h) if necessary, take the beam antenna out of the operator's bag and extend it in the direction of the communicating party;

(i) insert the plug of the headset in the receptacle located on the upper part of the pack or in the receptacle on the front panel of the radio set;

(j) in service the radio set is carried on the back of one operator with the aid of shoulder straps. To protect the operator's back, the radio set pack is furnished with a special shock-absorber pad. The shoulder straps are adjusted according to the operator's height with the aid of buckles. At the front the straps are hitched to the operator's combat belt.

The radio set is carried and operated on the move with the lids shut and the headset connected to the receptacle on the pack. When the radio set is carried by the operator and operated on the move, only the flexible rod antenna is used;

(k) when operating in a motor vehicle on the move the radio set should be protected from jolts and impacts. The flexible rod antenna, 1.5 m long, or the combination rod antenna, 2.7 m long, is installed next to the radio set on a special bracket secured to the side of the vehicle and is connected to the radio set by a conductor with a lug.

It is forbidden to mount the combined antenna directly on the antenna insulator of the pack when operating in a moving vehicle.

It should be taken into consideration that when the vehicle moves at a speed exceeding 60 km/h, the combined antenna deflects through a considerable angle from its vertical position under the action of ram air. This will shorten the operating distance. In this case the combined antenna should be made of a flexible rod and three rigid sections. Such an antenna will slightly deflect from its vertical position and the operating distance will not change.

To dismantle the radio set, it is necessary to:

(a) inform the communicating party that communication is over;

(b) switch off power supply by setting the on/off switch in the OFF (ОТКЛ.) position;

(c) take down the rod antenna and the counterpoise and stow them in the operator's bag. To dismantle the antenna, release the winged nut, turn the antenna clockwise and remove it from the insulator. Press with both thumbs the latch levers on the inner side of the antenna joint and "lower" the antenna. Then move the sections along the cable to the upper end of the antenna. Take the top of the antenna in the left hand, wind the antenna around the hand to form a ring of 10 to 12 cm in diameter. Stow the wound antenna in the operator's bag. Do not wind the "erected" antenna. When operating into a beam antenna wind it up on a fork and stow it in the radio operator's bag;

(d) disconnect the headset, fold it up and place it in the bag;

(e) shut the front lid of the pack.

Note. Prior to stowage, the antenna and the headset should be cleaned of dust and dirt.

### Checking the Radio Set Power Supply and Replacing the Storage Batteries

Prior to operation, it is necessary to ascertain whether the storage batteries are in order.

Discharged batteries are indicated by the pointer of the meter on the front panel positioned to the left of the painted luminous sector of the scale (with the toggle switch on the front panel of the radio set in the AFC OFF FILAMENT (АНЧ ОТКЛ. НАКАЛ) position. In addition, when the batteries are discharged, the level of the receiver set noise is reduced and the signal is less audible. Discharged batteries should be replaced by freshly charged ones.

Replace the batteries in the following way:

(a) set the on/off switch on the radio set pack in the OFF (ОТКЛ.) position;

(b) open the rear lid of the pack and remove the batteries from the battery compartment;

(c) disconnect the connecting wires from the batteries;

(d) screw the plugs in the freshly charged batteries, and connect the supply wires to them observing the polarity;

(e) install the batteries in the compartment, shut the rear lid of the pack and switch on the radio set.

Note. For prolonged storage of the radio set it is necessary to remove the batteries from the rear compartment and to keep them separately. The battery compartment of the pack should be wiped thoroughly of alkali and dirt.

#### Checking the Radio Set for Serviceability

Prior to operation, check the radio set for serviceability in the following way:

(a) examine the radio set and the battery compartment. On discovering dirt or any fault, eliminate the fault and remove dirt by any means available. When removing dirt, pay special attention to the cleanliness of the antenna insulator, the connectors of the headset, the connections of the batteries to the connecting wires and the bunched wires proper;

(b) listen to the set noises in reception. The noises should be loud and without crackling. If no noises are heard, check the headset by replacing it (or handset) by a new one;

(c) check the dial calibration.



~~The calibration accuracy~~

checked and, if necessary, its correction should be carried out with the aid of the correction trimmer which is accessible through the upper hole in the front panel of the radio set marked CORRECTION (КОРРЕКЦИЯ). The hole is stopped by a threaded stopper which should be screwed out with the aid of a screwdriver.

The tuning frequency should be corrected by turning the trimmer screw with a screwdriver until zero beats are obtained, the radio set dial being set precisely at the correction mark.

(d) make sure that the antenna is energized. In transmission, tune the antenna tuning circuit referring to the maximum readings of the instrument located on the radio set front panel.

The radio set should be properly tuned at any point of the band.

## 6. RADIO SET OPERATING PROCEDURE

The types P-105M, P-108M and P-109M radio sets provide for the following types of communication:

- direct radio communication using two or more radio sets in the radio network;
- telephone communication along a wire line;
- radio communication with remote control of the radio set from an outlying post via a telephone set;
- semiautomatic retransmission at manual control.

Prior to operation, prepare the radio set and check whether it is serviceable.

Prepare the radio set for operation in the following way:

(a) set the power on/off switch in the ON (ВКЛ.) position;

(b) set the switch in the REC. RETR. (ПР. ПЕТР.) position for lighting up the dial;

(c) check the calibration of the dial against the built-in crystal calibrator;

(d) set the given frequency with the FREQUENCY SETTING (УСТАНОВКА ЧАСТОТЫ) knob and lock it with the LOCK (СТОПОР) knob;

(e) set the toggle switch on the front panel in the AFC ANTENNA CURRENT (АПЧ ТОК АНТ.) position;

(f) depress the push-to-talk switch on the headset and obtain maximum deflection of the meter pointer with the aid of the ANTENNA TUNING (НАСТРОЙКА АНТЕННЫ) knob;

(g) set the switch in the RADIO (РАДИО) position.

This done, the radio set is ready for conducting the radio communication.

### Conducting the Radio Communication

For transmitting a message it is necessary to depress the push-to-talk switch on the headset and to speak into the microphone in a normal, articulate voice, without hurrying. The microphone should be held 2 - 4 cm from the mouth.

For reception, release the push-to-talk switch on the headset and listen to the headphones. In the case of a severe interference with reception, it is permissible to place the switch on the front panel of the radio set from the AFC (АПЧ) position to the OFF (ОТКЛ.) position, if this improves the quality of reception.

Operating the radio set when linked by wire line  
to Outlying Post

(a) Connect a type TA-57 telephone set by means of a two-conductor field cable to the radio set terminals LINE (ЛИНИЯ) and CHASSIS (КОРПУС);

(b) insert the headset connector into the receptacle located on the pack;

(c) open the front lid of the pack and set the knob of the function switch in the SERVICE (СЛУЖ.) position;

(d) depress the CALL (ВЫЗОВ) button to call the telephone operator. The radio operator can be called by the telephone operator by turning the magneto handle of the telephone set;

(e) depress the lever of the headset and the push-to-talk switch on the handset of the telephone set to conduct communication.

During the talk the noise of the receiver will be slightly audible. If during the radio operator's work over the wire line a call is received on the radio set from a communicating party, the operator must immediately pass over to radio operation by setting the switch from the SERVICE (СЛУЖ.) position to the RADIO (РАДИО) position.

Conducting the Communication with Remote Control  
of the Radio Set from Outlying Post

Having prepared the radio set for operation, set the function switch in the REMOTE (ДУСТ.) position.

Conduct radio communication from the outlying post, switching the radio set from reception to transmission by pressing the push-to-talk switch on the handset of the telephone set (when switching over to reception, release the push-to-talk switch).

In this case the push-to-talk switch on the handset of the radio set is released.

## Retransmission

For retransmission it is necessary to carry out the following operations:

(a) the two radio sets that are to be used for retransmission are positioned not closer than 25 m from each other, and their LINE (ЛИНИЯ) and CHASSIS (КОРПУС) terminals are respectively interconnected by a cable. The headset is plugged into the receptacle located on the pack or on the front panel;

(b) the assigned radio-communication frequencies are set. The frequencies of the two radio sets should differ by not less than 100 kHz (four fixed frequencies) according to the radio set dial. Frequency difference multiple of the radio set intermediate frequency should be avoided.

Should it be impossible to meet the frequency separation requirements, the radio sets should be removed to a distance of over 100 m from each other.

Prior to operation, it is necessary to make sure that the selected frequencies are suitable. Do this by checking whether the radio sets have any effect on each other.

For this purpose, one of the radio sets is switched to transmission, and the suppression (reduction) of noise is checked on the receiver of the other. Then, the first radio set is switched to reception and the second, to transmission, and the suppression of noise is checked again. If the suppression of noise is considerable, the radio sets should be moved farther apart;

(c) each radio set is tuned separately and checked for radio communication with its communicating party (the function switches of both radio sets should be in the RADIO position);

(d) on receiving a call from one of the parties, the radio operator in charge of retransmission sets the switch of the radio set that has received the call to the

~~REC. RETR. (NP. PETP.) position~~  
radio set retransmits the call in the direction of the second communicating party (the switch is in the RADIO position);

(e) the modes of operation of the radio sets are selected by the function switch. This switch is in the REC. RETR. (NP. PETP.) or TRANS. RETR. (NEP. PETP.) position, depending on the direction of the radio transmission. In this case the first radio set will be in the RECEIVE mode and the second, in the TRANSMIT mode or vice versa, when the switch is set in the TRANS. RETR. (NEP. PETP.) position. Performing the manipulations of the radio sets the operator in charge of retransmission listens to the transmission and switches over the retransmitting radio sets at the appropriate time;

(f) on finishing the retransmission, the knob of the switch should be returned to the RADIO position.

## 7. MAINTENANCE OF RADIO SET

### (Scheduled Maintenance Operations)

Maintenance of the radio set means carrying out those operations which ensure long life of the equipment and its constant readiness for operation.

The radio set maintenance includes:

- daily technical inspections;
- weekly maintenance;
- monthly maintenance;
- semiannual maintenance.

### Daily Technical Inspections

(a) Carry out external examination and remove dust and dirt from the accessible parts of the radio set, checking the latter for serviceability according to the corresponding Section of these Operating Instructions;

(b) take care to keep dirt, snow and sand from getting into the headset or handset connector, and also into the jack of the antenna insulator;

(c) keep water from getting inside the radio set. If water does get inside, take the radio set out of the pack and dry it;

(d) see to it that the storage battery plugs are always screwed in tight. Without good reason neither put the radio set on its side nor turn it with the antenna insulator down;

(e) protect the headset from the effect of moisture. After operation at low temperatures or high humidity (in the rain) dry the handset or the headset. When operating in the frost keep the microphone from freezing;

(f) do not twist or bend sharply the connecting wires of the headphones. See to it that the outer sheathings of the cables are in good repair. Disconnect the headset from the radio set by pulling the connector and not the cable;

(g) the jack of the antenna insulator should be clean. The antenna insulator should be protected from blows;

(h) the rod antenna should be cleaned of dirt and dried after the rain. Special attention should be paid to the joints between the antenna sections;

(i) the rod antenna should be cleaned with a dry rag and by no means with sandpaper or sand, which will result in removing the protective coating;

(j) the beam antenna should be wound onto the fork in even layers, turn to turn. Dirt should be wiped off the antenna wire with a rag. Damaged insulation should be restored by wrapping the damaged place with a thin layer of insulating tape.

In addition, it is necessary to keep the battery compartment of the pack clean. Before installing the batteries in the pack, the batteries and the battery compartment should be wiped with a rag to remove traces of electrolyte and alkali salts.

Throughout the operation and storage, at the first opportunity, open the rear lid of the radio set pack for examination and, if necessary, clean the battery compartment of the electrolyte.

~~Immediately before operating the~~

necessary to:

- (a) check the battery voltage according to the radio set meter;
- (b) check the power output in the antenna using the radio set meter;
- (c) check the dial calibration against the built-in calibrator;
- (d) check the serviceability of the headset, the handset and of the entire radio set;
- (e) check the tuning of the discriminator against the built-in crystal calibrator.

#### Weekly Maintenance

Weekly maintenance includes:

- (a) carrying out the operations included in daily technical inspections;
- (b) checking the condition of the antenna devices and plug connectors.

During the weekly maintenance operations special attention should be paid to the condition of the storage batteries, the headset, the handset and the antennas.

#### Monthly Maintenance

In monthly maintenance, in addition to the operations indicated for weekly and daily inspections, a detailed inspection of the radio set complement is made, and the missing parts are added to the single set of spare parts.

#### Semiannual Maintenance

Semiannual maintenance includes the operations of the monthly maintenance and technical checks of the following radio set parameters:

- (a) measuring the current in a dummy antenna;
- (b) checking the current consumed by the radio set;

- (c) checking the modulation of the transmitter;
- (d) measuring the sensitivity of the modulation input;
- (e) checking the sensitivity and the audio voltage at the receiver output;
- (f) checking the tuning accuracy of the receiver discriminator and mixer circuits;
- (g) checking the operation of the AFC system;
- (n) checking the error of the radio set frequency calibration.

## 8. MEASURING THE RADIO SET PARAMETERS

The technical checks of the radio set for conformity to the specifications are carried out at equipped work places, with the use of measuring instruments of the following accuracy:

- (a) standard-signal generators: in signal voltage,  $\pm 25\%$  in deviation,  $\pm 5\%$ ;
- (b) heterodyne wavemeters,  $\pm 0.01\%$ ;
- (c) pointer-type frequency meters,  $\pm 2\%$ ;
- (d) audio oscillators,  $\pm 5\%$ ;
- (e) instruments for measuring D.C. currents and voltages,  $\pm 1.5\%$ ;
- (f) instruments for measuring radio-frequency currents and voltages,  $\pm 5\%$ ;
- (g) frequency deviation meters,  $\pm 5\%$ ;
- (h) crystal calibrators (or radio-frequency meters),  $\pm 0.001\%$ .

The electrical characteristics of the radio set are measured, with the supply sources of the given radio set used. All the electrical characteristics should be measured:

- (a) under normal climatic conditions;
- (b) with the antenna circuit tuned (the antenna circuit is tuned in the TRANSMIT mode according to the maximum reading of a thermomilliammeter or the meter on the front panel of the radio set, with a dummy antenna (50-Ohm resistor) connected);



(c) at a storage battery voltage of 4.8 V (2.4 V per group).

The connection of the instruments for measurements is shown in Figs 5 and 6.

#### Measuring the Dummy-Antenna Current

To measure the dummy-antenna current, connect a thermomilliammeter together with a dummy antenna (a 50-Ohm resistor) to the antenna input.

Switch on the radio set for transmission and with the ANTENNA TUNING (НАСТРОЙКА АНТЕНЫ) knob obtain the maximum deflection of the meter. At the rated battery voltage of 4.8 V, the current in the dummy antenna should not be less than 140 mA.

The check should be made at both ends and at the mid-point of the range.

#### Measuring the Radio-Set Current Consumption

The current consumed by the radio set from the batteries should be measured with the aid of two ammeters connected to the positive and negative wires running from the batteries. In this case the transmitter should be tuned to maximum current in the dummy antenna.

Measurements are taken at the rated battery voltage of 4.8 V both in transmission and in reception. With a serviceable radio set the current in each circuit should not exceed 1.85 A in transmission and 0.85 A in reception.

#### Checking the Transmitter Modulation

Prepare the frequency-deviation meter according to the instructions and connect its measuring cable to the dummy antenna (antenna input - CHASSIS terminal). Switch on the radio set for transmission. Then pronounce a loud "ah" in front of the microphone of the headset. The value of the frequency deviation, as read off the scale of the

deviation meter, should not be less than 5 kHz. Measurements should be taken at three points: at the ends and in the middle of the range.

### Measuring the Sensitivity of Modulation Input

Measurements are taken at two cut-off and one mid-band frequencies of the range with the transmitter fully tuned. The transmitter loaded into the dummy antenna is coupled to the frequency modulation meter. The headset is plugged into receptacle on the front panel.

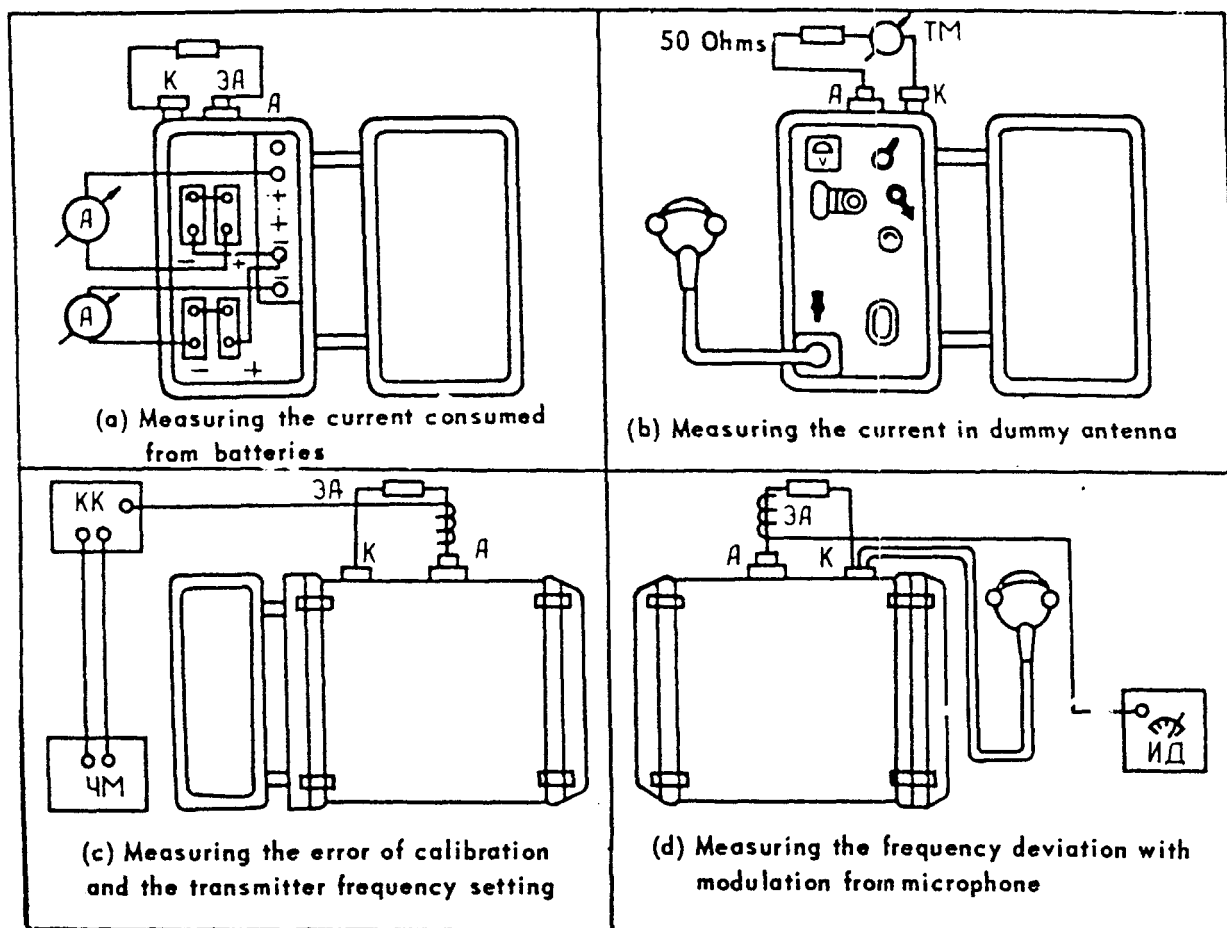


FIG. 5. CONNECTION OF INSTRUMENTS FOR TESTING THE RADIO SET

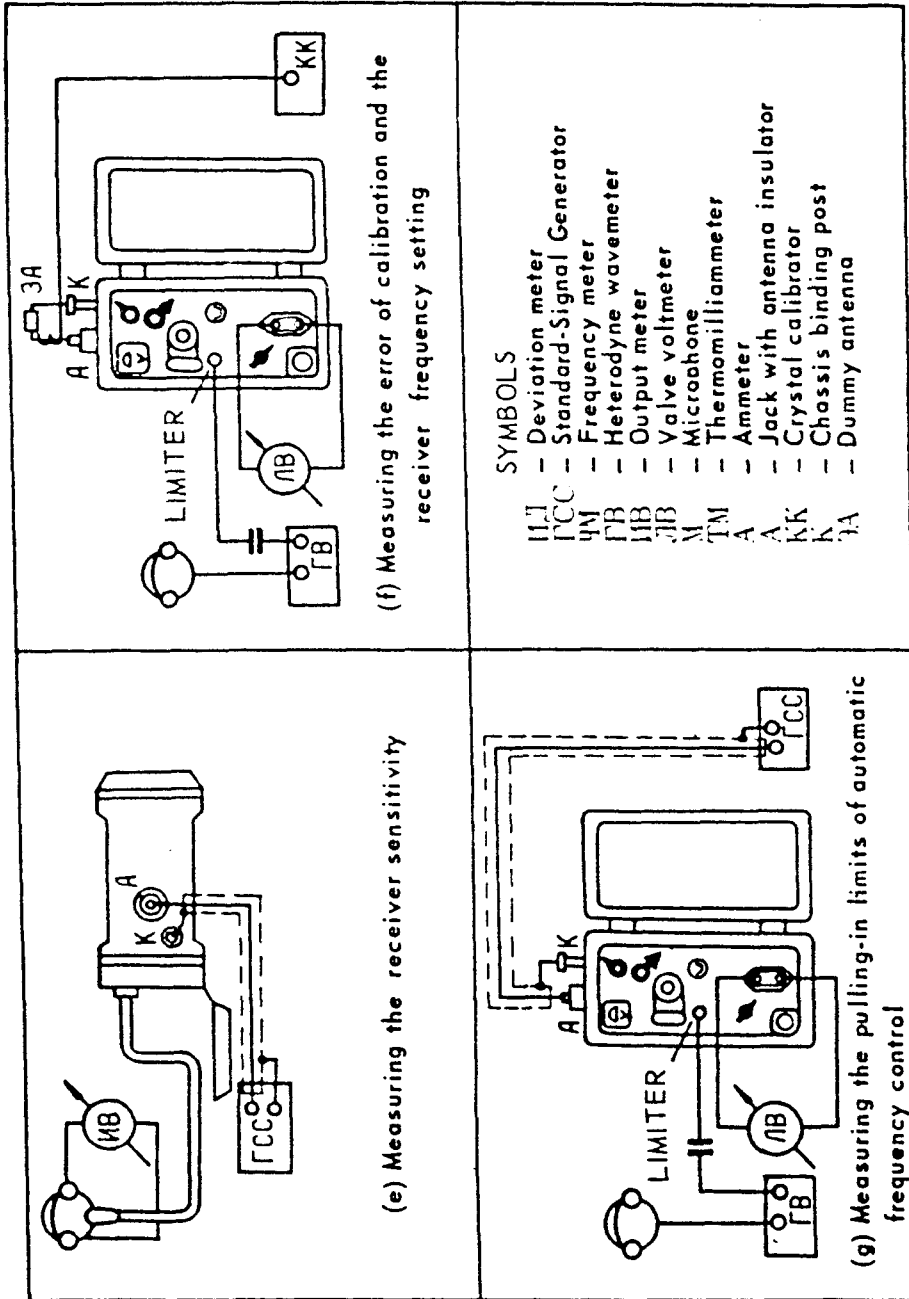


FIG. 6. CONNECTION OF INSTRUMENTS FOR TESTING THE RADIO SET

A voltage having a frequency of 1000 Hz is applied from the audio oscillator to the modulation input of the transmitter (3rd contact of the upper connector of the pack) via a 0.05- $\mu$ F capacitor, while a valve voltmeter for measuring this voltage is connected after the capacitor.

The voltage from the audio oscillator is set to such a value at which the pointer of the deviation meter will deflect by 5 kHz.

The value of the audio voltage required for changing the frequency by 5 kHz determines the sensitivity of the modulation input and should be within 80 to 200 mV.

#### Checking the Sensitivity and Audio Voltage at Receiver Output

Checking is done with the aid of a standard-signal generator and a valve voltmeter. Prior to measurements, set the frequency according to the dial, place the toggle switch in the AFC OFF FILAMENT (АНЧ ОТКЛ. НАКАЛ) position, connect the valve voltmeter to the telephone output of the receiver being checked.

Apply the voltage of 1.5  $\mu$ V from the standard-signal generator (S.S.G.) via its output cable to the input of the radio set, for which purpose connect the clips of the S.S.G. output cable to the antenna input and to the CHASSIS (КОМПЬС) terminal according to the markings on the cable, switch on the modulation of the S.S.G., set a deviation level equal to 5 kHz, and using the FREQUENCY (ЧАСТОТА) knob tune the S.S.G. to the receiver frequency against the discriminator zero voltage referring to the valve voltmeter connected to "+" and "-" jacks of the discriminator.

The audio output voltage should not be less than 1 V. Then, switch off the modulation and measure the residual noise voltage in the receiver, simultaneously determining the ratio of the audio output voltage ( $V_g$ ) to the residual receiver noise voltage ( $V_n$ ). Varying the output voltage

with the attenuator of the S.S.G. find the value at which ratio  $V_s : V_n$  will be equal to 10. This value is known as the sensitivity of the receiver.

The radio set can be considered serviceable if the receiver sensitivity is not worse than 1.5  $\mu$ V.

The sensitivity is checked at two extreme points of the range.

### Checking the Tuning Accuracy of Receiver Discriminator and Mixer Circuits

Misalignment of the discriminator and mixer circuits may cause malfunctioning of the AFC (automatic frequency control) system and as a final result, loss of communication. That is why during technical examinations and repairs it is necessary to check thoroughly the accuracy of tuning of these circuits.

To check the alignment of the discriminator circuit, a D.C. valve voltmeter is to be connected to jacks "+" and "-" of the discriminator. For this purpose, the cap covering the discriminator plate should be removed.

In the RECEIVE mode of operation the built-in crystal calibrator of the radio set is switched on (the CALIBRATOR-LIGHT button is to be depressed) and the voltage of the discriminator circuit is measured with the aid of the valve voltmeter across jacks "+" and "-". The voltage should not exceed  $\pm 0.5$  V.

If the voltage is other than  $\pm 0.5$  V, rotate the trimming capacitor located on the same ceramic plate with the aid of a special screwdriver to obtain a zero reading of the meter.

If the discriminator circuit is tuned correctly and precisely, the discriminator voltage, as indicated by the valve voltmeter, should increase (positive and negative sides) when the trimming capacitor rotor is turned to the right and left off the tuned position.

It should be borne in mind that a metal screwdriver causes detuning of the circuit (as the trimming capacitor is not earthed), therefore it is better to use a special screwdriver included in the set of standard equipment or a plastic screwdriver with a small metal tip.

After the discriminator circuit has been tuned, check the tuning of the mixer circuit according to the magnitude of the voltage across jacks "+" and "-", with the crystal calibrator switched off (the receiver set noise voltage is to be measured).

In this case the measured voltage should not be other than  $\pm 2.0$  V. If the voltage is beyond  $\pm 2.0$  V, tune the mixer circuit (at a repair shop), for which purpose remove the receiver-transmitter from the pack and connect it to the batteries via a coupling cable. Unsolder the metal cap of the mixer circuit screen located on the ceramic plate. Rotate the slug of the mixer coil to obtain zero readings of the valve voltmeter. Make sure that the circuit is tuned correctly (the zero reading of the voltmeter can be also obtained with the circuit fully detuned). Do this by turning the slug to the left and right of the zero-reading position; the voltmeter should indicate negative and positive voltages. Rotate the slug with care so as not to damage its slot. After tuning, carefully seal the circuit. The procedure for tuning the mixer and discriminator circuits should be the one described above. For example, it is not allowed to first tune the mixer and then the discriminator. All the tuning operations should be performed at the midband frequency free from interference.

#### Checking the Operation of the AFC System

The operation of the AFC system is checked at the midband frequency of the radio set range. An unmodulated signal of  $1.5 \mu\text{V}$  is applied from a S.S.G. to the receiver input. A heterodyne wavemeter is connected to jack I LIMITER

(OFF.) on the radio set front panel, and a valve voltmeter is connected to jacks "+" and "-" of the discriminator. The toggle switch is set in the AFC OFF FILAMENT position.

The S.S.G. is tuned exactly to the receiver frequency according to the zero reading of the valve voltmeter. Frequency value  $f_0$ , to which the discriminator is tuned, is measured with the aid of the heterodyne wavemeter.

The heterodyne wavemeter is detuned by 10 kHz to one side of the discriminator frequency, and the S.S.G. is tuned to zero beats with the heterodyne wavemeter. The AFC system is switched on and the newly obtained intermediate frequency  $f_{res.}$  is measured with the aid of the heterodyne wavemeter. The AFC system gain (G) is calculated according to the formula:

$$G = \frac{10}{f_0 - f_{res.}}$$

Then the measurement is repeated with the heterodyne wavemeter and the S.S.G. detuned by 10 kHz to the other side of the discriminator frequency. The AFC system gain should not be less than 5 times.

#### Checking the Dial Calibration. Frequency Correction Rules

The calibration should be checked and the frequency of the radio set corrected after checking all the above-mentioned electrical characteristics of the radio set and bringing them to the normal values.

The check is performed with the AFC system in the OFF position (the toggle switch is in the AFC OFF FILAMENT position), and begins with correction of the frequency against the built-in crystal calibrator. After this dial calibration is checked in transmission and reception throughout the whole range of the radio set, beginning with the maximum frequency of the range.

The calibration of the radio set dial is checked, beginning with the TRANSMIT mode, with the antenna circuit tuned and a dummy antenna (50-Ohm resistor) connected.

The calibration of the radio set dial is checked in the TRANSMIT mode with the aid of a crystal calibrator at frequencies that are multiples of 1 MHz, or with the aid of a radio-frequency meter.

The crystal calibrator is coupled to the antenna jack of the radio set with the aid of a radio-frequency cable, and the calibration of the dial is checked.

If the calibration error is within  $\pm 4.0$  kHz at any point of the band, then the calibration of the receiver should be checked.

If the dial calibration error in the TRANSMIT mode of operation is beyond  $\pm 4.0$  kHz, then it is necessary to correct the frequency against an external crystal calibrator. For this purpose the highest frequency that is a multiple of 1 MHz is set on the radio set dial, the antenna circuit is tuned and, by turning the rotor of the upper correction trimmer (upper opening next to inscription CORRECTION on the radio set front panel), zero beats or zero readings of the frequency meter (connected to the crystal calibrator output) are obtained.

After this the dial calibration error should be again checked over the whole range. If at any point of the range the dial calibration error is beyond  $\pm 4.0$  kHz, but less than 6 - 7 kHz, then it is necessary to spread this error evenly over the range with the aid of the upper correction trimmer.

For this purpose set the radio set dial to the frequency at which the error is the greatest. By turning the rotor of the upper correction trimmer decrease the calibration error. This done, check again the dial calibration error over the whole range. Do this until throughout the whole range the error is the least possible and is spread uniformly.



In case the upper correction trimmer does not help in reducing the dial calibration error to +4.0 kHz, but the calibration error is beyond +7 kHz, the correction should be performed by shifting the eyepiece.

At the upper frequency of the range the frequency correction is made with the aid of the trimmer, as described above. Then the lower frequency of the range is set and the correction is made by shifting the eyepiece. For this purpose, the screws securing the eyepiece framing (two to the left of the eyepiece and three under the rubber cap of the eyepiece) should be somewhat released.

Continue the frequency correction with the aid of the trimmer (at the upper end of the range) and eyepiece (at the lower end of the range) until a minimum and uniform error over the whole range of the radio set is obtained.

The correction completed, tighten up the five screws securing the eyepiece framing.

After the radio set dial calibration error has been reduced in the TRANSMIT mode to the minimum value and is not beyond +4.0 kHz at any point of the range, the calibration should be checked in the RECEIVE mode of operation.

If the dial calibration error in transmission cannot be reduced to +4.0 kHz, the radio set should be sent to a repair shop.

In reception the calibration is checked and the frequency is corrected in the following way.

The radio set dial is set to the correction notch in the upper part of the band, and (with button CALIBRATOR - LIGHT on the front panel of the radio set depressed) by turning the rotor of the lower calibration trimmer the zero beats are obtained in the earphones of the headset.

Then the calibration of the radio set dial is checked in the RECEIVE mode throughout the whole range.

The input of a heterodyne wavemeter is coupled via a capacitor of 10 - 50 pF to jack LIMITER (OFP.) located on the front panel. A frequency equal to the n-th harmonic of the external crystal calibrator is set on the radio set dial. The heterodyne wavemeter is used to measure the intermediate frequency signal ( $f_i$ ) which is formed by the frequency of the external crystal calibrator ( $f_{cc}$ ) and by the frequency of the receiver local oscillator ( $f_{l.o.}$ ). In the radio set  $f_i = f_{cc} - f_{l.o.}$ . In the case of exact tracking of the crystal calibrator frequency with that of the receiver local oscillator the intermediate frequency equals 793.8 kHz.

The difference between the nominal intermediate frequency and the measured one will give the frequency calibration error of the receiver.

## 9. STORAGE AND TRANSPORTATION RULES

The conditions of storage should ensure the preservation of the radio set electrical and operational characteristics without any change in the general appearance of the radio set.

The following storage conditions may be considered normal:

(a) relative air humidity in the storeroom from 50 to 65 per cent;

(b) air temperature from +10 to +25°C.

Sharp temperature fluctuations are not permissible.

When factory outfits are stored in stacks they should not be piled more than three rows high.

The radio sets require no special slushing for storage, since they are provided with adequate anticorrosive coating and paint. For prolonged storage however, it is recommended that the metal parts of the radio set should be coated with a thin layer of protective grease.

Before putting the radio sets that have been in operation in prolonged storage, it is necessary to remove the storage batteries from the pack, pour the electrolyte out of them, wash and dry thoroughly and lubricate all metal parts with a thin layer of protective grease. It is recommended that the batteries should be stored separately.

When transporting the factory outfits of the radio sets in packing boxes, it is necessary to observe the following:

(a) when transporting the radio sets in packing boxes in open motor vehicles it is permissible to stack them not more than two rows high. From above the radio sets should be covered with tarpaulin;

(b) it is forbidden to turn the packing boxes over when loading and unloading them;

(c) when transporting the factory outfits by railway, the radio sets can be stacked in the car up to four rows high with padding of cardboard or thick paper between the rows.

The rows of packing boxes with the radio sets are to be arranged across the car and secured by boards to prevent them from shifting.

SCHEMATIC DIAGRAM  
TO THE RADIO SET  
AND  
THE PARTS LIST  
TO THE SCHEMATIC DIAGRAM

PARTS LIST TO RADIO SET SCHEMATIC DIAGRAM

Ref. No.	Description and type	Qty	Note
101	Diode 1I9E	1	
102	Capacitor CKM-26-H30-125-5100 pF +50%-20%	1	
103	Current transformer	1	
104 <sup>x</sup>	Resistor OMЛT-0.5-510 Ω ±10%	1	
105	Capacitor KЛ-1-M1300-51 pF ±10%	1	
106	Switch	1	
107	Antenna coil (+3.5%): 0.55 μH 0.92 μH 1.52 μH	1	for P-105M for P-108M for P-109M
108	Trimmer 5 - 30 pF	1	
109	Capacitor CKM-16-M47-250-100 pF ±10%	1	
110	Anode choke 31.5 μH ±10%	1	
111	Capacitor CKM-26-M330-250-1000 pF ±20%	1	
112 <sup>x</sup>	Resistor OMЛT-0.5-18 kΩ ±10%	1	
113	Capacitor CKM-26-M330-250-1000 pF ±20%	1	
114	Valve 1П24Б-B	1	
115	Capacitor CKM-26-H30-125-5100 pF +50%-20%	1	
116	Resistor OMЛT-0.5-470 kΩ ±10%	1	

## PARTS LIST (continued)

Ref. No.	Description and type	Qty	Note
117	Capacitor KJ-1-M1300-51 pF $\pm 10\%$	1	
118	Valve 1W17E	1	
119	Resistor OMJT-0.5-150 k $\Omega$ $\pm 10\%$	1	
120	Capacitor CKM-26-H30-125-5100 pF +50%-20%	1	
121	Capacitor CKM-26-H30-125-5100 pF +50%-20%	1	
122	Resistor OMJT-0.5-240 k $\Omega$ $\pm 10\%$	1	
123	Resistor OMJT-0.5-82 k $\Omega$ $\pm 10\%$	1	
124	Trimmer 2 to 4.2 pF	1	
125 <sup>x</sup>	Capacitor KJ-1-M47-1 pF $\pm 0.4$	1	for P-105M
126 <sup>x</sup>	Capacitor KJ-1-M47-12 pF $\pm 10\%$	1	for P-108M
	Capacitor KJ-1-M47-8.2 pF $\pm 10\%$	1	for P-109M
	Capacitor KJ-1-M47-8.2 pF $\pm 10\%$	1	
127	Gang capacitor section 5.0 to 26 pF	1	
128	Anode coil of the 1st HF amplifier ( $\pm 2.5\%$ ): 0.45 $\mu$ H 0.8 $\mu$ H 1.45 $\mu$ H	1	for P-105M for P-108M for P-109M
129	Capacitor CKM-26-H30-125-5100 pF +50%-20%	1	
130	Resistor OMJT-0.5-10 k $\Omega$ $\pm 10\%$	1	
131	Ceramic capacitor 0.35 pF	1	

## PARTS LIST (continued)

Ref. No.	Description and type	Qty	Note
132	Grid-circuit coil of the 2nd HF amplifier (+2.5%): 0.45 $\mu$ H 0.8 $\mu$ H 1.45 $\mu$ H	1 1 1	for P-105M for P-108M for P-109M
133 <sup>x</sup>	Capacitor KJ-1-11100-1 pF $\pm$ 0.4	1	
134	Gang capacitor section 5.0 to 26 pF	1	
135 <sup>x</sup>	Capacitor KJ-1-M47-12 pF $\pm$ 10% Capacitor KJ-1-M47-10 pF $\pm$ 10% Capacitor KJ-1-M47-10 pF $\pm$ 10%	1 1 1	for P-105M for P-108M for P-109M
136	Trimmer 2 to 4.2 pF	1	
137	Capacitor KJ-1-M1300-51 pF $\pm$ 10%	1	
138	Resistor OMJT-0.5-150 k $\Omega$ $\pm$ 10%	1	
139	Valve 1K18B	1	
140	Capacitor CKM-26-H30-125-5100 pF +50%-20%	1	
141	Capacitor CKM-26-H30-125-5100 pF +50%-20%	1	
142	Resistor OMJT-0.5-100 k $\Omega$ $\pm$ 10%	1	
143	Resistor OMJT-0.5-68 k $\Omega$ $\pm$ 10%	1	
144	Anode coil of the 2nd HF amplifier (+3%): 0.45 $\mu$ H 0.8 $\mu$ H 1.45 $\mu$ H	1 1 1	for P-105M for P-108M for P-109M
145	Gang capacitor section 5.0 to 26 pF	1	

PARTS LIST (continued)

Ref. No.	Description and type	Qty	Note
146 <sup>x</sup>	Capacitor КЛ-1-П100-2.2 pF $\pm$ 0.4	1	for P-105M
	Capacitor КЛ-1-П100-1 pF $\pm$ 0.4	1	for P-108M
147 <sup>x</sup>	Capacitor КЛ-1-П100-1 pF $\pm$ 0.4	1	for P-109M
148	Trimmer 2 to 4.2 pF	1	
149	Capacitor СКМ-2а-Н30-125-5100 pF +50%-20%	1	
150	Resistor ОМЛТ-0.5-1.5 k $\Omega$ $\pm$ 10%	1	
151	Capacitor КЛ-1-М1300-51 pF $\pm$ 10%	1	
152	Resistor ОМЛТ-0.25-150 k $\Omega$ $\pm$ 10%	1	
153	Valve 1Ж18Б	1	
154	Capacitor КМ-5а-Н30-33,000 pF +50%-20%	1	
155	Filament choke $\geq$ 140 $\mu$ H	1	
156	Capacitor СКМ-26-Н30-125-5100 pF +50-20%	1	
157	Resistor ОМЛТ-0.5-200 k $\Omega$ $\pm$ 10%	1	
158	Resistor ОМЛТ-0.25-100 k $\Omega$ $\pm$ 10%	1	
159	Capacitor СКМ-26-Н30-125-5100 pF +50%-20%	1	
160	Wire-wound resistor 11 ?	1	
161	Resistor ОМЛТ-0.25-10 k $\Omega$ $\pm$ 10%	1	
162	Capacitor КМ-5а-М47-100 pF $\pm$ 10%	1	
163	Coil with core ( $\pm$ 2.5%) 400 $\mu$ H	1	



## PARTS LIST (continued)

Ref. No.	Description and type	Qty	Note
164	Capacitor CKM-16-M47-250-100 pF $\pm 10\%$	1	
165	Capacitor KИ-1-M47-8.2 pF $\pm 10\%$	1	
166	Capacitor KM-4a-M1500-180 pF $\pm 10\%$	1	
167	Crystal resonator PT-0.9-14TT-794 kHz -B1-Y	1	
168	Resistor OMJT-0.25-5.1 k $\Omega$ $\pm 5\%$	1	
169	Transistor П416A	1	
170	Resistor OMJT-0.5-4.3 k $\Omega$ $\pm 10\%$	1	
171	Resistor OMJT-0.25-15 k $\Omega$ $\pm 5\%$	1	
172	Capacitor K50-3B-50-10	1	
173	Capacitor CKM-2a-H30-125-5100 pF +50%-20%	1	
174 <sup>XX</sup>	Resistor OMJT-0.25-68 k $\Omega$ $\pm 10\%$	1	
175	Contact block	1	
176	Contact block	1	
177	Capacitor CKM-26-H30-125-5100 pF +50%-20%	1	
178	Capacitor CKM-26-H30-125-5100 pF +50%-20%	1	
179	Capacitor KM-4a-M1500-750 pF $\pm 10\%$	1	
184	Capacitor KИ-1-П100-2.2 pF $\pm 0.4$	1	
185	Capacitor KT-1-M1300-150 pF $\pm 10\%$	1	
186	Resistor OMJT-0.25-1.8 k $\Omega$ $\pm 10\%$	1	
187	Resistor OMJT-0.5-100 $\Omega$ $\pm 10\%$	1	
188	Capacitor CKM-2a-H30-125-5100 pF +50%-20%	1	

## PARTS LIST (continued)

Ref. No.	Description and type	Qty	Note
201	Exciter gang capacitor: 6.35 to 13.5 pF 6.35 to 15 pF 6.45 to 16.45 pF	1	for P-105M
202 <sup>x</sup>	Capacitor KM-5a-M1500-1800 pF $\pm 10\%$ Capacitor KM-5a-M1500-1600 pF $\pm 10\%$	1	for P-108M
203 <sup>x</sup>	Capacitor KM-4a-M750-430 pF $\pm 5\%$	1	for P-105M
204	Coil of exciter grid circuit: 1.31 $\mu$ H 1.97 $\mu$ H 3.28 $\mu$ H	1	for P-108M
205 <sup>x</sup>	Capacitor KII-1-M700-39 pF $\pm 10\%$	1	for P-109M
206	Resistor OMJIT-0.5-68 k $\Omega$ $\pm 10\%$	1	
207 <sup>xxx</sup>	Capacitor KII-1-M47-2.2 pF $\pm 0.4$ Capacitor KII-1-II100-1 pF $\pm 0.4$	1	for P-105M
208	Trimmer 2 to 4.2 pF	1	for P-108M
209	Auxiliary gang capacitor of exciter section: 3.45 to 21.95 pF	1	for P-105M for P-108M

PARTS LIST (continued)

Ref. No.	Description and type	Qty	Note
	3.45 to 25.95 pF	1	for P-109M
210	Trimmer 2 to 4.2 pF	1	
211	High-frequency relay PMB-2/7	1	
212	Resistor BC-0.125-10 $\Omega$ $\pm 20\%$	1	
213	Valve 1K29E-B (1K29E)	1	
214	Capacitor CKM-26-H30-125-5100 pF $+50\%-20\%$	1	
215	Filament choke 19.8 $\mu\text{H}$ $\pm 10\%$	1	
216	Capacitor CKM-26-H30-125-5100 pF $+50\%-20\%$	1	
217	Wire-wound resistor 14.9 $\Omega$	1	
218	Capacitor CKM-26-H30-125-5100 pF $+50\%-20\%$	1	
219	Resistor OMUT-0.5-51 k $\Omega$ $\pm 10\%$	1	
220 <sup>x</sup>	Capacitor КД-1-П33-5.1 pF $\pm 0.4$	1	for P-105M
	Capacitor КД-1-П33-5.6 pF $\pm 0.4$	1	for P-108M
	Capacitor КД-1-П33-6.2 pF $\pm 0.4$	1	for P-109M
223	Varicap Д901Г	1	
224 <sup>x</sup>	Choke: 1.7 $\mu\text{H}$	1	for P-105M
	2.7 $\mu\text{H}$	1	for P-108M
	4.5 $\mu\text{H}$	1	for P-109M
226	Resistor OMUT-0.5-100 k $\Omega$ $\pm 10\%$	1	

## PARTS LIST (continued)

Ref. No.	Description and type	Qty	Note
227	Capacitor KT-2-M700-100 pF $\pm 10\%$	1	
229	Filter choke $\geq 140 \mu\text{H}$	1	
230	Capacitor CKM-26-H30-125-5100 pF $+50\%-20\%$	1	
231	Contact block	1	
236 <sup>XX</sup>	Capacitor KT-2-M700-3.3 pF $\pm 0.4$	1	
237 <sup>XX</sup>	Capacitor KT-2-M47-2.2 pF $\pm 0.4$	1	for P-109M
238	Choke 14 turns	1	
239 <sup>X</sup>	Resistor OMT-0.5-68 $k\Omega \pm 10\%$	1	0-6.8 pF
240 <sup>XX</sup>	Capacitor KI-1-M47-5.1 pF $\pm 0.4$	1	
244 <sup>X</sup>	Capacitor KI-1-M75-24 pF $\pm 10\%$	1	
302	Capacitor KI-1-M1300-100 pF $\pm 10\%$	4	
303	Valve 1X18B	4	
304	Coil of IF amplifier anode circuit $414.5 \mu\text{H} \pm 10\%$	4	
306	Capacitor CKM-16-M10-250-100 pF $\pm 10\%$	4	
307	Capacitor CKM-16-M10-250-100 pF $\pm 10\%$	4	
308 <sup>X</sup>	Capacitor KI-1-M47-1.0 pF $\pm 10\%$	4	
309	Coil of IF amplifie. grid circuit $414.5 \mu\text{H} \pm 10\%$	4	
310	Capacitor CKM-26-H30-125-5100 pF $+50\%-20\%$	4	
311	Resistor BC-0.125-150 $k\Omega \pm 10\%$	4	
312	Capacitor CKM-26-H30-125-5100 pF $+50\%-20\%$	4	

## PARTS LIST (continued)

Ref. No.	Description and type	Qty	Note
313	Capacitor KM-5a-H30-33,000 pF +50%-20%	4	
314	Resistor BC-0.125-470 k $\Omega$ $\pm$ 10%	4	
315	Filament choke $\geq$ 140 $\mu$ H	1	
316	Filament choke $\geq$ 140 $\mu$ H	1	
317 <sup>x</sup>	Resistor OMJT-0.25-82 k $\Omega$ $\pm$ 10%	1	
318 <sup>xx</sup>	Capacitor KJ-1-M47-1 pF $\pm$ 0.4	4	
319 <sup>x</sup>	Resistor OMJT-0.25-82 k $\Omega$ $\pm$ 10%	1	
321	Resistor OMJT-0.25-15 k $\Omega$ $\pm$ 10%	1	
323	Resistor OMJT-0.25-15 k $\Omega$ $\pm$ 10%	1	
324	Resistor OMJT-0.25-51 k $\Omega$ $\pm$ 10%	1	
325	Resistor OMJT-0.25-820 k $\Omega$ $\pm$ 10%	1	
326	Capacitor KJ-1-H30-680 pF +50%-20%	1	
327	Resistor BC-0.125-330 k $\Omega$ $\pm$ 10%	1	
328	Capacitor KJ-1-M1300-100 pF $\pm$ 10%	1	
329	Valve 1X185	1	
330	Capacitor KM-5a-H30-33,000 pF +50%-20%	1	
331	Capacitor CKM-26-H30-125-5100 pF +50%-20%	1	
332	Coil of limiter anode circuit 414.5 $\mu$ H $\pm$ 10%	1	
333	Capacitor CKM-16-M10-250-82 pF $\pm$ 10%	1	
334	Capacitor KJ-1-M75-39 pF $\pm$ 10%	1	
335	Coil of discriminator circuit 414.5 $\mu$ H $\pm$ 10%	1	

## PARTS LIST (continued)

Ref. No.	Description and type	Qty	Note
336 <sup>x</sup>	Capacitor CKM-16-M10-250-91 pF $\pm 10\%$	1	
337 <sup>x</sup>	Capacitor KJ-1-M47-10 pF $\pm 10\%$	1	
338	Trimmer 4 to 9 pF	1	
339	Capacitor CKM-26-H30-125-5100 pF $\pm 50\%$ -20%	1	
340	Resistor BC-0.125-330 k $\Omega$ $\pm 10\%$	1	
341 <sup>x</sup>	Resistor OMJT-0.25-22 k $\Omega$ $\pm 10\%$	1	
342 <sup>x</sup>	Resistor OMJT-0.25-330 k $\Omega$ $\pm 10\%$	1	
343	Capacitor MEM-160-0.05 $\pm 10\%$	1	
344	Diode 1105	1	
345	Diode 1105	1	
346 <sup>x</sup>	Resistor OMJT-0.25-330 k $\Omega$ $\pm 10\%$	1	
347	Capacitor KCO-1-250- $\Gamma$ -620 pF $\pm 10\%$	1	
348	Resistor OMJT-0.25-510 k $\Omega$ $\pm 10\%$	1	
349	Resistor OMJT-0.25-1.1 k $\Omega$ $\pm 20\%$	1	
351	Capacitor EM-2-200-0.01 $\pm 10\%$	1	
352 <sup>x</sup>	Wire-wound resistor 10.3 $\Omega$	1	
353	Capacitor KT-1-H70-3300 pF $\pm 80\%$ -20%	1	
354 <sup>x</sup>	Resistor OMJT-0.5-10 k $\Omega$ $\pm 10\%$	1	
355	Contact block	3	
356	Contact Jack	3	

PARTS LIST (continued)

Ref. No.	Description and type	Qty	Note
357	Resistor BC-0.125-20 k $\Omega$ $\pm$ 10%	1	
358	Resistor BC-0.125-330 k $\Omega$ $\pm$ 10%	4	
359	Capacitor KT-1-H70-3300 pF +80%-20%	1	
360	Resistor OMJT-0.25-1M $\Omega$ $\pm$ 10%	1	
400	Resistor OMJT-0.25-750 k $\Omega$ $\pm$ 10%	1	
402 <sup>x</sup>	Resistor OMJT-0.25-430 k $\Omega$ $\pm$ 10%	1	
405	Capacitor MBM-160-0.1 $\pm$ 10%	1	
406	Resistor OMJT-0.25-68 k $\Omega$ $\pm$ 10%	1	
407	Transistor MП14Б	1	
408	Transistor MП14Б	1	
409	Capacitor EM-2-200-4700 pF $\pm$ 10%	1	
410	Transformer I - 600 $\Omega$ $\pm$ 20% II - 90 $\Omega$ $\pm$ 20% Choke $\geq$ 4 H	1 1 1	
411			
412	Resistor OMJT-0.25-16 k $\Omega$ $\pm$ 10%	1	
413 <sup>x</sup>	Resistor OMJT-0.25-75 k $\Omega$ $\pm$ 10%	1	
414 <sup>x</sup>	Capacitor KCO-1-250Г-750 $\pm$ 10%	1	
415	Capacitor K50-20-16-20	1	

## PARTS LIST (continued)

Ref. No.	Description and type	Qty	Note
416 <sup>x</sup>	Resistor OMJT-0.25-1.5 k $\Omega$ $\pm$ 10%	1	
417	Resistor OMJT-0.5-5.1 k $\Omega$ $\pm$ 10%	1	
418	Relay P3C-10	1	
419	Capacitor MEM-160-1 $\pm$ 10%	1	
420	Switching relay	1	
421	Switch 5П4ННМ	1	
422	Capacitor MEM-160-1 $\pm$ 10%	1	
423	Resistor OMJT-0.25-3 k $\Omega$ $\pm$ 10%	1	
424	Diode Д9Б	1	
425	Capacitor MEM-160-0.05 $\pm$ 10%	1	
426 <sup>x</sup>	Resistor OMJT-0.25-15 k $\Omega$ $\pm$ 10%	1	
427 <sup>x</sup>	Resistor OMJT-0.25-43 k $\Omega$ $\pm$ 10%	1	
428	Capacitor MEM-160-0.05 $\pm$ 10%	1	
429	Diode Д9Б	1	
430	Block	1	
431	Block	1	
433	Transistor МП13Б	1	
434	Microphone ДЭММ-1А	1	
435	Resistor OMJT-0.25-150 $\Omega$ $\pm$ 10%	1	
436 <sup>x</sup>	Resistor OMJT-0.25-300 $\Omega$ $\pm$ 10%	1	



## PARTS LIST (continued)

Ref. No.	Description and type	Qty	Note
437	Headset TA-56M	1	
438	Microswitch M111	2	
439	Plug with cord	1	
440 <sup>x</sup>	Resistor OMJT-0.25-1.1 k $\Omega$ $\pm$ 10%	1	
441	Resistor OMJT-0.25-10 k $\Omega$ $\pm$ 10%	1	
443	Capacitor MEM-160-0.05 $\pm$ 10%	1	
445	Resistor OMJT-0.25-82 k $\Omega$ $\pm$ 10%	1	
446	Resistor OMJT-0.25-8.2 k $\Omega$ $\pm$ 10%	1	
447 <sup>x</sup>	Resistor OMJT-0.25-2 k $\Omega$ $\pm$ 10%	1	
448	Resistor OMJT-0.25-68 k $\Omega$ $\pm$ 10%	1	
449	Resistor OMJT-0.25-100 $\Omega$ $\pm$ 10%	1	
450	Capacitor MEM-160-0.05 $\pm$ 10%	1	
451	Capacitor K50-3B-6-50	1	
454	Capacitor KT-1-M700-200 pF $\pm$ 10%	1	
455	Capacitor MEM-160-0.05 $\pm$ 10%	1	
456	Resistor OMJT-0.25-100 $\Omega$ $\pm$ 5%	1	
457	Resistor OMJT-0.25-100 $\Omega$ $\pm$ 5%	1	
462	Relay P3C-10	1	
463	Resistor OMJT-0.25-1 k $\Omega$ $\pm$ 10%	1	
467	Capacitor K50-20-6.3-20	1	

## PARTS LIST (continued)

Ref. No.	Description and type	Qty	Note
475	Microphone MK-16-MB-V (MK-10-MB)	1	
476	Telephone set TA4-65	1	
477	Resistor OMTT-0.25-510 $\Omega$ $\pm 10\%$	1	
478	Plug with cord	1	
479	Plug-in switch	1	
501	Jack PMAГ-14	1	
502	Capacitor K50-3B-6-50	1	
503	Capacitor K50-3B-6-50	1	
504 <sup>x</sup>	Resistor OMTT-0.25-8.2 k $\Omega$ $\pm 10\%$	1	
505	Capacitor K50-3B-50-10	1	
506	Choke 1.36 mH	1	
507	Choke 1.36 mH	1	
508	Block	1	
509	Resistor OMTT-0.5-12 k $\Omega$ $\pm 5\%$	1	
510	Capacitor OMEГ-3-200-2x0.5 $\mu$ F $\pm 10\%$	1	
511	Choke 105 mH	1	
512	Diode И226	1	
513	Diode И226	1	
514	Diode И226	1	
515	Diode И226	1	
516	Diode И223A(И105)	1	

## PARTS LIST (continued)

Ref. No.	Description and type	Qty	Note
517	Transformer	1	
518 <sup>x</sup>	Resistor OMЛT-0.5-510 $\Omega$ $\pm 5\%$	1	
519	Capacitor K50-3B-6-50	1	
520	Wire-wound resistor 20 $\Omega$	1	
521	Transistor П4Б3 (П217B)	1	
522	Transistor П4Б3 (П217B)	1	
523	Toggle switch ПП-1-2	1	
524	Storage battery 2HKП-20Y2 (2HKП-24)	2	
526	Capacitor MEM-160-0.25 $\pm 10\%$	1	
527	Diode Д223A (Д105)	1	
528	Resistor OMЛT-0.5-390 $\Omega$ $\pm 10\%$	1	
529	Capacitor K50-3B-50-10	1	
530	Choke 105 mH	1	
531	Capacitor MEM-160-0.5 $\pm 10\%$	1	
532	Capacitor K50-3B-6-50	1	
533	Capacitor MEM-160-0.25 $\pm 10\%$	1	
534	Choke	1	
535	Choke	1	
538	Diode Д223A (Д105)	1	
539	Avalanche diode Д814B	1	
540	Resistor OMЛT-0.5-2.0 k $\Omega$ $\pm 5\%$	1	

## PARTS LIST (continued)

Ref. No.	Description and type	Qty	Note
542	Capacitor MEM-160-0.05 $\pm 10\%$	1	
543	Resistor OMJT-0.5-82 k $\Omega$ $\pm 10\%$	1	
544 <sup>x</sup>	Resistor OMJT-0.5-1.8 k $\Omega$ $\pm 10\%$	1	
602	Resistor OMJT-0.25-11 k $\Omega$ $\pm 5\%$	1	
603	Resistor OMJT-0.25-8.2 k $\Omega$ $\pm 5\%$	1	
604	Button	1	
605	Incandescent lamp CM3-0.6	1	
606	Incandescent lamp CM3-0.6	1	
607	Button	1	
608	Voltmeter M-1131	1	
609	Resistor OMJT-0.25-100 k $\Omega$ $\pm 10\%$	1	
610	Toggle switch TII-1-2	1	
611	Capacitor MEM-160-0.1 $\pm 10\%$	1	
612	Block	1	
613	Block	1	
614	Block	1	
615	Block	1	
616	Plug PMA' -14	1	
617	Jack	1	
618	Block	1	
619	Terminal	1	

## PARTS LIST (continued)

Ref. No.	Description and type	Qty	Note
620	Jack	2	
621	Terminal	1	
622 <sup>xx</sup>	Capacitor KT-2-M700-300 pF $\pm$ 10%	1	
623	Capacitor KT-1-H70-2200 pF $\pm$ 80-20%	1	
624	Capacitor KT-1-H70-1000 pF $\pm$ 80-20%	1	
625	Resistor OMJT-0.25-620 k $\Omega$ $\pm$ 10%	1	
626	Capacitor MEM-160-0.1 $\pm$ 10%	1	
627	Diode J223	1	
628	Diode J223	1	

Notes: 1. Parts marked with an asterisk (x) are to be selected in adjustment.

2. Parts marked with two asterisks (xx) are to be used in case of necessity.

3. In some radio sets resistors and capacitors may be replaced by resistors and capacitors of other types, which does not influence the radio set quality.

4. Diodes J105A may be used instead of diodes J223A (J105).  
Avalanche diodes J810 may be used instead of avalanche diodes J814B.  
Transistors M115 may be used instead of transistors M114B.



**РАДИОСТАНЦИИ**  
**Р-105м, Р-108м, Р-109м**

**ТЕХНИЧЕСКОЕ**  
**ОПИСАНИЕ И ИНСТРУКЦИЯ**  
**ПО ЭКСПЛУАТАЦИИ**





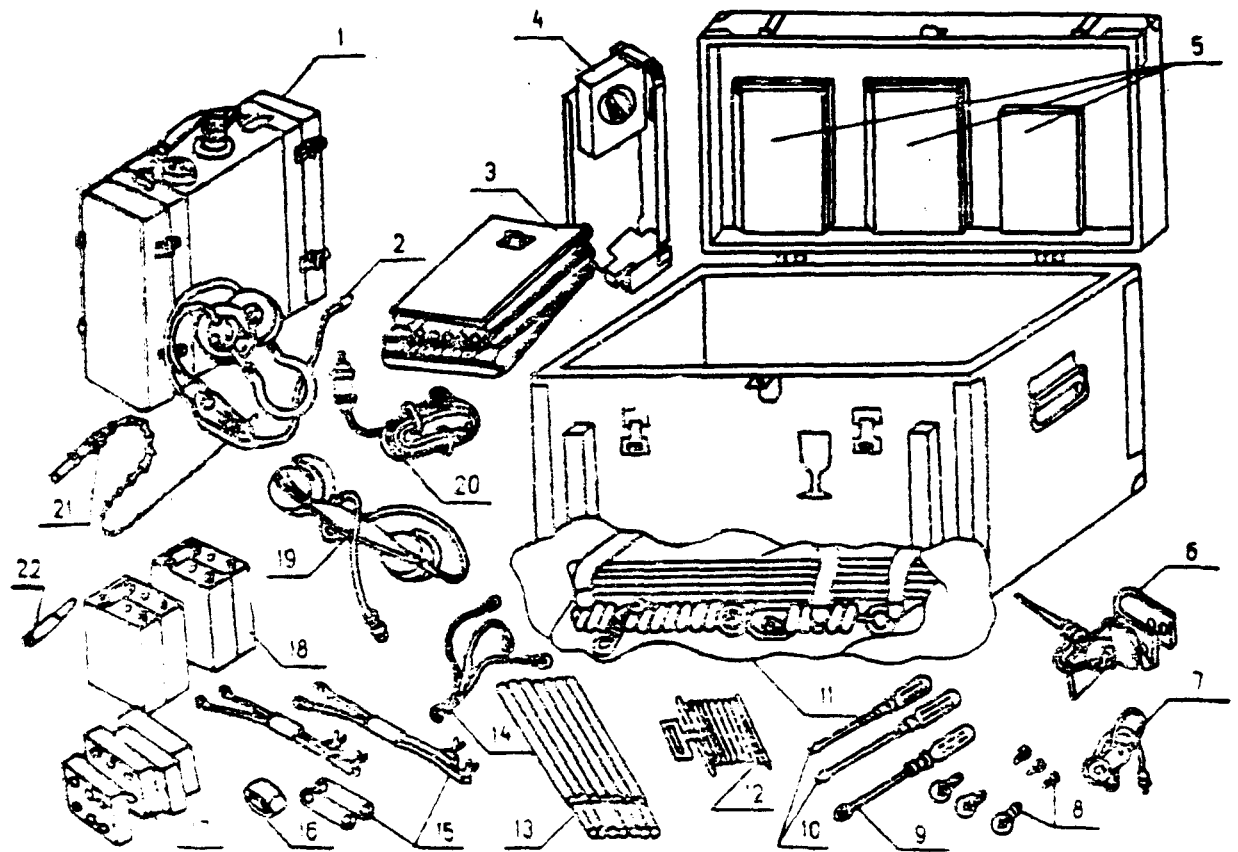


Рис. 2. Промышленный комплект радиостанции.

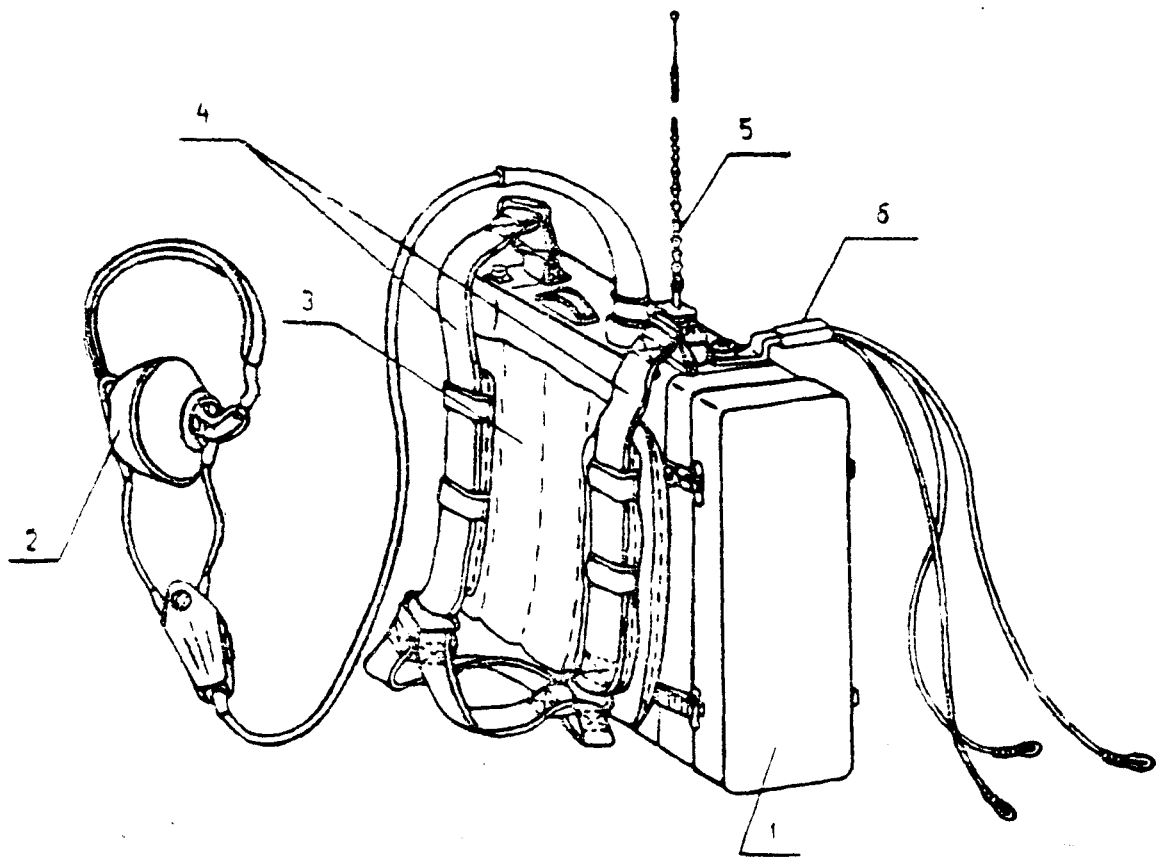


Рис. 3. Рабочий комплект радиостанции (вид спереди).



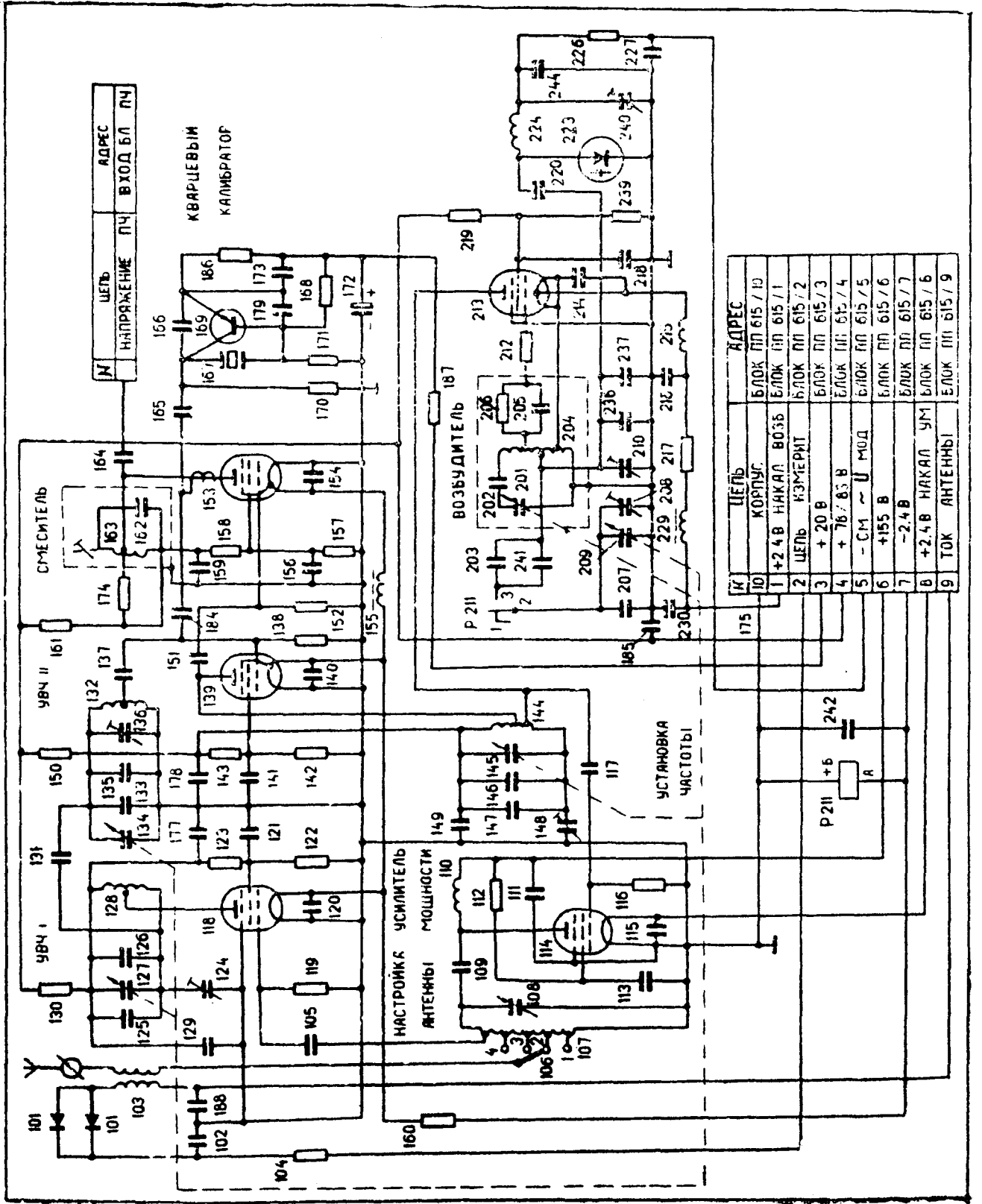








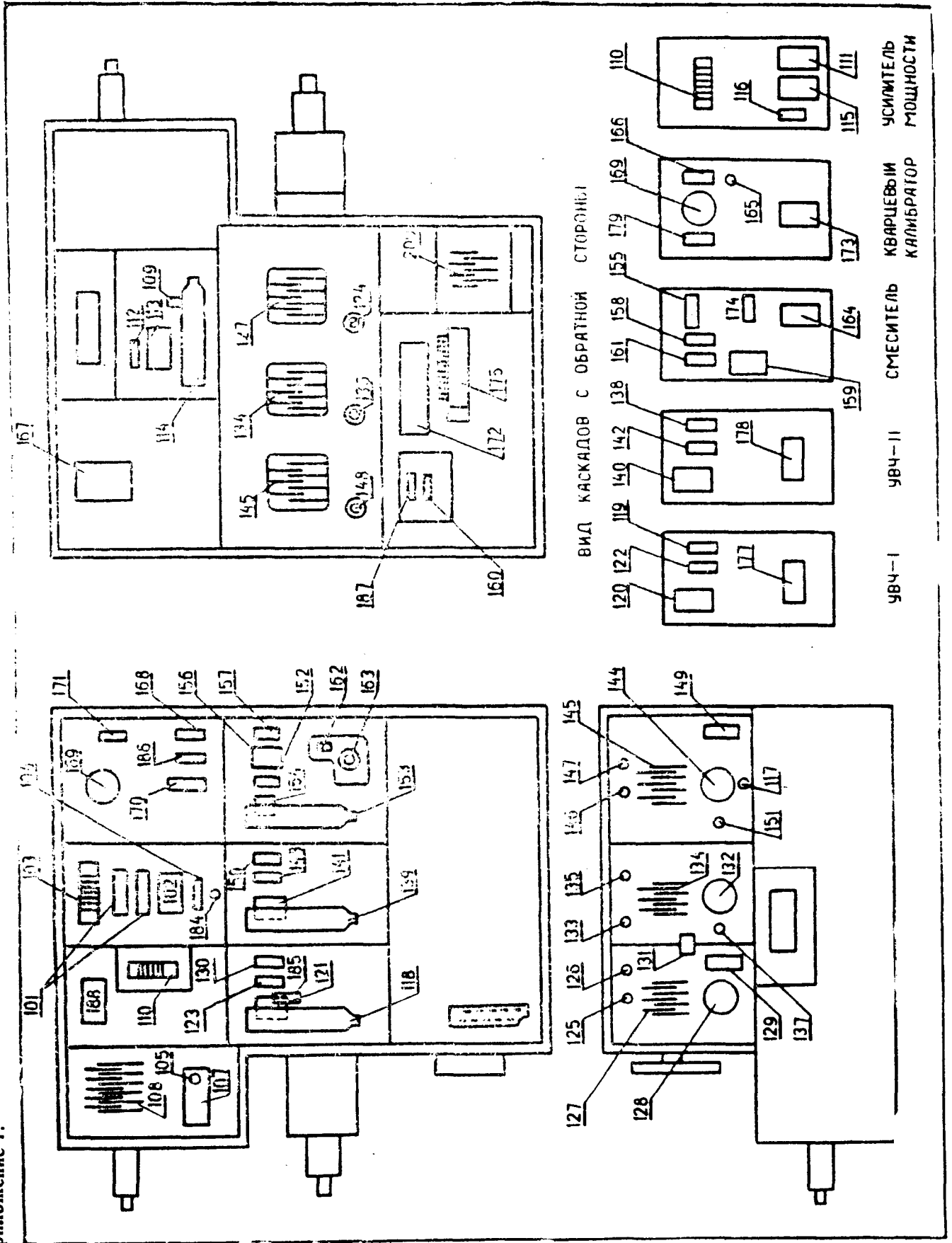
Приложение 6.





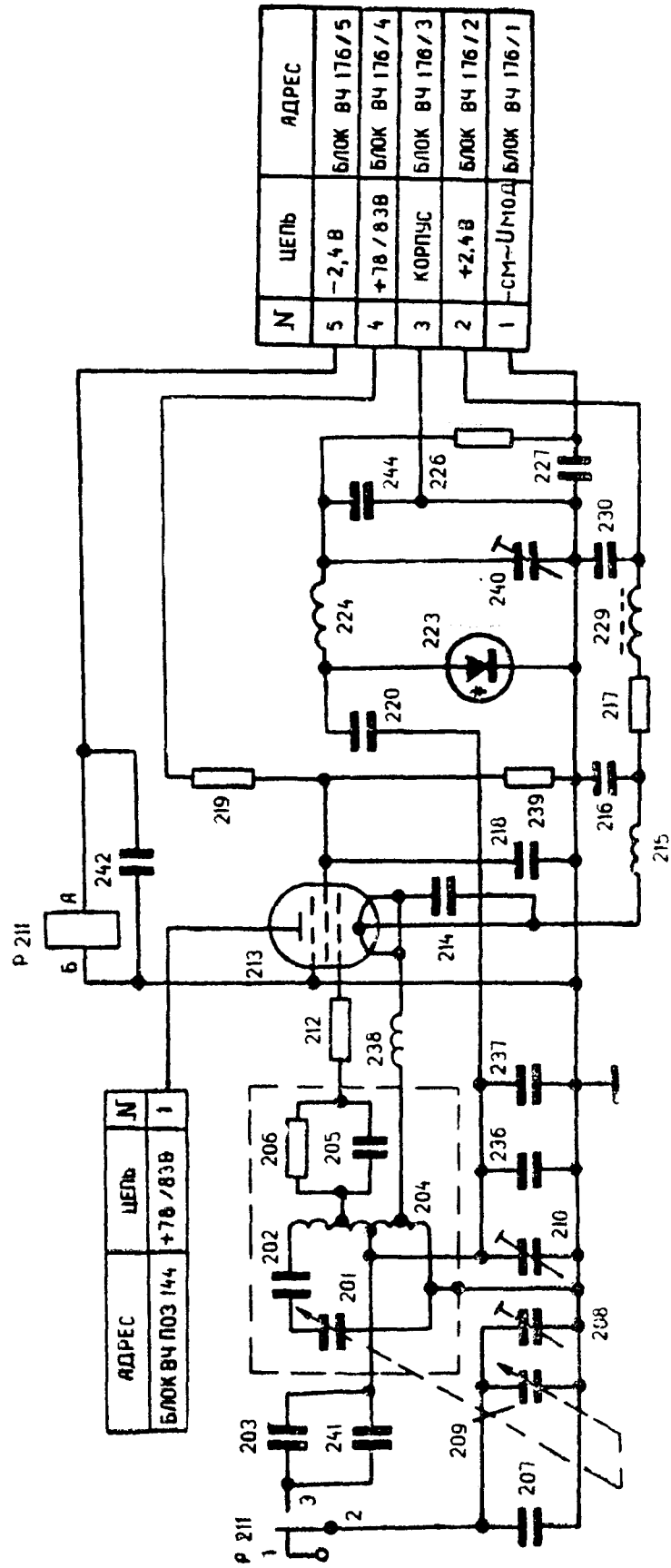


Приложение 7.





Приложение 8.

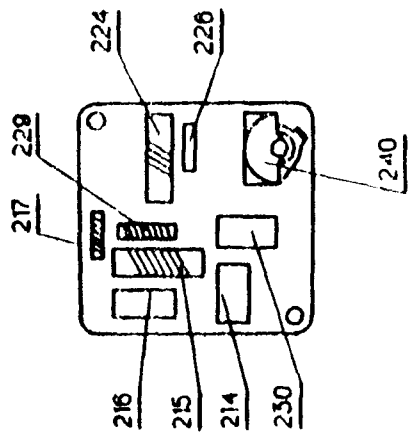
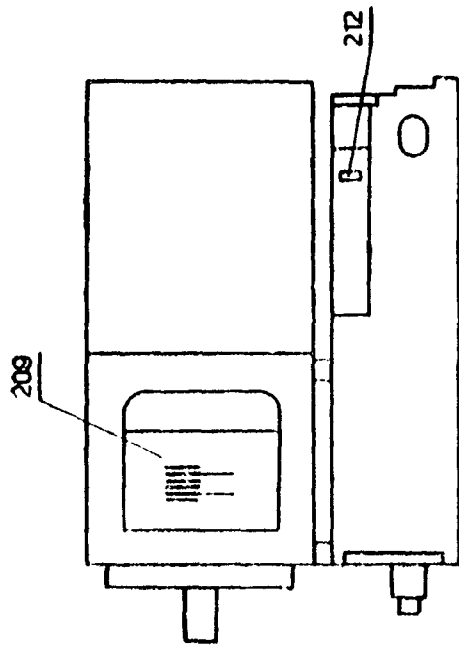
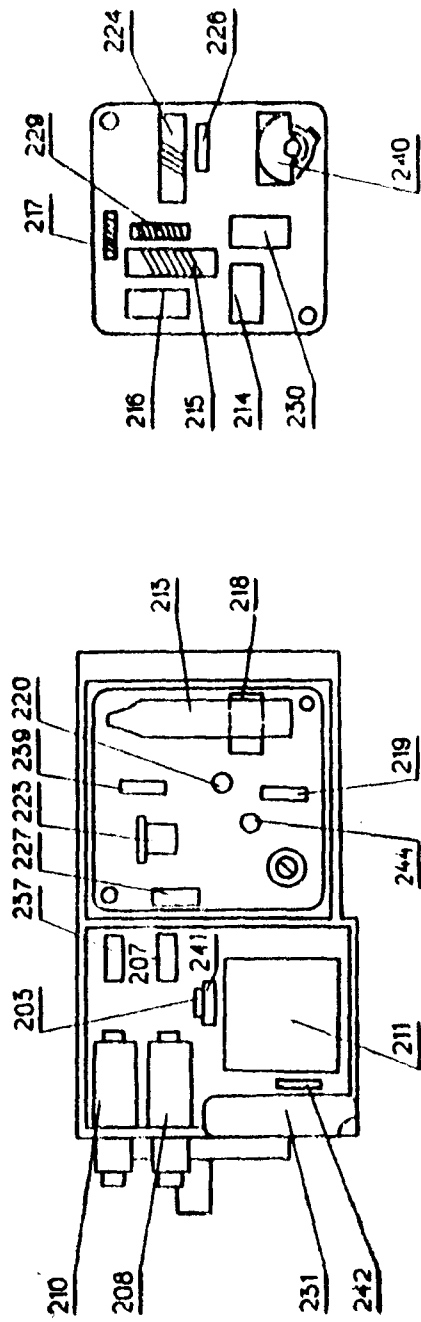


АДРЕС	ЦЕПЬ	№
БЛОК ВЧ ПОЗ 144	+78 / 83В	1

№	ЦЕПЬ	АДРЕС
5	-2,4 В	БЛОК ВЧ 176/5
4	+78 / 83В	БЛОК ВЧ 176 / 4
3	КОРПУС	БЛОК ВЧ 176 / 3
2	+2,4 В	БЛОК ВЧ 176 / 2
1	-СМ-УМОД	БЛОК ВЧ 176 / 1

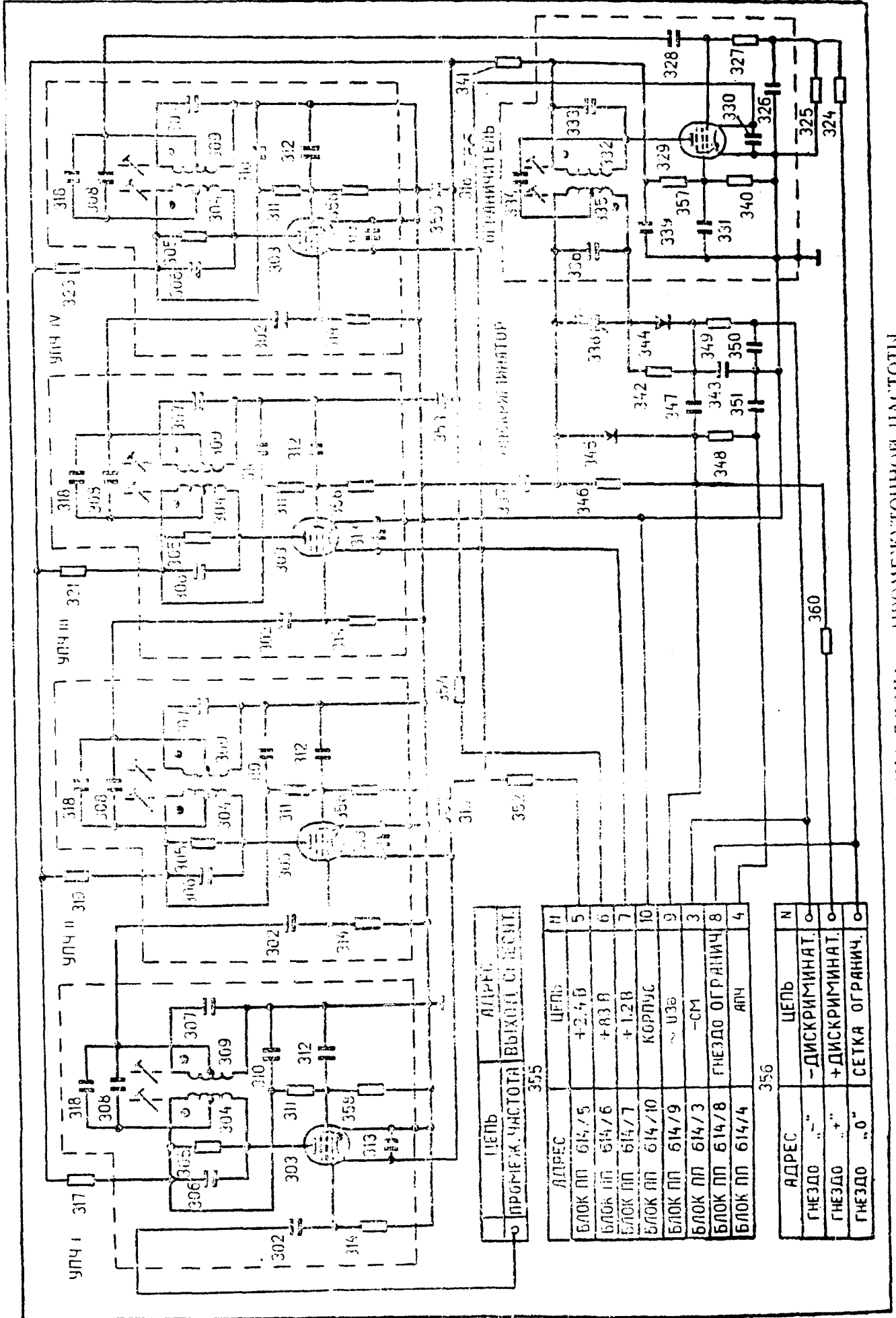


Приложение 9.





Приложение 10.



АДРЕС	ЦЕПЬ	АДРЕС
БЛОК ПП 614/5	+2,4 В	5
БЛОК ПП 614/6	+0,3 В	6
БЛОК ПП 614/7	+1,2 В	7
БЛОК ПП 614/10	КОРПУС	10
БЛОК ПП 614/9	~ 0,3 В	9
БЛОК ПП 614/3	-СМ	3
БЛОК ПП 614/8	ГНЕЗДО ОГРАНИЧ	8
БЛОК ПП 614/4	АПЧ	4

АДРЕС	ЦЕПЬ	АДРЕС
ГНЕЗДО " "	-ДИСКРИМИНАТ.	0
ГНЕЗДО " + "	+ДИСКРИМИНАТ.	0
ГНЕЗДО " 0 "	СЕТКА ОГРАНИЧ.	0

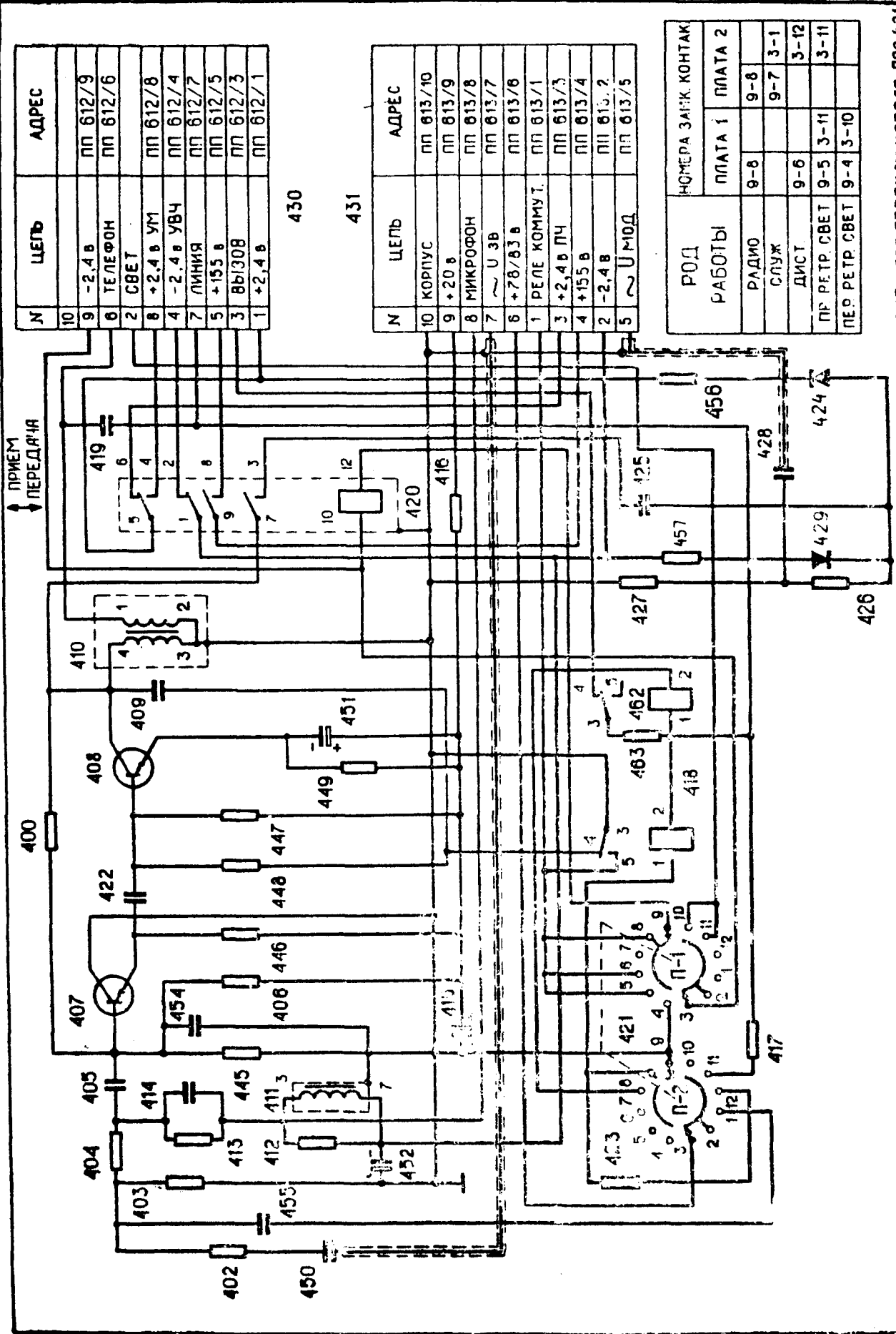
ПРИНЦИПИАЛЬНАЯ СХЕМА БЛОКА ПРОМЕЖУТОЧНОЙ ЧАСТОТЫ











№	ЦЕЛЬ	АДРЕС
10		
9	-2,4 в	ПП 612/9
6	ТЕЛЕФОН	ПП 612/6
2	СВЕТ	
8	+2,4 в УМ	ПП 612/8
4	-2,4 в УВЧ	ПП 612/4
7	ЛИНИЯ	ПП 612/7
5	+15,5 в	ПП 612/5
3	ВЫЗОВ	ПП 612/3
1	+2,4 в	ПП 612/1

430

431

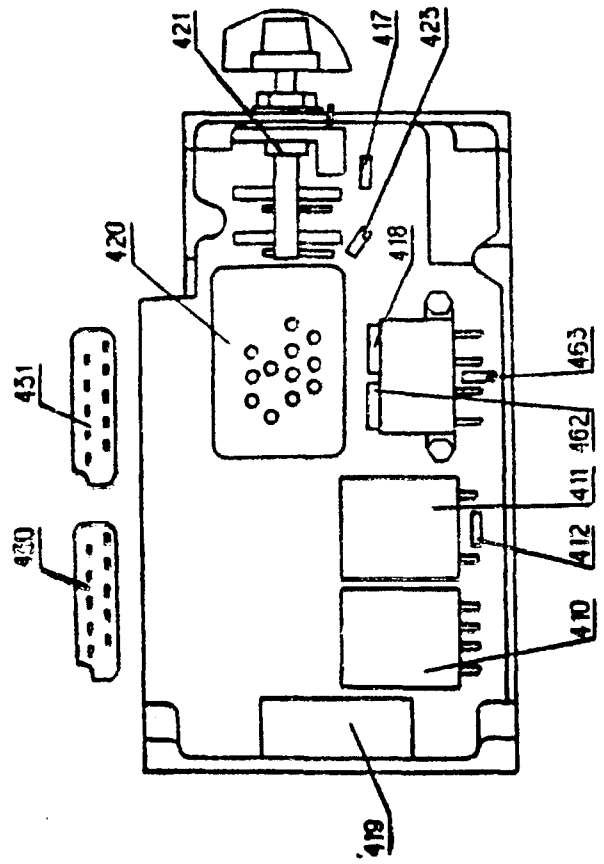
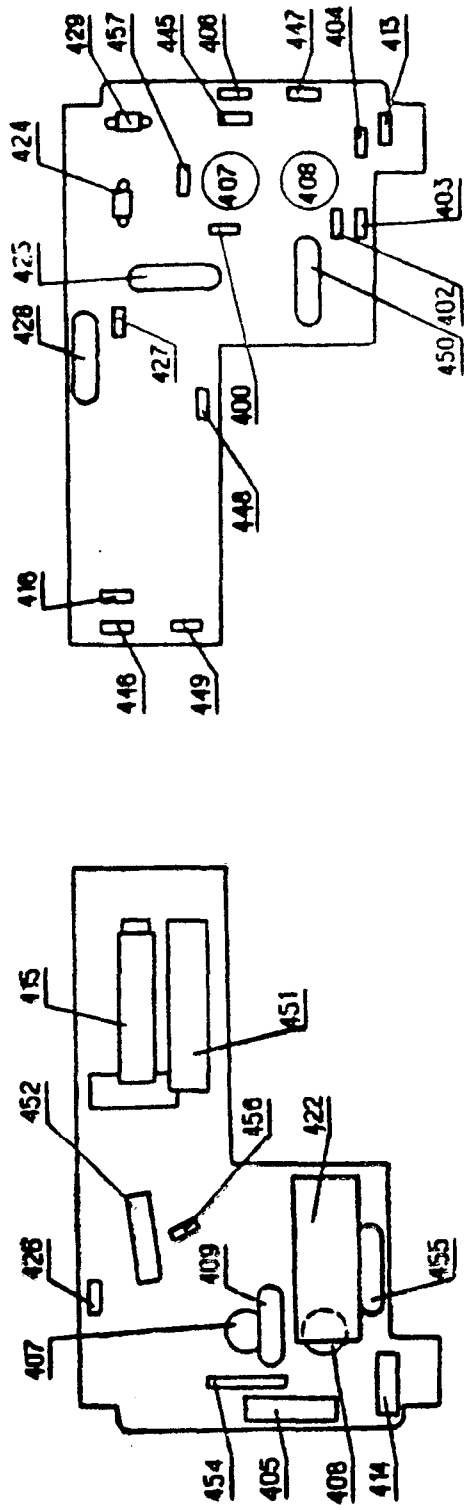
№	ЦЕЛЬ	АДРЕС
10	КОРПУС	ПП 613/10
9	+20 в	ПП 613/9
8	МИКРОФОН	ПП 613/8
7	~ U 3В	ПП 613/7
6	+70/83 в	ПП 613/6
1	РЕЛЕ КОММУТ.	ПП 613/1
3	+2,4 в ПЧ	ПП 613/3
4	+15,5 в	ПП 613/4
2	-2,4 в	ПП 613/2
5	~ U МОД	ПП 613/5

РОД РАБОТЫ	НОМЕРА ЗАМК. КОНТАК	
	ПЛАТА 1	ПЛАТА 2
РАДИО	9-8	9-8
СЛУЖ	9-7	3-1
ДИСТ.	9-6	3-12
ПР РЕТР. СВЕТ	9-5	3-11
ПЕР РЕТР. СВЕТ	9-4	3-10

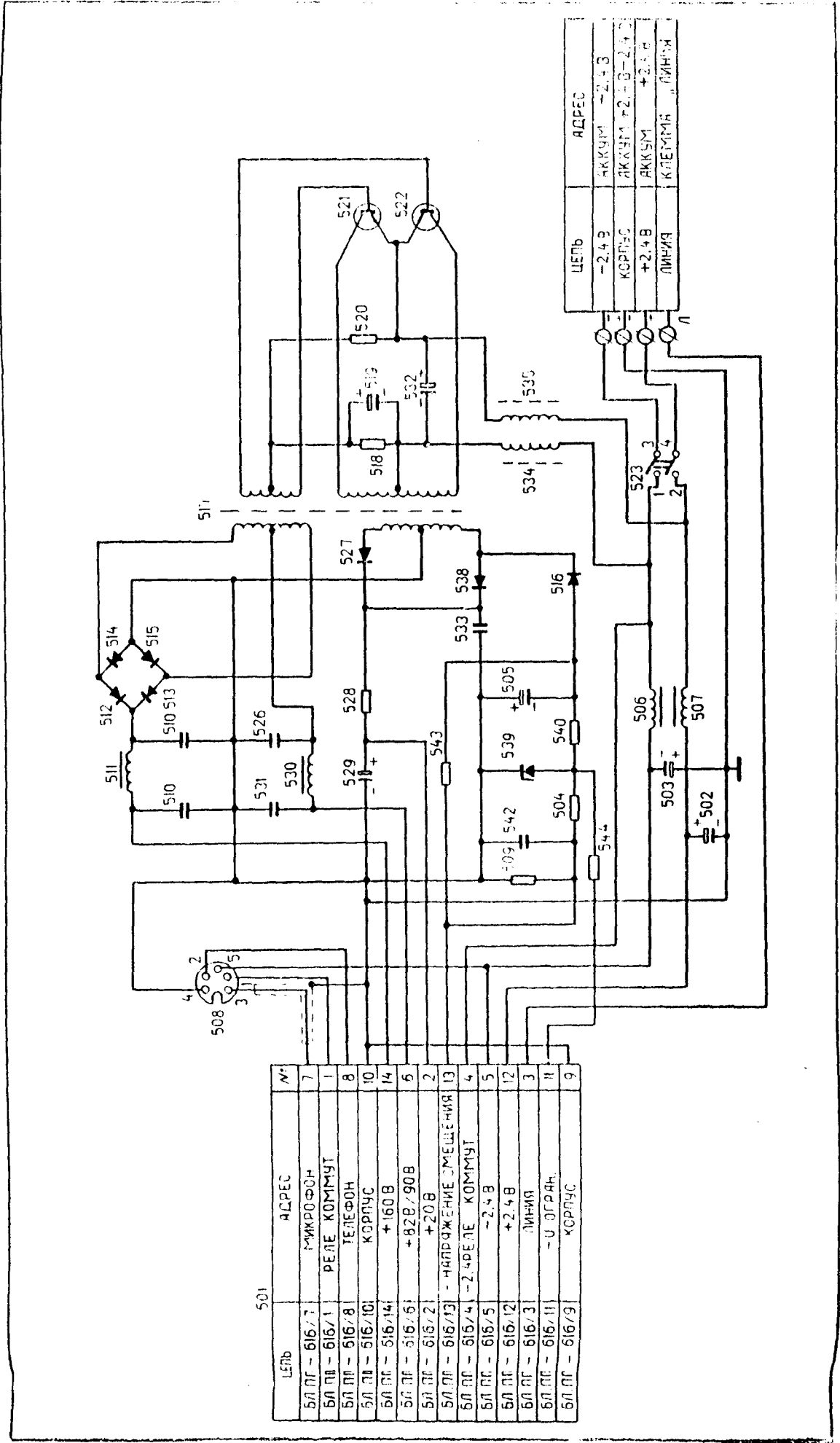
ТАБЛИЦА КОНТАКТОВ ПЕРЕКЛЮЧАТЕЛЯ ПОЗ.421



Приложение 13.







ЦЕПЬ	№	АДРЕС
БЛ ПП - 616/7	7	МИКРОФОН
БЛ ПП - 616/1	1	РЕЛЕ КОММУТ
БЛ ПП - 616/8	8	ТЕЛЕФОН
БЛ ПП - 616/10	10	КОРПУС
БЛ ПП - 616/14	14	+160 В
БЛ ПП - 616/5	5	+82В/90В
БЛ ПП - 616/2	2	+20 В
БЛ ПП - 616/13	13	- НАПРЯЖЕНИЕ СМЕЩЕНИЯ
БЛ ПП - 616/4	4	-2.4В РЕ КОММУТ
БЛ ПП - 616/5	5	-2.5 В
БЛ ПП - 616/12	12	+2.4 В
БЛ ПП - 616/3	3	ЛИНИЯ
БЛ ПП - 616/11	11	- У ОГРЯН
БЛ ПП - 616/9	9	КОРПУС

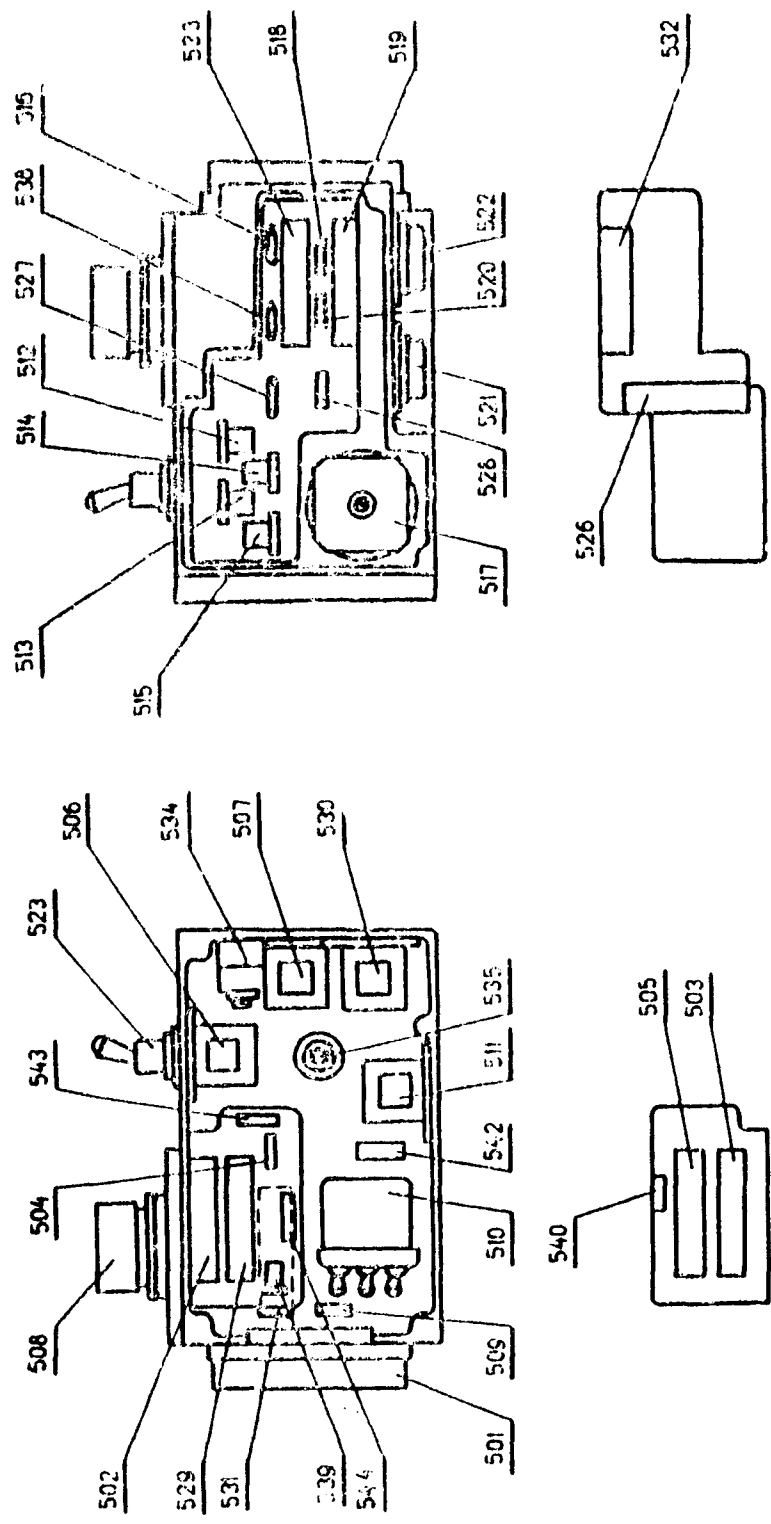
ЦЕПЬ	АДРЕС
-2.4 В	АККУМ -2.4 В
КОРПУС	АККУМ +2.0-2.4 В
+2.4 В	АККУМ +2.4 В
ЛИНИЯ	КЛЕММА "ЛИНИЯ"

ПРИНЦИПИАЛЬНАЯ СХЕМА БЛОКА ПИТАНИЯ



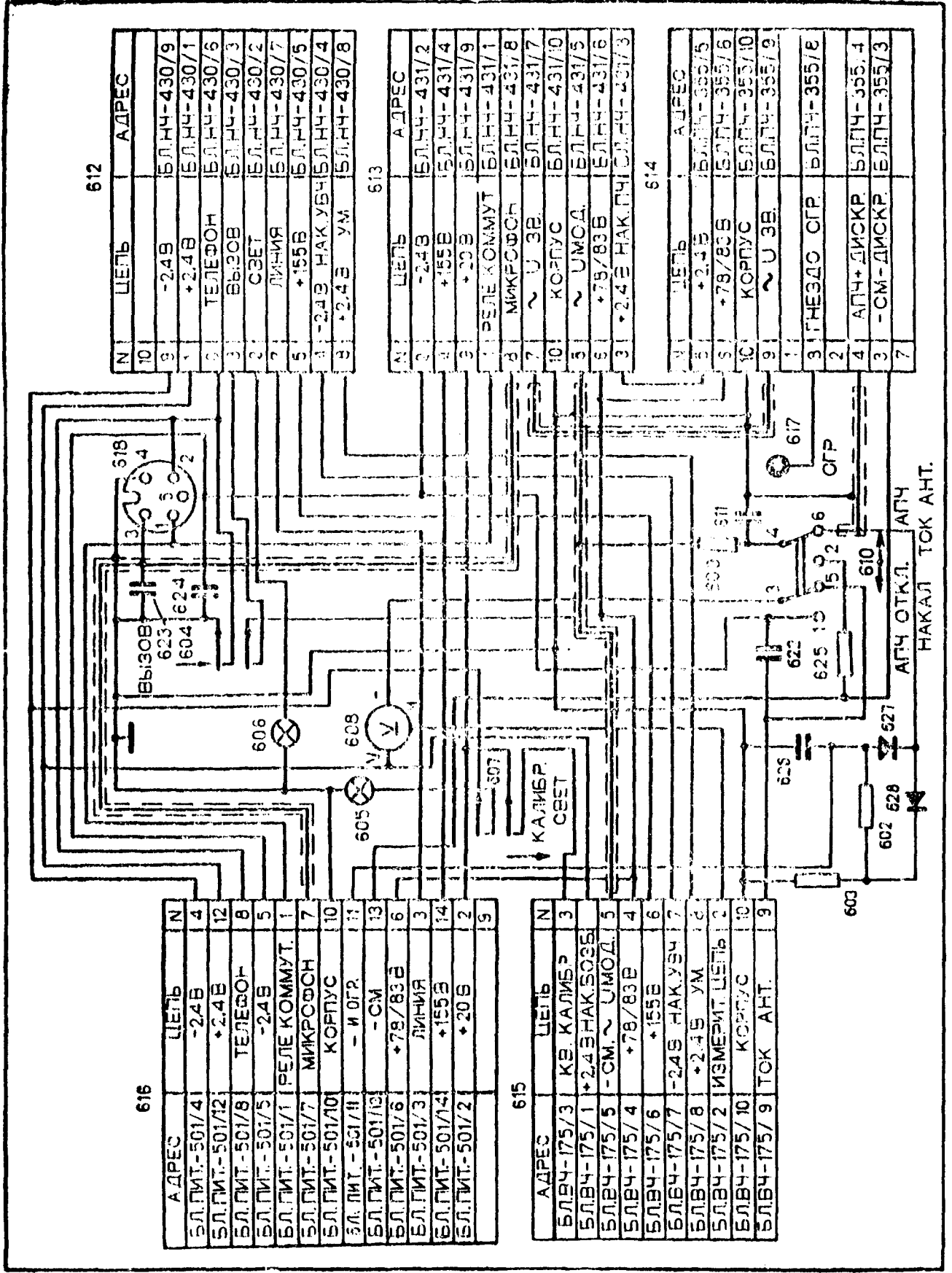


Приложение 15.



СКЕЛЕТНО-МОНТАЖНАЯ СХЕМА БЛОКА ПИТАНИЯ





612

N	ЦЕЛЬ	АДРЕС
10		
9	-24В	БЛ.НЧ-430/9
8	+24В	БЛ.НЧ-430/1
7	ТЕЛЕФОН	БЛ.НЧ-430/6
6	Вызоб	БЛ.НЧ-430/3
5	СВЕТ	БЛ.НЧ-430/2
4	ЛИНИЯ	БЛ.НЧ-430/7
3	+155В	БЛ.НЧ-430/5
2	-24В НАК.УЗЧ	БЛ.НЧ-430/4
1	+24В УМ	БЛ.НЧ-430/8

613

N	ЦЕЛЬ	АДРЕС
10	-24В	БЛ.НЧ-431/2
9	+155В	БЛ.НЧ-431/4
8	+20В	БЛ.НЧ-431/9
7	РЕЛЕ КОММУТ	БЛ.НЧ-431/1
6	МИКРОФОН	БЛ.НЧ-431/8
5	~ U ЗВ.	БЛ.НЧ-431/7
4	КОРПУС	БЛ.НЧ-431/10
3	~ UМОД.	БЛ.НЧ-431/5
2	+78/83В	БЛ.НЧ-431/6
1	+24В НАК.ПЧ	БЛ.НЧ-431/3

614

N	ЦЕЛЬ	АДРЕС
9		
8	+24В	БЛ.НЧ-355/5
7	+78/83В	БЛ.НЧ-355/6
6	КОРПУС	БЛ.НЧ-355/10
5	~ U ЗВ.	БЛ.НЧ-355/9
4		
3	ГНЕЗДО ОГР.	БЛ.НЧ-355/8
2		
1	АГЧ+ДИСКР	БЛ.НЧ-355/4
0	-СМ-ДИСКР	БЛ.НЧ-355/3

616

АДРЕС	ЦЕЛЬ	N
БЛ.ПИТ.-501/4	-24В	4
БЛ.ПИТ.-501/2	+24В	12
БЛ.ПИТ.-501/8	ТЕЛЕФОН	8
БЛ.ПИТ.-501/5	-24В	5
БЛ.ПИТ.-501/1	РЕЛЕ КОММУТ.	1
БЛ.ПИТ.-501/7	МИКРОФОН	7
БЛ.ПИТ.-501/10	КОРПУС	10
БЛ.ПИТ.-501/11	- И ОГР.	11
БЛ.ПИТ.-501/13	-СМ	13
БЛ.ПИТ.-501/6	+78/83В	6
БЛ.ПИТ.-501/3	ЛИНИЯ	3
БЛ.ПИТ.-501/4	+155В	14
БЛ.ПИТ.-501/2	+20В	2
		9

615

АДРЕС	ЦЕЛЬ	N
БЛ.ВЧ-175/3	КВ. КАЛИБР	3
БЛ.ВЧ-175/1	+24В НАК.СОЗБ.	1
БЛ.ВЧ-175/5	-СМ. ~ UМОД.	5
БЛ.ВЧ-175/4	+78/83В	4
БЛ.ВЧ-175/6	+155В	6
БЛ.ВЧ-175/7	-24В НАК.УЗЧ	7
БЛ.ВЧ-175/8	+24В УМ	8
БЛ.ВЧ-175/2	ИЗМЕРИТ.ЦЕЛЬ	2
БЛ.ВЧ-175/10	КОРПУС	10
БЛ.ВЧ-175/9	ТОК АНТ.	9



Приложение 17.

ПОЗ. 616 УСЛОВНО РАЗВЕРНУТА НА 180

