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PART II

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16. Abstracts
This report contains the basic technical data on the series produced equipment for the transmission systems of trunk, rural and municipal cable and open wire communications lines, as well as equipment which has been taken out of production, but which still exists on the network in considerable quantity. The following are indicated for each type of equipment: purpose, lines used, electrical characteristics, specific features of the electrical power supply, structural design and equipment complement.

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Repeater stations
Converters
Multiplexing equipment
Test equipment
Oscilloscopes
Frequency counters
VOM's
VTVM's
Signal generators
Cable line testers

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PART II

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[Continued from Part I]

SECTION 5.

Transmission Systems Using Coaxial Communications Cables

Section 5.1. The K-300 300-Channel Transmission System

Figures 5.1.1. - 5.1.9.

Purpose: Intended for multiplexing a coaxial cable having small diameter pairs with 300 telephone channels

Type of Line:

Miniature MKTP or MKTS coaxial cable with tubular polyethylene insulation and a polyethylene (MKTP) or lead (MKTS) jacket, which contains four coaxial pairs with a diameter of 1.2/4.6, five balanced pairs with a diameter of 0.7 mm, intended for service communications, and one enameled signal core with a diameter of 0.7 mm.

Depending on the cable laying conditions, they are armored with either flat strips or circular wire.

Communications System: Single-cable, single-band.

Electrical Characteristics:

Line frequency spectrum	60 - 1,300 KHz, formed from the first five secondary groups
The number of channels which can be organized through two coaxial pairs	300
The effectively transmitted passband of the channels	300 - 3,400 Hz
The capability of secondary multiplexing of the telephone channels	See the introduction
The maximum communications range	12,500 km
The maximum length of a voice frequency retransmission section	2,500 km
The number of retransmission sections	No more than five
The maximum length of a line channel (without HF retransmission)	1,500 km

Isolation of the telephone channels: No more than three isolation points are permitted on one HF retransmission section of a trunk route. In this case, three lower 60-channel groups of telephone channels (in a passband of 60 - 804 KHz) can be segregated at each point. The third 60-channel group is isolated with the loss of the upper edge channel of this group (in the 799.7 - 803.7 KHz spectrum).

The number of permissible HF transits on one voice frequency retransmission section:	Up to three for the 12-channel groups and up to three for the 60-channel groups. In this case, the edge channels (the first and 12th for the case of 12-channel through-working, and the first and 60th for the case of 60-channel through-working) cannot meet MKKTT [CCITT] standards for the amplitude-frequency distortions.
Spacing between OUP's [attended repeater stations]	Up to 240 km with 40 NUP's between two adjacent OUP's (maximum).
The nominal length of a repeater section between NUP's (for an average annual ground temperature of +7.5° C)	6.0 km
The permissible deviations in $l_{us.\ uch.}$ [repeater section length]:	+0.1, -0.3 km (5.7 - 6.1) km

In some cases, where it is impossible to maintain the lengths of the repeater sections as indicated, it is permissible to designed a shortened section. In this case, a phantom line should be inserted at the input to the line amplifier. Two adjacent, shortened sections should not be permitted in the design.

No more than two shortened sections are permitted on an OUP-OUP section.

The average electrical length of a repeater segment of an OUP-OUP section, including the phantom lines, should be as close as possible to the nominal length, but no longer than it.

Note: For localities where the average ground temperature differs from the +7.5° figure, the nominal length of a repeater section is determined from the formula:

$$l_t = l_{7,5}\frac{\alpha_{7,5}}{\alpha_t}; \quad \alpha_t = \alpha_{20}[1+\alpha_\alpha(t-20)],$$

where l_t and $l_{7.5}$ are the nominal lengths of the repeater sections at temperatures of t° and 7.5° C respectively;
$\alpha_t, \alpha_{7.5}$ and α_{20} are the attenuation factors of the cable for temperatures of t°, 7.5° and 20° C respectively;
α_α is the temperature coefficient of cable attenuation, equal to $2 \cdot 10^{-3}$ 1/deg.

The nominal values of phantom lines for shortened sections	0.355, 0.71, 1.42, 2.13 and 2.84 km
The residual attenuation of a channel at 800 Hz	0.8 Np
The nominal relative voice frequency levels of the four-wire section of a channel:	
At the input	-1.5 Np
At the output	+0.5 Np

The nominal relative levels at the point the line channel equipment interfaces with the terminal conversion equipment:	
At the input to the transmit channel	-4.1 Np
At the output of the receive channel	-2.6 Np
The nominal value of the input and output impedance of the transmit and receive channels	75 ohms
The gain of the line amplifier at 1,300 KHz	4.09 Np
The crosstalk isolation between the transmit and receive channels in the 60-1,300 KHz spectrum	11.5 Np
Compensation for line channel errors on an OUP-OUP section	It is accomplished by means of switching in fixed or semi-variable equalizers at the OUP's for the amplitude-frequency characteristic of the line channel. Additionally, a provision is made at all OUP's and OP's [terminal stations] for the installation of cosine correctors. Installed in the center of an OUP-OUP section is an equalized NUP (NUP-K) (see Table 5.1.1.)
The AGC system for the line channel	Magnetoelectric, using control frequencies (AGC with kch), and based on ground temperature (AGC without kch).
The control frequencies: Main	1,364 KHz
Auxiliary	308 KHz
The non-control-frequency type AGC at NUP's	Compensates for the temperature bariations in the frequency response of the repeater sections when the cable temperature changes within limits of -2 -- +20° C.
The installation of the temperature sensors	At each NUP (regardless of whether AGC using control frequencies is present). The temperature sensor is buried in the ground at a distance of 1.0 m from the NUP housing
The control frequency type AGC unit in OUP's and NUP's	Compensates for the temperature changes in the attenuation of the preceding cable section up to the point having AGC using control frequencies, and also eliminates control errors in the non-control-frequency type AGC devices inserted ahead of it.

Table 5.1.1. The Distribution of Unattended Repeater Stations on OUP-OUP [Attended Repeater] Sections.

Количество НУП (A)	(B) Номера НУП в секциях ОУП-ОУП		
	(C) с АРУ без кч	(D) с АРУ с кч	(E) с коррекир
6	1, 2, 3, 5, 6	4	
7	1, 2, 3, 5, 6, 7	4	
8	1, 2, 3, 5, 6, 7, 8	4	
9	1, 2, 3, 4, 6, 7, 8, 9	5	
10	1, 2, 3, 5, 6, 7, 9, 10	4, 8	
11	1, 2, 3, 5, 6, 7, 9, 10, 11	4, 8	
12	1, 2, 3, 4, 6, 7, 8, 10, 11, 12	5, 9,	
13	1, 2, 3, 4, 6, 7, 8, 9, 11, 12, 13	5, 10	
14	1, 2, 3, 4, 6, 7, 8, 9, 11 12, 13, 14	5, 10	
15	1, 2, 3, 5, 6, 7, 9, 10, 11, 13, 14, 15	4, 8, 12	
16	1, 2, 3, 5, 6, 7, 9, 10, 11, 13, 14, 15, 16	4, 8, 12	
17	1, 2, 3, 4, 6, 7, 8, 9, 11, 12, 13, 15, 16, 17	5, 10, 14	
18	1, 2, 3, 4, 6, 7, 8, 9, 11, 12, 13, 14, 16, 17, 18	5, 10, 15	
19	1, 2, 3, 4, 6, 7, 8, 9, 11, 12, 13, 14, 16, 17, 18, 19	5, 10, 15	
20	1, 2, 3, 5, 6, 7, 9, 11, 13, 14, 15, 17, 18, 19, 20	4, 8, 12, 16	10
21	1, 2, 3, 5, 6, 7, 9, 11, 13, 14, 15, 16, 18, 19, 20, 21	4, 8, 12, 17	10
22	1, 2, 3, 5, 6, 7, 9, 10, 12, 14, 15, 16, 17, 19, 20, 21, 22	4, 8, 13, 18	11
23	1, 2, 3, 5, 6, 7, 8, 10, 12, 13, 15, 16, 17, 18, 20, 21, 22, 23	4, 9, 14, 19	11
24	1, 2, 3, 4, 6, 7, 8, 9, 11, 13, 14, 16, 17, 18, 19, 21, 22, 23, 24,	5, 10, 15, 20	12
25	1, 2, 3, 5, 6, 7, 9, 10, 11, 14, 15, 16, 18, 19, 20, 21, 23, 24, 25	4, 8, 12, 17, 22	13
26	1, 2, 3, 5, 6, 7, 9, 10, 11, 14, 15, 16, 18, 19, 20, 21, 23, 24, 25, 26	4, 8, 12, 17, 22	13
27	1, 2, 3, 5, 6, 7, 9, 10, 11, 12, 15, 16, 17, 19, 20, 21, 22, 24, 25, 26, 27	4, 8, 13, 18, 23	14
28	1, 2, 3, 4, 6, 7, 8, 9, 11, 12, 13, 16, 17, 18, 19, 21, 22, 23, 24, 26, 27, 28	5, 10, 15, 20, 25	14
29	1, 2, 3, 4, 6, 7, 8, 9, 11, 12, 13, 16, 17, 18, 19, 21, 22, 23, 24, 26, 27, 28, 29	5, 10, 15, 20, 25	14
30	1, 2, 3, 4, 6, 7, 8, 9, 11, 12, 13, 16, 17, 18, 20, 21, 22, 24, 25, 26, 28, 29, 30	5, 10, 15, 19, 23, 27	14
31	1, 2, 3, 4, 6, 7, 8, 9, 11, 12, 13, 14, 17, 18, 19, 21, 22, 23, 25, 26, 27, 29, 30, 31	5, 10, 15, 20, 24, 28	16

(A)	(C)	(D)	(E)
32	1, 2, 3, 4, 6, 7, 8, 9, 11, 12, 13, 14, 17, 18, 19, 21, 22, 23, 24, 26, 27, 28, 30, 31, 32	5, 10, 15, 20, 25, 29	16
33	1, 2, 3, 4, 6, 7, 8, 9, 11, 12, 13, 14, 17, 18, 19, 21, 22, 23, 24, 26, 27, 28, 29, 31, 32, 33	5, 10, 15, 20, 25, 30	16
34	1, 2, 3, 4, 6, 7, 8, 9, 11, 13, 14, 16, 17, 18, 19, 21, 22, 23, 26, 27, 28, 29, 31, 32, 33, 34,	5, 10, 15, 20, 25, 30	12, 24
35	1, 2, 3, 4, 6, 7, 8, 9, 11, 13, 14, 16, 17, 18, 20, 21, 22, 25, 26, 27, 29, 30, 31, 33, 34, 35	5, 10, 15, 19, 23, 28, 32	12, 24
36	1, 2, 3, 4, 6, 7, 8, 9, 11, 13, 14, 16, 17, 18, 19, 21, 22, 23, 26, 27, 28, 30, 31, 32, 34, 35, 36	5, 10, 15, 20. 25, 29, 33	12, 24
37	1, 2, 3, 4, 6, 7, 8, 9, 11, 13, 14, 16, 17, 18, 19, 21, 22, 23, 26, 27, 28, 30, 31, 32, 34, 35, 36, 37	5, 10, 15, 20, 25, 29, 33	12, 24
38	1, 2, 3, 4, 6, 7, 8, 9, 11, 12, 14, 16, 17, 18, 19, 21, 22, 23, 24, 27, 28, 29, 31, 32, 33, 34, 36, 37, 38	5, 10, 15, 20, 25, 30, 35	13, 26
39	1, 2, 3, 4, 6, 7, 8, 9, 11, 12, 14, 16, 17, 18, 19, 21, 22, 23, 24, 27, 28, 29, 31, 32, 33, 34, 36, 37, 38, 39	5, 10, 15, 20, 25, 30, 35	13, 26
40	1, 2, 3, 4, 6, 7, 8, 9, 11, 13, 14, 16, 17, 18, 19, 21, 22, 23, 24, 27, 28, 29, 31, 32, 33, 34, 36, 37, 38, 39, 40	5, 10, 15, 20, 25, 30, 35	12. 26

Key: A. Quantity of unattended repeater stations;
B. The numbers of the unattended repeater stations in the OUP-OUP sections;
C. Having AGC not using control frequencies;
D. With AGC using control frequencies;
E. With equalization.

Notes: 1. NUP's having AGC which does not use control frequencies (TRU) are installed on sections containing less than six NUP's.
2. Power supply bypass filters (FOP) are installed at the end NUP's on a remote power supply (DP) section.

The service communications system:

-- Trunk service communications, MSS	Via a four-wire HF channel with selective ringing between terminal and retransmission stations, with the connecting in of points for segregating telephone channels.
-- Station-to-station service communications, PSS-1	Via a four-wire voice frequency channel with selective and circular ringing;
-- Station-to-station service communications, PSS-2	Via a four-wire voice frequency channel with selective ringing.

Both channels operate via the service pairs of a trunk cable having a core diameter of 0.7 mm. The length of a repeater section for service communications is twice as long as an HF channel repeater section, and for this reason, the amplifiers for the channels are installed at every other NUP in alternating order.

Communications of an OUP with an NUP is realized via the PSS-1 or PSS-2 channels.

The service communications equipment for any NUP consists of two independent blocks: the service communications amplifiers (BUSS) and the block of service communications line transformers (BLTSS).

The capability of joint utilization of the channels by UKM-RKM [expansion unknown] services and station services is provided. One service communications channel is brought out from the NUP to an angular branch connecting outlet, located in the wall of the NUP housing.

Types of Stations

A distinction is drawn between the following stations in the K-300 transmission system:

- Terminal station (OP);
- Attended repeater station (OUP);
- Unattended repeater station with AGC using a control frequency (NUP with AGC using kch);
- Unattended repeater station with AGC based on the ground temperature without using a control frequency (NUP with AGC without kch);
- Unattended, equalized repeater station (NUP-K);
- PUS-8 mobile amplifier station for the operational replacement of any NUP or OUP which has failed, as well as for operation as a backup feed point when repairing a cable.

Climatic Operational Conditions

OP and OUP. At an ambient air temperature of from +10 to +40° C with a relative air humidity of up to 75%. An increase in the humidity up to 85% is permitted at a temperature of up to +25° C.

NUP. At an air temperature in the container of from -10 to +40° C with a relative humidity of 80%. During repair work, a short term exposure to temperatures of up to +25° C with a relative humidity of up to 98% is permitted, as well as a drop in the temperature down to -20° C.

Electrical Power Supply

Voltages:

Direct current values for OP and OUP equipment:

Main circuits	21.2 volts ± 3%
Signaling circuits	24 volts ± 10%
Using alternating current	220 volts ± 3% (when a guaranteed AC installation [backup] is present at OP's or OUP's,

	it is permissible to feed the power from a SDP rack. For SPL rack power, it is necessary to install a rectifier with a smoothing filter.
Remote power of the HF channel	DC, the maximum voltage fed into the line runs up to 1,000 volts.

Attended stations provide for remotely powering up to 20 NUP's in each direction from the OUP with the loads connected in series.

The remote power system is a "wire-wire" configuration using the center conductors of the coaxial pairs.

Remote powering of the service communications channel:	Direct current, the maximum voltage fed into the line runs up to 420 volts. Remote power is provided for up to 10 NUP's with service communications amplifiers (forward and return routes). The remote power supply system is a "wire-wire" configuration using service pair phantom circuits.

Current and Power Consumption

Equipment		21.2 volts amps	24 volts amps
	Terminal Station		
SIP-60:	Main Circuits	1	-
	Signaling	-	0.4
STV-DS-60:	Main Circuits (when transmitting a ring via 50% of the channels)	5.3	-
	Signaling	-	0.4
USPP-1:	Main Circuits	4.7	-
	Signaling	-	1.3
USVP:	Main Circuits	3.6	-
	Signaling	-	1.3
SLUK-OP		2.9	-
STDP		15	-
SDP		36	-
SSS-1 (or SSS-2)		0.1 (0.18)	0.8 (0.82)
SUGO-1-4:	Transistor circuits	11.4	-
	Signaling	-	1.7
SUGO-II:	Transistor circuits	3.3	-
	Signaling	-	2.0
	Plate circuits, 206 volts	1.96 a	
	Filament circuits, 220 volts AC	250 VA	

Current and Power Consumption, [continued]:

Equipment	21.2 volts amps	24 volts amps
Attended Repeater Station		
SLUK-OUP	5.8	-
SDP	36	-
STDP	15	-
SSS-1 (or SSS-2)	0.1 (0.18)	0.8 (0.82)
Unattended Repeater Station		
Remote power supply current for the HF channel	0.035 ± 3%	
Remote power supply current for the service communications channel	0.027 + 3%	

Note: The electrical power consumption by the SUGO-1 and SUGO-II racks is given for the main and standby equipment sets. Power is fed to each of the sets via a separate feeder.

Protection Against External Influences

The permissible extraneous voltage induced by high current lines should not exceed:

a) Short term exposure to electrical power transmission line influence (over a proximity length of 120 km), as well as for the influence of an electrified railroad (over a proximity length of 60 km): 740 volts eff.

b) Long term exposure to the influence of an electrified railroad (over a proximity length of 60 km): 200 volts eff. If the length of proximity to an electrical power transmission line or electrified railroad is less than the quantities indicated (120 and 60 km), then the permissible extraneous voltage on one repeater section with a length of 6 km can be increased, but not more than:

   a) short term exposure: 80 volts eff.
   b) long term exposure: 30 volts eff.

Equipment Complement:

Terminal Station

Individual conversion equipment (see section 7):

-- Individual conversion rack, SIP-60;
-- Voice frequency ringing and differential system rack, STV-DS-60;
-- Individual equipment rack, SIO-24p;

Group conversion equipment (see section 7):

-- The standardized racks of primary converters, USPP-1 and USPP-2;
-- The standardized racks of secondary converters, USVP-1 and USVP-2.

Generator equipment (see section 6):

-- The standardized generator equipment rack, SUGO-I-4;
-- The standardized generator equipment rack, SUGO-II.

Switching equipment (see section 1):

-- The primary group switching rack for 50 12-channel groups, SKP-1;
-- The switching rack for secondary or ternary groups for 30 60-channel or 300-channel groups, SKVT-1.

Line channel equipment (for two systems):

-- The line amplifier and corrector rack of a terminal station, SLUK-OP;
-- Remote power supply rack, SDP;
-- Remote control and remote power rack, STDP (remote power for remote control and service communications);
-- Rack for powering the line equipment shop equipment, SPL;
-- Rack of standardized service communications equipment, SSS-1 or SSS-2.

Attended Repeater Station

Line channel equipment (for two systems):

-- Rack of line amplifiers and correctors of an attended repeater station, SLUK-OUP;
-- Two remote power supply racks, SDP;
-- Remote control and remote power supply rack, STDP (remote power for remote control and service communications);
-- Rack for powering the equipment of the line equipment shop, SPL;
-- Rack of standardized service communications equipment, SSS-1 or SSS-2.

Unattended Repeater Station

The input-connection equipment
The HF channel for two systems
Service communications for two channels
Remote control.

Purpose

SLUK-OP. Rack of line amplifiers and correctors of a terminal station for amplifying signals in a frequency range of 60 - 1,300 KHz, providing for the nominal levels at the point of line channel interface with the terminal conversion equipment, and for manual and automatic equalization of the amplitude-frequency response of the line channel. The line channel equipment, mounted in the rack, permits the organization of transmit and receive channels for two systems.

SLUK-OUP. Rack of line amplifiers and correctors of an attended repeater station, for amplifying signals in a frequency range of 60 - 1,300 KHz, and for automatic and manual correction of the amplitude-frequency response of the line channel.

SDP. Remote power supply rack for providing power to the line amplifiers of an NUP of one system in both directions from an OUP, or for supplying power to two systems in one direction from an OP. The remote power supply of one communications system in one direction consists of two sets: a main one and the standby. In all, four remote power supply sets are housed in the rack.

STDP. Remote control and remote power rack for bringing the service cores of a cable into an OUP and distributing them according to function to provide for the transmission of information and control signals between the OUP and NUP's, for matching the input impedances of the lines and station devices for service communications and for remote power supply to the service communications amplifiers at the NUP's.

SPL. The equipment power supply rack for a line equipment shop to provide direct current at 21.2 volts $\pm$ 3% for the line channel equipment, including the remote power supply unit, installed at OUP's, at OUP's with channel segregation and at OP's.

SSS-1 or SSS-2. Rack of standardized service communications equipment for providing operationally timely telephone service on the trunk. The service communications rack consists of the switching, ringup and amplifier equipment.

NUP with ARU without kch. An NUP having AGC based on the ground temperature, to compensate for the attenuation of a repeater section using line amplifiers with automatic gain control referenced to the ground temperaure (the line amplifier block with temperature referenced gain control is the BUL with TRU).

NUP with ARU with kch. An NUP with AGC using a control frequency, to compensate for the attenuation of a repeater section with line amplifiers having automatic gain control by means of a control frequency (BUL with ARU [AGC]). In contrast to the BUL with TRU, the block contains a control channel receiver and a control frequency filter for 1,364 KHz.

NUP-K. An NUP with equalization to compensate for the attenuation of a repeater section using line amplifiers with equalization of the amplitude-frequency response (BUL-K). No provision is made in the NUP-K for the installation of phantom lines, and for this reason, the amplifier sections adjacent to the NUP-K should not be shortened ones.

Construction

Attended Stations. The rack of the base structure have dimensions of 2,600 x x 650 x 250 mm. Exceptions are the SDP and SPL racks, which have a depth twice as great: 500 mm.

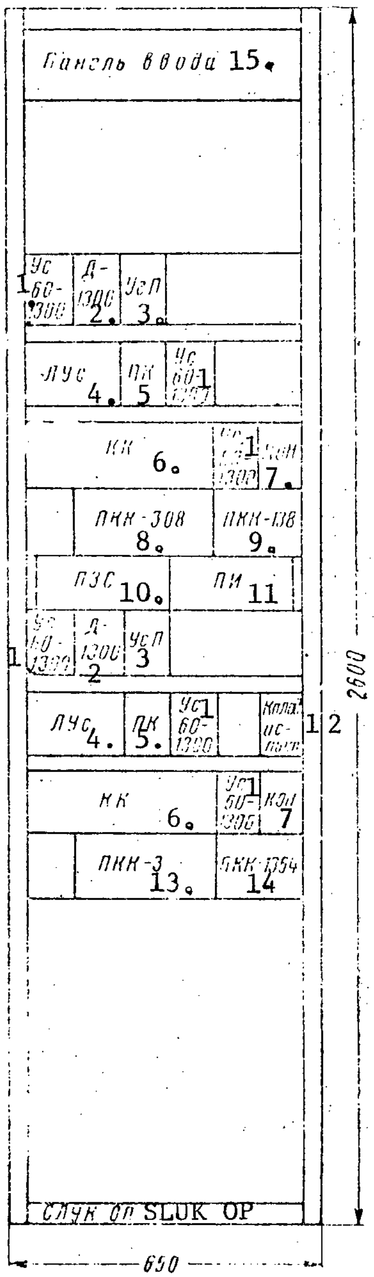
Unattended Stations. The NUP is made to be buried directly in the ground. Structurally, the NUP consists of: a housing, a recessed chassis, four line amplifier blocks, a service communications amplifier block, block of line transformers for service communications, remote control block, three multiple cable input sleeves, a remote ground referenced AGC probe and four line panels. The NUP housing serves for the placement of all of the NUP assemblies cited above (with the exception of the temperature transducers). It takes the form of a steel cylinder, 930 mm high, with a diameter of 720 mm, and a wall thickness of 9 mm. Mounted on the exterior surface of the housing are:

clamps for securing protective covers, installed above the cable entrances into the NUP, through stuffing boxes with rubber seals, which provide for a hermetically sealed entrance of the cables into the NUP; an angular branch pipe with a cap for housing the jack for connecting a lineman's telephone handset; a pin for welding on a ground, a hermetically sealing cover which provides access to the equipment; the NUP is supplied with a cable section and a temperature sensor with MKTP-4 cable brought out from the NUP housing to a distance of one meter. Located in it are the thermistors for ground temperature referenced AGC.

The equipment layout inside the NUP housing, as well as its mutual positioning, is designed so that in the majority of cases, the replacement of defective blocks and devices can be accomplished without disrupting normal operation of the other blocks.

Weight and Cost

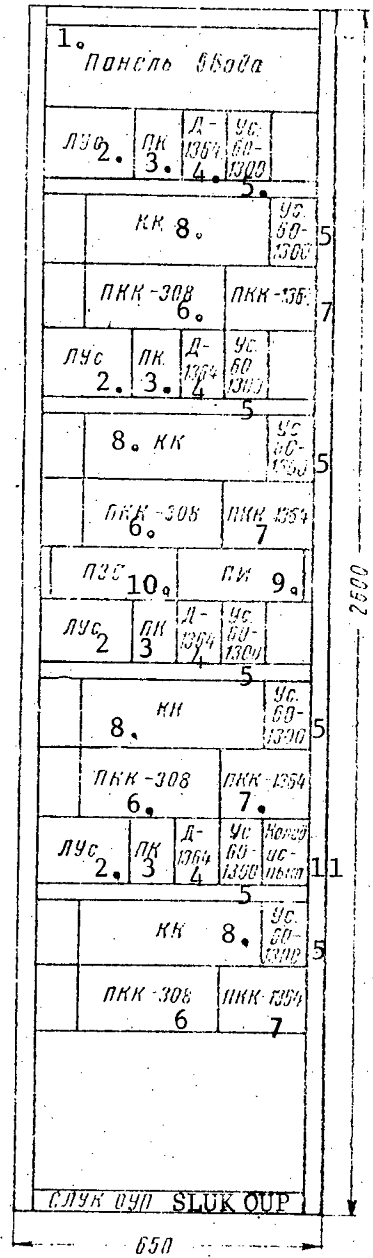
Equipment	Weight, kg	Price, rubles
SLUK-OP	350	8,340
SLUK-OUP	400	13,280
SDP	300	4,032
STDP	300	6,000
SPL	250	3,000
NUP with AGC using control frequencies	350	7,500
NUP with AGC not using control frequencies	350	6,500
NUP-K	350	7,000



Key:

1. 60 - 1,300 KHz amplifier;
2. D-1300 filter;
3. Us P [unknown type of amplifier];
4. Line amplifier;
5. PK [?phase equalizer?];
6. KK [?cosine corrective network?];
7. KON [inverse slope network];
8. 308 KHz control channel receiver;
9. 138 KHz control channel receiver;
10. Protection and signaling panel;
11. PI [measurement instrument];
12. Test terminal;
13. 3 KHz control channel receiver;
14. 1,364 KHz control channel receiver;
15. Entrance panel.

Figure 5.1.1. The placement of the equipment in the rack of line amplifiers and corrective networks, SLUK-OP of the K-300 equipment.



Key:

1. Entrance panel;
2. Line amplifier;
3. PK [?phase equalizer?];
4. D-1,364 filter;
5. 60 - 1,300 KHz amplifier;
6. 308 KHz control channel receiver;
7. 1,364 KHz control channel receiver;
8. Corrective network;
9. PI [measurement instrument];
10. PZS [protection (breaker or fuse) and signaling panel];
11. Test terminals

Figure 5.1.2. The placement of the equipment in the amplifier and corrective network rack, SLUK-OUP, of the K-300 equipment.

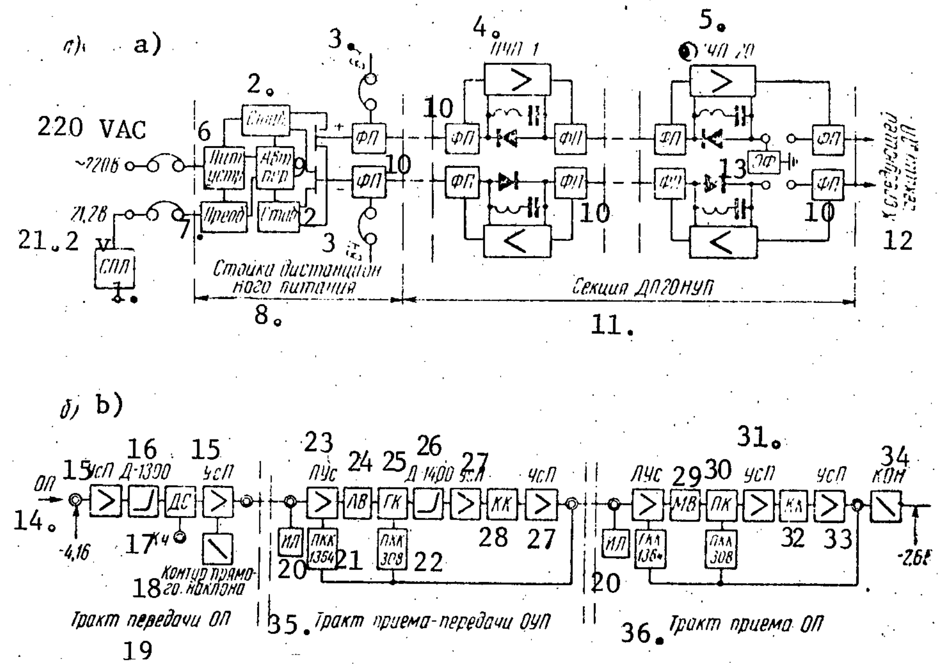


Figure 5.1.3. Block diagram of the K-300 system: a) remote power supply section; b) line equipment of the OP and OUP.

Key:
1. SPL [line equipment shop power supply rack];
2. Regulator;
3. VCh [?high frequency?];
4. Unattended repeater station No. 1;
5. Unattended repeater station No. 20;
6. Power supply;
7. Converter;
8. Remote power supply rack;
9. Transmit autotransformer;
10. Power filter;
11. Remote power supply section for 20 NUP's;
12. To the next remote power supply section;
13. OF [unknown type of filter];
14. OP [terminal station];
15. UsP [unknown type of amplifier];
16. D-1,300 filter;
17. Control frequency;
18. Straight slope network;
19. Terminal station transmit channel;
20. IL [phantom line];
21. 1,364 KHz control channel receiver;
22. 308 KHz control channel receiver;
23. Line amplifier;
24. LV [line equalizer];
25. GK [monitor generator];
26. D-1400 filter;
27. UsP;
28. Corrective network;
29. MV [trunk equalizer];
30. PK [phase corrector];
31. UsP [unknown type of amplifier];
32. Corrective network;
33. UsP;
34. KON [inverse slope network];
35. Attended repeater station receive-transmit channel;
36. Terminal station receive channel.

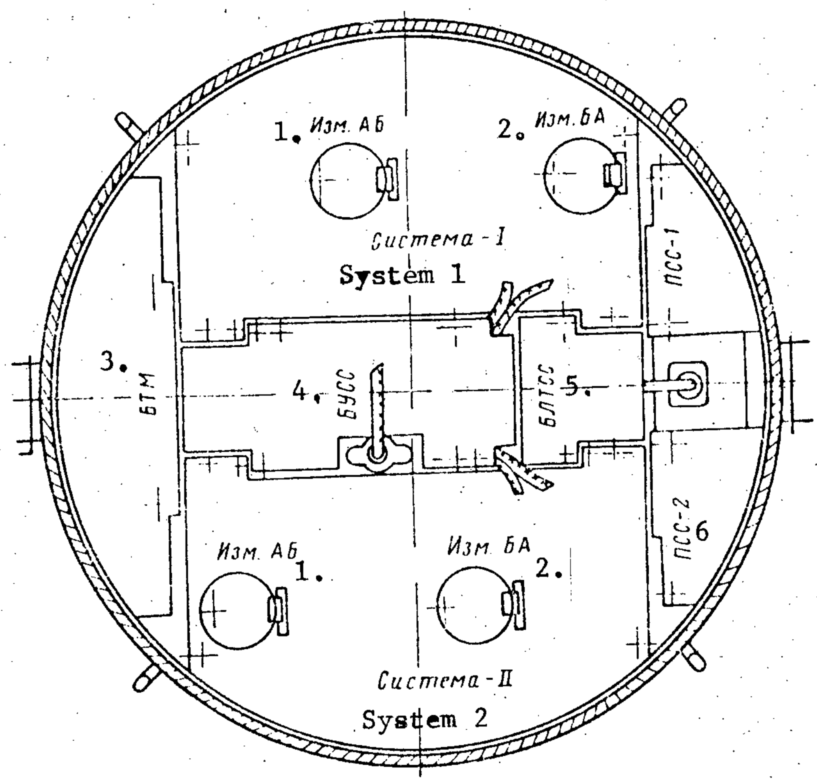


Figure 5.1.4. The K-300 NUP [unattended repeater station] with the cover removed (view from above).

Key: 1. A - B meter;
2. B - A meter;
3. Remote control block;
4. Service communications amplifier block;
5. Block of service communications line transformers;
6. PSS-2 station-to-station service communications unit.

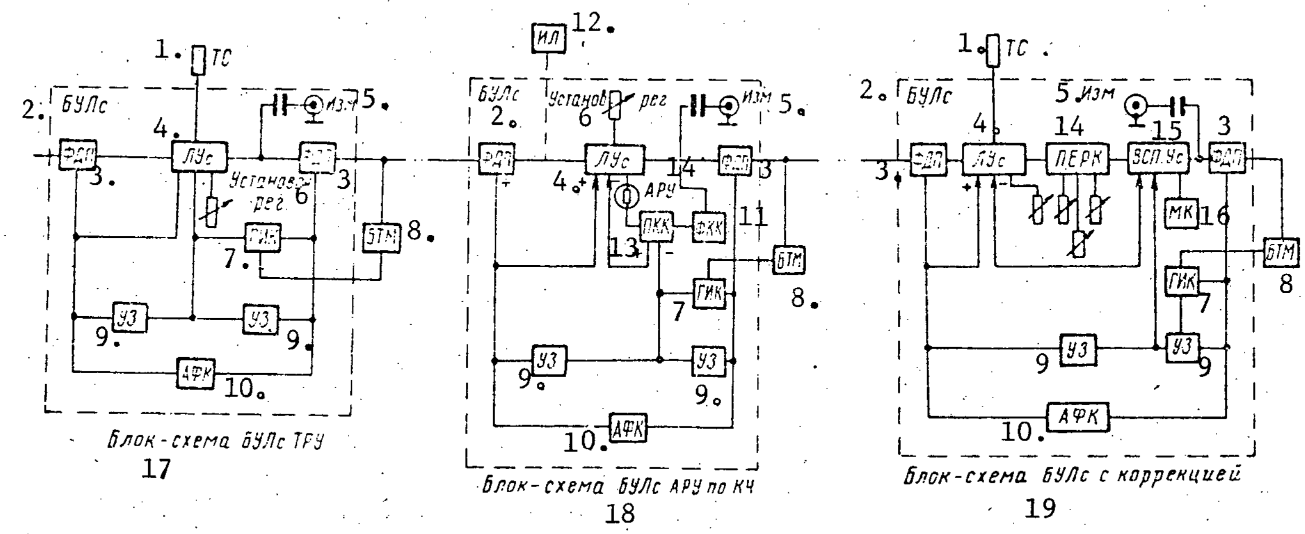


Figure 5.1.5. Block diagram of an unattended repeater station of the K-300 system.

Key:
1. TS [temperature sensor];
2. BULs [line amplifier block];
3. FDP [remote power supply filter];
4. Line amplifier;
5. Metering jack;
6. Adjustment control;
7. GIK [expansion unknown];
8. Remote monitor block;
9. UZ [protective device?];
10. AFK [?amplitude-phase corrective network?];
11. FKK [?phase correction network?];
12. IL [phantom line];
13. Control channel receiver;
14. ARU [automatic gain control];
15. VSP. Us [?auxiliary amplifier?];
16. MK [expansion unknown];
17. Block diagram of the BULs TRU [line amplifier block with AGC not based on control frequencies];
18. Block diagram of the line amplifier block with AGC based on control frequencies;
19. Block diagram of the line amplifier block with equalization.

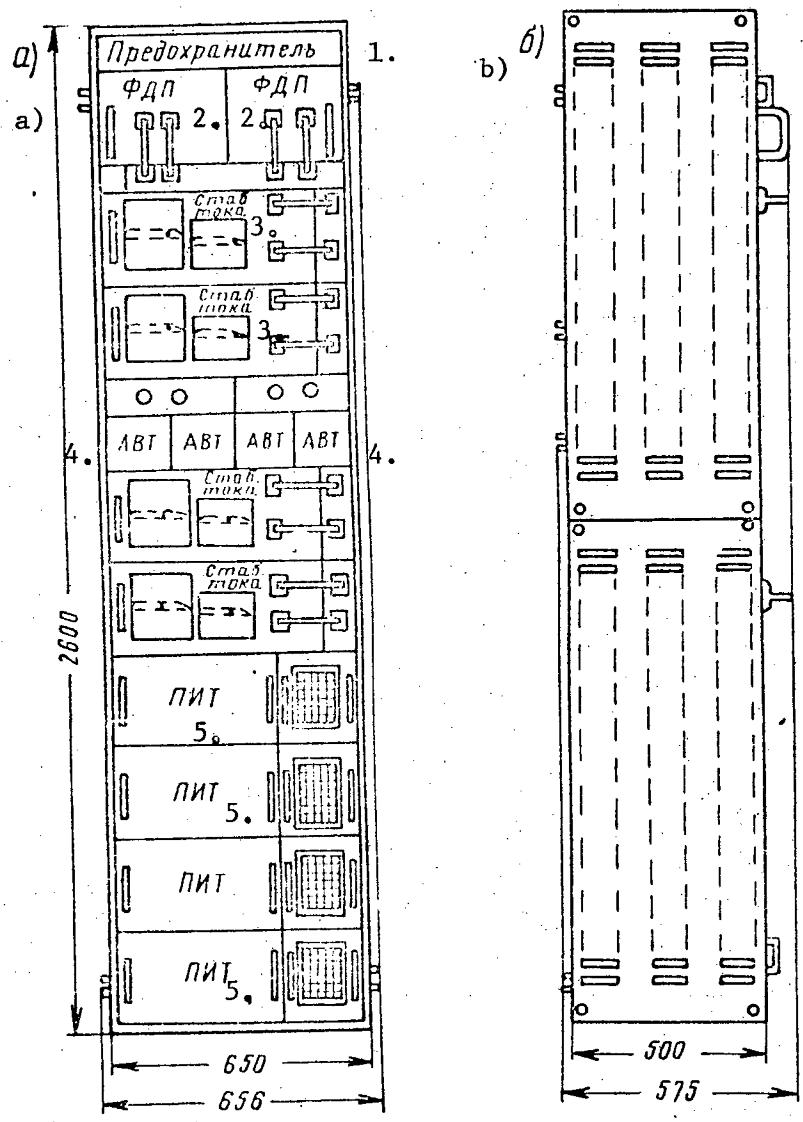


Figure 5.1.6. The placement of the equipment in the remote power supply rack, SDP, of the K-300 equipment:
a) View from the front; b) View from the side.

Key: 1. Fuse panel;
2. Remote power filters;
3. Current regulator;
4. Autotransformer;
5. PIT [?power supply?].

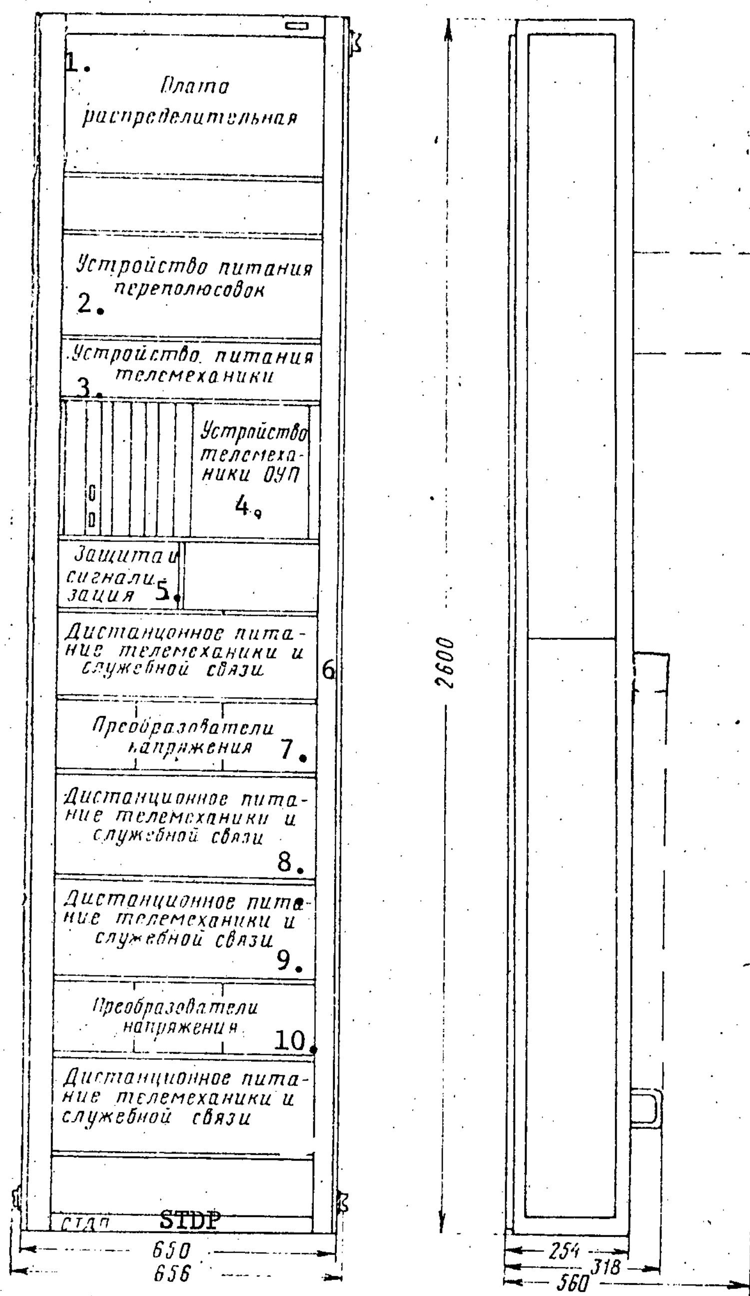


Figure 5.1.7. The placement of the equipment in the remote control and remote power supply rack, STDP, of the K-300 equipment.

Key: 1. Distribution panel;
2. Device for power supply polarity reversal;
3. Remote control power supply;
4. Unattended repeater station remote control unit;
5. Protection and signaling;

[Key to Figure 5.1.7, continued]:

6. Remote control and service communications remote power supply;
7. Voltage converters;
8, 9. Remote control and service communications remote power supply;
10. Voltage converters.

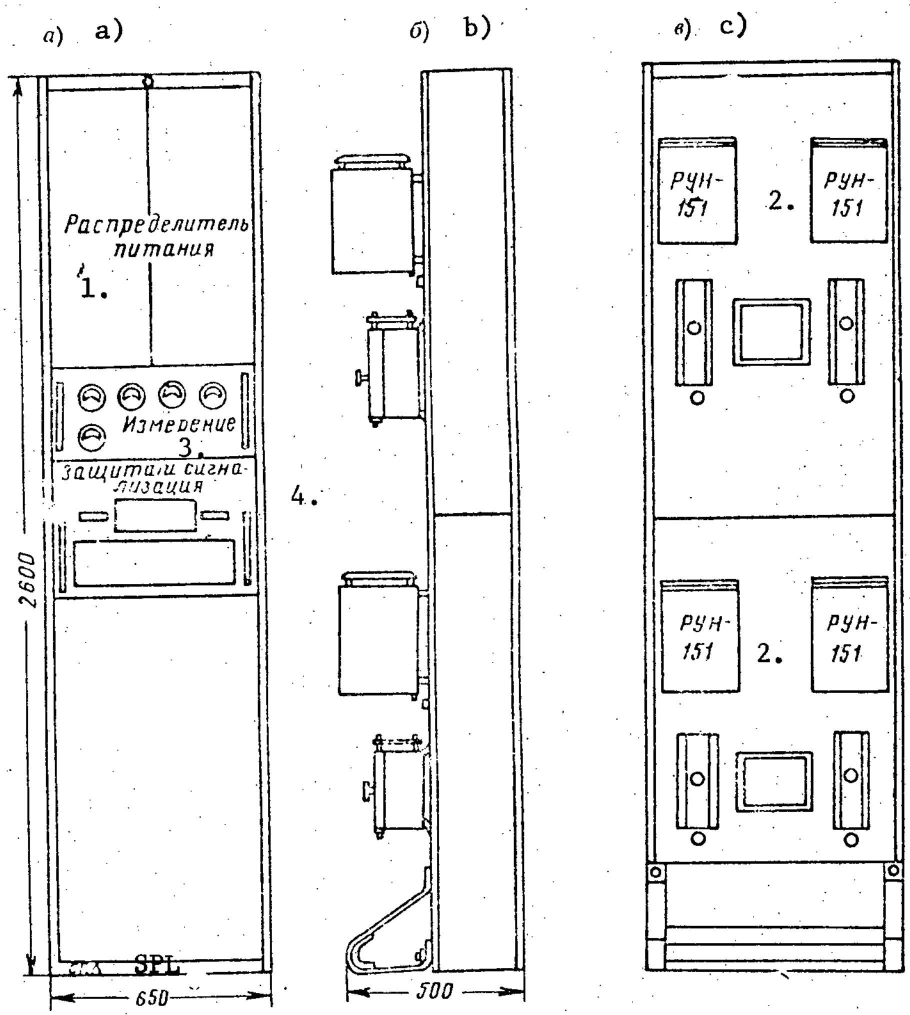


Figure 5.1.8. The placement of the equipment in the line equipment shop power supply rack, SPL, of the K-300 equipment:
a) View from the front; b) View from the Side;
c) View from the rear.

Key: 1. Power distributor;
2. RUN-151 [expansion unknown];
3. Metering;
4. Protection and signaling.

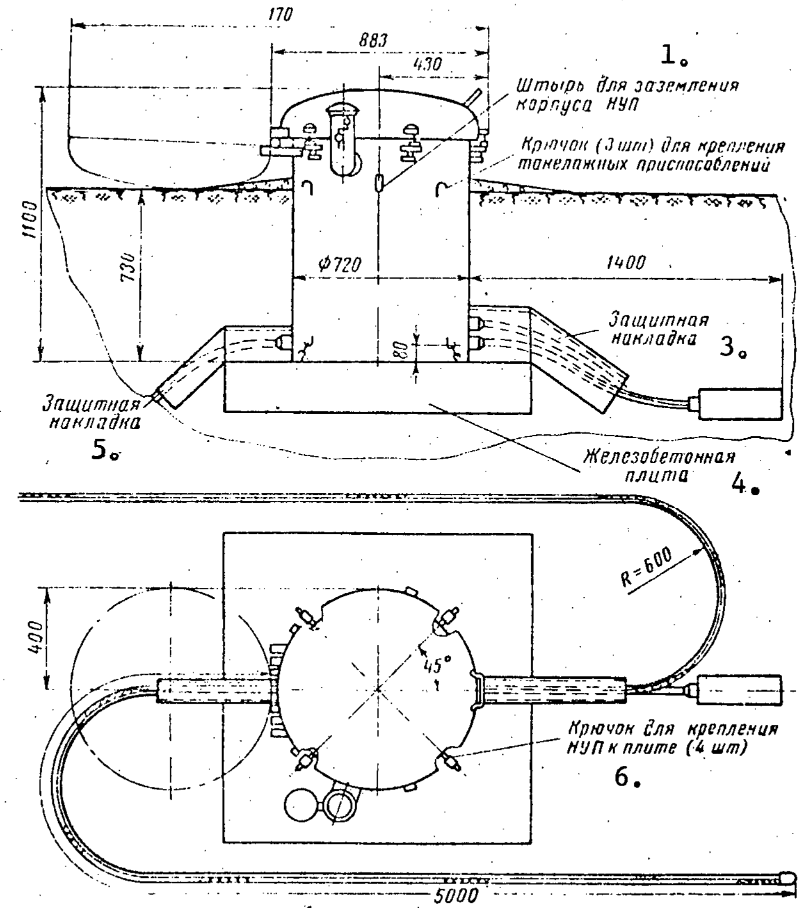


Figure 5.1.9. The placement of the unattended repeater station of the K-300 equipment in the ground.

Key: 1. Stud for grounding the unattended repeater station housing;
2. Hook (three hooks) for fastening tackle accessories;
3. Protective sleeve;
4. Steel reinforced concrete base;
5. Protective sleeve;
6. Hook for fastening the unattended repeater station to the base (four units).

5.2. The K-1920 1,920-Channel Transmission System

Figures 5.2.1 - 5.2.41.

Purpose:

Intended for the organization of telephone and television channels in a coaxial cable. The K-1920U (improved system) will be produced in the immediate future.

Type of Line:

Coaxial, trunk cable, contains 2.6/9.4 mm diameter coaxial pairs and five balanced quads with core diameters of 0.9 mm, intended for service communications and remote control.

Depending on the conditions for cable laying, various types of cables are used: KMG-4, KMB-4, KMK-4.

Communications System: Single-cable, single-band.

Electrical Characteristics

Line spectrum:	
For the transmission of 1,920 telephone channels	0.312 - 8.524 MHz
For the transmission of 420 telephone channels	0.312 - 2.044 MHz
For the transmission of 300 telephone channels	0.312 - 1.548 MHz
For television transmission	1.891 - 8.491 MHz
For the audio accompanying a television channel	273.03 - 288 KHz
The number of channels which can be organized	1,920 telephone channels or 300 telephone channels in conjunction with two-way transmission of a television program with the accompanying audio
The capability of secondary multiplexing of the telephone channels	See the introduction
The effectively transmitted passband:	
Telephone channels	0.3 - 3.4 KHz
Television channels	50 Hz - 6.0 MHz
The audio accompanying a TV channels	30 Hz - 15 KHz
The characteristic of the TV channels	The electrical characteristics of the channel for transmitting video signals provide for the transmission of signals at the domestic TV standard with a bandwidth of 6.0 MHz and with the scanning of the image in 625 horizontal traces at 50 frame fields per second, and satisfies the recommendations of the MKKR [International Consultative Committee for Radio] and the MKKTT [International Consultative Committee for Telegraphy and Telephony].

The maximum length of a line section (without HF retransmission)	1,500 km
The maximum length of telephone links	12,500 km
The length of a repeater section (for the case of an average annual ground temperature of +7.5° C)	6 ± 0.3 km
The average design length of a repeater segment in an OUP-OUP section should fall within limits of (for an average annual ground temperature of + 7.5° C)	5.85 - 6.0 km

Note: For cases where the average ground temperature differs from the 7.5° temperature, the lengths of repeater sections are determined from the formulas:

$$l'_{avg} = l'_{cp} = l_{cp} \frac{\alpha_{7,5}}{\alpha_t},$$

$$\alpha_t = \alpha_{7,5} [1 + \alpha_\alpha (t - 7,5)],$$

where α_t is the cable attenuation at t° C;
$\alpha_{7.5}$ is the cable attenuation at 7.5° C;
α_α is the temperature coefficient of attenuation, equal to $2 \cdot 10^{-3}$ 1/deg. for coaxial pairs in a frequency range of 0.25 - 8.5 MHz.

The maximum number of NUP's on an OUP-OUP section	30
The nominal values of phantom lines for shortened sections	0.25, 0.5, 1.25, 1.5 and 2 km

The conversion of the HF spectra in the equipment:

-- Individual conversion	The 0.3 - 3.4 KHz spectrum to 60 - 108 KHz spectrum and back (carrier frequencies of 64, 68 . . . 108 KHz).
-- Primary group conversion (of 12-channel groups)	The 60 - 108 KHz spectrum to the 312 - 552 KHz spectrum and back (carrier frequencies of 420, 468, 516, 564 and 612 KHz). The following supplemental carrier frequencies are provided: 252, 300, 348, 396, 444 KHz for the capability of converting the main and inverse spectra for the case of 60-channel through-working.

-- Secondary group conversion (of the 60-channel groups)	The 312 - 552 KHz spectrum to the 812 - 2,044 KHz spectrum. The second 60-channel group is transmitted into the line without conversion, while the third group is converted to the 564 - 804 KHz spectrum by means of 1,116 KHz carrier. For the remaining groups, the carrier frequencies are 1,364, 1,612, 1,860, 2,108 and 2,356 KHz.
-- Ternary group conversion (of the 300-channel groups)	The 812 - 2,044 KHz spectrum to the 2,108 - 8,524 KHz spectrum, and in this case, five ternary groups are created. The first ternary group (812 - 2,044 KHz) is transmitted without conversion, while for the remaining ternary groups, the carrier frequencies are 4,152, 5,448, 6,744, 8,040 and 9,366 KHz.

Note: No provision is made for through working of the first ternary group.

The possibility of splitting out telephone channels	On one retransmission section of a trunk, one can permit up to three isolations of the lower two 60-channel groups of telephone channels (in the 312 - 804 KHz passband).
The number of permissible HF transits on one voice frequency retransmission section	Up to three for 12-channel groups, up to three for 60-channel and up to three for 300-channel groups (with special selection of the lines)
Splitting out a television channel	A provision is made for the capability of branching out a TV program and the accompanying audio program at any attended station of a trunk.
Television program insertion	A provision is made for the capability of inserting a television program in attended stations with channel switching (OUP-P).
The residual attenuation of a voice frequency channel at 800 Hz	0.8 Np
The nominal relative voice frequency levels in the four-wire section of a channel:	
At the input	-1.5 Np
At the output	+0.5 Np

The nominal relative transmit levels at the output of the line amplifiers for the case of the simultaneous transmission of 300 telephone channels and a television channel:	
Telephone channel	-1.4 Np (0.312 - 1.548 MHz)
Television channel	+1.3 Np (1.9 - 8.55 MHz)
Accompanying audio channels	-0.5 Np (0.273 - 0.288 MHZ)
The master oscillator frequency:	
In the system for 1,920 channels	1,024 KHz with a stability of $\pm 5 \cdot 10^{-8}$
In the system for 420 channels	128 KHz with a stability of $\pm 2 \cdot 10^{-7}$
The harmonic generator frequency	4, 12 and 124 KHz
Control frequencies for automatic gain control (ARU) [AGC] of the line channel of a trunk	5,974, 8,544, 1,056 and 308 KHz
The control frequencies of the primary, secondary and ternary groups (12-, 60- and 300-channel groups)	84.14, 411.86 and 1,552 KHz
The control frequency levels:	
5,974 KHz	-2.0 Np
308 and 1,056 KHz	-4.0 Np
8,544 KHz	-3.0 Np
When the level deviates at the input with respect to the main frequency (5,974 KHz) by the amount of ± 0.35 Np, the change in the level at the output of an OUP station should be no more than	± 0.05 Np
The length of a section for line channel changeover to the backup	300 - 400 km
The condition for the multiplexing of service (balanced) quads with the K-24k system	Two pairs from different quads are used having a near end crosstalk attenuation of no less than 9 Np without balancing. Normal operation is assured when multiplexing with only one system in a cable with a working range of no more than 300 km (see section 4 for more details).
The service communications system:	
Trunk service communications, MSS	Via the HF channels between terminal and retransmission points.
Station-to-station service communications PSS-1	Via the four-wire voice frequency channel between retransmission points with the insertion of all OUP's.

Station-to-station service communications PSS-2	Via a four-wire voice frequency channel between the administrations of regions of a cable trunk with the insertion of the the corresponding OUP's
Sectional service communications, USS	Via a two-wire voice frequency channel between OUP's and all associated unattended points
The service communications amplifier gain at 800 Hz	1.85 ± 0.1 Np
Measurement frequencies:	
For checking the frequency response of the line channel	3,372 and 4,656 KHz
For remote monitoring of amplifier nonlinearity (the GFCh-1 fixed frequency generator is employed to obtain the frequencies)	60, 1,364.12 KHz
The line carrier frequency of the TV signal	2,491 KHz
The carrier frequency of the accompanying signal spectrum	273 KHz (not transmitted into the line).
The AGC system of the line channel	Magneto-electric, using control frequencies (AGC with KCh), using the groun temperature (AGC without KCh) by means of temperature sensors, installed at the depth at which the cable is layed.
AGC unit not using control frequencies (with a temperature transducer)	Compensates for temperature variations in the frequency response of repeater sections at a frequency of 8.55 MHz with a precision of no less than ± 0.03 NP when the ground temperature changes within limits of -5 to +20° C, 0 to +25° C or +5 to +30° C, depending on the average ground temperature.
The installation of the temperature sensors	At each NUP (with AGC not using control frequencies)
The AGC unit using control frequencies	Compensates for the temperature variations in the attenuation of the preceding cable section, and also eliminates the control error of the AGC devices which do not use control frequencies and are inserted ahead of it (the AGC installation is accomplished in accordance with Table 5.2.1).

TABLE 5.2.1.

1. Количество НУП на участке ОУП-ОУП	7	8	9	10	11	12	13	14	15	16	17	18	19	20
2. № НУП, оборудованных АРУ с кч	-	5	5	6	6	6	7	7	8	6;11	6;12	6;13	7;13	7;14

Продолжение

Continuation

1. Количество НУП на участке ОУП-ОУП	21	22	23	24	25	26	27	28	29	30
2. № НУП, оборудованных АРУ с кч	7;15	8;15	8;16	6;13;19	6;13;20	7;13;20	7;14;21	7;14;22	7;15;23	8;16;23

Key: 1. The number of unattended repeater stations on an OUP-OUP section;
2. The numbers of the unattended repeater stations which are equipped with AGC using control frequencies.

Note: Used at the remaining NUP's is AGC which does not employ control frequencies.

Types of Station Points

There are the following types of stations in the K-1920 transmission system:

-- Terminal station (OP MTS) [terminal station - long distance telephone exchange]
-- Terminal station for television channels and the accompanying audio (OAMT),
-- Attended repeater station (OUP),
-- Attended repeater station with channel route switching (OUP-P)
-- Unattended repeater station with automatic gain control using a control frequency with service communications amplifiers (NUP with ARU based on the KCh with USS),
-- Unattended repeater station with automatic gain control using a control frequency without service communications amplifiers (NUP with ARU using KCh),
-- Unattended repeater station with automatic gain control based on the ground temperature without the use of a control frequency and having service communications amplifiers (NUP with ARU without KCh with USS),
-- Unattended repeater station with automatic gain control based on the ground temperature without the use of a control frequency and without service communications amplifiers (NUP with ARU without KCh),
-- Unattended repeater station with automatic gain control based on the ground temperature without using a control frequency, having an autotransformer block capable of handling greater power, and without service communications amplifiers (NUP-M with ARU without KCh).

A mobile intermediate amplifier station (PUS-5 or PUS-7) is used to substitute for a failed NUP or OUP unit, or as a mobile supply station when repairing a cable.

Climatic Operational Conditions

OP's and OUP's. At an ambient air temperature of from +10 to +40° C, with a relative air humidity up to 75%; at a temperature of up to +25° C, with a relative humidity of up to 85%.
NUP's. At an ambient air temperature of from +5 to +40° C with a relative air humidity of up to 75% and up to 25° C with a relative humidity of up to 85%. A short term increase in the humidity up to 95% is permitted at temperatures up to +20° C (during installation and alignment).
PUS's. At an ambient air temperature of from +5 to +40° C, with a relative air humidity of up to 85%.

Electrical Power Supply

Voltages:

Terminal station:	
With alternating current	220 volts ± 3%
With direction current (plate circuits)	206 volts ± 3%
Filament circuits	21.2 volts ± 3%
Signaling	24 volts ± 10%
Attended repeater station with AC	220 volts ± 3%
Unattended repeater station with AC	Up to 2,000 volts (remote power fed via the center cores of the coaxial pairs).

The mobile amplifier station using AC	220 volts from a mobile electrical power plant.

The Power Consumed by the K-1920 Line Channel Equipment When Powered From:

	220 volts AC	24 volts DC
SLU-1 -- SLU-10	375 VA	-
SKK-1 or SKK-2	600 VA	-
SKKU	300 VA	-
SPTR-1 or SPTR-2	300 VA	-
SGOPP (main, standby - for each)	120 VA	-
MTS-TTs	450 VA	35 watts
STVT-OP	350 VA	30 watts
STVT-OUP	350 VA	70 watts
SOPT	300 VA	-
SKTP	600 VA	-
KIS (not counting the metering equipment)	700 VA	-
GFCh-1	250 VA	-
SU-NUP with ARU with KCh (from a 2000 volt remote power source)	260 watts	-
SU-NUP with ARU without KCh (from a 2000 volt remote power source)	260 watts	-

Power Consumed by the Television Channel and the Accompanying Audio Channel Equipment at 220 volts AC

SPUT-1, SUPT-1	1,450 VA
SPrUT-1	700 VA
SPUZS-1	600 VA
SPrUZS-1	600 VA
SGK	500 VA
VKU-411	220 - 240 VA
G6-2	1,100 VA

Equipment Complement and Function

Terminal Station (OP-MTS)

Equipment Complement

Individual conversion equipment (see Section 7):

-- Individual conversion rack, SIP-60;
-- Voice frequency ringing and differential systems rack, STV-DS-60
-- Individual equipment rack, SIO-24p (where necessary).

Group conversion equipment (see Section 7):

-- Standardized racks of primary converters, USPP-1, USPP-2;
-- Standardized racks of secondary converters, USVP-1, USVP-2;
-- Rack of ternary converters for one system, STP;
-- Rack of ternary converters for 720 channels via a coaxial cable, or 1,020 channels via RRL-STP-1 [unknown type of radio relay link gear];

Generator equipment (see Section 6):

-- Standardized generator equipment rack for 600 telephone channels, SUGO-I;
-- Standardized generator equipment rack for one K-1920 system, SUGO-II;
-- Master oscillator and ternary carrier frequency rack for two K-1920 systems, STGO;
-- The same, two sets for 720 channels of the K-1920 system, or two sets of 1,020 channels each, RRL-STGO-1.

Line channel equipment:	For one system	For two systems
-- Rack of line amplifiers, SLU-1 -- SLU-10	1	2
-- Rack of improved cosine corrective networks, SKKU	1	1
-- Remote power supply cabinet, ShPD-1 or ShDP-5 [sic]	1	1
-- MTS-TTs rack	1	2
-- Rack for switching the channels, SPTR-1	1	1
-- Remote control rack, STO-1	1	1
-- Service communications rack, SSS-1 or SSS-2	1	1
-- Current distribution rack, STKR	1	1
-- Rack for high frequency through-working and the insertion of television programs at a terminal station, STVT-OP	1	1
-- Television program monitor rack, SKTP	1	1
-- Monitor and measurement stand, KIS	1	1
-- Generator of fixed frequencies, GFCh-1	1	1
-- Video monitor, VKU-411	1	1

Note: The equipment for the line channel of a terminal station (OP-L) is supplied as a compelte set. Where necessary, separate powering of the racks is permitted. Included in the complement of the stations, besides the main equipment, are also spare boards and measurement instruments.

Switching equipment (see Section 1):

-- Rack for switching the primary groups for 50 12-channel groups, SKP-1;
-- Rack for switching the secondary and ternary groups for 30 60-channel or 300-channel groups, SKVT-1.

Purpose:

SLU-OUP. Rack of line amplifiers. For amplifying the line frequency spectrum in a range of 0.27 - 8.55 MHz, for automatic control of the signal levels, as well as for correcting the amplitude-frequency and phase-frequency distortions of the channel. Each rack is designed for operation via one coaxial pair. The SLU-OUP racks are manufactured in 10 different variants, and differ from each other in the type and equipment complement of the fixed phase correctors and the AGC unit, in accordance with Table 5.2.2.

Table 5.2.2.

1. Наименование фазовых корректоров и АРУ	СЛУ-1 (SLU-1)	СЛУ-2	СЛУ-3	СЛУ-4	СЛУ-5	СЛУ-6	СЛУ-7	СЛУ-8	СЛУ-9	СЛУ-10 (SLU-10)
2. Постоянный фазовый корректор на 90 *км* I типа	+	—	+	—	+	—	—	—	—	—
3. Постоянный фазовый корректор на 90 *км* II типа	—	+	—	+	—	+	—	—	—	—
4. Постоянный фазовый корректор на 45 *км*	—	—	—	—	—	—	—	—	—	+
5. Постоянный фазовый корректор на 90 *км* I типа и ФК на 45 *км*	—	—	—	—	—	—	+	—	—	—
6. Постоянный фазовый корректор на 90 *км* II типа и ФК на 45 *км*	—	—	—	—	—	—	—	+	—	—
7. Постоянный фазовый корректор на 90 *км* I типа и ФК на 90 *км* II типа	—	—	—	—	—	—	—	—	+	—
8. АРУ на частоту 5974 *кгц*	+	+	—	—	—	—	—	—	—	—
9. АРУ на частоты 5974 и 8544 *кгц*	—	—	+	+	—	—	—	—	—	—
10. АРУ на частоты 5974, 8544, 308 и 1056 *кгц*	—	—	—	—	+	+	+	+	+	+

Key: 1. Designation of the phase compensators and AGC;
2. Fixed phase compensator for 90 km, type I;
3. Fixed phase compensator for 90 km, type II;
4. Fixed phase compensator for 45 km;
5. Fixed phase compensator for 90 km, type I and phase compensator for 45 km;
6. Fixed phase compensator for 90 km, type II, and phase compensator for 45 km;
7. Fixed phase compensator for 90 km, type I, and phase compensator for 90 km, type II;
8. AGC at a frequency of 5,974 KHz;
9. AGC at frequencies of 5,974 and 8,544 KHz;
10. AGC at frequencies of 5,974, 8,544, 308 and 1,056 KHz.

Note: The outfitting of the SLU-OUP racks with fixed phase networks (FK's) is realized in accordance with the distances between the OUP's:

From 15 to 75 km: FK for 45 km;
From 60 to 120 km: FK (type I or II) for 90 km
From 105 to 165 km: FK (type I or II) for 90 km and FK for 45 km
From 150 to 210 km: FK for 90 km (type I) and FK for 90 km (type II).

When designing the trunks, it is necessary to observe the order for the installation of the SLU's with phase compensators of types I and II along the trunk. An effort should be made to see that FK's of the same type (I or II) are installed at the same station (OUP).

Dimensions of the racks: 2,600 x 644 x 250 mm.

SKKU. Rack of cosine corrective networks (improved). For compensating for the accumulating amplitude-frequency distortions of the line channel. The rack contains two equipment sets for operating via two coaxial pairs. One SKKU rack replaces the SKK-1 and SKK-2 racks. The SKK-1 and SKK-2 racks have been taken out of production. The rack dimensions are 2,600 x 644 x x 250 mm.

SPTR-1. Channel switching rack. For the automatic switching of the channel routes when one of the main routes is damaged. The SPTR-1 rack contains an equipment set for two systems. Located in the rack are the switching panels for switching the channels, two transmit amplifiers, four suppression filters (two units for 5,974 KHz and two units for 8,544 KHz) for suppressing the control frequencies, two power supply boards and fuse boards.

The rack dimensions are 2,600 x 644 x 250 mm.

MTS-TTs. Long distance telephone exchange and TV center rack. To provide for television and telephone channels on transmit, their separation on receive, and the amplification of the TV signals. At the present time, included in the rack complement is only one set of equipment for one system, instead of two sets for the racks produced previously.

The rack provides for the following connection variants on transmit and receive: the transmission of 300 telephone channels and television, or the transmission of up to 1,920 telephone channels. The connection of the rack to the cable going to the television center is accomplished by means of terminal, hermetically sealed couplings (OGKM), located above the rack in open channels. The following phantom lines are supplied in the equipment set of the rack: One unit for 0.25 km, two units for 0.5 km, one unit for 1.25 km, two units for 1.5 km and two units for 2.0 km.

The rack dimensions are 2,600 x 644 x 250 mm.

STV-OP. The rack for high frequency through working, branching out and insertion of television programs in the line frequency spectrum at the terminal station. The rack provides for the following television programs switching capabilities:

Through working three programs between three trunks with the capability of branching out any of these programs at a local television center.

Branching out one program in three directions.

Through working progams between two trunks with the capability of branching out two programs to a local television center.

The segregation and insertion of two programs at a local television center.

Located in the rack are the following:

Transmit amplifier	3 units
Panel of isolation filters	3 units
Protection and signaling panel	1 unit
Switching panel	1 unit
Power supply panel	1 unit

The rack is supplied in two variants: STVT-OP-1 for trunks, outfitted with the MTS-TTs racks of the first production series (one MTS-TTs rack for two K-1920 systems), and the STVT-OP-2 for trunks, outfitted with the MTS-TTs racks for one K-1920 systems.

The rack dimension of 2600 x 644 x 250 mm.

SKTP. The television program monitor rack. For the visual monitoring of the quality of the flow of the TV signals and audio monitoring of the quality of the accompanying audio signals.

The SKTP is installed at OP-MTS's, OUP's and OUP's with channel switching. This rack can also be employed at OUP's for branching out television programs to a low power repeater of the TRSA type, and in this case, the installation of the SPrUT-1, SPrUZS-1 and SGK racks is not required.

The use of the SKTP rack for branching out a television is possible if the OUP and repeater are located in the same building, or in different buildings, but in this case, the junction lines should be no more than 100 meters long.

When using the SKTP rack for branching out television programs, it is necessary that it be connected to the line channels of a trunk through a rack for branching out the television programs (SOPT). The SOPT provides for automatic connection to the television transmit channel, and includes the necessity of taking up monitored jacks in the OUP equipment. Moreover, the SOPT provides for the capability of precise equalization of the phase-frequency distortions of the line channels at the branching out point by means of variable phase compensators of PFK-10 type, which are included in the equipment compliment of this rack.

With the method indicated here for feeding television programs to a repeater, the possibility for operationally timely monitoring of the flow of television programs to the OUP should not be disrupted, i.e., a separate SKTP rack should additionally be used for feeding programs to the repeater besides the SKTP rack, intended for the operational engineering monitoring of the trunk operation.

The rack dimensions are 2600 x 644 x 250 mm. (316 mm. with the protruding parts).

KIS. Monitor and measurement stand. For performing monitor tests of the panels and blocks NUP racks during the trunk installation and alignment period, as well as when in operation. The stands are installed at all OP and OUP stations, which monitor NUP operation. It is also possible to install KIS's in repair shops. When the appropriate measurement equipment is present, the stand equipment permits the performance of all of the necessary test measurements of the boards and blocks of the SU-NUP and SV-NUP racks for the purpose of determining their servicability and suitability for installation in the line channel. The stand contains rows of panels of an auxiliary nature, which are permanently installed in it. Moreover, the following panels are installed in the stand: line amplifier, power supply filters, autotransformer, AGC devices, NUP supply units, and a number of other panels of the NUP racks, permanently mounted in the stand, which serve as reference calibration units.

When testing, the panel being tested is installed in the stand in place of the calibration reference one. A high voltage supply going up to 2000 volts is provided in the stand for checking the remote power supply devices NUP.

The rack dimensions are 2600 x 644 x 520 mm.

GFCh-1. A generator of fixed frequencies. For remote monitoring of amplifier nonlinearity. It is provided in the equipment complement of a terminal station, OUP and OUP with channel switching, OUP-P. The generator is packaged in the form of a portable instrument. It can also be mounted in a rack of the basic standard construction.

ShDP-1, Sh DP-5. Remote power supply cabinets. For supppling NUP's with alternating current at 50 Hz and a voltage of 2000 volts, as well as for current distribution in the line equipment shop when feeding the equipment of attended repeater stations with alternating current at 220 volts.

The ShDP-1 provides remote power via the center cores of two coaxial pairs for no more than 11 NUP's, and the ShDP-5 supplies no more than 15 NUP's.

Included in the cabinet compliment are four 230/1000 volts step-up transformers to obtain the remote poser supply voltage, for remote power supply panels for transmission of the remote power supply voltage from the step-up transformers into the line, four ammeters with current measurement transformers for monitoring the NUP remote power supply current, at a current distribution panel for providing power to the line equipment shop (6 single phase feeders).

The cabinet dimensions are 2600 x 918 x 500 mm.

Note: Installed in the ShDP-1 are 3- KVA step-up transformers and in the ShDP-5, transformers with a power of 6 KVA.

STO-1. Remote control rack (with contact remote control), serves for the following: connecting in the balanced quads of a cable which are used for remote control and service communications units, as well as protecting them against overvoltages; remote monitoring of the condition of the equipment in the NUP's and 60 KHz generator remote control; remote signaling of the number actuating the signaling unit when the pressure drops in a cable; protecting the rack against short circuits in it, signaling faults and control of the common rack and row signaling when receiving signals from the NUP's and from the cable; compensating for the attenuation of a PSS [station to station service communications] service communications circuits, and organizing USS [sectional service communications links]; powering the remote control equipment; powering the common signaling in the line equipment shop.

Additionally supplied with the rack are: spare parts, tools, remote control panel, and cable wiring for the inner rack connection of the last NUP's (adjacent to OUP), three portable lights, and three soldering irons.

The rack dimensions are 2600 x 644 x 250 mm.

STKR. Current distrubution rack. For the distribution of the three phase current to single phase with an output voltage of 220 volts. A provision is made for protection and signaling and the loss of power with output to a common station display. The rack is installed in line equipment shops for powering the OP-L, MTS and OAMT equipment of the K-1920 system. Up to four current distribution panels can be installed in the rack. Each panel provides for the power, protection and signaling for 6 single phase feeders, when alternating three phase current is fed to the input with the neutral or without the neutral.

Note: At the present time, the rack is manufactured in equipment sets for 2, 3 and 4 current distribution panels, the number of which is stipulated in order.

The current in each feeder should be no more than 10 amps. The overall carrying capacity of a panel is no more than 5 KW. Signaling for the loss of AC and fuse burn-out is provided with a voltage of 24 volts.

The rack dimensions are 2600 x 644 x 250 mm.

SSS-3, SSS-4. Service communications racks (see section 11).

SKP-1, SKVT-1. Racks for switching the primary and secondary groups (see section 1).

The OAMT Terminal Station for Television Channels and the Accompanying Audio

Equipment Complement

Included in the OAMP equipment, which provides for the reception and transmission of television programs, are:

Rack of television transmit units, SPUT-1	1 unit
Rack of television transmission amplifiers, SUPT-1	1 unit
Rack of television receivers, SPrUT-1	1 unit
Rack of transmit units for the accompanying audio, SPUZZ-1	1 unit
Rack of receivers for the accompanying audio, SPrUZS-1	2 units
Harmonic equalizer rack, SGK	1 unit
Video monitor, VKU-411	2 units
Television test signal generator, G6-2	1 unit
Current distribution rack, SPKR	1 unit
Row signaling transparancy, RST	2 units

Note: The equipment for television is supplied as a complete set. Where necessary, separate delivery of the racks permitted. Also included in the equipment compliment of the transmit and receive stations, besides the main equipment, are spare parts and instrumentation blocks.

Purpose:

SPUT-1. Rack of television transmit units. For the conversion of the video signal from the 50 Hz--6.0 MHz frequency spectrum to the 1.9--8.5 MHz line frequency spectrum. The rack dimensions are 2600 x 644 x 250 mm.

SUPT-1. Rack of television transmit amplifiers. For amplifying the signal in the 1.9--8.5 MHz spectrum up to the transmit level, and for monitoring the signal fed to the line with the VKU-411 video monitor. The rack dimensions are 2600 x 644 x 306 mm.

SPrUT. The rack of television receivers. For amplifying the line TV signal (1.9--8.5 MHz) and converting it to a video signal (50 Hz--6.0 MHz). The rack dimensions are 2600 x 644 x 306 mm.

SPUZS-1. Rack of accompanying audio transmitters. For the conversion of the signal from the frequency spectrum of from 30 Hz up to 15 KHz to the line frequency spectrum of from 273 to 288 KHz. The rack dimensions are 2600 x 644 x 316 mm.

SPrUZS-1. The rack of accompanying audio receivers. For the conversion of the accompanying audio line signal (273--288 KHz) to the audio frequency signal (30 Hz--15 KHz). One rack is used as the receive unit, while the second rack is used for monitoring at the TV audio transmit output. The rack dimensions are 2600 x 644 x 310 mm.

SGK. The harmonic corrector rack. For the fine alignment equalization of the phase characteristic of the TV channel and the separation of the television and accompanying audio line signals. The rack dimensions are 2600 x 644 x 250 mm.

VKU-411. Video monitor. For the visual monitoring of the television signal quality. It is a display unit. It is used in the transmission and reception of the television program.

G6-2. Television test signal generator. For measuring and monitoring the parameters of television communications channels under operational conditions. The rack dimensions are 1740 x 960 x 800 mm.

The Attended Repeater Station, OUP

Equipment Complement:	For 1 System	For 2 Systems
The SLU-OUP (SLU-1 -- SLU-10) rack	2	4
The SKKU rack	1	2
The STO rack	1	1
The ShDP-1 or ShDP-5 cabinet	1	2
The SSS-3 or SSS-4 service communications rack	1	1

Equipment Complement [continued]:

	For One System	For Two Systems
The KIS stand	1	1
The SKTP rack	1	1
The VKU-411	1	1
The RST transparency [row and signaling]	2	2
The GFCh-1 fixed frequency generator	1	1

The Attended Repeater Station with Channel Switching, OUP-P

Equipment Complement

	For One System	For Two Systems
The set of racks, included in the complement of the OUP without channel switching, and additionally:		
SPTR-II rack	2 units	2 units
SGOPP-I rack	1 unit	1 unit

Purpose:

SPTR-II. The route switching rack. For automatically switching channels in a switching section when one of the routes is damaged, as well as amplifying telephone and television signals.

The rack contains the set of equipment for four coaxial pairs. The SPTR-II rack differs from the SPTR-I only in the number of suppression filters: in the SPTR-II there are two filters, and in the SPTR-I, there are four filters. The dimensions are 2,600 x 644 x 250 mm.

SGOPP-I and SGOPP-II. The rack of generator equipment of the channel switching station. For the retransmission of the 5,974 and 8,544 KHz control frequencies. The racks are designed for powering four coaxial channels in two directions. The SGOPP-II, in contrast to the SGOPP-I, does not have an 8,544 KHz generator. The dimensions of the racks are 2,600 x 644 x 250 mm.

Note: Since 1969, the SGOPP-I racks have been installed only at a station where a provision is made for the installation of the STV-OUP.

Supplemental Equipment for Branching Out, Inserting and the Through-Working of Television Programs from the OUP and OUP-P

SOPT. The supplemental equipment in the OUP: a rack for splitting out television programs. For splitting out one of two transmit directions of the television programs from any of four coaxial pairs of a trunk cable at any OUP. The rack is connected in parallel with the channel using its own high impedance input. To compensate for the residual phase distortion of the channel, provisions are made at the given point for fixed and variable phase correctors of the same type as are used in the SLU-OUP rack. A suppression filter is provided to suppress the control frequencies. The rack dimensions are 2,600 x 644 x 250 mm. The receiving television equipment at the television center or repeater is similar to the OAMT, i.e., to the SPrUT-1, SPrUZS-1, and SGK racks, and to the VKU-411 video monitor.

STVT-OUP. The supplemental equipment at an OUP-P: a rack for the high frequency through-working, branching out and insertion of television programs. For splitting out and inserting television programs and the accompanying audio at attended repeater stations with channel switching. The STVT-OUP rack provides for the following:

-- Forward passage of telephone channels and control frequencies in the 308 - 1,552 KHz spectrum;

-- Forward passage of two television programs with the branching out of one of them or the through passage of one television program with the insertion of the television program of a local television center in the return direction channel with branching out of a program passing through in the forward direction or incoming from another channel. The rack is designed for the operation of one system. The rack dimensions are 2,600 x 644 x 250 mm.

The Unattended Repeater Station, NUP

Equipment Complement	For one system	For two systems
SU-NUP rack	1	2
SV-NUP rack	1	1
Automatic shutter with a fan	1	1

Note: The equipment for unattended intermediate stations (NUP's) is supplied as a complete set for an OUP-OUP section. Where necessary, it is permissible to supply the racks separately. Included in the NUP station complement, besides the main equipment, are also boards with chokes, a set of phantom lines and spare parts and modules.

Purpose:

SU-NUP with AGC with KCh. A rack of NUP amplifiers having automatic gain control using a control frequency. For operation via two coaxial pairs, it contains equipment which provides for the amplification of television and telephone signals in a frequency range of from 0.27 to 8.55 MHz. The rack contains two line amplifiers, two AGC receivers using a control frequency, four remote power supply filters, a panel of voltage regulators, two blocks of rectifiers and an autotransformer block. The rack dimensions are 2,000 x 650 x 440 mm.

SU-NUP with AGC without KCh. A rack of NUP amplifiers with automatic gain control not using a control frequency. The purpose is the same as for the SU-NUP with control frequency AGC, but differs in that in the rack, instead of two panels of control frequency AGC receivers, there are two ground temperature referenced AGC panels. Used in the AGC circuit without control frequencies are temperature sensors, which are located at a distance of 20 - 25 m from the NUP boax at the depth at which the trunk cable is laid. The rack dimensions are 2,000 x 650 x 440 mm.

SU-NUP-M with AGC without KCh. A rack of NUP amplifiers with AGC not using a control frequency with an autotransformer block of increased power. The purpose is the same as that of the SU-NUP with AGC without control frequencies. It differs in that an autotransformer block of increased power is installed in placed of the usual block. The SU-NUP-M is installed at the NUP's closest to the OUP, where the number of NUP's powered in a half-section exceeds 14, (for example, with 12 NUP's, at the first NUP, for the case of 13 NUP's, at the first two NUP's, and so on).

The rack dimensions are 2,000 x 650 x 440 mm.

SV-NUP without USS. An auxiliary rack without service communications amplifiers. For fanning out the service pairs of a cable and protecting them against overvoltages; monitoring the climatic conditions and the condition of the NUP equipment; remote control with a 60 KHz generator to locate an amplifier with increased nonlinearity; service communications; and for the connection of auxiliary loads to the power supply circuits.

In accordance with this, the rack is outfitted with the following boards: input terminal blocks, 60 KHz generator, remote control (contact) NUP, PVU [intercom-callup unit], auxiliary loads, boxes. The rack dimensions are 2,000 x 650 x 310 mm.

SV-NUP with USS. An auxiliary rack with service communications amplifiers. The purpose is the same as for the SV-NUP without USS; it differs in that, additionally, there are four simplex transistorized service communications amplifiers in the rack, as well as line transformers and a panel of power supply units. The rack dimensions are 2,000 x 650 x 310 mm.

Note: Also installed in the SV-NUP is a K-24k solid state amplifier for the multiplexing of service quads with one system for 24 channels (see Section 4).

The following products are additionally included in the SV-NUP set:

-- Cable bundle for inter-rack connections;
-- Toggle switch in a housing for the NUP lighting;
-- Switch with a base for signaling the opening of the hatch;
-- A remote telephone plug-in socket;
-- A signaling unit for the water level in the NUP;
-- A temperature sensor for the K-1920.

The Mobile Amplifier Station (PUS-5 and PUS-7)

Placement:

The mobile stations: the main equipment is located in a ZIL-157 truck, while the ESD-20-VS/230 (or ESD-30m-VS/230) is located in a trailer.

Purpose:

Intended for operation as a mobile, backup feed station during repair work on a cable, as well as for operation under emergency conditions in place of a failed NUP or OUP.

The PUS-5 supplies trunks, on which the number of NUP's in a remote power supply half-section is no more than 11, while the PUS-7 supports no more than 15 NUP's. Each of the PUS's provides the backup equipment for one K-1920 system.

Equipment Complement

The amplifier rack, SU	1 unit
The auxiliary rack, SV	1 unit
The remote power supply cabinet (ShDP-4 for the PUS-5, and the SHDP-6 for the PUS-7)	2 units
The current distribution panel (TRShch for the PUS-5 and the ShchTR for the PUS-7)	1 unit

Approximate Weight and Cost

Equipment	Weight, kg	Price, rubles
MTS-TTs	350	5,200
SPTR-1	300	5,241
SPTR-II	300	4,484
SGOPP-I	200	2,118
SGOPP-II	190	1,646
GFCh-I	15	863
SLU-1; SLU-2	220	4,700
SLU-3; SLU-4	250	5,300
SLU-5 -- SLU-10	300	6,800
SKKU	250	4,000
KIS	400	5,600
STO-1	400	6,000
ShDP-1	500	2,600
STKR (for two panels)	144	905
STKR (for three panels)	164	1,195
STKR (for four panels)	184	1,477
SPUT-1	300	6,906
SUPT-1	300	5,543
SPrUT-1	300	5,658
SPUZS-1	400	5,389
SPrUZS-1	400	5,927
SGK-1	300	5,898
SOPT	250	4,200
STVT-OP-1	350	8,000
STVT-OP-2	350	8,400
STVT-OUP	350	6,110
SKTP	300	6,560
PKS-1	8	692
VKU-411	38	735
SU-NUP with control frequency type AGC	265	4,100
SU-NUP with AGC not using a control frequency	250	3,400
SU-NUP-M with AGC not using a control frequency	250	3,500
SV-NUP with USS	150	2,100
SV-NUP	120	1,200

Approximate Weight and Cost, [continued]

Equipment	Weight, kg	Price, rubles
Panel with chokes	12	168
Line amplifier	20	455
Transmit amplifier	20	405
Phantom line: 0.25 km, 0.5 km, 1.25 km, 1.5 km and 2.0 km each	0.2	9.80

The K-1920U Transmission System

Purpose:

The K-1920 transmission system has now been improved, and has been designated the K-1920U.

The equipment was improved for the purpose of eliminating defects discovered in the K-1920 equipment, improving communications system reliability, as well for the capability of using this equipment on combination cables, which contain normal and reduced diameter coaxial pairs. Given below are some of the distinctive features.

Type of Line

Coaxial, trunk cables: KMB-4, which contains four coaxial pairs, 2.6/9.4 mm, and five service (balanced) quads with 0.9 mm diameter cores, intended for service communications and remote control; KMB-8/6, which contains eight 2.6/9.4 mm coaxial pairs, six 1.2/4.6 mm coaxial pairs, 10 balanced pairs with 0.9 mm diameter cores and six individual cores with a diameter of 0.9 mm; and KMB-6/4, which contains six 2.6/9.4 mm coaxial pairs, four 1.2/4.6 mm coaxial pairs and 13 balanced pairs with a corediameter of 0.9 mm.

The Service Communications System

Trunk communications (MSS): via HF channels between terminal and retransmission stations;
Station-to-station communications (PSS-1): via a four-wire voice frequency channel between retransmission stations with all OUP's tied in;
Station-to-station communications (PSS-2): via a four-wire voice frequency channel between the administration of regions of a cable trunk with the connecting in of the corresponding OUP's;
Station-to-station communications (PSS-3): via a four-wire voice frequency channel for servicing group channels and individual channels in a combination cable on segregated routes of a trunk using the K-300R transmission system;
Sectional Communications (USS): via a two-wire voice frequency channels between OUP's and NUP's, which are located in a half-section, as well as adjacent to OUP's and between NUP's in these half-sections.

The Composition and Function of the Line Channel Equipment

SLUK. Rack of line amplifiers and correctors, for compensating for the attenuation of the cable preceding the repeater section, and correcting the amplitude-frequency and phase-frequency distortions of the channel. Each rack is designed for operation via two coaxial pairs. Three types of the SLUK racks are manufactured (SLUK-1, SLUK-2 and SLUK-3). They differ from each other in the equipment complement of phase correctors and amplitude equalizers:

SLUK-1. They include a type I phase corrector, designed for 90 km, and an amplitude equalizer.

SLUK-2. They include a type II phase corrector for 90 km and an amplitude equalizer.

SLUK-3. They include type I and II phase correctors, and two amplitude equalizers.

SPAK. The variable amplitude equalization rack for:

-- Correction of the amplitude-frequency distortions throughout the entire line frequency spectrum by means of a cosine corrective network;

-- Automatic control of the amplitude-frequency response of the line channel based on four control frequencies: 308, 1,056, 5,974 and 8,544 KHz;

-- Feeding the 5,974 and 8,544 KHz control frequencies with the channel switching unit;

-- Amplifying the 308 KHz control frequency for feeding it through in the control frequency retransmission points;

-- Blocking of the AGC devices and signaling when the level of any of the control frequencies deviate by $\pm(0.3 \pm 0.05)$ Np or more from the nominal value;

-- The capability of connecting television signal branching devices. Two types of SPAK racks are manufactured: SPAK-1 and SPAK-2, which differ from each other only in that the SPAK-1 contains 24 harmonics, while the SPAK-2 has 12 harmonics.

The order for the installation of the SPAK-1 and SPAK-2 racks on a trunk has not as yet been established.

SORTK. A rack for combining and separating telephone channels to provide for the operation of four channel routes: two receive channel routes and two transmit channel routes.

SLUT. A rack of line amplifiers for the junction line of an MTS-TTs, is intended for compensating for the junction line cable attenuation, the correction of the phase characteristics, noise suppression in the frequency range of the 300 telephone channels and the segregation of the TV channel and accompanying audio from the composite spectrum during the joint transmission of the telephone channel and television spectra. The SLUT provides for the operation of two routes: transmit and receive.

SZFD. A rack of suppression filters and differential systems, which is intended for combining and separating 300 telephone channels and a television channel (with accompanying audio) for the case of their joint transmission, and the suppression of the 5,974 and 8,544 KHz control frequencies. The SZFD is designed for two transmission directions.

SKKT. The rack of TV cosine corrective networks, which is intended for the supplemental amplitude equalization of the television channel, independently of the line channel. The SKKT is installed at OUP's or OP-L's, where a provision is made for the insertion, through-working or splitting out of television programs.

The function of the SPTR, STVT, SKTP, ShDP, SOPT, STO, SSK, KIS, and STKR racks is similar to that of the K-1920 transmission system equipment.

ShDP-7 and SSK differ from the existing racks in that the current distribution panel is excluded from the ShDP-7, while introduced into the SSK, which is intended for service communications via a combination cable, is station-to-station service communications, PSS-3, for servicing the group channels and individual channels via separate routes of a trunk using the K-300R transmission system.

The Equipment Complement of the Line Channel Equipment

Terminal Station (OP-L)

Designation of the Equipment	Number of Units		
	For two systems	For three systems	For four Systems
The rack of line amplifiers and corrective networks (SLUK-1 -- SLUK-3)	1	2	2
The variable amplitude equalization rack (SPAK-1)	2	3	4
The rack for combining and separating telephone channels (SORTK)	1	2	2
The rack of line amplifiers for a junction line (MTS-TTs-SLUT)	1	1	1
The rack of suppression filters and differential systems (SZFD)	-	1	1
The control frequency rack (SKCh)	1	1	1
The rack for channel switching of a terminal station for four channels (SPTR OP-4)	1	-	-
The channel switching rack of a terminal station for eight channel routes (SPTR OP-8)	-	1	1
Remote power supply cabinet (ShDP-7)	1	2	2
Remote control rack (STO-4)	1	-	-
Remote control rack (STO-3)	-	1	1
Service communications rack (SSK-1 or SSK-2)	1	1	1
The rack for through-working and insertion of television programs (STVT OP-3)	1	1	1
The rack of TV cosine correctors (SKKT)	1	1	1
The TV program monitor rack (SKTP-1)	1	1	1
Monitor-measurement stand (KIS-1)	1	1	1
Current distribution rack (STKR)	1	1	1
Generator of fixed frequencies (GFCh-1)	1	1	1
Transparency	2	2	2

The Attended Repeater Station (OUP)

Equipment Designation	Number of Units For two systems	For three Systems	For four systems
Rack of line amplifiers and corrective networks (SLUK-1 -- SLUK-3)	2	3	4
Variable amplitude equalization rack (SPAK-1 or SPAK-2)	4	6	8
Rack for HF through working and insertion of television programs (STVT OUP-1)	1	1	1
Rack for HF through working and insertion of television programs (STVT OUP-2)	1	1	1
Direct passage rack (SPPr)	1	1	1
Rack for switching channels at an OUP for four channels (SPTR OUP-4)	1	-	-
Rack for switching channels at an OUP for six to eight channels (SPTR OUP-8)	-	1	1
Rack for splitting out a television program (SOPT-4 or SOPT-8)	1	1	1
Rack of TV cosine correctors (SKKT)	1	1	1
Remote power supply cabinet (ShDP-7)	2	3	4
Remote service rack (STO-3)	-	1	1
Remote service rack (STO-4)	1	-	-
Service communications rack (SSK-1 or SSK-2)	1	1	1
Rack for monitoring TV programs (SKTP-1)	1	1	1
Monitor-test stand (KIS-1)	1	1	1
Generator of fixed frequencies (GFCh-1)	1	1	1
Transparency	2	2	2

Note: In the K-1920U system, the line channel is switched over to the backup only at the ends of a retransmission section. At points where it is necessary to provide for television through-working or insertion, or the isolation of 60-channel groups of telephone channels, a provision must also be made for OUP-P's.

The Unattended Repeater Station (NUP)

Equipment Designation	Number of Units For two systems	For three systems	For four systems
Rack of NUP amplifiers with AGC without KCh [control frequencies] having a trans former of increased power capacity (SU NUP-M-1 with ARU without KCh)	2	3	4
Rack of NUP amplifiers with AGC without KCh (SU NUP-1 with ARU without KCh)	2	3	4
Rack of NUP amplifiers with AGC using KCh (SU NUP-1 with ARU with KCh)	2	3	4
Rack for an auxiliary NUP with sectional service communications (SV NUP-1 with USS)	-	1	1
Auxiliary NUP rack (SV NUP-1)	-	1	1
Auxiliary NUP rack (SV NUP-2)	1	-	-
Auxiliary NUP rack with sectional service communications (SV NUP-2 with USS)	1	-	-

The Terminal Equipment for Intercity Television Service (OAMT)

Equipment which provides for the transmission and reception of TV programs:

Rack of television transmit units, SPUT-2;
Rack of television transmit amplifiers, SUPT-2;
Rack of television receive units, SPrUT-2;
Rack of accompanying audio transmit units, SPUZS-2;
Rack of accompanying audio receive units, SPrUZS-2;
Harmonic corrector rack, SGK-2;
Video monitor;
Current distribution rack, STKR;
Transparency.

The designation of the racks is similar to that of the corresponding racks of the K-1920 system.

(a) (b) (c) (d)

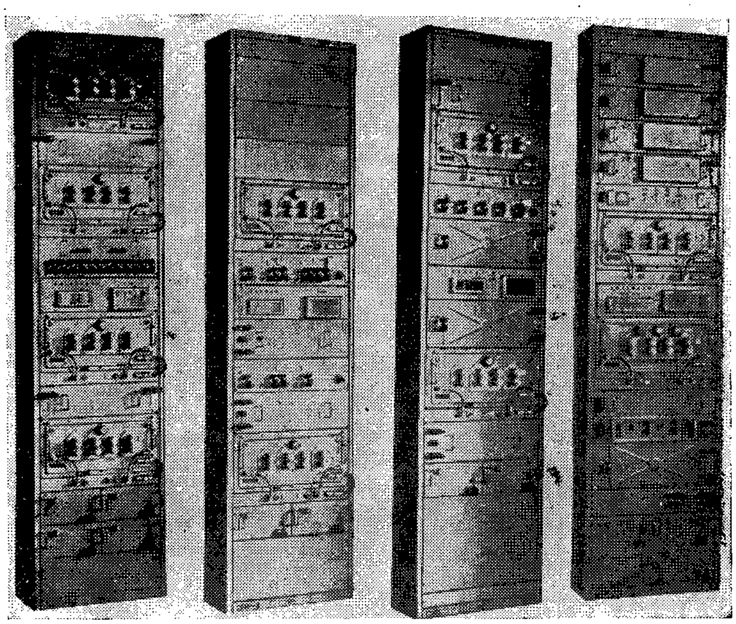
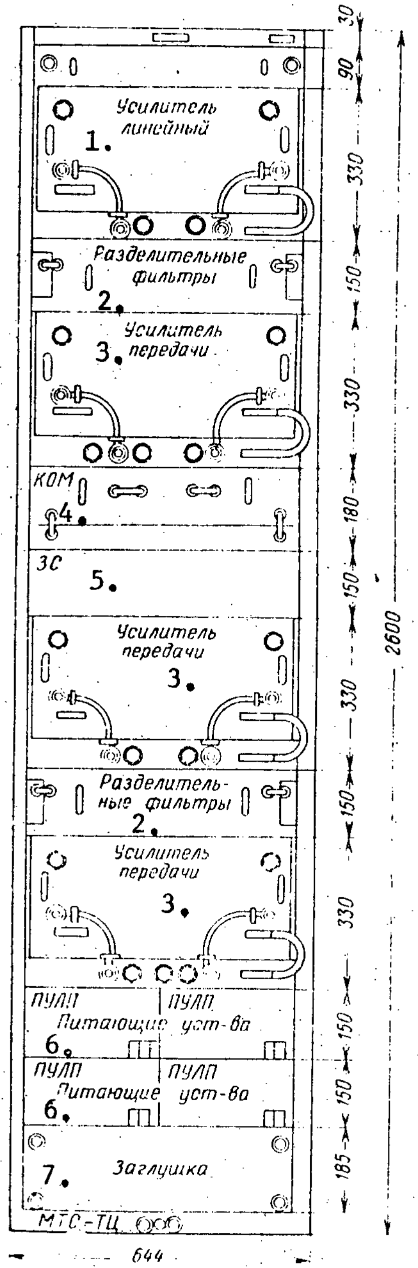


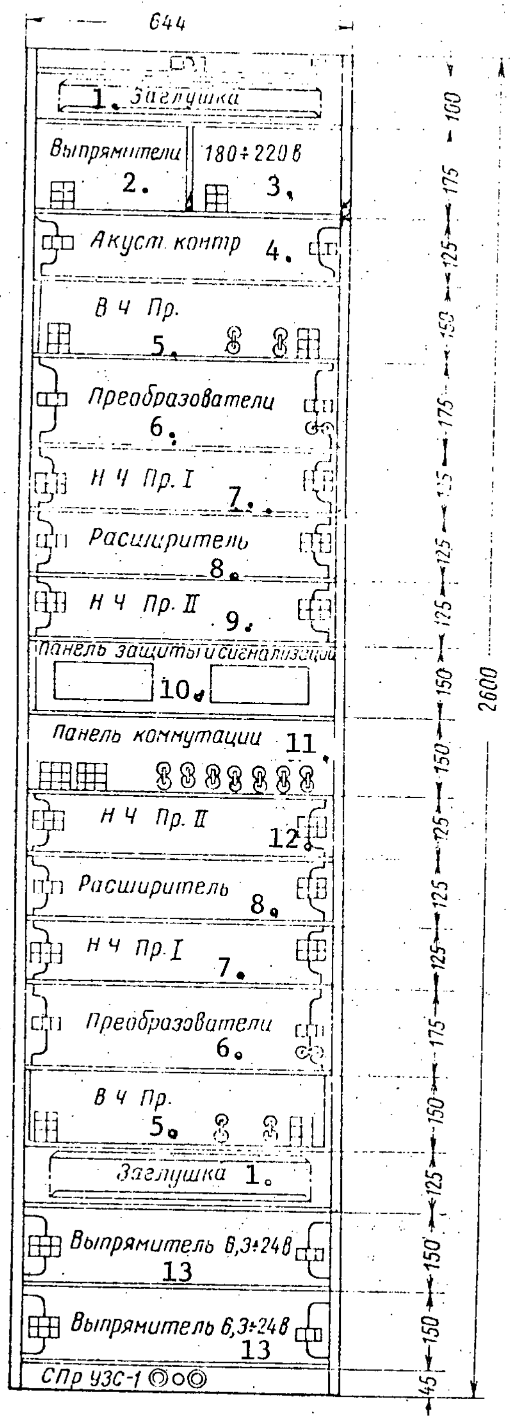
Figure 5.2.1. Exterior view of the K-1920 equipment racks:
a) MTS-TTs;
b) SPTR-II;
c) SOPT;
d) SLU.



Key:

1. Line amplifier;
2. Separating filters;
3. Transmit amplifier;
4. KOM [expansion unknown];
5. ZS [protection and signaling panel];
6. PULP power supplies;
7. Blank panel.

Figure 5.2.2. The placement of the equipment in the MTS-TTs rack of the K-1920 equipment.



Key:

1. Blank panel;
2. Rectifiers;
3. 180 - 220 volts;
4. Audio monitor;
5. HF receiver;
6. Converters;
7. Low frequency receiver I;
8. Expander;
9. Low frequency receiver II;
10. Protection and signaling panel;
11. Switching panel;
12. Low frequency receiver II;
13. 6.3 - 24 volt rectifier.

Figure 5.2.3. The placement of the equipment in the SPrUZS-1 television broadcast audio receiver rack of the K-1920 equipment.

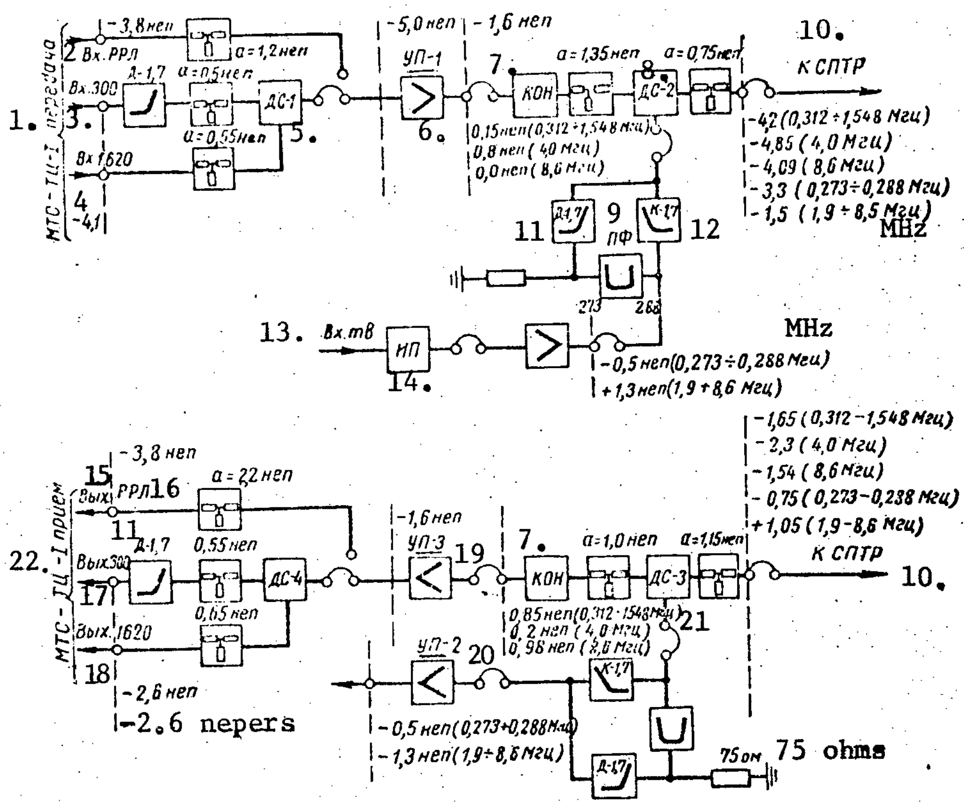


Figure 5.2.4. Block diagram of the MTS-TTs rack of the K-1920 equipment.

Key:
1. MTS-TTs-I, transmit;
2. Radio relay link input;
3. 300 [channel] input;
4. 1,620 [channel] input;
5. Differential system 1;
6. UP-1 [?transmit amplifier 1?];
7. KON [inverse slope network];
8. Differential system 2;
9. PF [bandpass filter];
10. To the SPTR [terminal station channel switching rack];
11. D-1.7 filter;
12. K-1.7 filter;
13. TV input;
14. IP [?meter?];
15. Output;
16. RRL [radio relay link];
17. 300 [channel] output;
18. 1,620 [channel] output;
19. UP-3 [?transmit amplifier 3?];
20. UP-2;
21. 0.8 Np (0.312 - 1,548 MHz); 0.2 Np (4.0 MHz); 0.98 Np (8.6 MHz)
22. MTS-TTs-I, receive.

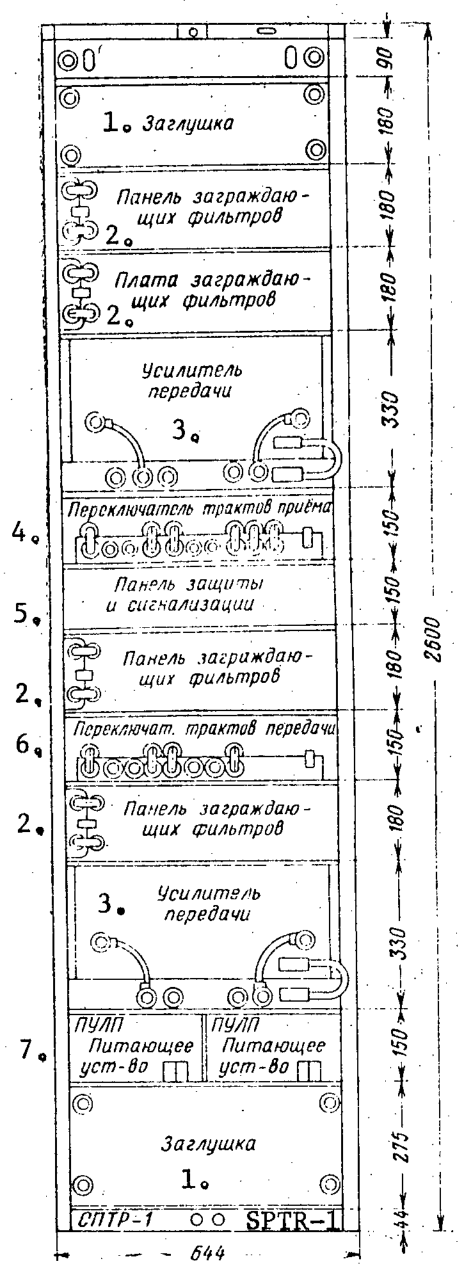


Figure 5.2.5. The placement of the equipment in the terminal station channel switching rack, SPTR-I, of the K-1920 equipment.

Key: 1. Blank panel;
2. Panel of suppression filters;
3. Transmit amplifier;
4. Receive channel switcher;
5. Protection and signaling panel;
6. Transmit channel switcher;
7. PULP power supply unit.

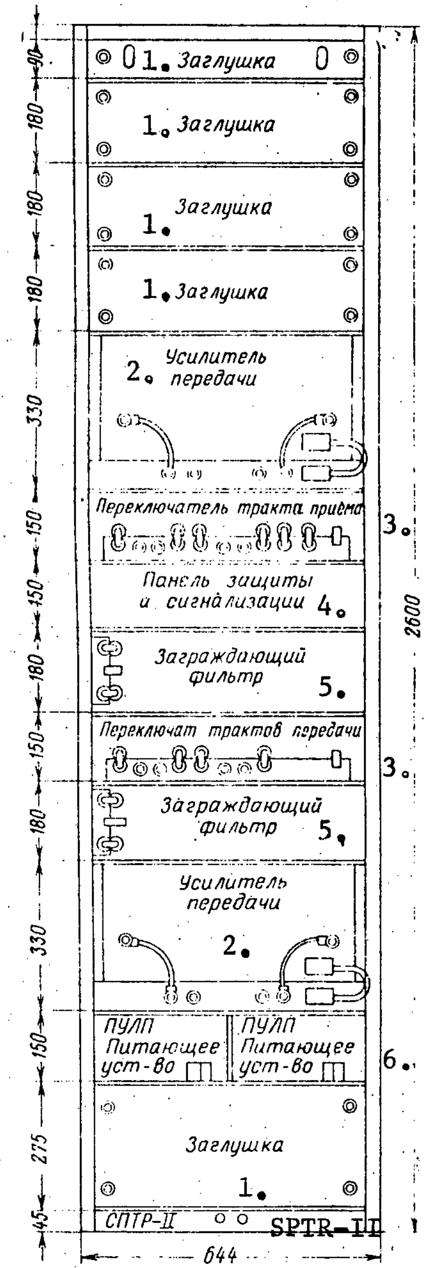


Figure 5.2.6. The placement of the equipment in the channel switching rack of a switching station, SPTR-II, of the K-1920 equipment.

Key: 1. Blank panel;
2. Transmit amplifier;
3. Receive channel switcher;
4. Protection and signaling panel;
5. Suppression filter;
6. PULP power supply unit.

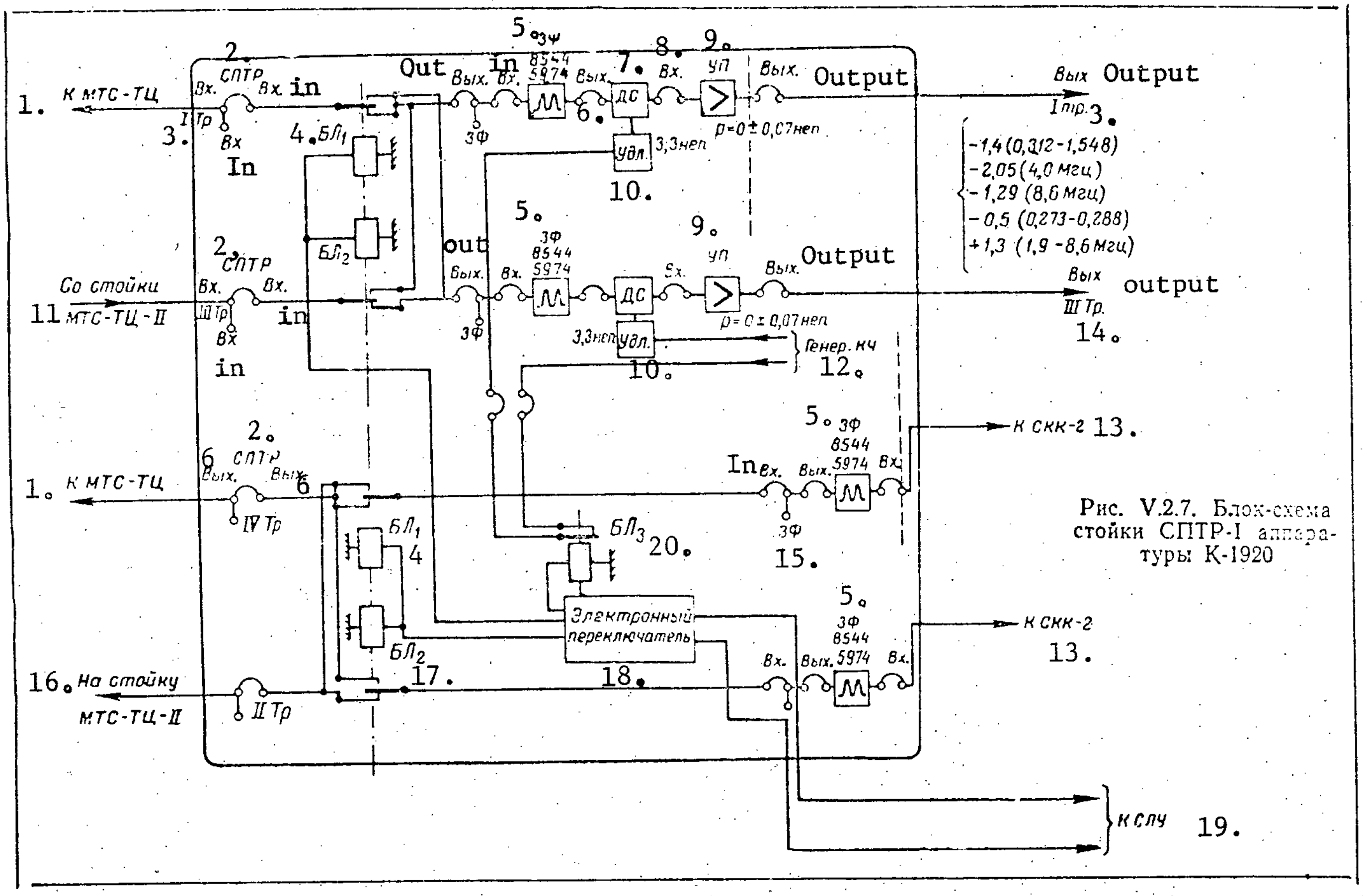


Figure 5.2.7. Block diagram of the SPTR-I rack of the K-1920 equipment.

Key:
1. To the MTS-TTs [long distance telephone exchange--television center];
2. SPTR [terminal station channel switching rack];
3. I Tr [transformer I];
4. BL_1 [expansion unknown];
5. ZF 8544 - 5974 [8,544 and 5,974 KHz suppression filter];
6. Output;
7. DS [differential system];
8. Input;
9. UP [?transmit amplifier?];

[Key to Figure 5.2.7, continued]:

10. Pad, 3.3 Np;
11. From the MTS-TTs-II rack;
12. Control frequency generator;
13. To the SKK-2 [cosine corrective network rack];
14. III Tr [transformer III];
15. ZF [suppression filter];
16. To the MTS-TTs-II rack;
17. BL_2;
18. Electronic switch;
19. To the SLU [line amplifier rack];
20. BL_3.

Key [Figure 5.2.8]: →

1. Blank panel
2. RSU II [expansion unknown] panel;
3. Frequency difference meter for 5,974 and 8,544 KHz;
4. Protection and signaling panel;
5. 5,974 KHz control frequency blocks;
6. Control frequency generator per.ust. [either 'switcher' or 'transmitter'] panel;
7. Control frequency blocks (8,544 KHz control frequency).

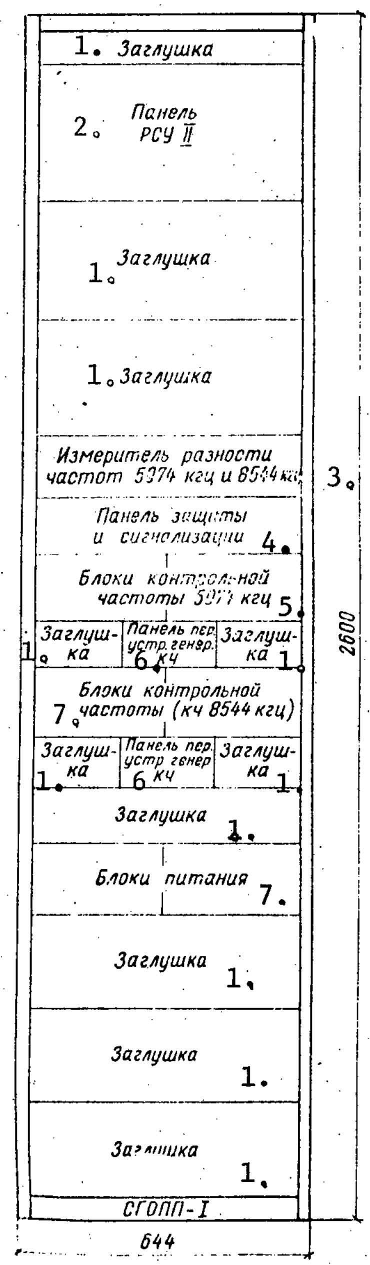


Figure 5.2.8. The placement of the equipment in the generator equipment rack of a switching station, SGOPP-I, of the K-1920 equipment.

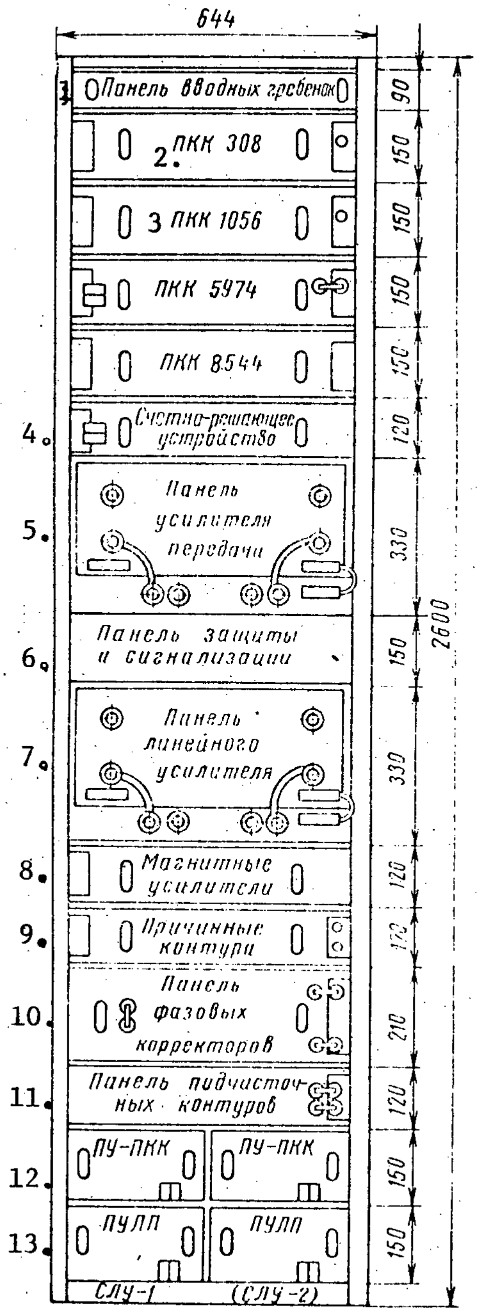


Figure 5.2.9. The placement of the equipment in the line amplifier rack SLU, of the K-1920 equipment.

Key:

1. Panel of input terminal blocks;
2. 308 KHz control channel receiver;
3. 1,056 KHz control channel receiver;
4. Counter-resolver;
5. Transmit amplifier panel;
6. Protection and signaling panel;
7. Line amplifier panel;
8. Magnetic amplifiers;
9. Causal [sic] networks;
10. Panel of phase compensators;
11. Panel of trimmer networks;
12. PU-PKK [control channel receiver switching unit];
13. PULP [expansion unknown].

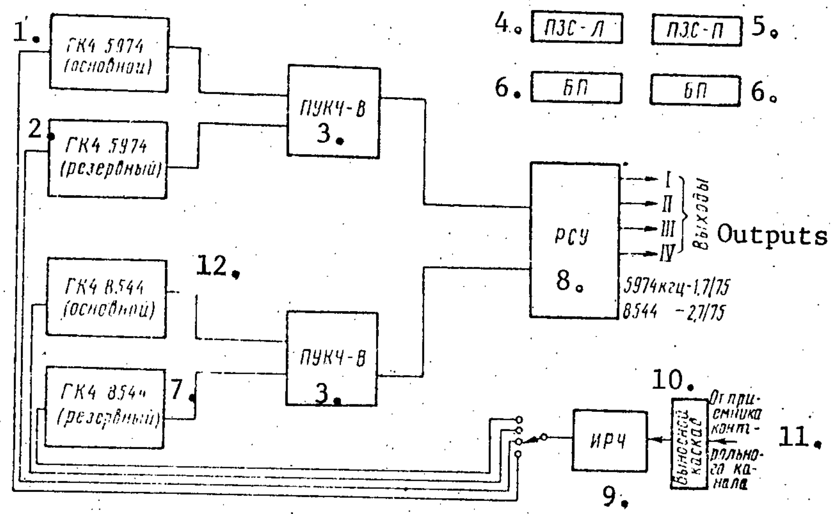


Figure 5.2.10. Block diagram of the rack of generator equipment of a channel switching station, SGOPP, of the K-1920 equipment.

Key: 1. (Main) 5,974 KHz generator, GK4;
2. (Standby) 5,974 KHz generator, GK4;
3. PUKCh-V [unknown type of control frequency switcher, possibly manually controlled];
4. PZS-L [line protection and signaling panel?];
5. PZS-P [transmit protection and signaling panel?];
6. BP [power supply blocks?];
7. (Standby) 8,544 KHz generator, GK4;
8. RSU [expansion unknown];
9. IRCh [expansion unknown];
10. Outboard stage;
11. From the control channel receiver;
12. (Main) 8,544 KHz generator, GK4.

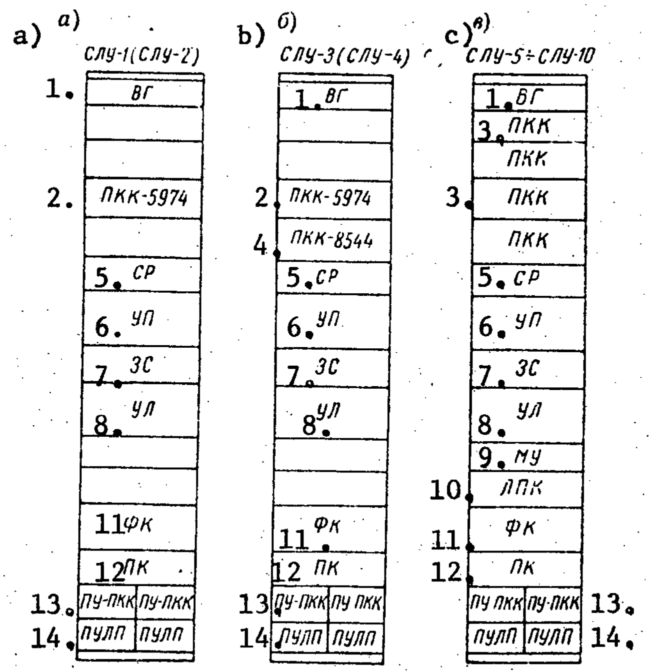


Figure 5.2.11. The placement of the panels in the following racks:
a) SLU-1 (or SLU-2);
b) SLU-3 (or SLU-4);
c) SLU-5 -- SLU-10 of the K-1920 equipment.

Key: 1. Input terminal blocks;
2. 5,974 KHz control channel receiver;
3. Control channel receiver;
4. 8,544 KHz control channel receiver;
5. SR [counter-resolver];
6. UP [?transmit amplifier?];
7. Protection and signaling panel;
8. UL [?line amplifier?];
9. MU [magnetic amplifier];
10. LPK [expansion unknown];
11. FK [phase compensator];
12. PK [trimmer networks];
13. PU-PKK [control channel receiver switcher (from the main to the standby unit)];
14. PULP [expansion unknown].

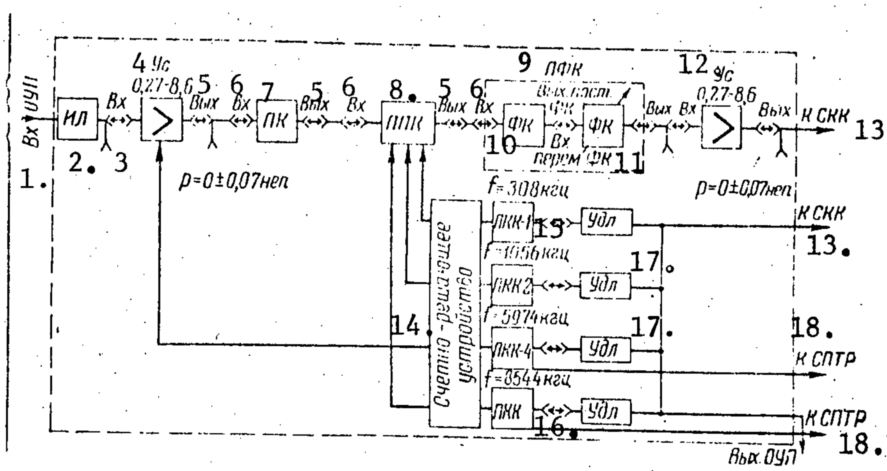


Figure 5.2.12. Block diagram of the rack of line amplifiers, SLU, of the K-1920 equipment.

Key:
1. Unattended repeater station input;
2. IL [phantom line];
3. Input;
4. 0.27 - 8.6 MHz amplifier;
5. Output;
6. Input;
7. PK [trimmer network];
8. PPK [?variable trimmer network?];
9. PFK [?variable phase compensator?];
10. FK [phase compensator];
11. Variable phase compensator input;
12. 0.27 - 8.6 MHz amplifier;
13. To the SKK;
14. Counter-resolver;
15. PKK-1 [control channel receiver 1];
16. PKK [control channel receiver];
17. Pads;
18. To the SPTR;
19. Unattended repeater station output.

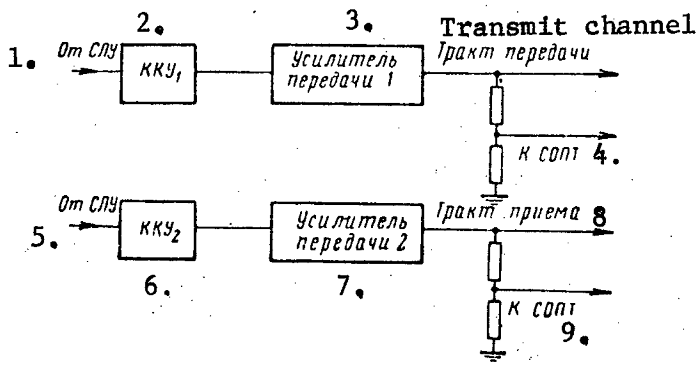


Figure 5.2.13. Block diagram of the SKKU rack of the K-1920 equipment.

Key:
1. From the SLU [line amplifier rack];
2. KKU_1 [improved cosine corrector 1];
3. Transmit amplifier 1;
4. To the SOPT;
5. From the SLU;
6. KKU_2 [improved cosine corrector 2];
7. Transmit amplifier 2;
8. Receive channel;
9. To the SOPT.

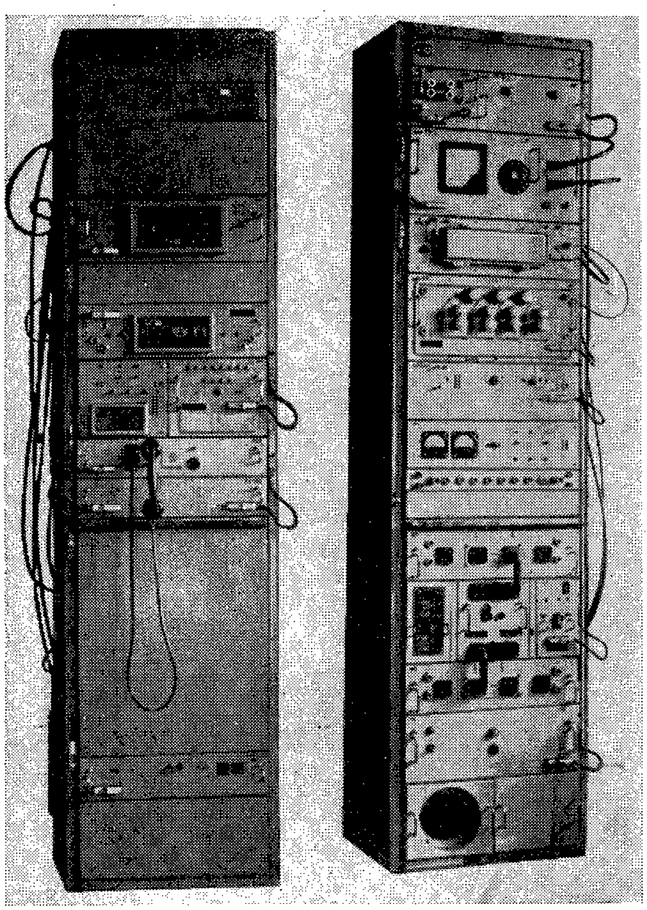


Figure 5.2.14.

Exterior view of the KIS Monitor-measurement stand of the K-1920 equipment.

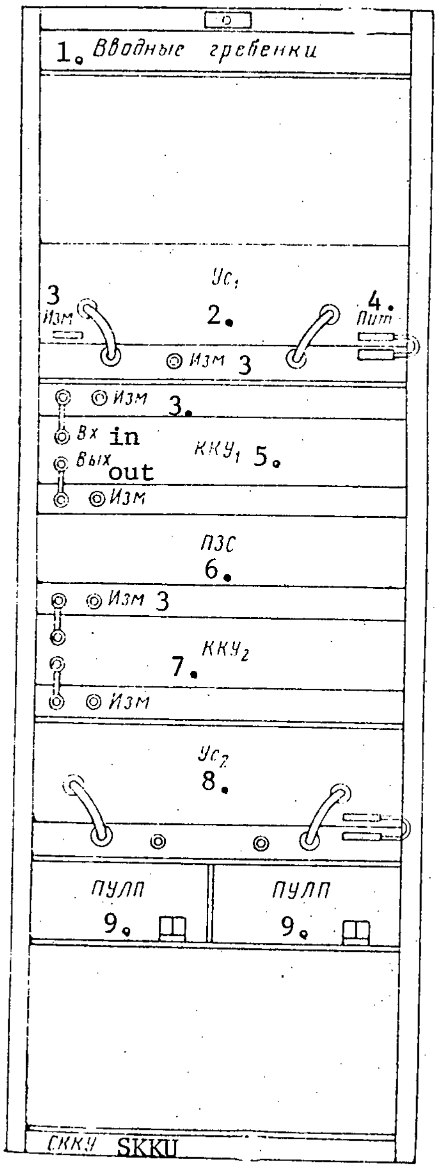


Figure 5.2.15.

The placement of the equipment in the rack of improved cosine correctors, SKKU, of the K-1920 equipment.

Key:
1. Input terminal blocks;
2. Amplifier 1;
3. Metering;
4. Power;
5. KKU_1 [improved cosine corrector 1];
6. PZS [protection and signaling panel];
7. KKU_2;
8. Amplifier 2;
9. PULP [expansion unknown].

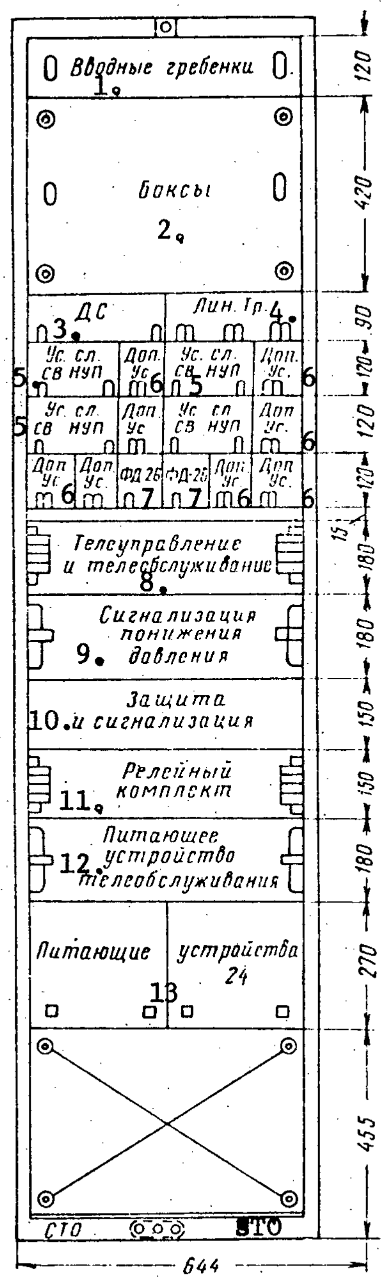


Figure 5.2.16.

The placement of the equipment in the remote servicing rack of an unattended repeater station, STO, of the K-1920 equipment.

Key:

1. Input terminal blocks;
2. Boxes;
3. Differential systems;
4. Line transformers;
5. Service communications amplifier for unattended repeaters;
6. Supplemental amplifier;
7. FD-26 filter;
8. Remote control and remote servicing;
9. Pressure drop signaling;
10. Protection and signaling;
11. Relay complex;
12. Remote servicing power supply;
13. Power supplies.

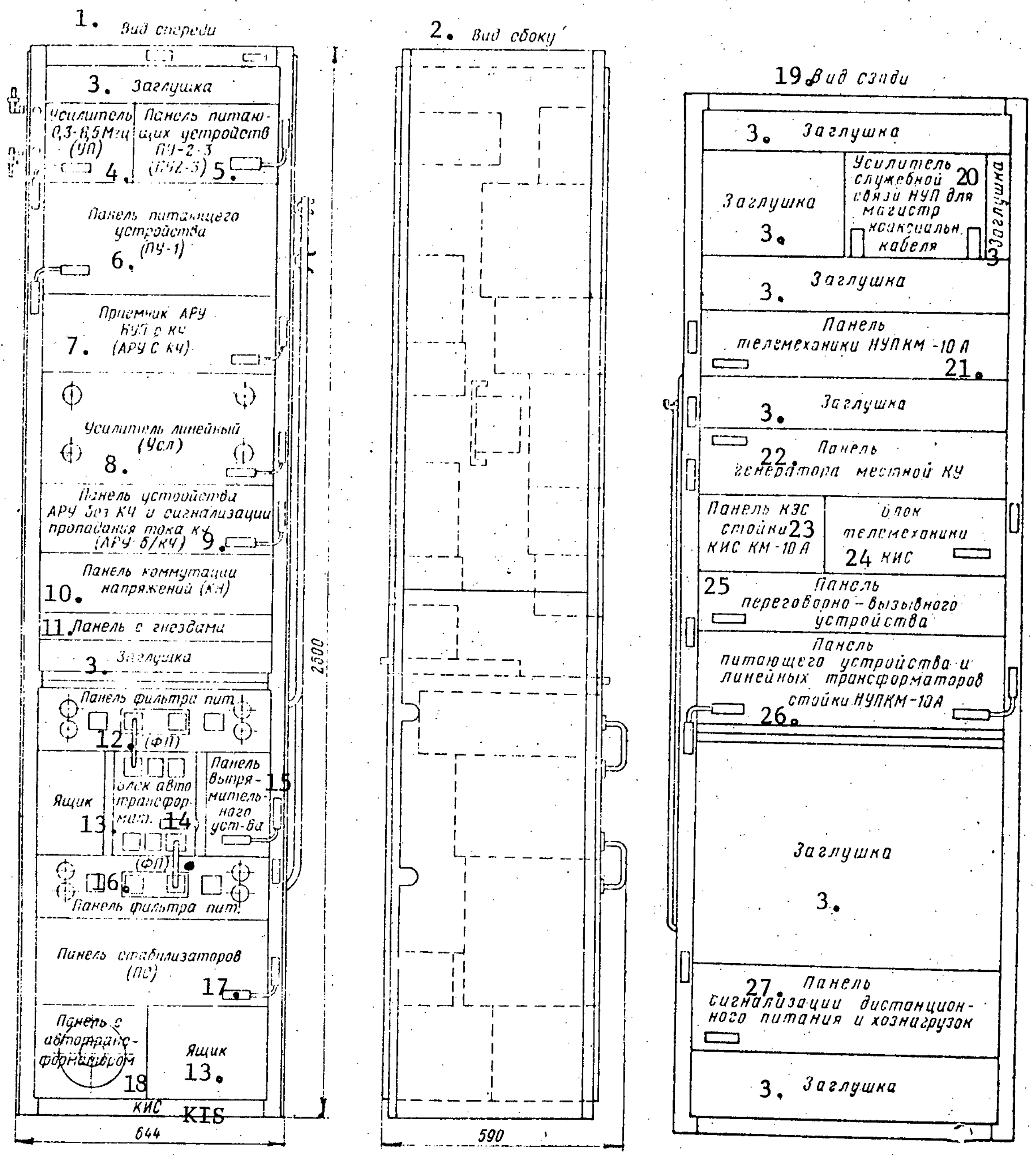


Figure 5.2.17. The placement of the equipment in the monitor and measurement stand, KIS, of the K-1920 equipment.

Key: 1. Front view;
2. Side view;
3. Blank panel;
4. 0.3 - 8.5 MHz amplifier (UP);

[Key to Figure 5.2.17, continued]:

5. Panel of power supplies, PU-2-3 (PU2-3) [sic];
6. Power supply panel (PU-1);
7. Receiver for unattended repeater station AGC using control frequencies (ARU with KCh);
8. Line amplifier (Usl);
9. Panel of the non-control frequency type AGC unit and for signaling the loss of control frequency current (ARU b/KCh);
10. Voltage switching panel (KN);
11. Jack panel;
12. Power supply filter panel (FP);
13. Box;
14. Block of autotransformers;
15. Rectifier panel;
16. Power supply filter panel (FP);
17. Panel of regulators (PS);
18. Panel with autotransformer;
19. View from the back;
20. Unattended repeater station service communications amplifier for a trunk coaxial cable;
21. NUPKM-10A remote control panel;
22. KU local generator panel;
23. KES [expansion unknown] panel of the KIS KM-10A rack;
24. Remote control block of the KIS [monitor-measurement stand];
25. Intercom-callup unit panel;
26. Panel of the power supply unit and line amplifiers of the NUPKM--10A rack;
27. Signaling, remote power and supervisory loads panel.

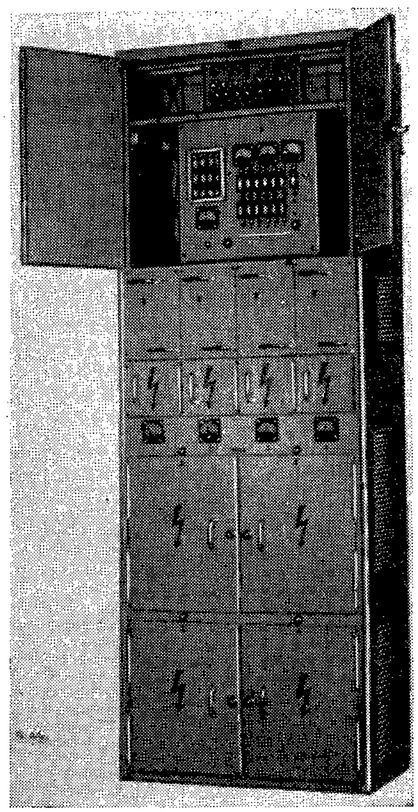


Figure 5.2.18.

Exterior view of the remote power supply cabinet, ShDP.

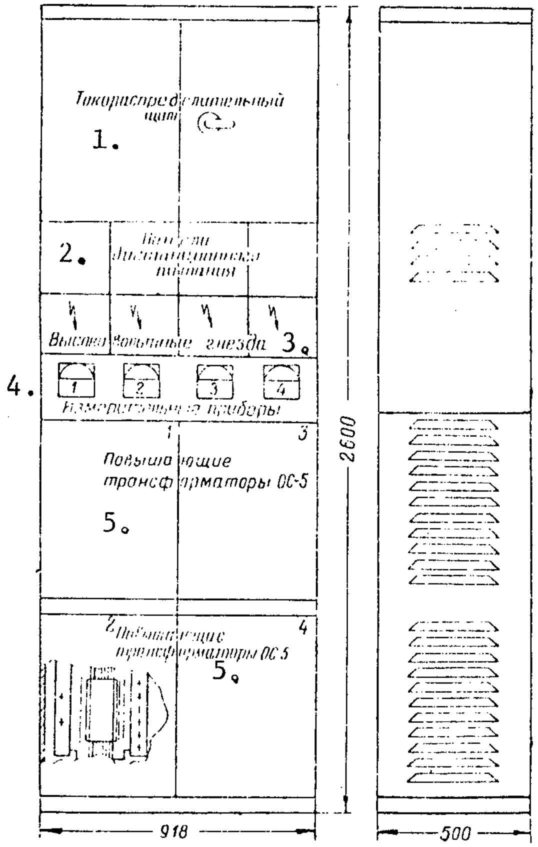


Figure 5.2.19.

The placement of the equipment in the ShDP-5 remote power supply cabinet of the K-1920 equipment.

Key: 1. Current distribution panel;
2. Remote power supplies panel;
3. High voltage jacks;
4. Meters;
5. OS-5 step-up transformers.

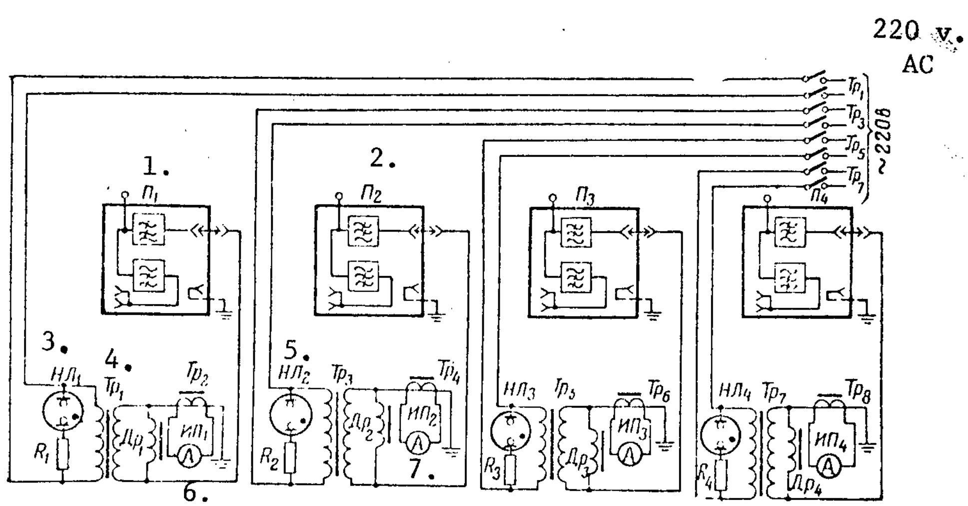


Figure 5.2.20. Schematic of the ShDP-1 and ShDP-5 remote power supply cabinets of the K-1920 equipment.

Key: 1. P_1 [?panel 1?];
2. P_2
3. NL_1 [neon lamp 1];
4. Transformer 1;
5. NL_2 [neon lamp 2];
6. Ammeter 1;
7. Ammeter 2.

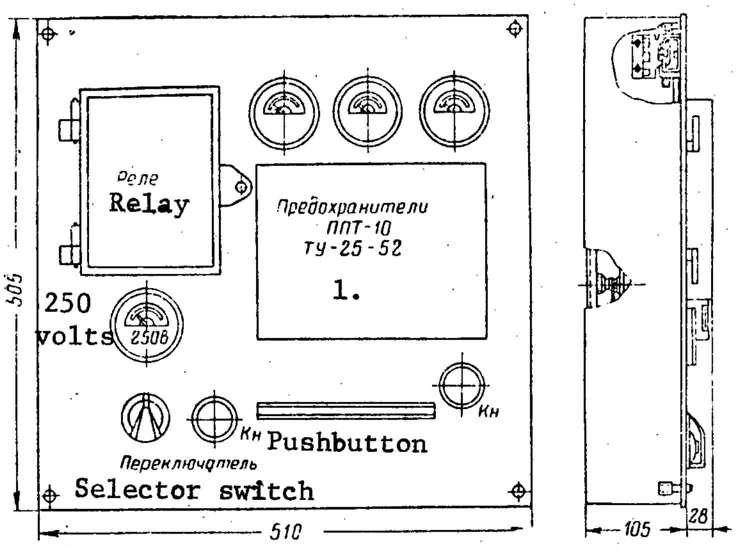


Figure 5.2.21.

The placement of the equipment on the panel of the current distribution rack, STKR, of the K-1920 equipment.

Key:

1. PP-10 fuses, Tu-25-52.

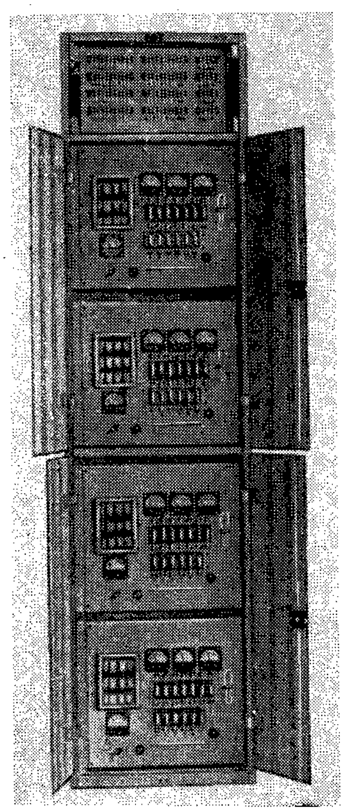


Figure 5.2.22. Exterior view of the STKR rack of the K-1920 equipment.

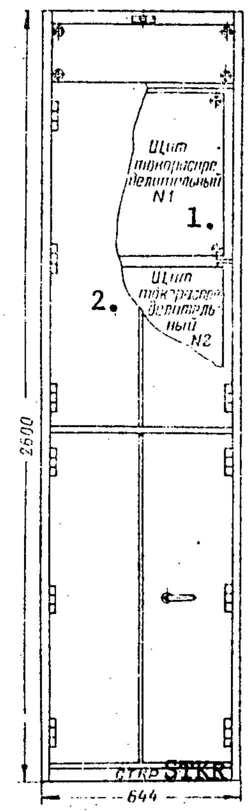


Figure 5.2.23. The placement of the equipment in the STKR current distribution rack of the K-1920 equipment.

Key: 1. Current distribution panel No. 1;
2. Current distribution panel No. 2.

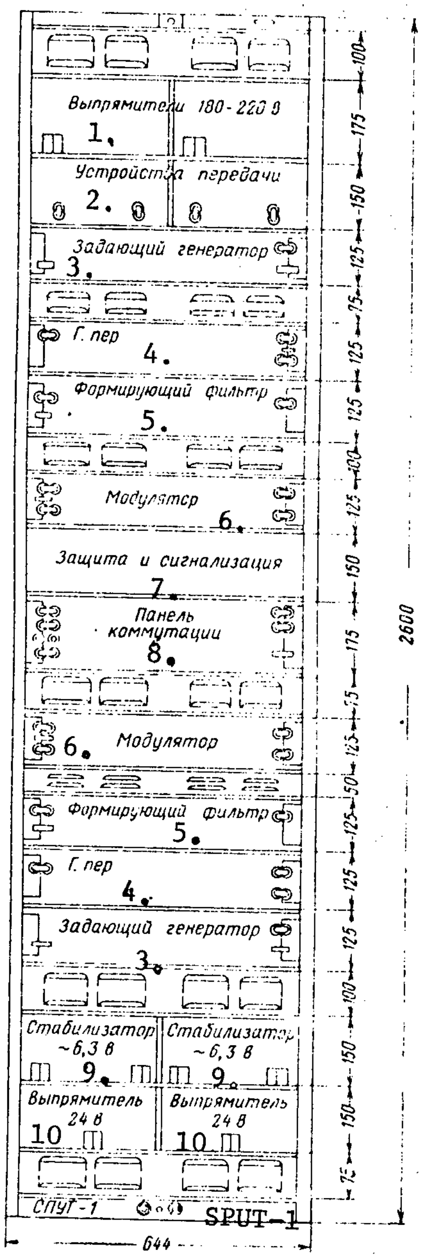


Figure 5.2.24.

The placement of the equipment in the rack of televsion broadcast transmit units, SPUT-1, of the K-1920 equipment.

Key:
1. 180 - 220 volt rectifiers;
2. Transmitters;
3. Master oscillator;
4. Transmit generator;
5. Shaping filter;
6. Modulator;
7. Protection and signaling;
8. Switching panel;
9. 6.3 volts AC, regulator;
10. 24 volts rectifier.

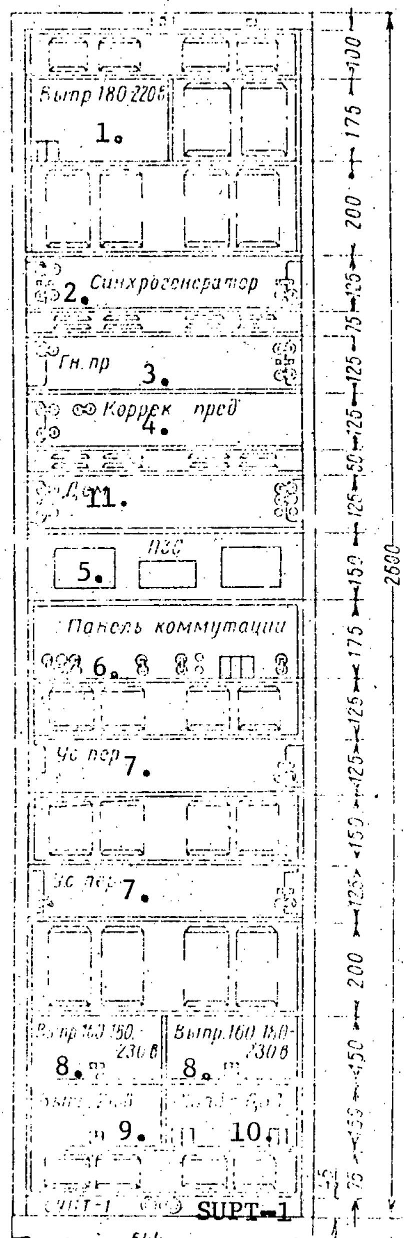


Figure 5.2.25.

The placement of the equipment in the rack of television broadcast transmit amplifiers, SUPT-1, of the K-1920 equipment.

Key:

1. 180 - 220 volt rectifiers;
2. Sync generator;
3. [?receive jacks?];
4. Preliminary equalization;
5. Protection and signaling panel;
6. Switching panel;
7. Transmit amplifier;
8. 160 - 180 - 230 volt rectifiers;
9. 24 volt rectifier;
10. 6.3 volt AC regulator;
11. Demodulator.

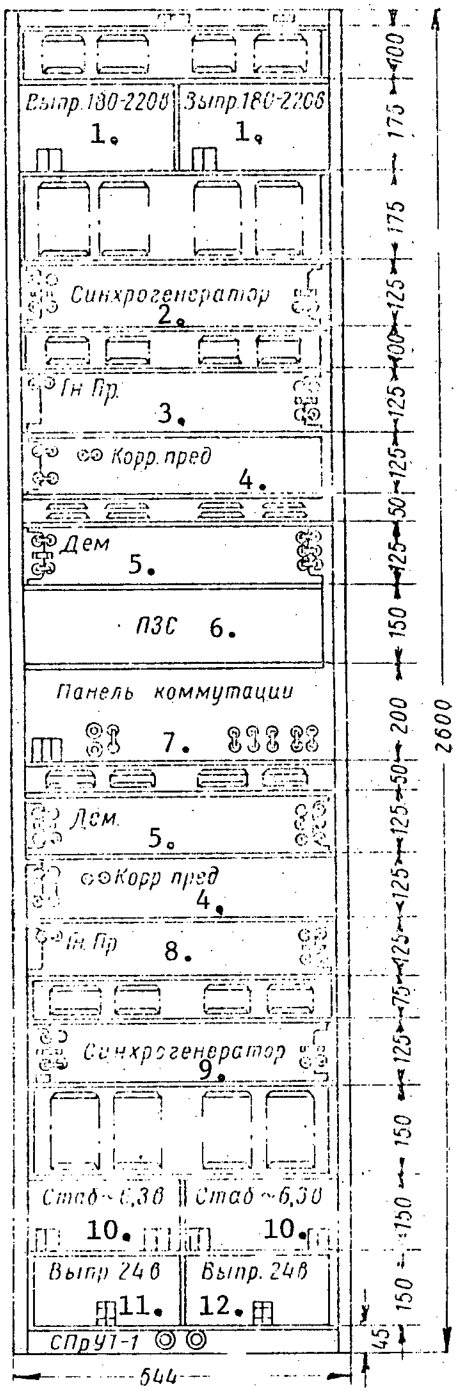


Figure 5.2.26.

The placement of the equipment in the rack of television broadcast receivers, SPrUT-1, of the K-1920 equipment.

Key:

1. 180 - 220 volt rectifiers;
2. Sync generator;
3. [?receive jacks?];
4. Preliminary equalization;
5. Demodulator;
6. Protection and signaling panel;
7. Switching panel;
8. [?receive jacks?];
9. Sync generator;
10. 6.3 volt AC regulator;
11. 24 volt rectifier;
12. 24 volt rectifier.

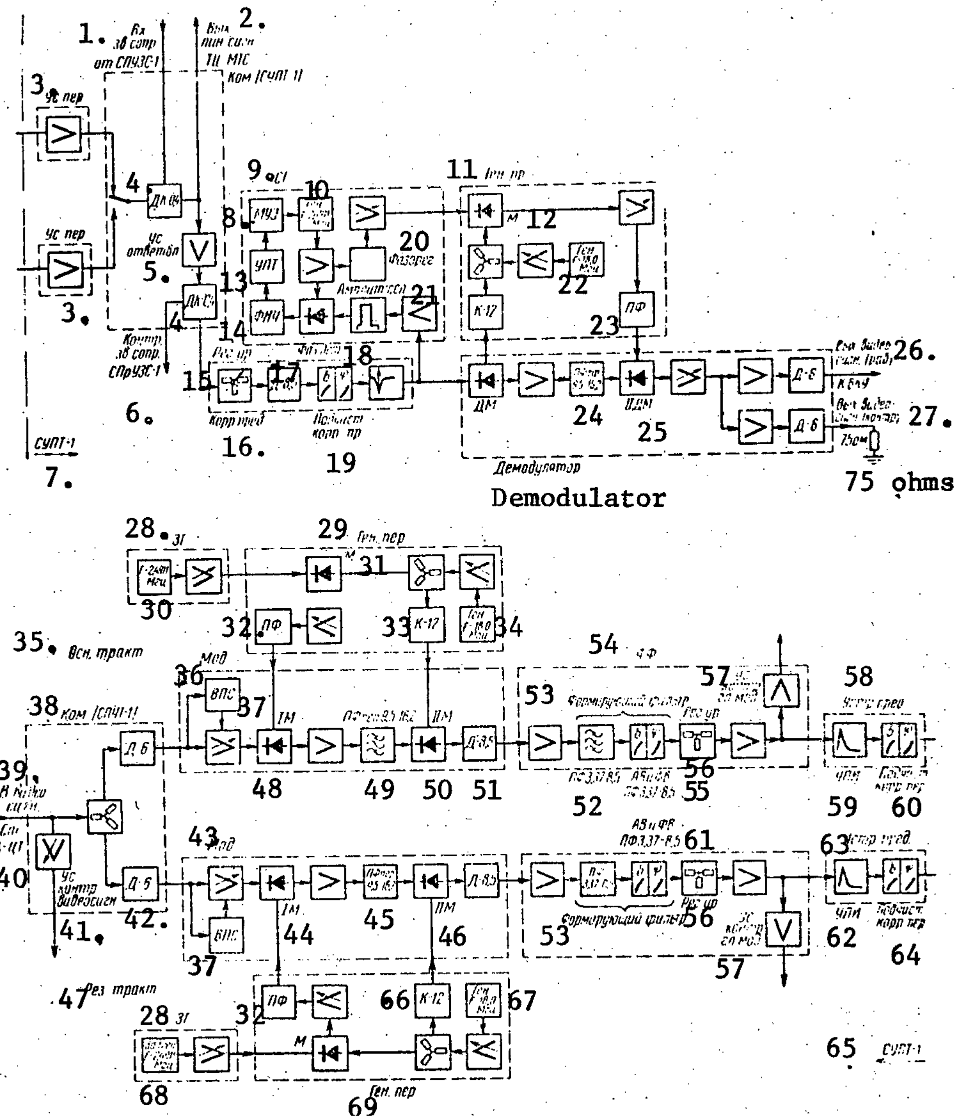


Figure 5.2.27. Block diagram of the terminal station of the K-1920 television broadcast equipment.

Key:
1. Accompanying audio input from the SPUZS-1;
2. Line signal output, TTs-MTS [TV center--long distance telephone exchange] switchboard (SUPT-1);
3. Transmit amplifier;
4. DK-0.4 filter;
5. Branching amplifier;
6. Accompanying audio monitor, SPrUZS-1;

[Key to Figure 5.2.27, continued]:

7. SUPT-1 [rack of television broadcast transmit amplifiers];
8. MUE [magnetic amplifier element];
9. [?sync generator?];
10. 2.4911 MHz oscillator;
11. Receive generator;
12. Modulator;
13. UPT [expansion unknown];
14. FNCh [low pass filter];
15. Level control;
16. Preliminary equalization;
17. D-8.5 filter;
18. Phase demodulator;
19. Receive trimmer corrective network;
20. Phase control;
21. Amplitude gate;
22. 18.0 MHz oscillator;
23. PF [bandpass filter];
24. 9.5 - 15.2 [MHz] receive bandpass filter;
25. Demodulator II;
26. Video signal output (working);
27. Video signal output (monitor);
28. Master oscillator;
29. Transmit generator;
30. 2.4911 MHz oscillator;
31. Modulator;
32. PF [bandpass filter];
33. K-12 filter;
34. 18.0 MHz generator;
35. Main channel;
36. Modulator;
37. VPS [expansion unknown];
38. Kom [?switching?] (SPUT-1);
39. Video signal input;
40. TsA-TsT St [expansion unknown];
41. Amplifier for the video monitor;
42. D-6 filter;
43. Modulator;
44. Modulator 1;
45. 9.5 - 16.2 [MHz] transmit bandpass filter;
46. Modulator II;
47. Backup channel;
48. Modulator I;
49. 9.5 - 16.2 [MHz] transmit bandpass filter;
50. Modulator II;
51. D-8.5 filter;
52. 3.37 - 8.5 MHz bandpass filter;
53. Shaping filter;
54. FF [shaping filter];
55. 3.37 - 8.5 [MHz] bandpass filter; AV i FV [amplitude and phase equalizers];
56. Level control;
57. [unknown type of modulation monitor amplifier];
58. Preliminary equalization;
59. UPI [?pre-emphasis amplifier?];
60. Transmit trimmer correctors;
61. 3.37 - 8.5 [MHz] bandpass filter; amplitude and phas equalizers;
62. UPI;
63. Preliminary equalization unit;
64. Transmit trimmer equalization networks;
65. SUPT-1;
66. K-12 filter;
67. 18.0 MHz generator;
68. 2.4911 MHz master oscillator;
69. Transmit generator.

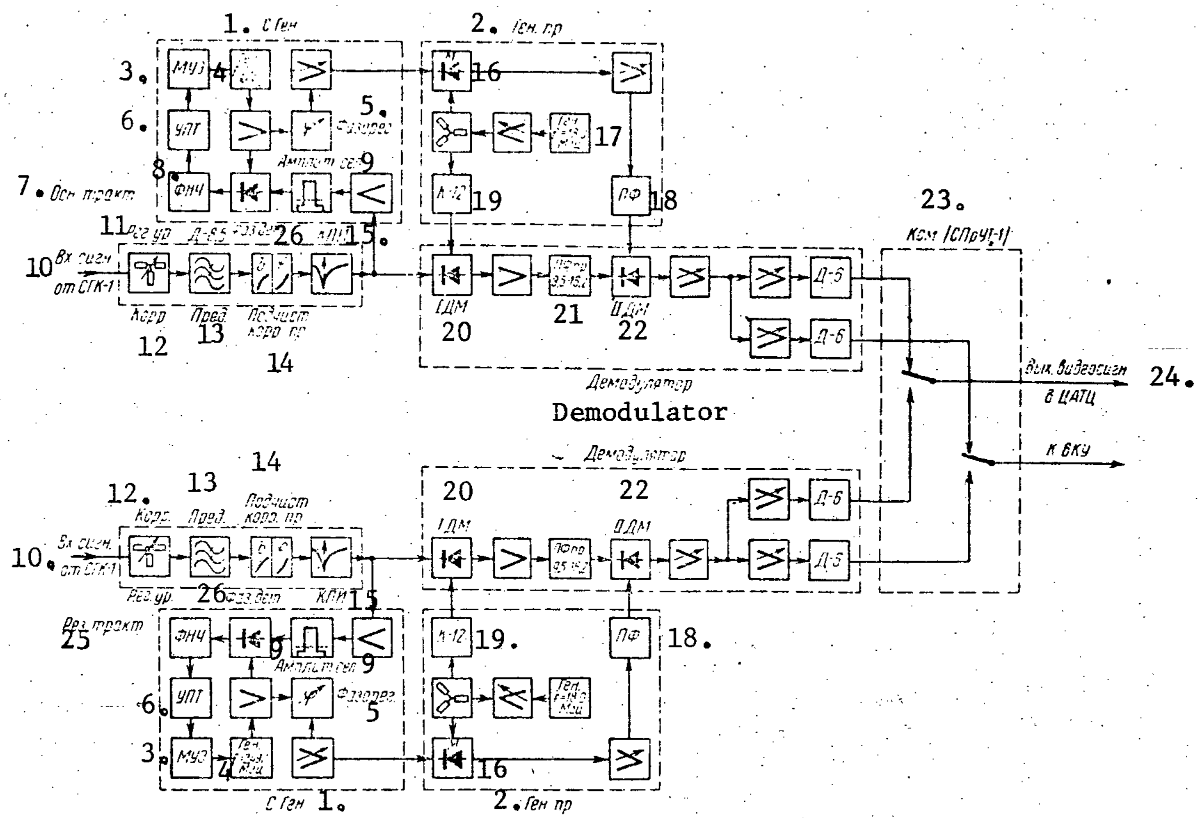


Figure 5.2.28. Block diagram of the rack of receivers of the television broadcast equipment, SPrUT-1, of the K-1920 equipment.

Key:
1. Sync generator;
2. Conversion generator;
3. MUE [magnetic amplifier element];
4. 2.4911 MHz oscillator;
5. Phase regulator;
6. UPT [expansion unknown];
7. Main channel;
8. FNCh [low pass filter];
9. Amplitude gate;
10. Input signal from the SGK-1 [harmonic corrector rack 1];
11. Level control;

[Key to Figure 5.2.28, continued]:

12. Equalizer;
13. Pred. [?preliminary?];
14. Receiver trimmer equalization networks;
15. KPI [?predistortion network?];
16. Modulator;
17. 18.0 MHz oscillator;
18. Bandpass filter;
19. K-12 filter;
20. Demodulator I;
21. 9.5 - 16.2 KHz receiver bandpass filter;
22. Demodulator II;
23. KOM [?switching?] (SPrUT-1);
24. Video signal output to the TsATTs [expansion unknown];
25. Backup channel;
26. Phase demodulator;
27. To the VKU [video monitor].

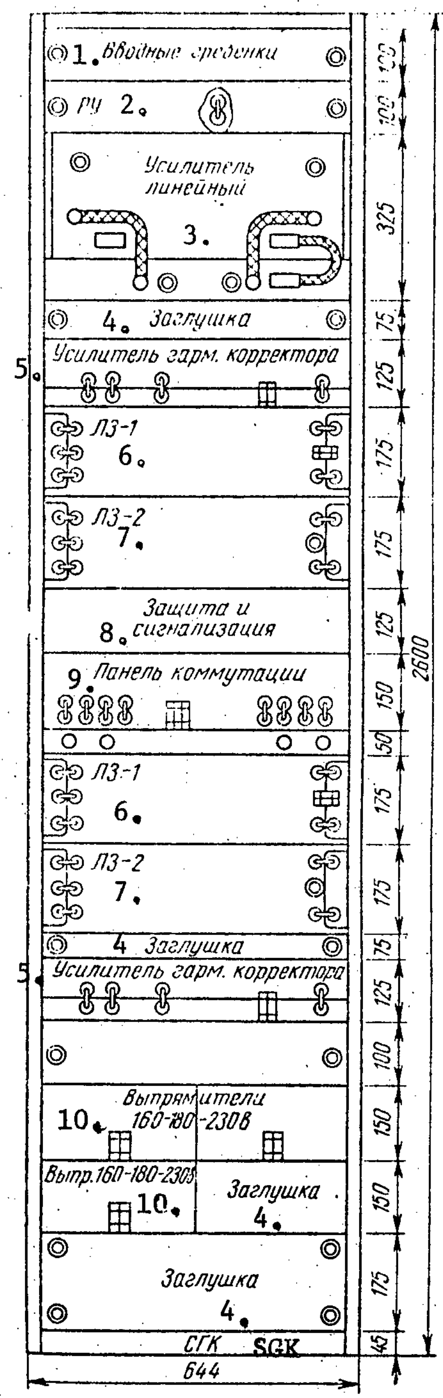


Figure 5.2.29. →

The placement of the equipment in the rack of harmonic correctors, SGK, of the K-1920 equipment.

Key:

1. Input terminal blocks;
2. Level control;
3. Line amplifier;
4. Blank filler panel;
5. Harmonic corrector amplifier;
6. LZ-1 [delay line 1];
7. LZ-2;
8. Protection and signaling;
9. Switching panel;
10. 160 - 180 - 230 volt rectifiers.

Figure 5.2.30. The placement of the equipment in the rack of television broadcast audio transmitters, SPUZS-1, of the K-1920 equipment.

Key:
1. Blank panel;
2. 180 - 220 volt rectfiers;
3. Supplemental low frequency amplifier;
4. HF transmit;
5. Converters;
6. Low frequency transmit;
7. Dynamic range compressor;
8. Protection and signaling panel;
9. Switching;
10. 6.3 - 24 volt rectifier.

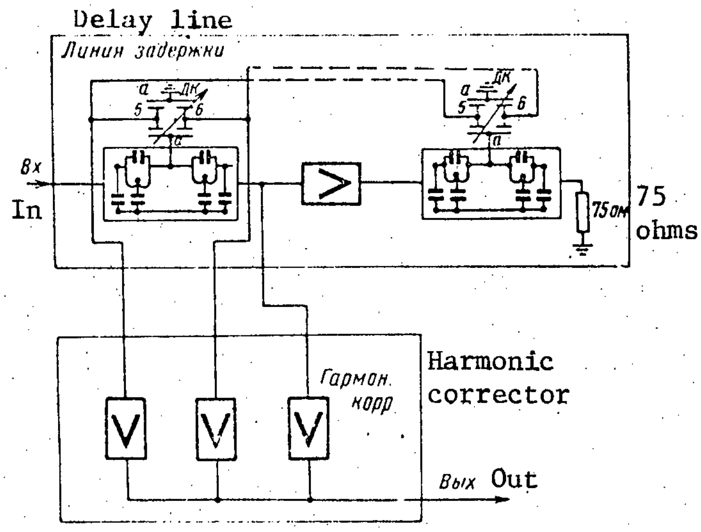


Figure 5.2.31. Block diagram of the rack of harmonic correctors of the K-1920 equipment.

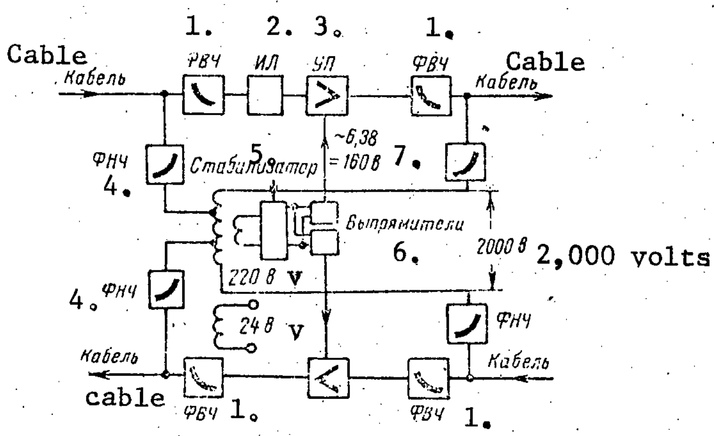


Figure 5.2.32. Block diagram of the SU-NUP amplifier rack of the K-1920 equipment.

Key: 1. FVCh [high pass filter];
2. IL [phantom line];
3. UP [?transmit amplifier?];
4. FNCh [low pass filter];
5. Regulator;
6. Rectifiers;
7. 6.38 volts AC, 160 volts DC.

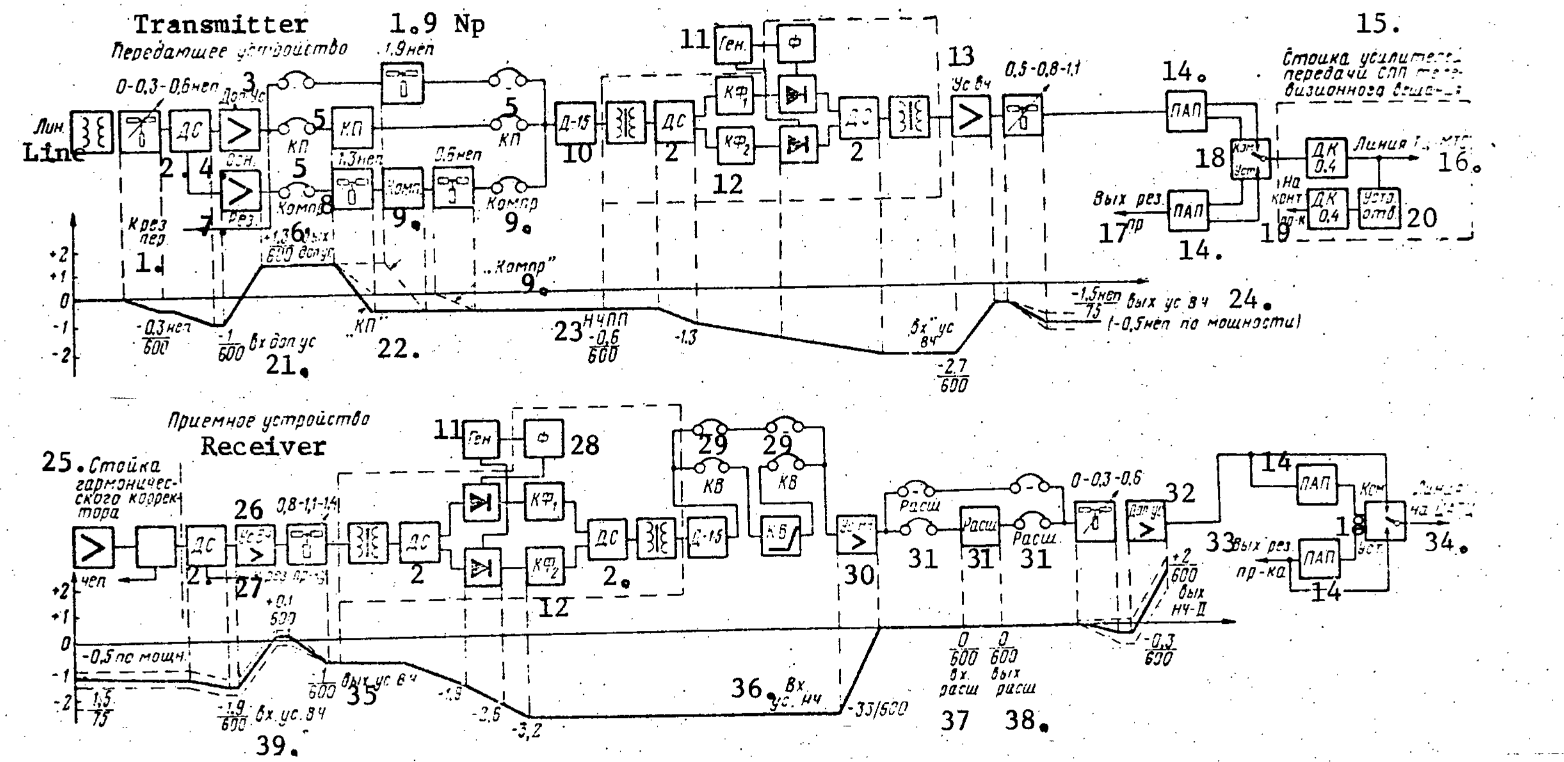


Figure 5.2.33. Block diagram and diagram of the TV broadcast audio levels of the K-1920 equipment.

Key:
1. To the backup transmitter;
2. Differential system;
3. Supplemental amplifier;
4. Osn. [main];
5. KP [?connection panel?];
6. +1.3 [Np] out, 600 [ohms], supplemental amplifier;
7. Standby;
8. Compressor;
9. Compressor;
10. D-15 filter;
11. Generator;
12. KF_2 [?crystal filter 2?]
13. HF amplifier;
14. PAP [expansion unknown];
15. Rack of transmit amplifiers, SPP, for television broadcasting;
16. Line to the television center—long distance telephone exchange;
17. Standby receiver output;
18. Switcher;
19. To the monitor receiver;

[Key to Figure 5.2.33, continued]:

20. Splitter;
21. Supplemental amplifier input, - 1 Np, 600 ohms;
22. "KP" [?connection panel?];
23. NChPP [expansion unknown], - 0.6 Np, 600 ohms;
24. HF amplifier output, - 1.5 Np, 75 ohms (- 0.5 Np with respect to power);
25. Harmonic corrector rack;
26. HF amplifier;
27. To the backup receiver;
28. Filter;
29. KV [expansion unknown];
30. Low frequency amplifier;
31. Expander;
32. Supplemental amplifier;
33. Backup receiver output;
34. Line to the TsATS [?central, automatic telephone exchange?];
35. HF amplifier output, -1 Np, 600 ohms;
36. Low frequency amplifier input, -3.3 Np, 600 ohms;
37. Expander input, 0 Np, 600 ohms;
38. Expander output, 0 Np, 600 ohms;
39. HF amplifier input, -1.9 Np, 600 ohms.

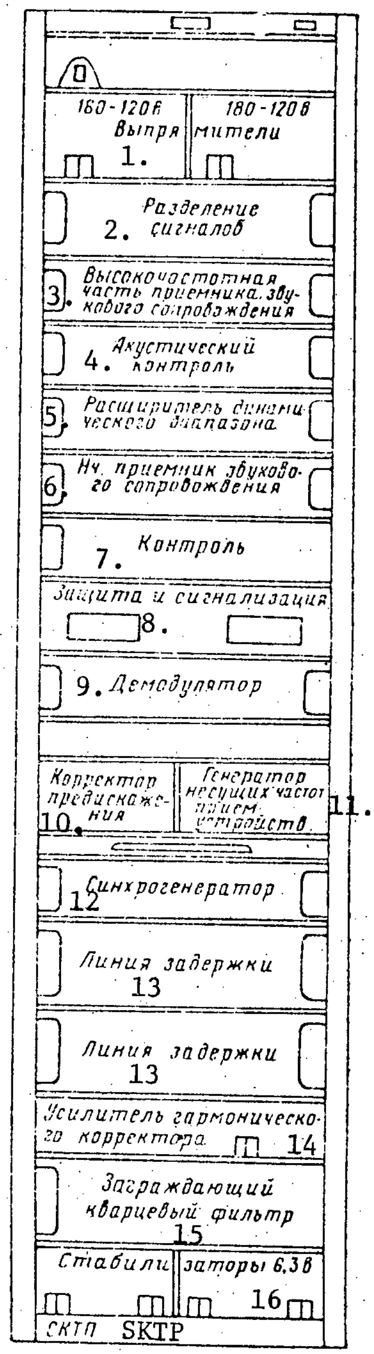


Figure 5.2.34. →

The placement of the equipment in the TV program monitor rack, SKTP, of the K-1920 equipment.

Key:
1. 180 - 120 volt rectifiers;
2. Signal separation;
3. High frequency section of the accompanying audio receiver;
4. Audio monitor;
5. Dynamic range expander;
6. Low frequency audio receiver;
7. Monitor;
8. Protection and signaling;
9. Demodulator;
10. Predistortion corrector;
11. Carrier frequency generator, receive unit;
12. Sync generator;
13. Delay line;
14. Harmonic corrector amplifier;
15. Crystal suppression filter;
16. 6.3 volt regulators.

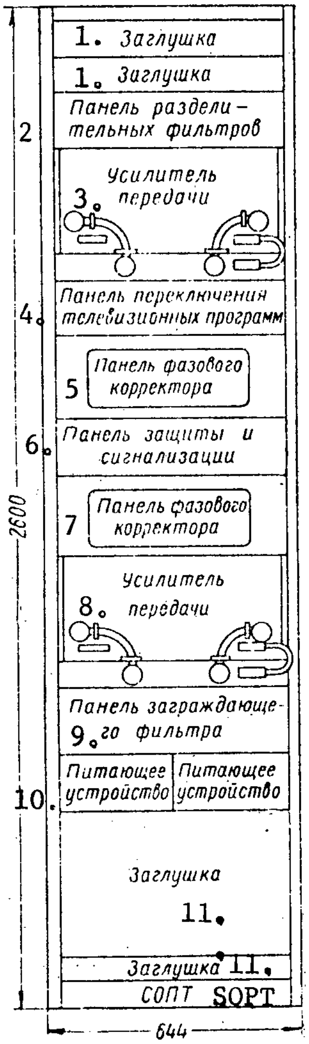


Figure 5.2.35. The placement of the equipment in the rack for splitting out a TV program, the SOPT, of the K-1920 equipment.

Key: 1. Blank panels;
2. Panel of separation filters;
3. Transmit amplifier;
4. Television program switching panel;
5. Phase corrector panel;
6. Protection and signaling panel;
7. Phase corrector panel;
8. Transmit amplifier;
9. Suppression filter panel;
10. Power supply unit;
11. Blank panel.

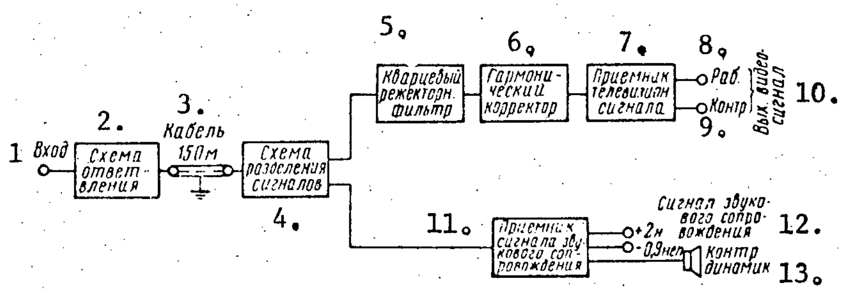


Figure 5.2.36. Block diagram of the television program monitor rack [SKTP] of the K-1920 equipment.

Key: 1. Input;
2. Branching circuit;
3. 1.50 meter cable;
4. Signal separation circuit;
5. Crystal rejection filter;
6. Harmonic corrector;
7. TV signal receiver;
8. Working;
9. Monitor;
10. Video signal output;
11. Accompanying audio receiver;
12. Audio signal;
13. Monitor speaker.

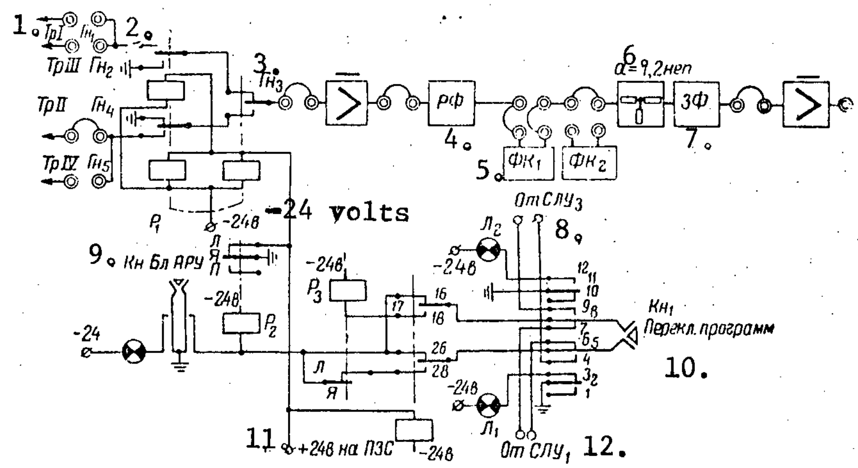


Figure 5.2.37. Schematic of the television program branching rack, SOPT, of the K-1920 equipment.

Key:
1. Transformer I;
2. Jack 1;
3. Jack 3;
4. Rejection filter;
5. Phase compensator;
6. 1.2 Np attenuation;
7. Suppression filter;
8. From the SLU_3 [line amplifier rack 3];
9. AGC blocking key;
10. Program switching key;
11. +24 volts to the protection and signaling panel;
12. From the SLU_1.

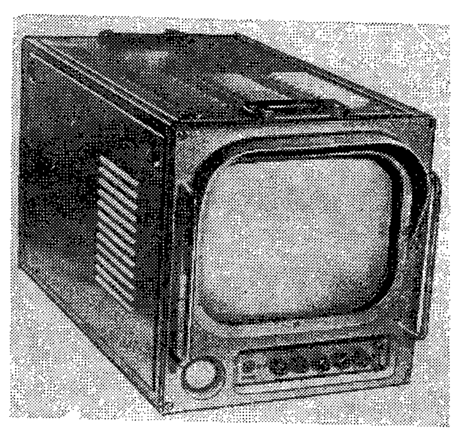


Figure 5.2.38.

Exterior view of the VKU-411 video monitor.

(a) (b) (c)

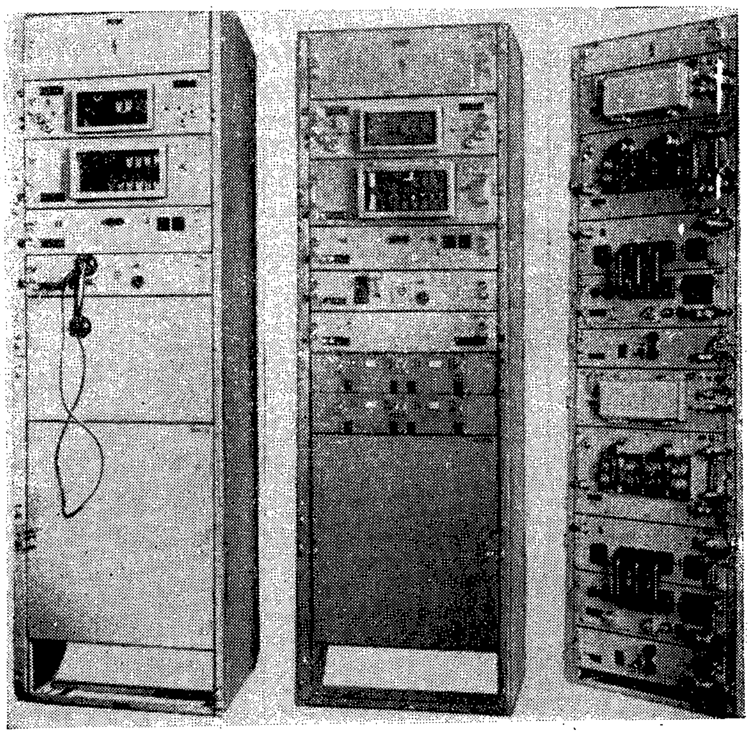


Figure 5.2.39. Exterior view of the following racks:

(a) SV-NUP without the service communications amplifiers;
(b) SV-NUP with the service communications amplifiers;
(c) SU-NUP.

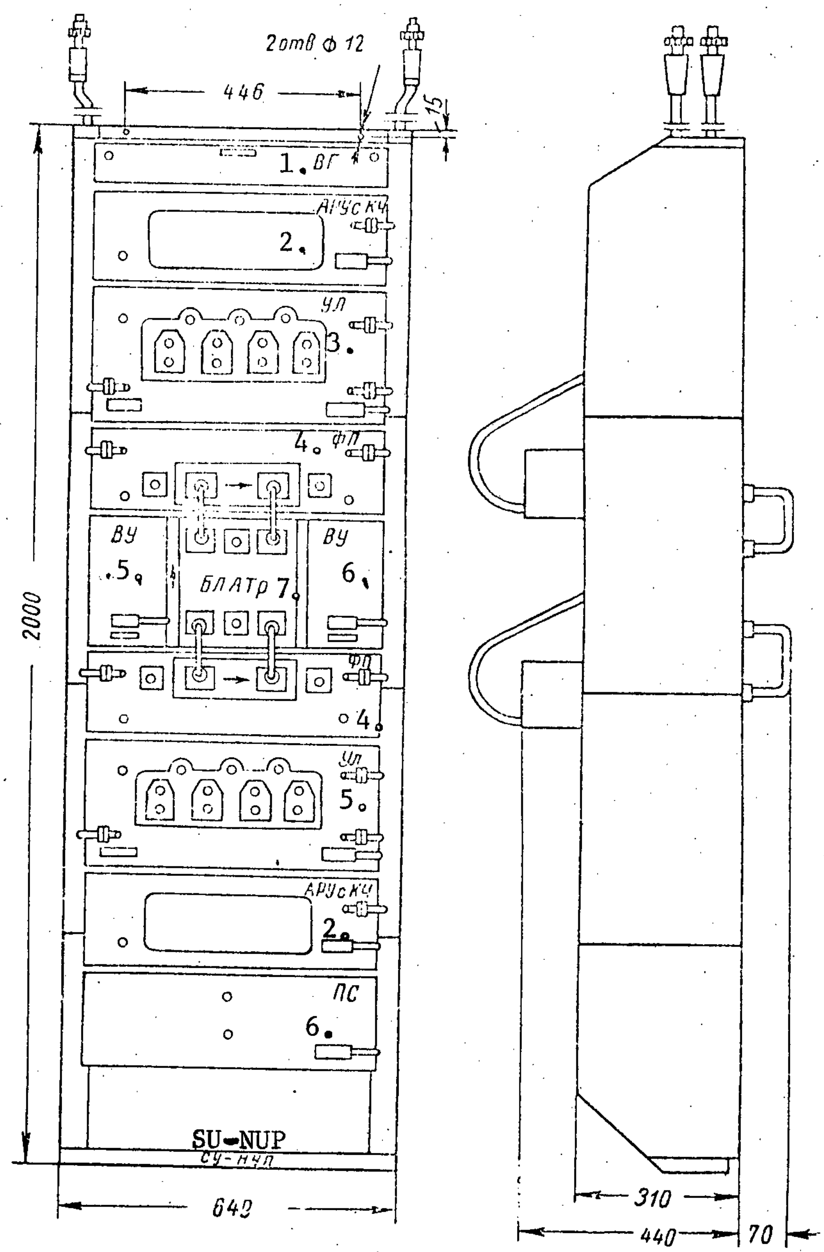


Figure 5.2.40. The placement of the equipment in the rack of amplifiers of an unattended repeater station, SU-NUP, of the K-1920 equipment.

Key:
1. Input terminal blocks;
2. Control frequency type AGC;
3. Line amplifier;
4. Power supply filter;
5, 6. VU [?ringup units?];
7. BLATr [block of line auto-transformers].

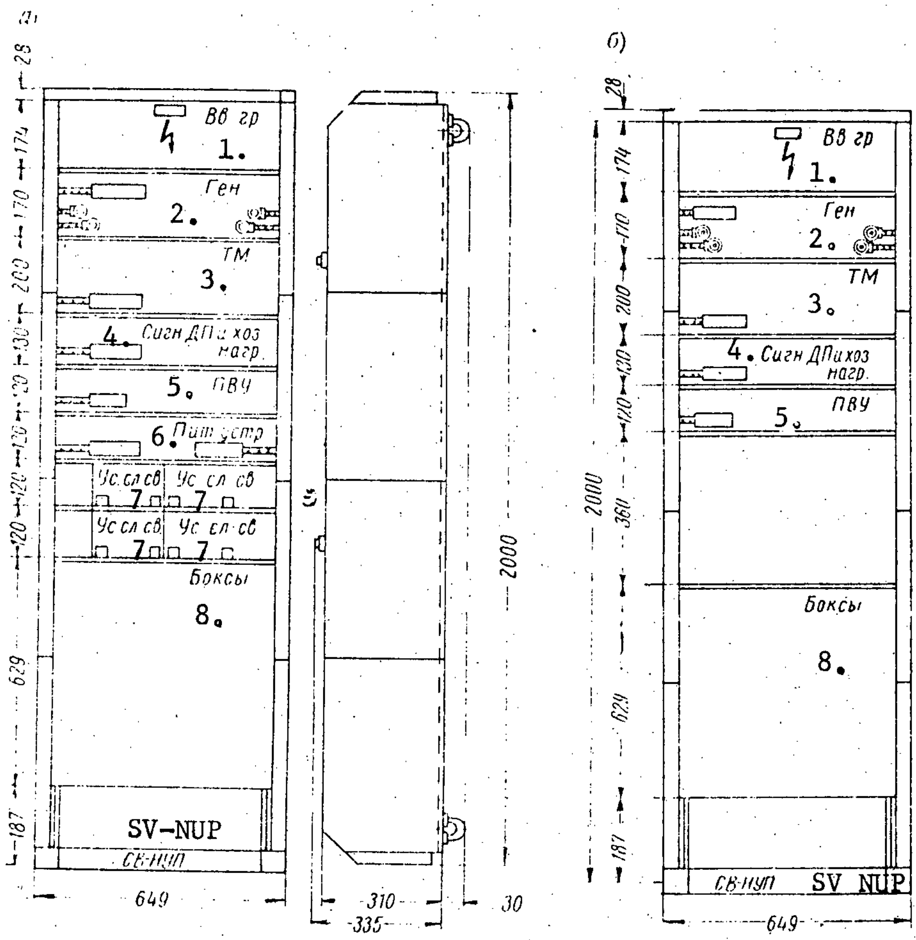


Figure 5.2.41. The placement of the equipment in the auxiliary rack of an unattended repeater station, SV-NUP, of the K-1920 equipment:

a) With the service communications amplifiers;
b) Without the service communications amplifiers.

Key: 1. Input terminal blocks;
2. Generator;
3. Remote control panel;
4. Signaling for the remote power and the supervisory loads;
5. Intercom-callup unit;
6. Power supply;
7. Service communications amplifiers;
8. Boxes.

SECTION 6. THE STANDARDIZED GENERATOR EQUIPMENT OF THE K-24, K-60, K-300, R-600 AND K-1920 TRANSMISSION SYSTEMS

6.1. The SUGO-I, SUGO-II and STGO Standardized Generator Equipment

Figures 6.1.1 - 6.1.7.

Purpose:

The standardized generator equipment is part of the terminal station equipment of transmission systems, and is intended for supplying carrier and control frequencies for the K-24, K-60, K-300, and K-1920 systems, as well as radio relay link equipment of the R-600 type.. The generator equipment complex consists of three racks: the SUGO-I, SUGO-II and STGO. The use of the racks for various multiplexing systems is presented in Table 6.1.1.

Table 6.1.1.

1. Система уплотнения	2. Тип стойки ген. оборудования	Количество Quantity
К-24	SUGO СУГО-I-3	1
К-60	СУГО-I-1	1
К-300	СУГО-I-4	1
	СУГО-II	1
R-600 Р-600	СУГО-I-4	1
	СУГО-II	1
К-1920	СУГО-I-4	1—4
	СУГО-II	1
	STGO СТГО	1

Key: 1. Multiplex system;
2. Type of generator equipment rack.

Equipment Complement and Classification

SUGO-I-1. Intended for supplying carrier and control frequencies for the K-60 systems, but can also be used for the K-300, R-600 and K-1920 systems with an overall capacity of up to:

-- 600 telephone channels using the individual carrier frequencies and the 84.14 KHz control frequency, which are necessary for the formation of the standard 12-channel groups in the 60 - 108 KHz spectrum;
-- 600 telephone channels using the primary group carriers and the 411.86 KHz control frequency, which are needed for forming the main 60-channel groups in the main and inverted frequency spectra of 312 - 552 KHz;
-- 480 telephone channels using the secondary group carrier at 564 KHz and the line control frequencies of the K-60 system (eight K-60 systems), which are necessary for the formation of the 12 - 252 KHz spectrum.

SUGO-I-2. Intended for supplying the carrier and control frequencies for the K-60, K-300, R-600 and K-1920 systems, and differs from the SUGO-I-1 in the absence of blocks for generating the individual carrier frequencies.

SUGO-I-3. Intended for supplying the carrier and control frequencies for the K-24-2 systems with an overall capacity of up to:

-- 600 telephone channels using individual carriers and the 84.14 KHz control frequency;
-- 192 telephone channels using the 120 KHz group carrier frequency and line control frequencies of 64 and 104 KHz (eight K-24-2 systems).

SUGO-I-4. Intended for supplying the carrier and control frequencies to the K-300, R-600 and K-1920 systems, and differs from the SUGO-I-1 in the absence of blocks for generating the group carriers and the 16, 112 and 248 KHz control frequencies for the K-60 systems.

SUGO-II. Intended for supplying secondary group carriers and control frequencies to the K-300 and K-1920 systems. Moreover, the SUGO-II rack provides the R-600 system with the ternary group carrier frequency (4,152 KHz), and the K-300 system with the secondary group carrier frequency (612 KHz).

STGO. Intended for supplying the ternary conversion equipment carrier frequencies, for shifting five 300-channel groups of telephone channels from the 813 - 2,044 KHz frequency spectrum to the 2,108 - 8,524 KHz spectrum in the transmit channel, as well as the back conversion in the receive channel of K-1920 systems, and supplying the 128 KHz reference frequency to the SUGO racks.

STGO-I. Intended for supplying the carrier frequencies of the conversion equipment, for the shifting of two 300-channel groups of telephone channels from the 812 - 2,044 KHz spectrum to the 2,108 - 4,636 KHz spectrum in the transmit channel, as well as the back conversion in the receive channel of the K-1920 and R-600 systems, and supplying the 128 KHz reference frequency for the SUGO racks.

The frequencies generated by the SUGO-I, SUGO-II and STGO racks are given in Table 6.1.2.

Table 6.1.2.

Kind of Frequencies (Вид частот)	1. Значения частоты, вырабатываемой стойками, кгц						
	SUGO-I-1 (СУГО-I-1)	СУГО-I-2	SUGO-I-3 (СУГО-I-3)	СУГО-I-4	SUGO-II (СУГО-II)	STGO (СТГО)	STGO-I (СТГО-I)
Individual Carrier (Индивидуальные несущие)	64	—	64	64	—	—	—
	68	—	68	68	—	—	—
	72	—	72	72	—	—	—
	76	—	76	76	—	—	—
	80	—	80	80	—	—	—
	84	—	84	84	—	—	—
	88	—	88	88	—	—	—
	92	—	92	92	—	—	—
	96	—	96	96	—	—	—
	100	—	100	100	—	—	—
	104	—	104	104	—	—	—
	108	—	108	108	—	—	—

Table 6.1.2, [continued]:

Вид частот / Kind of Frequencies	1. Значения частоты, вырабатываемой стойками, кгц СУГО-I-1 / SUGO-I-1	СУГО-I-2	СУГО-I-3 / SUGO-I-3	СУГО-I-4	СУГО-II	СТГО / STGO	СТГО-I / STGO-I
2. Первичные групповые несущие	420 468 516 564 612	420 468 516 564 612	— — — — —	420 468 516 564 612	— — — — —	— — — — —	— — — — —
3. Групповые несущие	—	—	120	—	—	—	—
4. Первичные групповые несущие инверсного спектра	252 300 348 396 444	252 300 348 396 444	— — — — —	— — — — —	— — — — —	— — — — —	— — — — —
Вторичные групповые несущие Secondary Group Carriers	564	564	—	—	1116 1364 1612 1860 2108 2356 2612	— — — — — — —	— — — — — — —
Контрольные Control [AGC]	16 112 248 84,11 411,86	16 112 248 84,14 411,86	16 104 — 84,14 —	— — — 84,14 411,86	308 1056 1364 1552 5974 8544	— — — — — —	— — — — — —
Измерительные Metering	—	—	—	—	3372 4656	— —	— —
5. Третичные групповые несущие	—	—	—	—	4152	4152 5448 6744 8040 9336	4152 5448 — — —
6. Опорные	128	128	128	128	—	128	128

Key: 1. Values of the frequency generated by the following racks, in KHz;
2. Primary group carriers;
3. Group carriers;
4. Primary group carriers of the inverted spectrum;
5. Ternary group carriers;
6. Reference [frequencies].

Climatic Operational Conditions

At temperatures of from +10 to +40° C, and a relative humidity of 75%, and 85% at a temperature of +25° C.

Electrical Power Supply

Voltages:

SUGO-I:	Transistors	21.2 volts ± 3%
	Signaling circuits	24 volts ± 10%
	Oscilloscope	220 volts AC
SUGO-II:	Filaments	220 volts AC ± 3%
	Plate	206 volts ± 3%
	Transistors	21.2 volts ± 3%
	Signaling	24 volts ± 10%
STGO and STGO-I:	Filaments	220 volts AC ± 3%
	Plate	206 volts ± 3%
	Transistors	21.2 volts ± 3%
	Signaling and thermostats	24 volts ± 10%

Current and Power Consumption

Стойки Racks	1. Расход тока, а (amperes) 21,2 в V	24 в V	206 в V	2. Мощность, ва VA ~ 220 в VAC
СУГО-I-1 SUGO-I-1				
основн. main	8,7	1,67	—	25
резерв. standby	8,7			
СУГО-I-2				
основн. main	8,0	1,67	—	25
резерв. standby	8,0			
СУГО-I-3				
основн. main	3,05	1,67	—	25
резерв. standby	3,05			
СУГО-I-4				
основн.	5,7	1,67	—	25
резерв.	5,7			
СУГО-II				
основн.	1,65	2,0	1,0	125
резерв.	1,65		1,0	125
СТГО STGO				
основн. main	3,5	2,5	0,6	80
резерв. standby	3,5	2,5	0,6	80
СТГО-I STGO-1				
основн. main	3,5	2,5	0,3	40
резерв. standby	3,5	2,5	0,3	40

Key: 1. Current consumption, amperes; 2. Power, VA.

Construction

The SUGO and STGO racks are designed around a base structure. A provision is made in the equipment for backing up all of the main units with standbys, for those units which contain active elements. Located on the left side of the rack are the panels of the main equipment, while the standby gear is on the right.

The switching from the standby equipment to the backup is accomplished automatically. Switching it back is carried out manually. A provision is made in the equipment for 100 percent backup of the power which is fed to the panels and blocks through the protection and signaling panel. The power supply circuits are connected to the upper panel of the rack, where there is also a bolt for grounding the equipment. The SUGO-I racks are supplied with outboard power distributors, RMINCh II, two units (see section 12).

The dimensions are 2,600 x 650 x 250 mm.

Weight and Cost

Equipment	Weight, kg	Price, Rubles
SUGO-I-1	350	6,600
SUGO-I-2	350	5,300
SUGO-I-3	350	4,200
SUGO-I-4	350	5,300
SUGO-II	350	5,784
STGO	400	14,500
STGO-I	400	10,500

Note: The racks of standardized generator equipment are being improved at the present time. The following designations have been assigned to the new sets of the SUGO-I and SUGO-II racks:

SUGO-I-5 corresponds to the SUGO-I-1 rack,
SUGO-I-6 corresponds to the SUGO-I-2 rack,
SUGO-I-7 corresponds to the SUGO-I-3 rack,
SUGO-I-8 corresponds to the SUGO-I-4 rack, and
SUGO-I-9 is a new set, while the SUGO-II-1 corresponds to the SUGO-II.

The SKCh is for supplying the line control and measurement frequencies of up to eight K-1920 systems, and up to three K-300 systems.

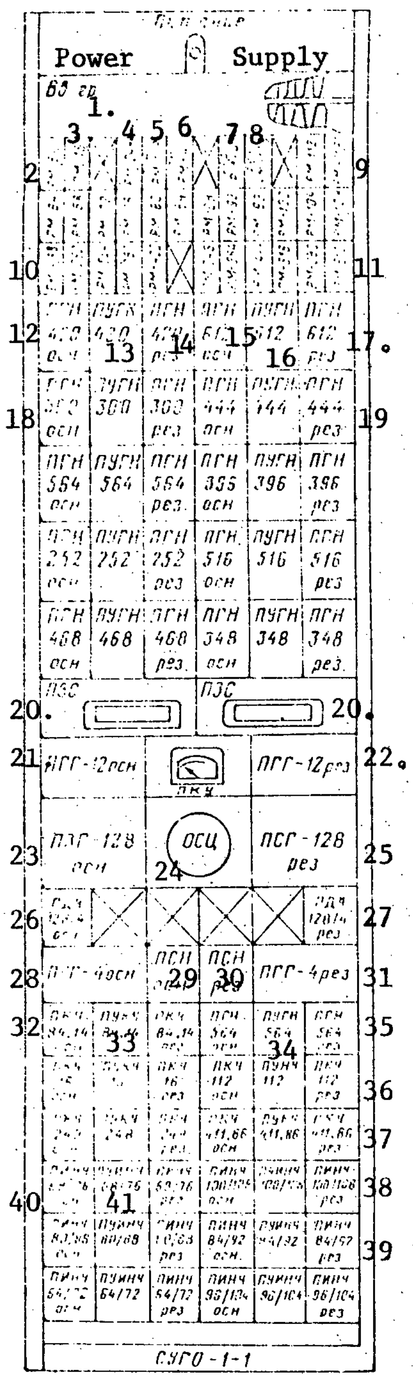


Figure 6.1.1.

The placement of the blocks in the SUGO-I-1 standardized generator equipment rack.

Key:

1. Input terminal blocks;
2. 84.14 KHz power distributor;
3. 16 KHz power distributor;
4. 248 KHz power distributor;
5. Main 128 KHz power distributor;
6. Main 4 KHz power distributor;
7. Standby 4 KHz power distributor;
8. Standby 128 KHz power distributor;
9. 411.86 KHz power distributor;
10. 468 KHz power distributor;
11. 612 KHz power distributor;
12. Main 420 KHz group carrier panel;
13. 420 KHz PUGK [probable typographical error for PUGN (group carrier switcher)];
14. Standby 420 KHz group carrier panel;
15. Main 612 KHz group carrier panel;
16. 612 KHz PUGN [group carrier switcher (main to standby unit)];
17. Standby 612 KHz group carrier panel;
18. Main 300 KHz group carrier panel;
19. Standby 444 KHz group carrier panel;
20. PZS [protection and signaling panel];
21. Main 12 KHz PGG [harmonic generator panel];
22. Standby 12 KHz PGG;
23. Main 128 KHz PZG [master oscillator panel];
24. Oscilloscope;
25. Standby 128 KHz PSG [probable intention: PZG, master oscillator panel];
26. Main 128/4 KHz frequency divider panel
27. Standby 128/4 KHz frequency divider panel;
28. Main 4 KHz PGG [harmonic generator panel];
29. Main PSN [expansion unknown];
30. Standby PSN;
31. Standby 4 KHz PGG;
32. Main 84.14 KHz control channel panel;
33. 84.14 KHz control channel switcher [from the main to the standby unit];

[Key to Figure 6.1.1, continued]:

34. 564 KHz group carrier switcher;
35. Standby 564 KHz group carrier panel;
36. Standby 112 KHz control channel panel;
37. Standby 411.86 KHz control channel panel;
38. Standby 100/108 KHz PINCh [individual carrier frequency panel];
39. Standby 84/92 KHz PINCh;
40. Main 68/76 KHz individual carrier frequency panel;
41. 68/76 KHz individual carrier frequency switcher.

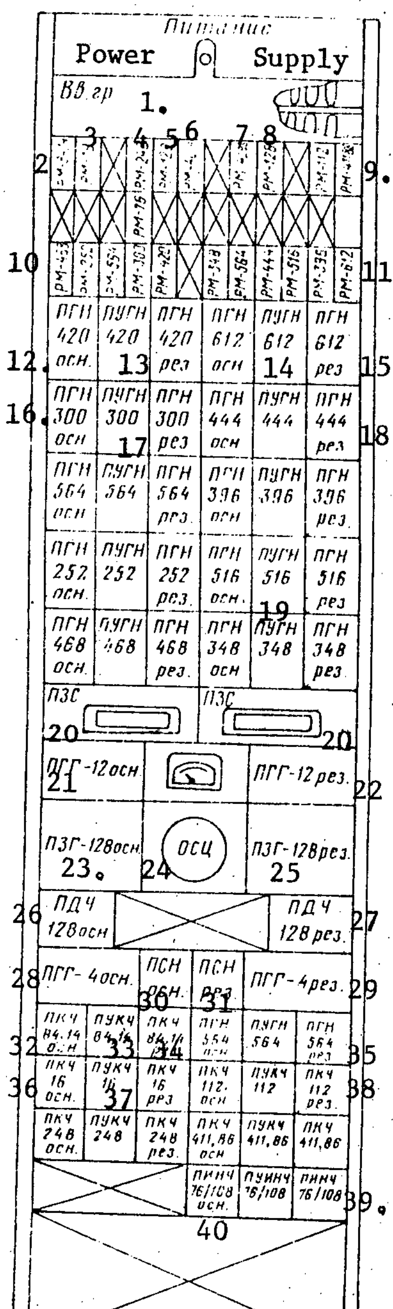


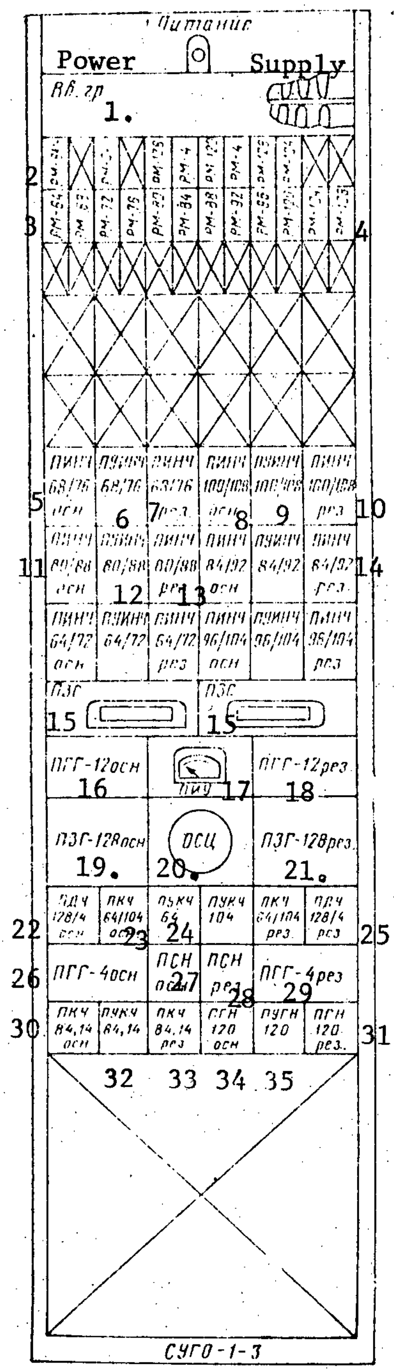
Figure 6.1.2. The placement of the blocks in the SUGO-I-2 rack of standardized generator equipment.

Key:

1. Input terminal blocks;
2. 84.14 KHz power distributor;
3. 16 KHz power distributor;
4. 248 KHz power distributor;
5. 128 KHz power distributor;
6. Main 4 KHz power distributor;
7. Standby 4 KHz power distributor;
8. 128 KHz power distributor;
9. 411.86 KHz power distributor;
10. 468 KHz power distributor;
11. 612 KHz power distributor;
12. Main 420 KHz group carrier panel;
13. 420 KHz group carrier switcher [main to standby unit];
14. 612 KHz group carrier switcher;
15. Standby 612 KHz group carrier panel;
16. Main 300 KHz group carrier panel;
17. 300 KHz group carrier switcher;
18. Standby 444 KHz group carrier panel;
19. 516 KHz PUGN [group carrier switcher];
20. PZS [protection and signaling panel];
21. Main 12 KHz harmonic generator panel;
22. Standby 12 KHz harmonic generator panel;
23. Main 128 KHz master oscillator panel;
24. Oscilloscope;
25. Standby 128 KHz master oscillator panel;
26. Main 128 KHz frequency divider panel;
27. Standby 128 KHz frequency divider panel;

[Key to Figure 6.1.2, continued]:

28. Main 4 KHz harmonic generator panel;
29. Standby 4 KHz harmonic generator panel;
30. Main PSN [expansion unknown];
31. Standby PSN;
32. Main 84.14 KHz control frequency panel;
33. 84.14 KHz control frequency switcher;
34. Standby 84.14 KHz control frequency panel;
35. Standby 564 KHz PGN [group carrier panel];
36. Main 16 KHz control channel panel;
37. 16 KHz control frequency switcher;
38. Standby 112 KHz control frequency panel;
39. 76/108 PINCh [individual carrier frequency panel (probably the standby unit--translator)];
40. Main 76/108 KHz PINCh.



← Figure 6.1.3. The placement of the blocks in the SUGO-I-3 standardized generator equipment rack.

Key:

1. Input terminal blocks;
2. 84.14 KHz power distributor;
3. 64 KHz power distributor;
4. 108 KHz power distributor;
5. Main 68/76 KHz individual carrier frequency panel;
6. 68/76 KHz individual carrier frequency switcher [main to standby unit];
7. Standby 68/76 KHz individual carrier frequency panel;
8. Main 100/108 KHz individual carrier frequency panel;
9. 100/108 KHz individual carrier frequency switcher;
10. Standby 100/108 KHz individual carrier frequency panel;
11. Main 80/88 KHz individual carrier frequency panel;
12. 80/88 KHz individual carrier frequency switcher;
13. Standby 80/88 KHz individual carrier frequency panel;
14. Standby 84/92 individual carrier frequency panel;
15. Protection and signaling panel;
16. Main 12 KHz harmonic generator panel;
17. Meter;

[Key to Figure 6.1.3, continued]:

18. Standby 12 KHz harmonic generator panel;
19. Main 128 KHz master oscillator panel;
20. Oscilloscope;
21. Standby 128 KHz master oscillator panel;
22. Main 128/4 KHz frequency divider panel;
23. Main 64/104 KHz control frequency receiver;
24. 64 KHz control frequency switcher;
25. Standby 128/4 KHz frequency divider panel;
26. Main 4 KHz harmonic generator panel;
27. Main PSN [expansion unknown];
28. Standby PSN;
29. Standby 4 KHz harmonic generator panel;
30. Main 84.14 KHz control frequency panel;
31. Standby 120 KHz group carrier panel;
32. 84.14 KHz control frequency switcher;
33. Standby 84.14 KHz control frequency panel;
34. Main 120 KHz group carrier panel;
35. 120 KHz group carrier switcher.

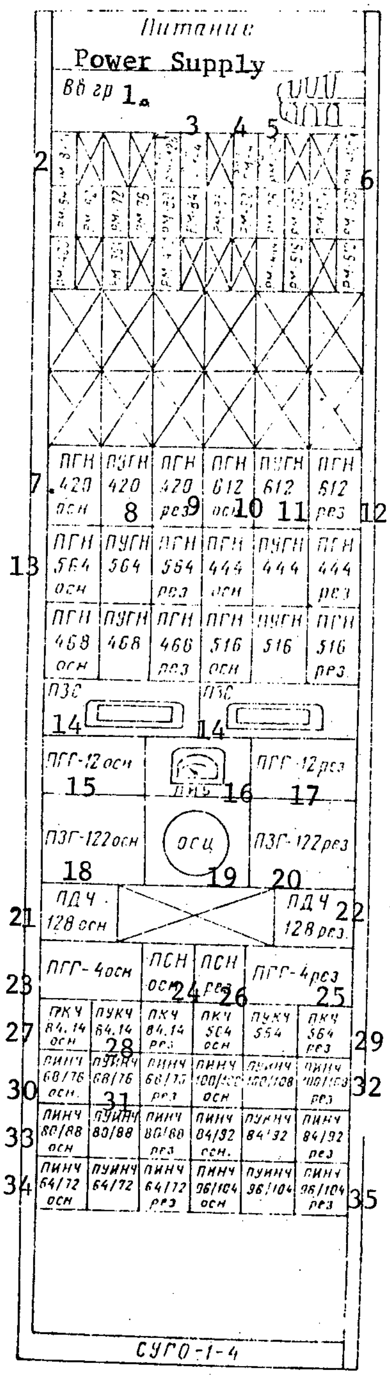


Figure 6.1.4. The placement of the blocks in the SUGO-I-4 standardized generator equipment rack.

Key:
1. Input terminal blocks;
2. 84.14 KHz power distributor;
3. Main 4 KHz power distributor;
4. Standby 4 KHz power distributor;
5. 128 KHz power distributor;
6. 411.86 KHz power distributor;
7. Main 420 KHz group carrier panel;
8. 420 KHz group carrier switcher;
9. Standby 420 KHz group carrier panel;
10. Main 612 KHz group carrier panel;
11. 612 KHz group carrier switcher [main to standby unit];
12. Standby 612 KHz group carrier panel;
13. Main 564 KHz group carrier panel;
14. Protection and signaling panel;
15. Main 12 KHz harmonic generator panel;
16. Meter;
17. Standby 12 KHz harmonic generator panel;
18. Main 122 KHz master oscillator panel;
19. Oscilloscope;
20. Standby 122 KHz master oscillator panel;
21. Main 128 KHz frequency divider panel;
22. Standby 128 KHz frequency divider panel;
23. Main 4 KHz harmonic generator panel;
24. Main PSN [expansion unknown];
25. Standby 4 KHz harmonic generator panel;

[Key to Figure 6.1.4, contined]:

26. Standby PSN;
27. Main 84.14 KHz control frequency panel;
28. 84.14 KHz control frequency switcher;
29. Standby 564 KHz control frequency panel;
30. Main 68/76 individual carrier frequency panel;
31. 68/76 KHz individual carrier frequency switcher;
32. Standby 100/108 individual carrier frequency panel;
33. Main 80/88 individual carrier frequency panel;
34. Main 64/72 individual carrier frequency panel;
35. Standby 96/104 KHz individual carrier frequency panel.

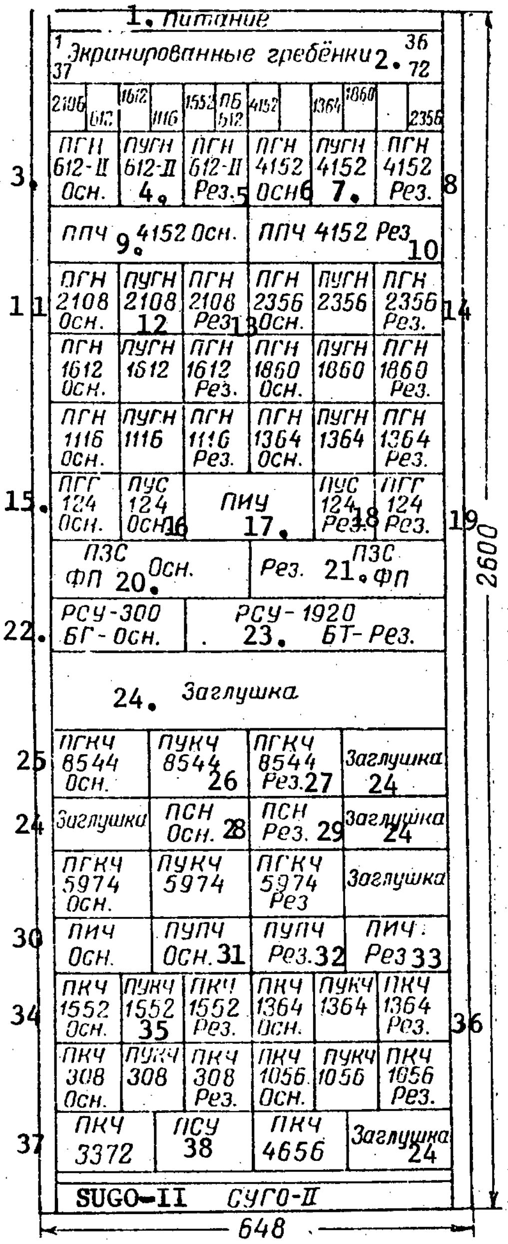


Figure 6.1.5. The placement of the blocks in the SUGO-II rack of standardized generator equipment.

Key:

1. Power supply;
2. Shielded terminal blocks;
3. Main, 612 KHz II group carrier panel;
4. 612 KHz II group carrier switcher;
5. Standby 612 KHz II group carrier panel;
6. Main 4,152 KHz group carrier panel;
7. 4,152 KHz group carrier switcher;
8. Standby 4,152 KHz group carrier panel;
9. Main 4,152 KHz PPCh [expansion unknown];
10. Standby 4,152 KHz PPCh;
11. Main 2,108 KHz group carrier panel;
12. 2,108 KHz group carrier switcher;
13. Standby 2,108 group carrier switcher;
14. Standby 2,356 KHz group carrier panel'
15. Main 124 KHz harmonic generator panel;
16. Main 124 KHz PUS [expansion unknown];
17. PIU [?crosstalk test unit?];
18. Standby 124 KHz PUS;
19. Standby 124 KHz harmonic generator panel;
20. Main power filter and protection and signaling panel;
21. Standby power filter and protection and signaling panel;
22. Main BG, RSU-300 [expansion unknown];
23. Standby BT, RSU-1920 [expansion unknown];
24. Blank filler panel;
25. Main 8,544 KHz control frequency generator panel;

[Key to Figure 6.1.5, continued]:

26. 8,544 KHz control frequency switcher;
27. Standby 8,544 KHz control frequency generator panel;
28. Main PSN [expansion unknown];
29. Standby PSN;
30. Main PICh [measurement frequency panel];
31. Main PUPCh [expansion unknown];
32. Standby PUPch;
33. Standby PICh;
34. Main 1,552 KHz control frequency panel;
35. 1,552 KHz control frequency switcher;
36. Standby 1,364 KHz control frequency switcher;
37. 3,372 KHz control frequency panel;
38. PSU [expansion unknown].

[Key to Figure 6.1.6 (page 493)]:

1. Main 4,152 KHz amplifier I;
2. 4,152 KHz amplifier switcher I;
3. Standby 4,152 KHz amplifier I;
4. Main 4,152 KHz amplifier II;
5. 4,152 KHz amplifier switcher [main to standby] II;
6. Standby 4,152 KHz amplfier II;
7. Main 5,448 KHz amplifier I;
8. Standby 5,448 KHz amplifier II;
9. Main 4,152 KHz LI [sic, expansion unknown; possible error for 'PCh' (frequency converter)];
10. Main 5,448 PCh [frequency converter source for the ternary group carrier generator panel];
11. Oscilloscope;
12. Kn [?Keys?];
13. Standby 4,152 KHz PCh;
14. Standby 5,448 KHz PCh;
15. Protection and signaling;
16. Main 6,744 KHz PCh;
17. Master oscillators;
18. Main 1,296 KHz PCh;
19. Standby 1,296 KHz PCh;
20. Standby 6,144 KHz PCh;
21. Main frequency divider;
22. Standby frequency divider;
23. Standby 600 KHz PCh;
24. Main 1,200 KHz PCh;
25. Standby 1,200 KHz PCh;
26. Main 206 [volt] power supply filter;
27. Standby 206 [volt] power supply filter;
28. Main 21.2 [volt] power supply filter;
29. Standby 21.2 [volt] power supply filter.

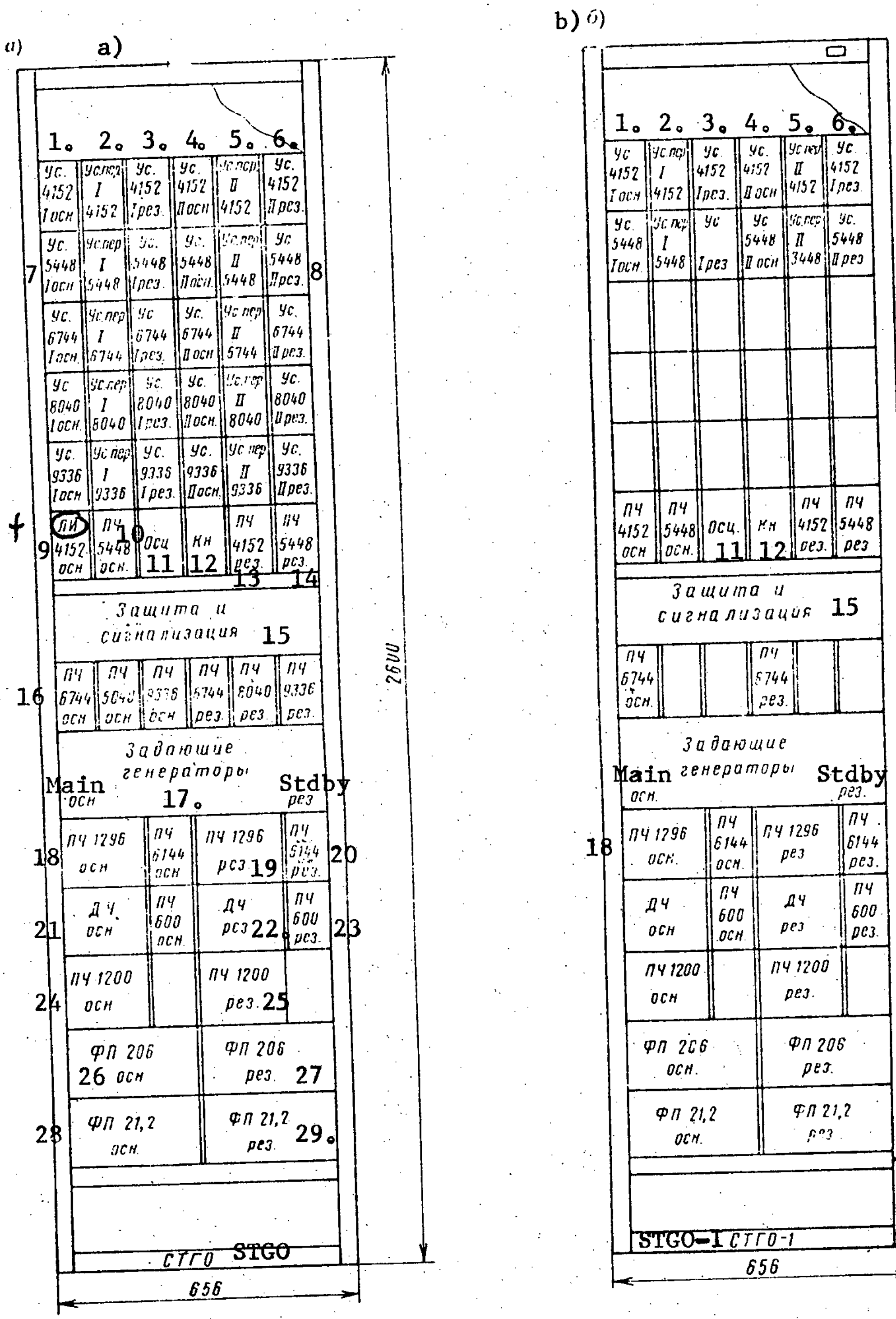


Figure 6.1.6. The placement of the blocks in the following ternary generator equipment racks:

a) STGO; b) STGO-1.

[Key: See page 492]

[Key to Figure 6.1.5, continued]:

26. 8,544 KHz control frequency switcher;
27. Standby 8,544 KHz control frequency generator panel;
28. Main PSN;
29. Standby PSN;
30. Main PICh [measurement frequency panel];
31. Main PUPCh [expansion unknown];
32. Standby PUPCh;
33. Standby PICh;
34. Main 1,552 KHz control frequency panel;
35. 1,552 KHz control frequency switcher;
36. Standby 1,364 KHz control frequency switcher;
37. 3,372 KHz control frequency panel;
38. PSU [expansion unknown]

[Key to Figure 6.1.6. (page 493)]:

1. Main 4,152 KHz amplifier I;
2. 4,152 KHz amplifier switcher, I;
3. Standby 4,152 KHz amplifier I;
4. Main 4,152 KHz amplifier II;
5. 4,152 KHz amplifier switcher [main to standby unit], II;
6. Standby 4,152 KHz amplifier II;
7. Main 5,448 KHz amplifier I;
8. Standby 5,448 KHz amplifier II;
9. Main 4,152 KHz LI [sic, expansion unknown; possible typographical error for 'PCh'];
10. Main 5,448 PCh [probably ternary group carrier generator panel];
11. Oscilloscope;
12. Kn [?keys?];
13. Standby 4,152 KHz PCh [frequency converter?];
14. Standby 5,448 KHz PCh;
15. Protection and signaling;
16. Main 6,744 KHz PCh;
17. Master oscillators;
18. Main 1,296 KHz PCh;
19. Standby 1,296 KHz PCh;
20. Standby 6,144 KHz PCh;
21. Main frequency divider;
22. Standby frequency divider;
23. Standby 600 KHz PCh;
24. Main 1,200 KHz PCh;
25. Standby 1,200 KHz PCh;
26. Main 206 [volt] power supply filter;
27. Standby 206 [volt] power supply filter;
28. Main 21.2 [volt] power supply filter;
29. Standby 21.2 [volt] power supply filter.

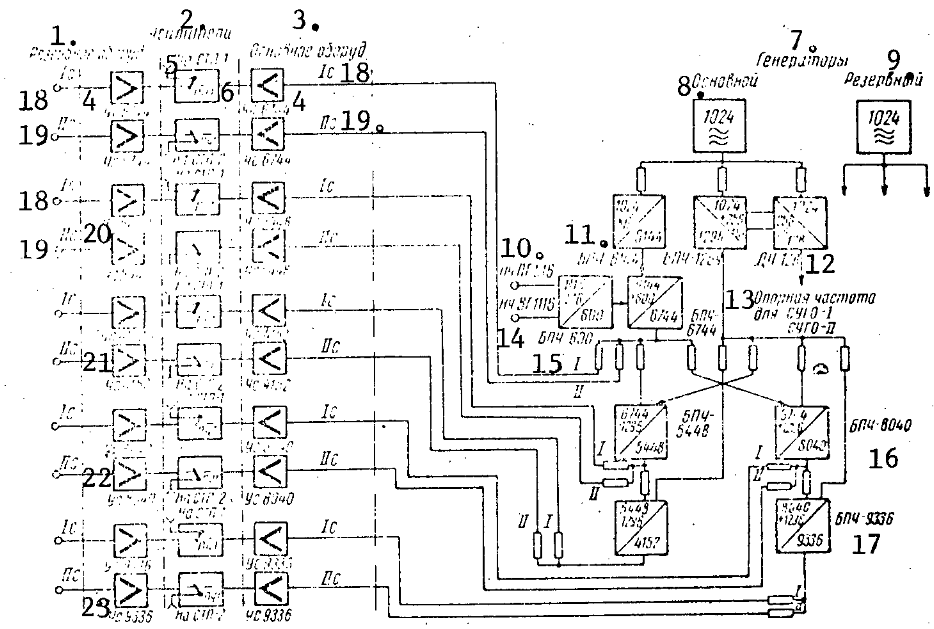


Figure 6.1.7. Block diagram of the STGO rack of ternary generator equipment of the K-1920 equipment.

Key: 1. Standby equipment;
2. Amplifiers;
3. Main equipment;
4. 6,744 KHz amplifier;
5. To the STP-1 [ternary conversion rack 1];
6. PUT [?ternary switcher?];
7. Oscillators;
8. Main;
9. Standby;
10. Carrier freq., 516 KHz, primary group;
11. BPCh-6144 [6,144 KHz frequency conversion block];
12. DCh-128 [128 KHz frequency divider];
13. Reference frequency for the SUGO-1, SUGO-II;
14. 1,116 KHz carrier frequency secondary group;
15. BPCh-600 [600 KHz frequency conversion block];
16. BPCh-8040;
17. BPCh-9336;
18. System I;
19. System II;
20. 5,448 KHz amplifier;
21. 4,152 KHz amplifier;
22. 8,040 KHz amplifier;
23. 9,336 KHz amplifier.

SECTION 7. INDIVIDUAL AND GROUP CONVERSION EQUIPMENT

7.1. The SIO-12 and SIO-24 Individual Equipment Racks
(The SIO-24 rack has been taken out of production)

Figures 7.1.1 - 7.1.3.

Purpose:

Intended for the conversion of 300 - 3,400 Hz voice frequencies to the frequency range of a 12-channel group at 60 - 108 KHz, and the back conversion from the 60 - 108 KHz range to the 300 - 2,400 Hz spectrum, as well as for providing ringing through the channels.

Electrical Characteristics

The input impedance looking into the group equipment	135 ohms
The input impedance looking into the switchboard	600 ohms
The control range in the receive section of a channel	Continuous within limits of no less than 1 Np
Nominal relative levels:	
At the input of the two-wire section of a differential systems	-0.4 Np
At the input of the four-wire transmit channel	-1.5 Np
At the output of the transmit channel	-4.5 Np or -4.8 Np
At the input of a receive channel	-0.6 Np
At the ouput of a four-wire receive channel	+0.5 NP
The working frequency of the voice frequency ring receiver	2,100 ± 25 Hz
The frequency of the voice frequency ringing generator	2,100 ± 5 Hz
The measurement frequencies of the generator of the neper meter	300, 400, 600, 800, 1,600, 2,100, 2,400, 3,000 and 3,400 Hz.
The output levels of the generator	+0.5, 0.0, -0.4, -0.7, -1.5, -2.0 Np
The noise voltage measured at the point of the +0.5 Np measurement level	No more than 0.15 mv psophometric
The isolation against perceptible crosstalk between the channels at 800 Hz	No less than 6.7 Np
The reflection factor	No more than 10% at frequencies of 62, 82 and 106 KHz; no more than 5% in the two-wire section; No more than 10% in a four-wire section at frequencies of 300, 800 and 3,400 Hz.

Electrical Power Supply

Voltages:	Plate	206 ± 3% volts (regulated)
	Filaments and signaling	21.2 ± 3% volts (regulated)

Current Consumption:

SIO-12:	Plate	0.38 a
	Filaments and signaling	4.0 a
SIO-24:	Plate	0.57 a
	Filaments	5.4 a
	Signaling	0.5 a

Type of Vacuum Tubes Employed: 6Zh1PYe

Equipment Complement

SIO-12 and SIO-24: Panels of converters for 12 or 24 channels;
Panels of low frequency amplifiers;
Distribution unit;
Panel of differential systems;
Neper meter;
Voice frequency ringing generator panel (main and standby);
Panel of magneto ringing relays;
Panel of compensating networks and the test amplifier;
Signaling panel;
Fuse panel;
Panel of input terminal blocks.

Construction

A standard rack of channel steel sections with equipment mounted on both sides. Housed in the rack is equipment for 12 channels (SIO-12) or 24 channels (SIO--24). The dimensions of the racks are 2,500 x 648 x 478 mm. The extending desk protrudes 100 mm out from the housings of the panels.

Weight:

SIO-12	290 kg
SIO-24	330 kg

Cost:

SIO-12 2,628 rubles.

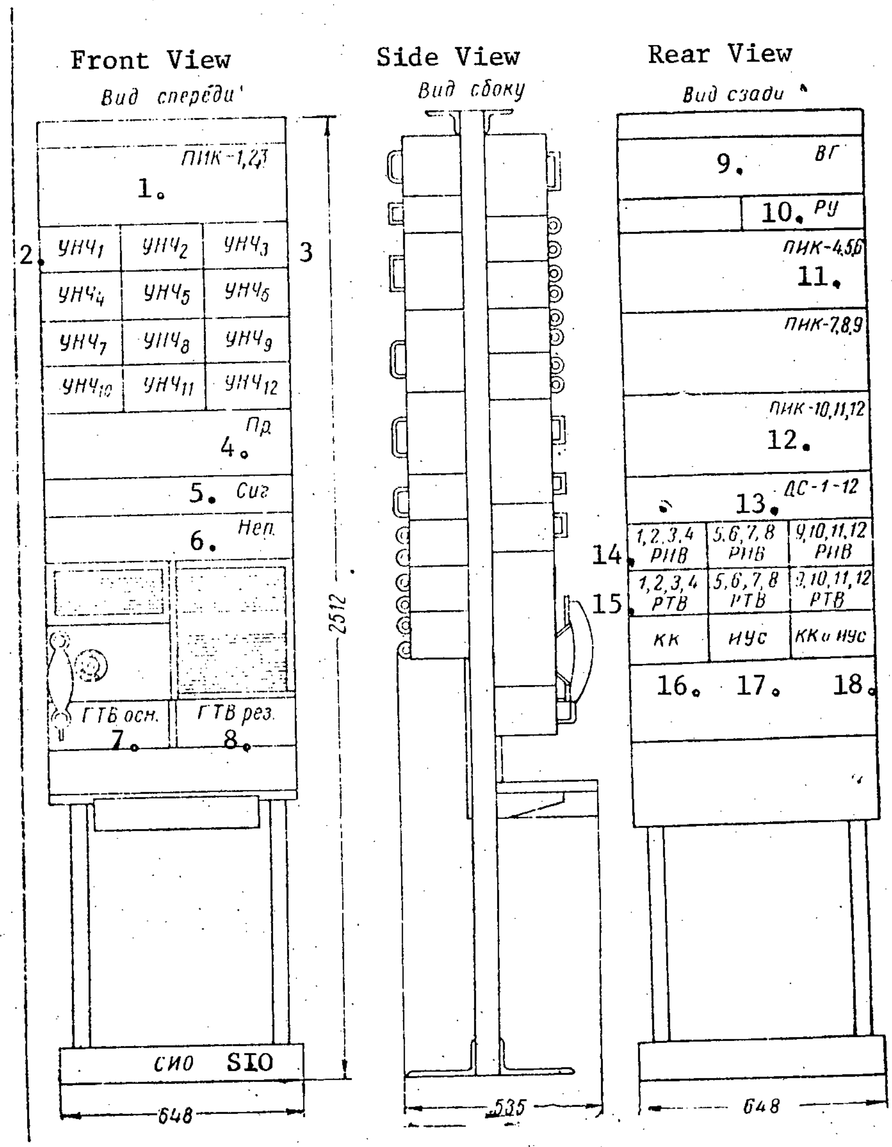


Figure 7.1.1. The placement of the blocks in the SIO-12 individual equipment rack.

Key: 1. PIK-1, 2, 3 [Individual channel converters 1, 2 and 3];
2. $UNCh_1$ [low frequency amplifier 1];
3. Low frequency amplifier 3;
4. Fuse panel;
5. Signaling panel;
6. Neper meter;
7. Main voice frequency ringing generator;
8. Standby voice frequency ringing generator;
9. Input terminal block;
10. Distribution unit;

[Key to Figure 7.1.1, continued]:

11. Individual channel converters, 4, 5, and 6;
12. Individual channel converters, 10, 11 and 12.
13. Differential systems 1 - 12;
14. Magneto ringing relays 1, 2, 3 and 4;
15. Voice frequency ringing relays 1, 2, 3 and 4;
16. Compensating networks;
17. Test amplifier;
18. Compensating networks and test amplifier.

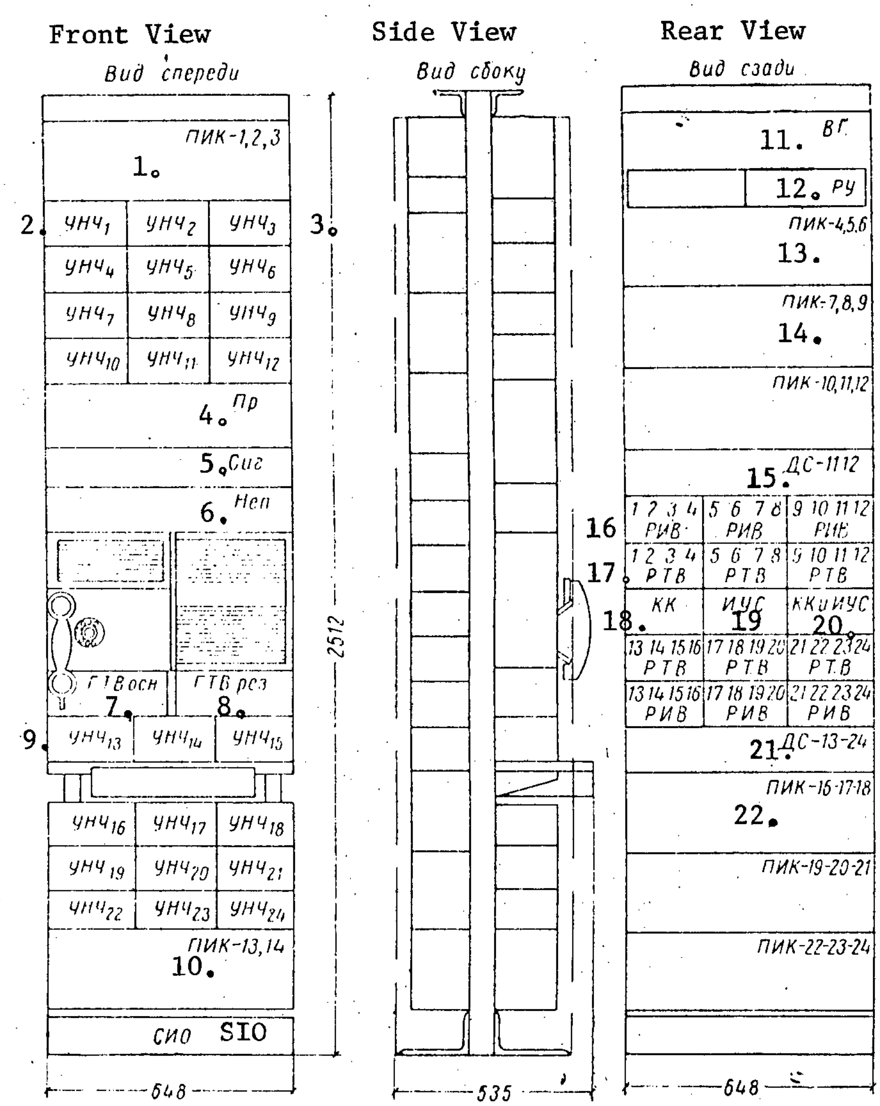


Figure 7.1.2. The placement of the blocks in the SIO-24 individual equipment rack:

Key: 1. Individual channel converters, 1, 2 and 3;
2. Low frequency amplifier 1;

[Key to Figure 7.1.2, continued]:

3. Low frequency amplifier 3;
4. Fuse panel;
5. Signaling panel;
6. Neper meter;
7. Main voice frequency ringing generator;
8. Standby voice frequency ringing generator;
9. Low frequency amplifier 13;
10. Individual channel converters 13 and 14;
11. Input terminal blocks;
12. Distribution unit;
13. Individual channel converters 4, 5 and 6;
14. Individual channel converters 7, 8 and 9;
15. Differential systems 11 and 12;
16. Magneto ringing relays 1, 2, 3 and 4;
17. Voice frequency ringing relays 1, 2, 3 and 4;
18. Compensating networks;
19. Test amplifier;
20. Compensating networks and test amplifier;
21. Differential systems 13 - 24;
22. Individual channel converters 16, 17 and 18.

[Key to Figure 7.1.3 (page 501)]:

1. Compensating network, transmit;
2. KF [crystal filter];
3. BIP [block of individual converters];
4. PCh [frequency converters];
5. Variable attenuator;
6. To the 11 other channels;
7. Carrier frequencies;
8. MI [?magneto ringer?];
9. Magneto ringing panel;
10. Differential system;
11. PTNV [voice frequency dial-ring receiver];
12. GTV [voice frequency ringing generator];
13. Compensating network, receive;
14. BIP;
15. Correcting network;
16. Low pass filter;
17. Low frequency amplifier;
18. BUV [block of ringing devices].

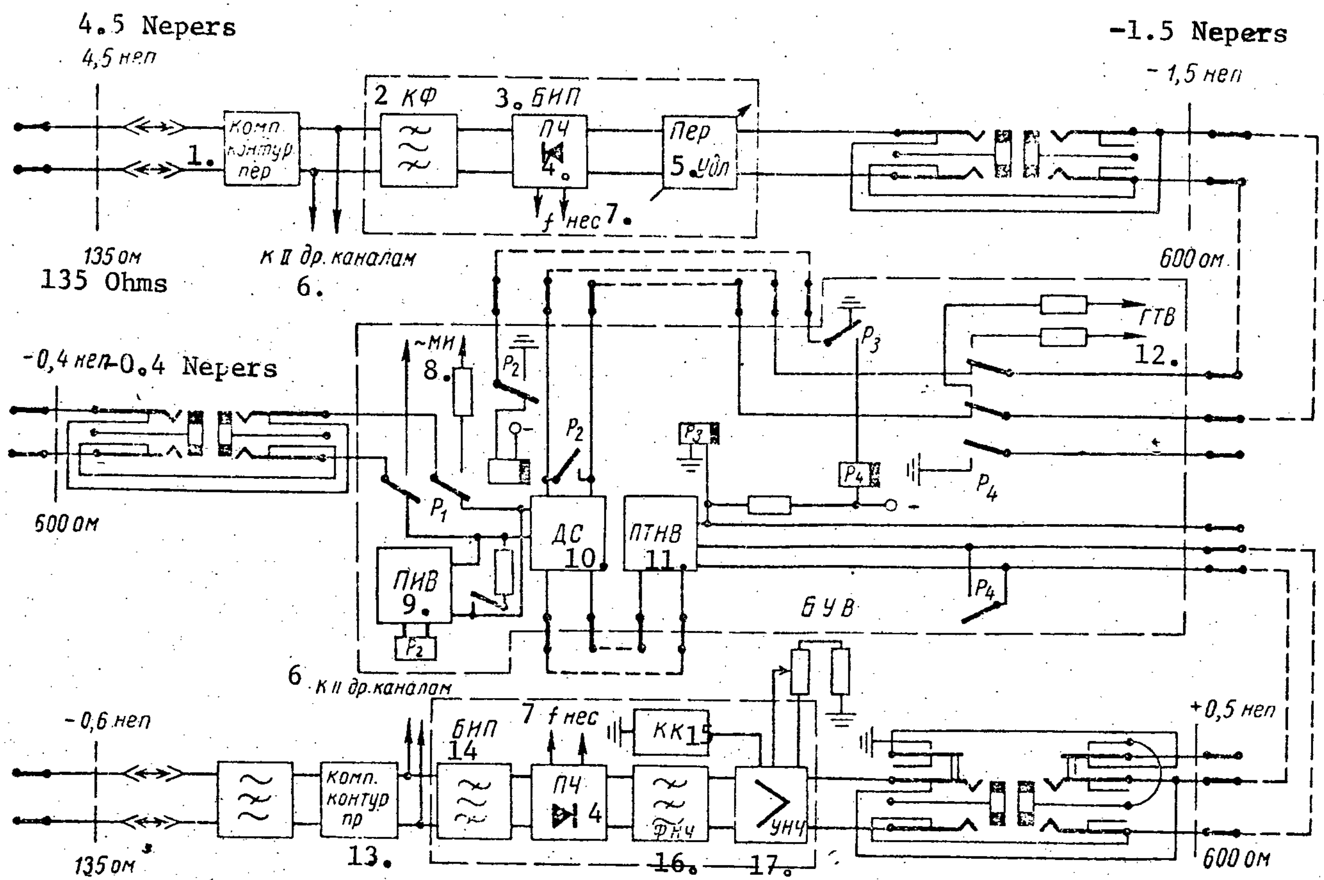


Рис. VII.1.3. Схема индивидуального оборудования СИО-12 (24)

Figure 7.1.3. Schematic of the SIO-12 (or 24) individual equipment.

[Key on preceding page, 500]

7.2. The SIO-24p Individual Equipment Rack

Figures 7.2.1 - 7.2.3.

Purpose:

Intended for the conversion of 300 - 3,400 Hz voice frequencies to the 60 - 108 KHz frequency range of a 12-channel group, and the back conversion from the 60 - 108 KHz range to the 300 - 3,400 Hz spectrum, as well as to provide for callup through the channels.

Electrical Characteristics

The input impedance looking into the group equipment	135 ohms
The input impedance looking into the switchboard	600 ohms
The nominal relative levels:	
At the input to a four-wire transmission section	-1.5 Np
At the output of a four-wire receive section	+0.5 Np
At the transmit channel output of each 12-channel group	-4.5 Np or -4.8 Np
At the receive channel input for a 12-channel group	-0.6 Np
At the output of a two-wire section of a channel	-0.4 Np
The measurement frequencies of the neper meter generator	300, 400, 600, 800, 1,200, 1,600, 1,800, 2,000, 2,400, 2,700, 3,000 and 3,400 Hz
The generator output levels	+0.5, 0.0, -0.5, -0.7, -1.0, -1.1 and -1.5 Np
The working frequency of the voice frequency ring receiver	2,100 Hz or 1,600 Hz
The voice frequency ringing generator frequency	2,100 Hz or 1,600 Hz, as well as 1,020 Hz or 500/20 Hz
The internal noise voltage of a channel at the +0.5 Np level point	No more than 0.3 mv psophometric for 20% of the channels and 0.2 mv psoph. for the remaining ones.

Isolation:

Between the receive and transmit group channels of 12-channel groups	9.0 Np
Between adjacent channels	7.0 Np

Reflection factor with respect to the nominal resistance of 135 ohms	No more than 25% at the transmit channel output and 15% at the receive channel input for each 12-channel group.
Reflection factor with respect to the nominal resistance of 600 ohms	No more than 5% at frequencies of 400 Hz and 3,400 Hz, and no more than 10% for the four-wire section of a receive and transmit channel.

Electrical Power Supply

Voltages: For the semiconductor components	21.2 ± 3%, volts
For signaling	24 ± 10% volts
Current Consumption:	
Of the semiconductor componens	1.5 a
For the case of simultaneous ringing via 12 channels	2.5 a
Signaling	0.47 a

Equipment Complement:

One 12-channel group has been adopted as the equipment complement unit of the SIO-24p. The SIO-24p rack is put together as a set of 12 channels with the wiring for 24 channels. The PIB instrument for testing the BIP blocks is specially stipulated when ordering. To fill out the equipment complement of the rack to 24 channels, the 12-channel set is ordered (the set of individual equipment for 12 channels for the SIO-24p).

Equipment Complement for 24 Channels

Included in the equipment complement of a fully outfitted rack are:

24 BIP individual frequency conversion blocks;
24 BUV blocks of ringing devices;
2 voice frequency ringing generator blocks for frequencies of 2,100 and 1,600 Hz;
2 voice frequency ringing generator blocks for frequencies of 1,000/20 Hz and 500/20 Hz (supplied on special order);
2 blocks of switching devices;
Neper meter;
Two-wire intercom-callup unit;
Four-wire intercom-callup unit;
60 - 108 KHz test amplifier;
Protection and signaling unit;
Connection unit;
Input unit;

Installed in the rack are six attenuator pads of 1.3 Np each for the channels used for AF telegraphy. A provision is made in the SIO-24 p transmit channel for feeding in the 84.14 KHz control frequency with the capability of control up to 0.08 Np in steps of 0.02 Np each.

Construction

Basic design. The equipment is housed in one rack, with equipment filling one side. All of the equipment elements are placed in grooved plug-in blocks with a notched fron panel (with the exception of the input terminal blocks and jack field). The dimensions of the racks are 2,600 x 650 x 280 mm, counting the protruding parts.

Weight: 250 kg   Cost: 3,767 rubles.

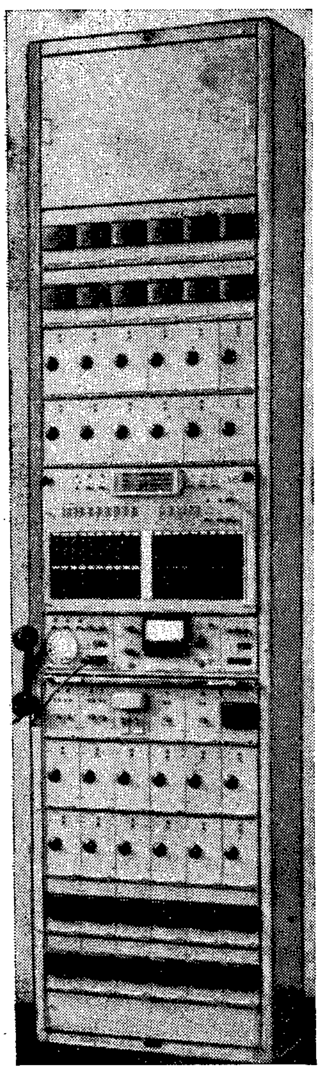


Figure 7.2.1. Exterior view of the SIO-24p rack.

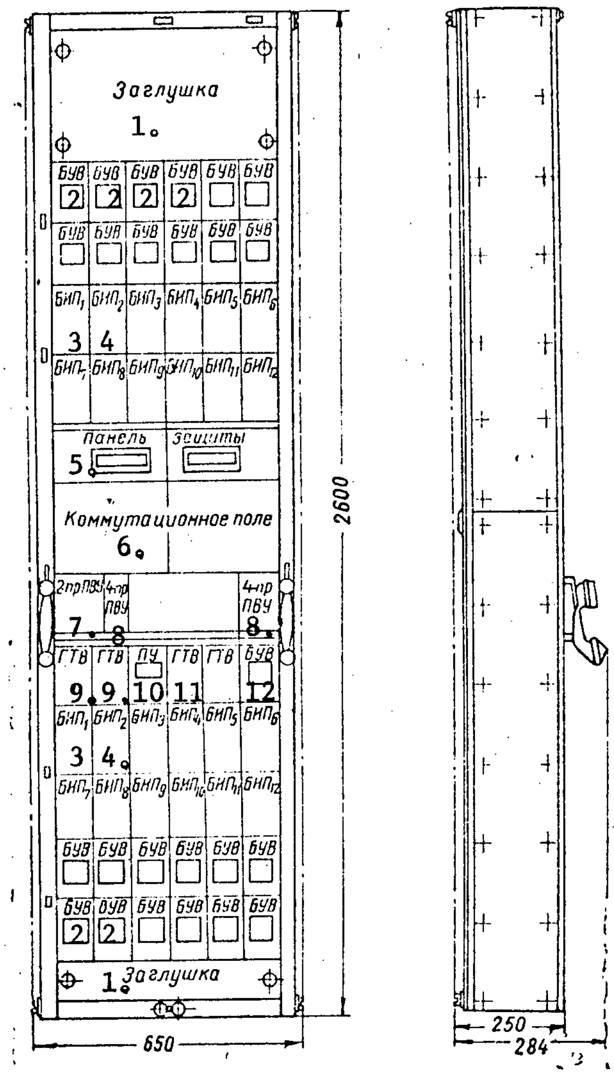


Figure 7.2.2 The placement of the equipment in the individual equipment rack, SIO-24p.
Key: 1. Blank filler panel;
2. BUV [block of ringing devices];

[Key to Figure 7.2.2, continued]:

3. BIP_1 [individual frequency conversion block 1];
4. Individual frequency conversion block 2;
5. Protection panel;
6. Jackfield;
7. Two-wire intercom-callup unit;
8. Four-wire intercom-callup unit;
9. Voice frequency ringing generator;
10. Switcher;
11. Voice frequency ringing generator;
12. Block of ringing devices.

[Key to Figure 7.2.3 (page 506)]:

1. Four-wire transmit switchboard;
2. Four-wire transmit line;
3. Carrier;
4. To the other channels;
5. Transmit, group 1;
6. BIP [individual frequency conversion block];
7. Amplitude limiter;
8. Variable attenuator pad;
9. Modulator;
10. Bandpass filter;
11. Connection complex;
12. Two-wire switchboard;
13. Two-wire line;
14. Differential system;
15. GTV [voice frequency ringing generator];
16. PTNV [voice frequency ring and dial receiver];
17. BUV [block of ringing devices];
18. Four-wire channel;
19. Four-wire line;
20. FZ [expansion unknown];
21. Low frequency amplifier;
22. D-3400 filter;
23. Demodulator;
24. Switching complex;
25. Receive, group 1;
26. Correcting network;
27. Gain control;
28. BIP [individual frequency conversion block];
29. To 11 other channels.

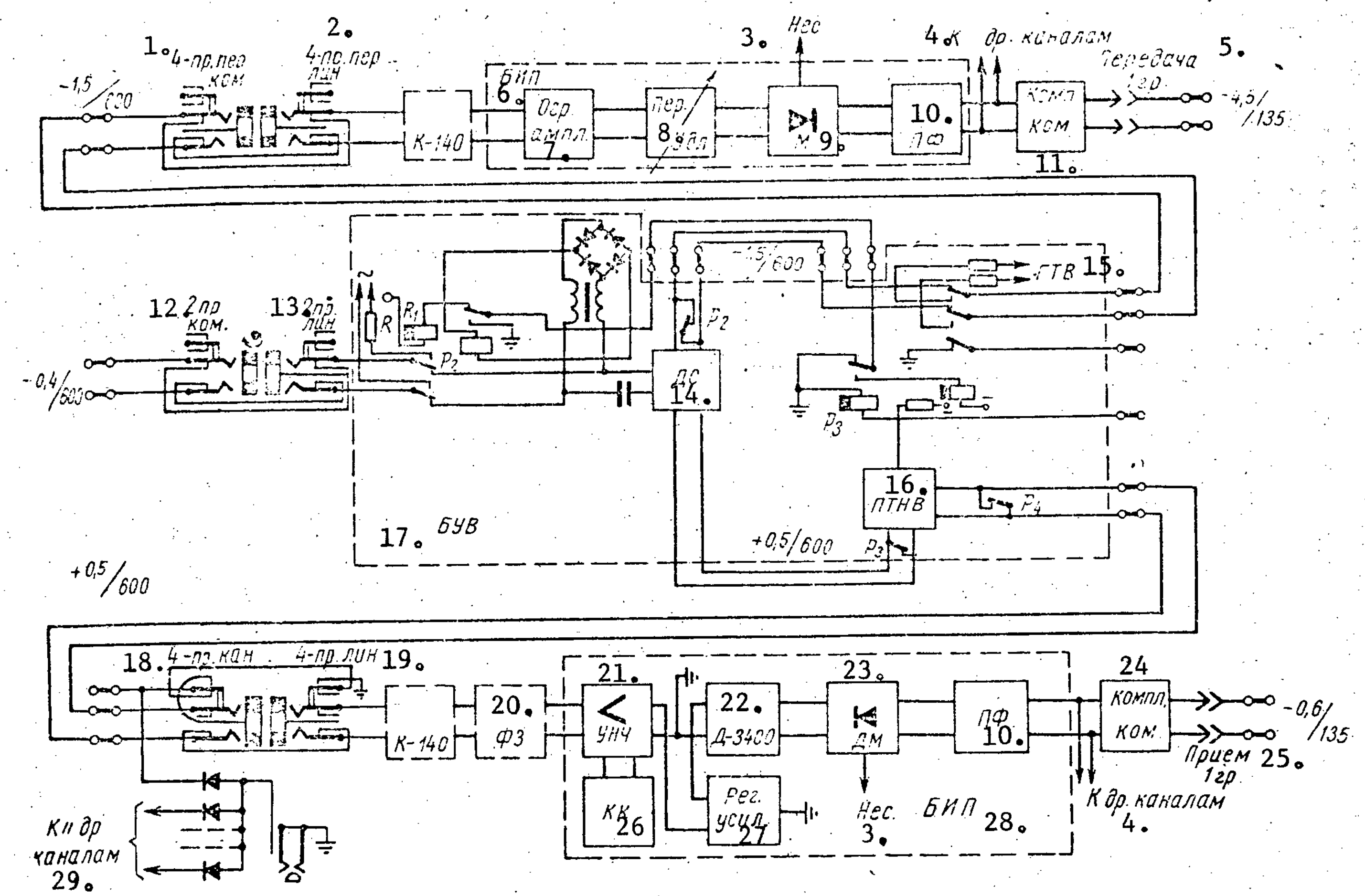


Figure 7.2.3. Block diagram of the SIO-24p individual equipment rack.

[Key on preceding page, 505]

7.3. The SIP-60 and STV-DS-60 Individual Equipment Racks

Figures 7.3.1 - 7.3.5.

Purpose:

Intended for the conversion of the 300 - 3,400 Hz voice frequencies to the 60 - 108 KHz frequency range of a 12-channel group and the back conversion from the 60 - 108 KHz range to the 300 - 3,400 Hz spectrum, as well as for providing ringing via the channels.

Electrical Characteristics

Input impedance looking into the group equipment	135 ohms
Reflection factor of the transmission channel:	
At the output	25%
At the input	15%
Input impedance looking in the direction of the connection of two- and four-wire sections of an individual channel	600 ohms
Reflection factor:	
For the input of the transmit channel	15%
For the output of the receive channel (with the exception of channel 6)	10%
The nominal relative levels:	
At the input to a four-wire transmission section	-1.5 Np
At the output of a four-wire receive section	+0.5 Np. The gain control at the input to the audio amplifier varies the level at the output of the receive channel by no less than 1 Np in steps of 0.1 Np each.
At the output of the transmit channel of each 12-channel group	-4.5 Np or -4.8 Np
At the output of the receive channel of the 12 channel group	-0.6 Np
At the output of the two-wire section of a channel	-0.4 Np
The output levels of the generator	+0.5, 0.0, -0.4, -0.5, -0.7, -1.0, -1.1 and -1.5 Np
The measurement frequencies of the neper meter generator	300, 400, 600, 800, 1,200, 1,400, 1,600, 2,000, 2,700, 3,000 and 3,400 Hz.
The working frequency of the voice frequency ring receiver	2,100 or 1,600 Hz

The frequency of the voice frequency ring generator	2,100, 1,600, 1000/20 or 500/20 Hz (the switcher switches the generators from the main to the standby unit).

Isolation:

Against perceptible and imperceptible crosstalk between adjacent channels at a frequency of 800 Hz	7.0 Np
Between group receive and transmit channels of 12-channel groups at a frequency of 84 - 96 KHz	9.0 Np

Climatic Operational Conditions:

At temperatures of from +10 to +40° C, and a relative humidity of 75% (short term exposure to 85% at +25° C).

Electrical Power Supply

Voltages:

SIP-60:	Main circuits	21.2 ± 3%, volts
	Signaling	24 ± 10%, volts
STV-DS-60:	Main circuits	21.2 ± 3%, volts or 24 ± 10% v.
	Signaling	24 ± 10% volts.

Note: The SIP-60 rack was designed around semiconductor devices.

Current Consumption:

SIP-60:	Main circuits	1.0 a
	Signaling	0.4 a
STV-DS-60:	Main circuits	3.2 a
	The same, for simultaneous ringing via 30 channels	5.2 a
	Signaling	0.4 a

Types of semiconductor devices used: D9V, P13A, P13B, D2V, P202.

Equipment Complement

SIP-60. Individual conversion rack with a maximum capacity of 60 channels. Supplied as an equipment set for 36 channels.

The BIP [individual conversion block] sets for 12 channels to fill the equipment complement of the rack up to 60 channels are ordered separately. The rack wiring is manufactured for 60 channels. There are the following in the rack:

Individual converters (BIP);
Neper meter;
Two-wire intercom-callup unit;
Four-wire intercom-callup unit;

Test amplifier for 60-108 kHz;
Protection and signaling devices;
Switching unit;
Unit for connecting a broadcast channel.

Installed in the SIP rack are 12 pads of 1.3 Np each for channels used for AF telegraphy. A provision is made in the SIP transmit channel for the insertion of the 84.14 kHz control frequency, with the capability of adjusting the level up to 0.08 Np in steps of 0.02 Np each.

Note: The PIB instrument for testing the BIP blocks is supplied on special order.

STV-DS-60. The voice frequency ringing and differential systems rack with a maximum capacity of 60 channels. Supplied as an equipment set for 36 channels (three 12-channel groups). To fill the equipment complement of the rack out to 60 channels, the STV-DS sets for 12 channels are ordered separately. There are the following in the rack: ring devices (BUV's), two voice frequency ringing generators for 2,100 or 1,600 Hz and for 1,000/20 or 500/20 Hz (supplied on special order), a device for switching to the standby voice frequency ringing generator, as well as protection and signaling panels.

Note: The factory supplies PTNV's [voice frequency ring-dial receivers], tuned to a frequency of 2,100 Hz, if tuning to a frequency of 1,600 Hz is not specified in the order.

Weight: SIP-60 no more than 340 kg
STV-DS-60 no more than 300 kg

Cost

Оборудование Equipment	1. Цена, руб., для числа каналов		
	36	60	12
СИП-60 SIP-60	6101	8685	1292
СТВ-ДС-60 STV-DS-60	2878	3926	524

Key: 1. Price in rubles for the following numbers of channels.

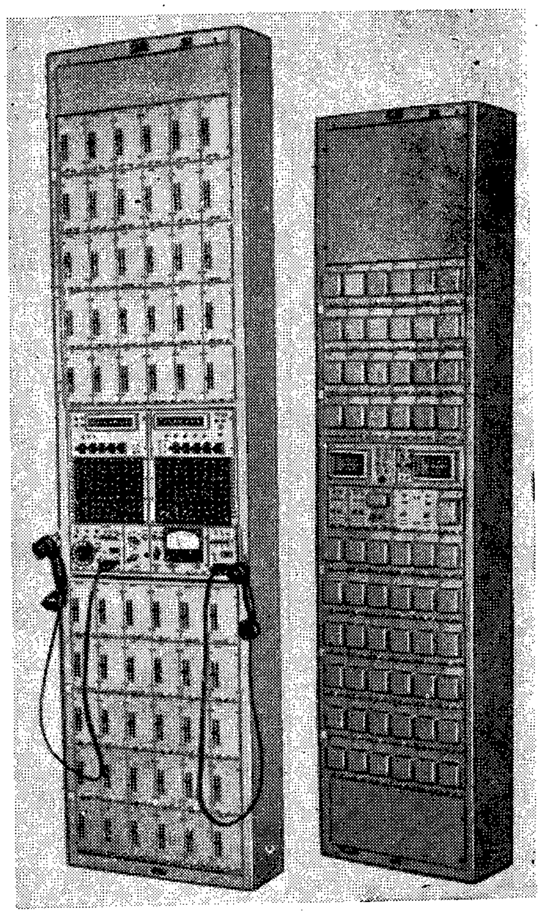


Figure 7.3.1. Exterior view of the SIP-60 and STV-DS-60 racks.

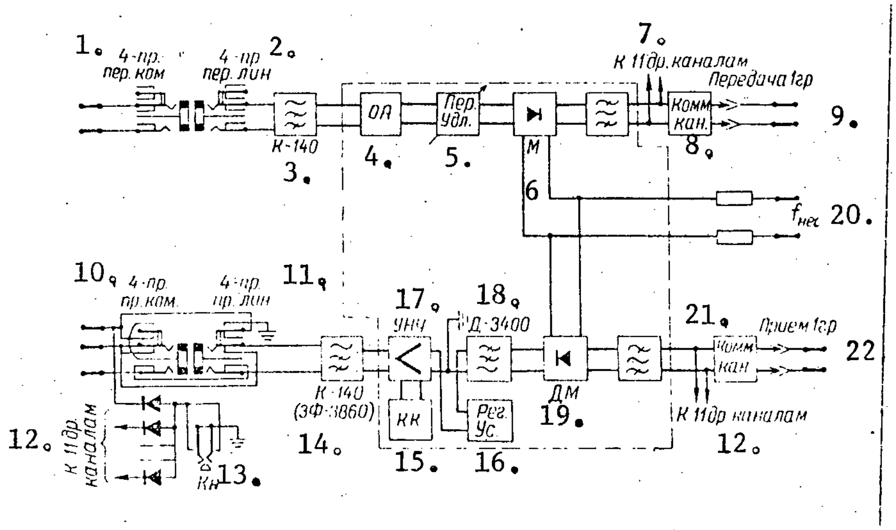


Figure 7.3.2. Schematic of the SIP-60 rack of individual converters.
Note: Shown in the schematic is the insertion of the K-140 filter for the seventh channel, and for the sixth channel a ZF-3860 [suppression] filter is inserted in the receive channel.

Key:
1. 4-wire, transmit switchboard;
2. 4-wire, transmit line;
3. K-140 filter;
4. OA [amplitude limiter];
5. Variable attenuator pad;
6. Modulator;
7. To the 11 other channels;
8. Channel switching;
9. Telegraph transmission;
10. 4-wire, receive switchboard;
11. 4-wire, receive line;
12. To the 11 other channels;
13. Push button switch;
14. K-140 (or ZF-3860) filter;
15. Corrective network;
16. Gain control;
17. Low frequency amplifier;
18. D-3400 filter;
19. Demodulator;
20. Carrier frequency;
21. To 11 other channels;
22. Telegraphy receive.

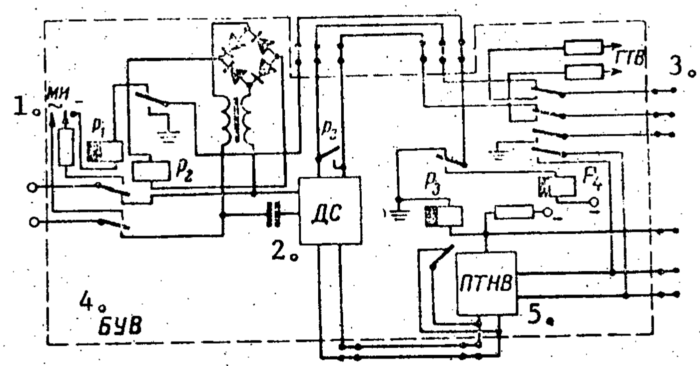


Figure 7.3.3. Schematic of the voice frequency ringing and differential system rack, STV-DS-60.

Key:
1. Magneto ringer;
2. Differential system;
3. GTV [voice frequency ringing generator];
4. BUV [block of ringing devices];
5. Voice frequency ring-dial receiver.

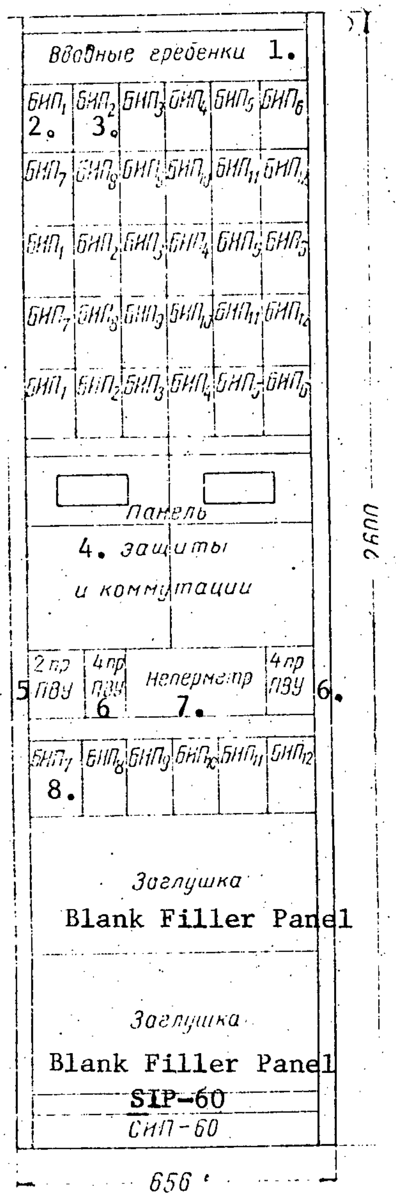


Figure 7.3.4. The equipment placement in SIP-60 individual conversion rack.

Key:
1. Input terminal blocks;
2. BIP_1 [individual frequency conversion block 1];
3. Individual frequency conversion block 2;
4. Protection and switching panel;
5. 2-wire intercom-call up unit;
6. 4-wire intercom-call up unit;
7. Neper meter;
8. Individual frequency conversion block 7.

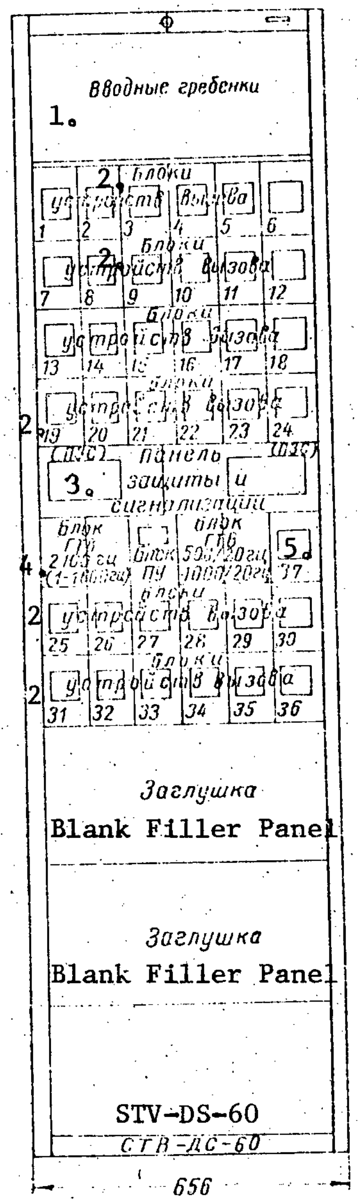


Figure 7.3.5. The placement of the equipment in the voice frequency ringing and differential system rack, the STV-DS-60.

Key:
1. Input terminal blocks;
2. Blocks of ringing devices;
3. Protection and signaling panel;
4. 2,100 Hz (1 - 1,600 Hz) voice frequency ringing generator block;
5. 500/20 Hz, 1000/20 Hz voice frequency ringing generator block;
6. Switcher block.

7.4. The USPP (USPP-1, USPP-2) Standardized Primary Conversion Equipment. Figures 7.4.1-7.4.3

Purpose:

Intended for converting the 60-108 KHz spectrum of 12-channel groups to the 312 - 552 KHz spectrum of the 60-channel (secondary) groups in the transmit channel, and the back conversion in the receive channel.

The USPP rack can be used in the equipment complement of terminal stations and points for splitting out the 60-channel groups of multichannel transmission systems using communications lines where the channels number 60 and more: K-60, K-300, R-600 and K-1920.

Electrical Characteristics

Nominal relative levels:

At the input to a transmission section	-4.5 Np
At the output of a transmission section	-4.1 Np
At the input to a receive section	-2.6 Np
At the output of a receive section	-0.6 Np
Reflection factor	$\leq$15%
The input impedance at the carrier frequency feed points	400 ohms
The AGC frequency of the 12-channel groups where a control frequency is used	84.14 KHz
The automatic gain control range for the primary groups, no less than	$\pm$ 0.4 Np
The thermal noise voltage at the +0.5 Np level point does not exceed:	
For 98% of the channels	0.35 mv psoph. } Counting the SIP
For 2% of the channels	0.6 mv psoph. } Counting the SIP
The gain introduced by the transmit channel equipment at 84 KHz, in each primary group	0.4 $\pm$ 0.03 Np
The gain introduced by the receive channel equipment in each primary group is continuously adjustable within limits of	From $S_{min} \geq$ 1.6 Np Up to $S_{max} \leq$ 2.4 Np
The isolation from perceptible line crosstalk between channels of the same type	8.8 Np

Climatic Operation Conditions:

At temperatures of from +10 to +40° C at a relative humidity of 75%, and short term exposure to 85% at a temperature of +25° C.

Electrical Power Supply

Voltages:

Transistor circuits	21.2 volts ± 3%
Signaling and thermostat circuits	24 volts ± 10%

Current Consumption:

USPP-1:	Main circuits	4.7 a
	Signaling circuits	1.3 a
USPP-2:	Main circuits	3.8 a
	Signaling circuits	1.3 a

Equipment Complement

USPP-1. Designed for the generation of five 60-channel groups (300 channels) from 25 12-channel groups with the standard or inverse configuration of the channels.

USPP-2. For the formation of two 60-channel groups (120 channels) with the capability of adding 60-channel blocks up to the full capacity (300 channels).

Construction

The rack frame is made of sectional steel with chassis base plates. The rack dimensions are 2,600 x 650 x 250 mm. The panels plug in from the front, and are enclosed using standard plug terminals with 16 and 24 knife contacts. The "ground" bus is brought out to two studs above the frame and is fanned out to the chassis from both sides.

Weight:	USPP-1	400 kg
	USPP-2	260 kg

Cost:	USPP-1	8,421 rubles
	USPP-2	5,004 rubles

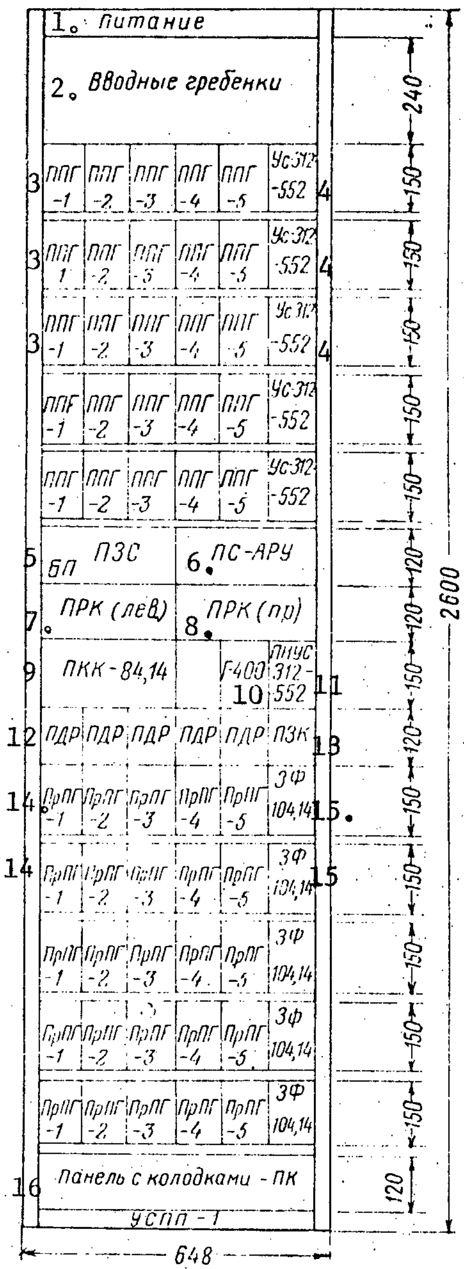


Figure 7.4.1.

The placement of the equipment in the USPP-1 standardized rack of primary converters.

Key:

1. Power;
2. Input terminal blocks;
3. PPG-1 [group conversion panel 1];
4. 312 - 552 KHz amplifier;
5. PZS, BP [protection and signaling panel, (?power supply block?)];
6. PS ARU [unknown type of AGC unit];
7. PRK [expansion unknown], left;
8. PRK, right;
9. 84.14 KHz control channel receiver;
10. G-400 generator;
11. 312 - 552 KHz crosstalk test unit;
12. PDR [expansion unknown];
13. PZK [expansion unknown];
14. PrPG-1 [receive group conversion panel 1];
15. 104.14 KHz suppression filter;
16. Panel with connection blocks, PK.

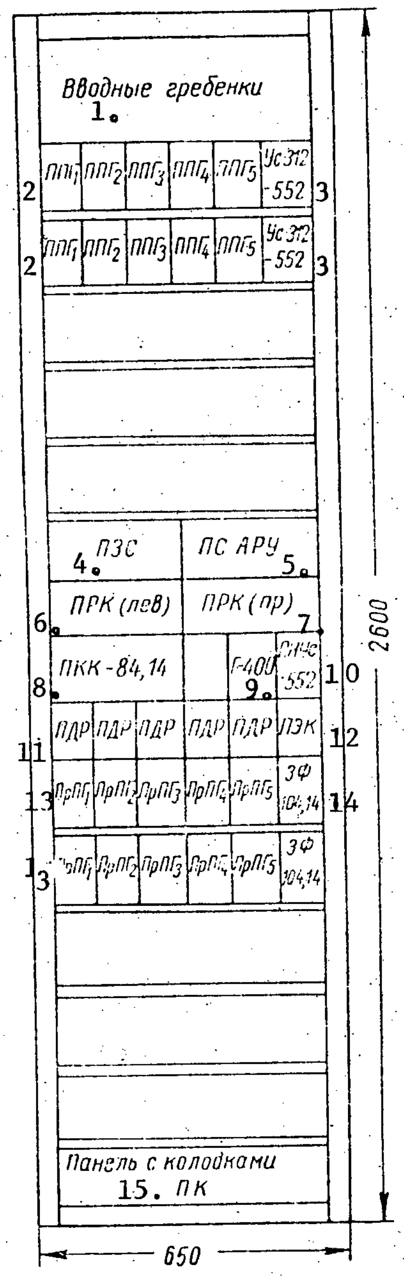


Figure 7.4.2.

The equipment placement in the USPP-2 standardized rack of primary converters.

Key:

1. Input terminal blocks;
2. PPG$_1$ [primary group conversion panel 1];
3. 312 - 552 KHz amplifier;
4. Protection and signaling panel;
5. PS ARU [unknown type of AGC unit];
6. PRK [expansion unknown], (left);
7. PRK (right);
8. 84.14 KHz control channel receiver;
9. G-400 generator;
10. PIUS-552 [sic, probable intention: 312 - 552 KHz crosstalk test unit];
11. PDR [expansion unknown];
12. PEK [?shielded terminal block panel?];
13. PrPG$_1$ [receive, group conversion channel 1];
14. 104.14 KHz suppression filter;
15. Panel with connection blocks, PK.

[Key to Figure 7.4.3, page 519)]:

1. 60 - 108 KHz, -4.5 Np, 135 ohms;
2. Transformer;
3. Transmit channel;
4. PPPG$_4$ [primary group conversion transmit panel 4];
5. Primary group conversion transmit panel 1;
6. D-125 filter;
7. Pad;
8. Carrier;
9. BPR [?transmit conversion block?];
10. Variable attenuator;
11. PFPG [primary group bandpass filter];
12. BPRPGper [Block for the parallel operation of primary groups, transmit];
13. ZF 411,85 [411.85 KHz suppression filter];
14. 312 - 552 KHz transmit amplifier;
15. PPrPG$_4$ [primary group conversion receive panel 4];
16. RKCh-411,86 [411.86 KHz (?control frequency distributor?];

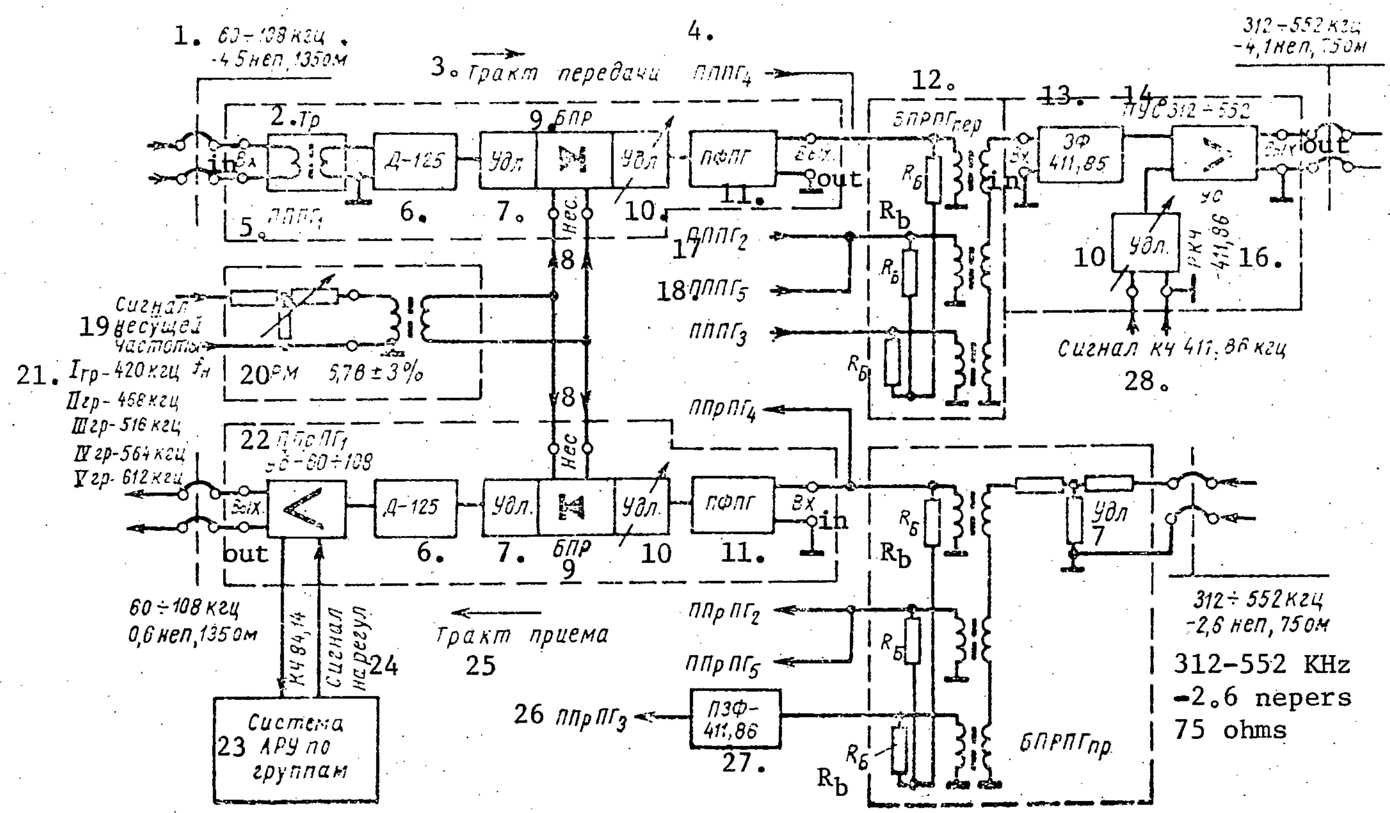


Figure 7.4.3. Block diagram of the standardized rack of primary converters, USPP.

[Key, continued from page 518]:

17. $PPPG_2$ [primary group conversion transmit panel 2];
18. Primary group conversion transmit panel 5;
19. Carrier frequecy;
20. Power distributor;
21. Group 1, 420 KHz; group 2, 468 KHz; group 3, 516 KHz; Group 4, 564 KHz, group 5, 612 KHz.
22. $PPrPG_1$ [primary group conversion receive panel 1];
23. Group referenced AGC system.
24. Signal to the controller;
25. Receive channel;
26. Primary group conversion receive panel 3;

[Key to Figure 7.4.3, continued]:

27. 411.86 KHz suppression filter panel;
28. 411.86 KHz control frequency signal;
29. BPRPGpr [block for the parallel operation of primary groups, receive];

7.5. The USVP (USVP-1, USVP-2) Standardized Secondary Conversion Equipment

Figures 7.5.1 - 7.5.4.

Purpose:

Intended for the conversion of the main secondary group frequency spectrum at 312 - 552 KHz to the main 812 - 2,044 KHz ternary group spectrum in the transmit channel, and the back conversion in the receive channel. The USVP is used in the equipment complement of terminal stations of multichannel transmission systems for communications lines, the K-300, R-600 and the K-1920 systems.

Electrical Characteristics

Nominal relative levels	
At the input and output of a transmission channel	-4.1 Np
At the input and output of a receive channel	-2.6 Np
Reflection factor	No higher than 15%
The input impedance at the carrier frequency feed points:	
For the 564 KHz frequency	500 ohms
For all the remaining frequencies	75 ohms
The frequency of the automatic gain control for the 60-channel groups where a control frequency is used	411.86 KHz
The limits of the automatic control of the attenuation (or gain) of the secondary groups	± 0.4 Np
The thermal noise voltage at the +0.5 Np level point does not exceed the following:	
For 98% of the channels	0.5 mv psophometric
For 2% of the channels	0.6 mv psophometric
The gain introduced by the transmit channel equipment at 412 KHz in each secondary group	0 ± 0.7 Np
The gain introduced by the receive channel equipment in each secondary group	≥ 0.4 Np

The isolation from perceptible line crosstalk between channels of the same type	8.8 nepers

Climatic Operational Conditions

At temperatures of from +10 to +40° C with a relative humidity of 75%, and 85% at a temperature of +25° C.

Electrical Power Supply

Voltages:	Transistor circuits	-21.2 volts ± 3%
	Signaling and thermostat circuits	-24 volts ± 10%

Current Consumption:

USVP-1:	Main circuits	3.6 a
	Signaling circuits	1.3 a
USVP-2:	Main circuits	3.2 a
	Signaling circuits	1.3 a

Equipment Complement

USVP-1. Designed for the formation of 21 60-channel groups (1,260 channels).

USVP-2. Designed for the formation of 16 60-channel groups (960 channels) with the option bringing the equipment complement up to full capacity (1,260 channels).

Construction

The rack frame is made of sectional steel with chassis foundations for the installation of notched panels. The rack dimensions are 2,600 x 650 x 250 mm. The panels of the transmit channel are housed in the upper part of the rack, and those of the receive channel, in the lower part of the rack, while the common rakc function assemblies are housed in the center of the rack.

The "ground" bus is brought out to two studs on top of the frame and fanned out to the chassis foundations.

Weight:

USVP-1	400 kg
USVP-2	350 kg

Cost:

USVP-1	8,044 rubles
USVP-2	6,965 rubles

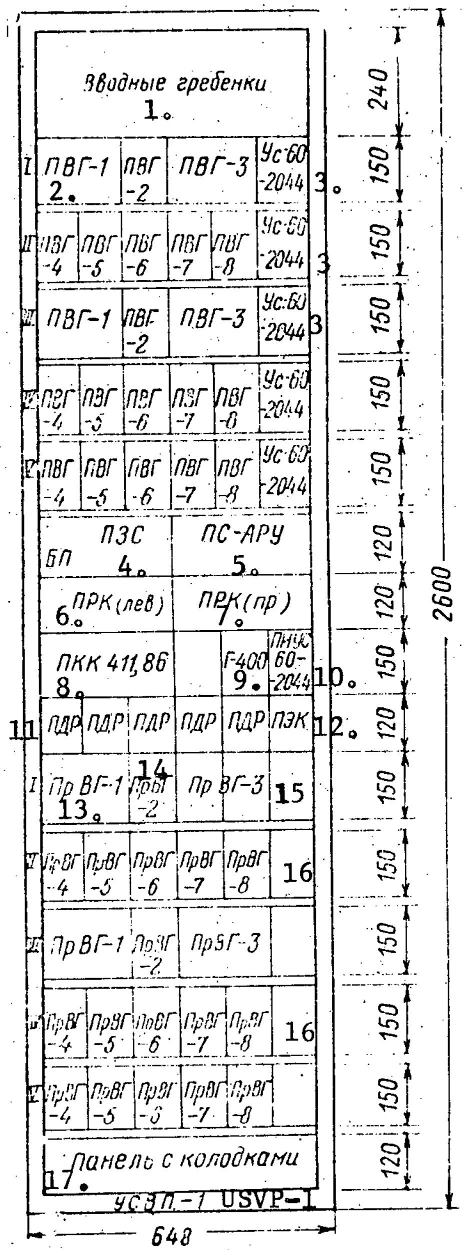


Figure 7.5.1.

The equipment placement in the USVP-1 rack of secondary converters

Key:

1. Input terminal blocks;
2. PVG-1 [secondary group conversion panel 1];
3. 60 - 2,044 KHz amplifier;
4. PZS, BP [protection and signaling panel, (?power supply panel?];
5. PS-ARU [unknown type of AGC panel];
6. PRK [expansion unknown] (left);
7. PRK (right);
8. 411.86 KHz control channel receiver;
9. G-400 generator;
10. 60 - 2,044 KHz crosstalk test unit;
11. PDR [expansion unknown];
12. PEK [shielded terminal block panel?];
13. PrVG-1 [secondary group receiver 1?];
14. PrVG-2 [secondary group receiver 2?];
15. Secondary group receiver 3 (?);
16. Secondary group receiver 8;
17. Panel with connecting blocks.

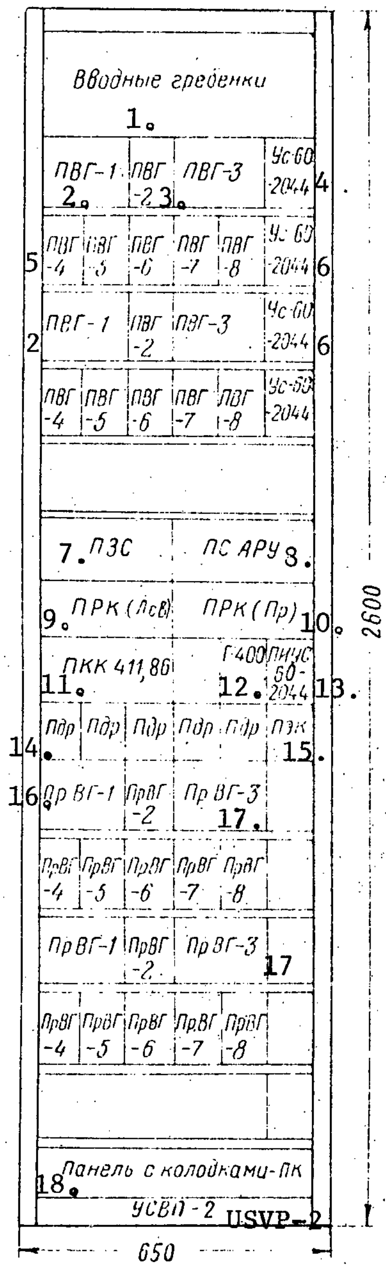


Figure 7.5.2.

The equipment placement in the USVP-2 rack of secondary converters.

Key:

1. Input terminal blocks;
2. PVG-1 [secondary group conversion panel 1];
3. Secondary group conversion panel 2;
4. 60 - 2,044 K z amplifier;
5. PVG-4;
6. 60 - 2,044 KHz amplifier;
7. PZS [protection and signaling panel];
8. PS ARU [unknown type of AGC panel];
9. PRK [expansion unknown] (left);
10. PRK (right);
11. 411.86 KHz control channel receiver;
12. G-400 generator;
13. 60 - 2,044 KHz crosstalk test unit;
14. Pdr [expansion unknown];
15. PEK [?shielded terminal block panel?];
16. PrVG-1 [secondary group receiver 1?];
17. PrVG-3 [?secondary group receiver 3?];
18. Panel with connecting blocks, PK.

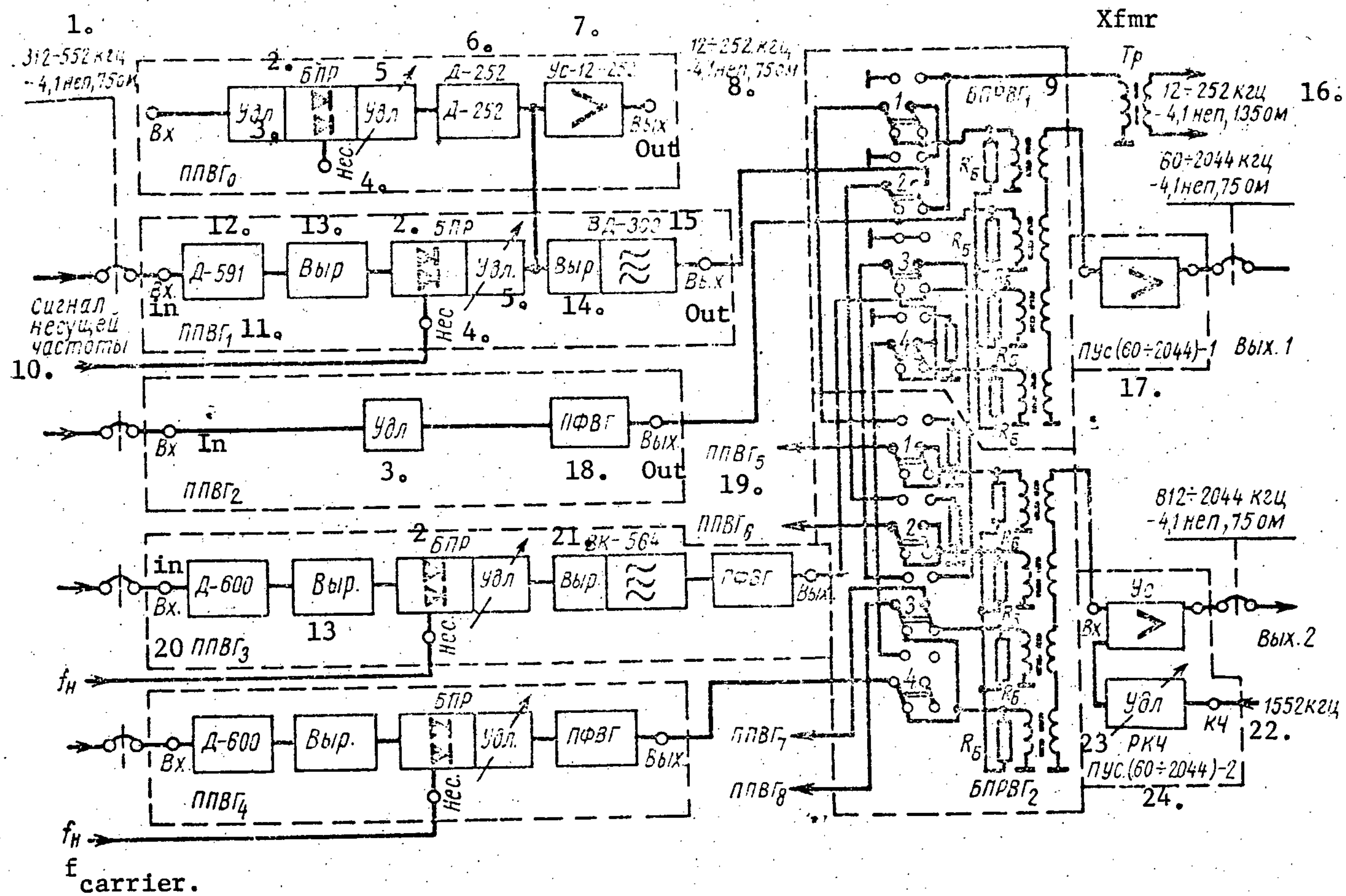


Figure 7.5.3. Block diagram of the USVP-2 standardized rack of secondary converters (receive channel) [sic; apparently mislabeled, Figure 7.5.4 is the receive channel - translator];

Key:
1. 312 - 552 KHz, -4.1 Np, 75 Ohms;
2. BPR [expansion unknown];
3. Attenuator pad;
4. Carrier;
5. Variable attenuator;
6. D-252 filter;
7. 12 - 252 KHz amplifier;
8. 12 - 252 KHz, -4.1 Np, 75 Ohms;

[Key to Figure 7.5.3, continued]:

9. $BPRVG_1$ [block 1 for the parallel operation of secondary groups [transmit]];
10. Carrier frequency signal;
11. $PPVG_1$ [secondary group transmit converter panel 1];
12. D-591 filter;
13. Equalizer;
14. Equalizer;
15. VD-300 filter;
16. 12 - 252 KHz, -4.1 Np, 135 ohms;
17. Transmit amplifier 1, (60 - 2,044 KHz);
18. PFVG [secondary group bandpass filter];
19. $PPVG_5$ [secondary group transmit converter panel 5];
20. $PPVG_3$ [secondary group transmit converter panel 3];
21. VK-564 filter;
22. 1,552 KHz control frequency;
23. RKCh [?control frequency level control?];
24. Transmit amplifier 2, (60 - 2,044 KHz).

[Key to Figure 7.5.4 (Page 526)]:

1. To the AGC;
2. Output;
3. Amplifier;
4. $PPrVG_0$ [secondary group receive converter panel 0];
5. From the AGC;
6. D-552 filter;
7. Attenuator pad;
8. BPR [expansion unknown];
9. Carrier;
10. Variable attenuator;
11. D-252 filter;
12. BPRVGpr1 [block 1 for the parallel operation of secondary groups (receive)];
13. 12 - 252 KHz, -2.6 Np, 135 ohms;
14. 312 - 552 KHz, -2.6 Np, 75 ohms;
15. D-591 filter;
16. From the AGC;
17. VD-300 filter;
18. Carrier frequency;
19. $PPrVG_2$ [secondary group receive converter panel 2];
20. $PPrVG_5$ [secondary group receive converter panel 5];
21. 60 - 2,044 KHz, -2.6 Np, 75 ohms;
22. $PPrVG_3$ [secondary group receiver converter panel 3];
23. D-600 filter;
24. Equalizer;
25. VG [input terminals];
26. PFVG [secondary group bandpass filter];
27. BPRVGpr2 [block 2 for the parallel operation of secondary groups (receive)];
28. $PPrVG_8$ [secondary group receive converter panel 8].

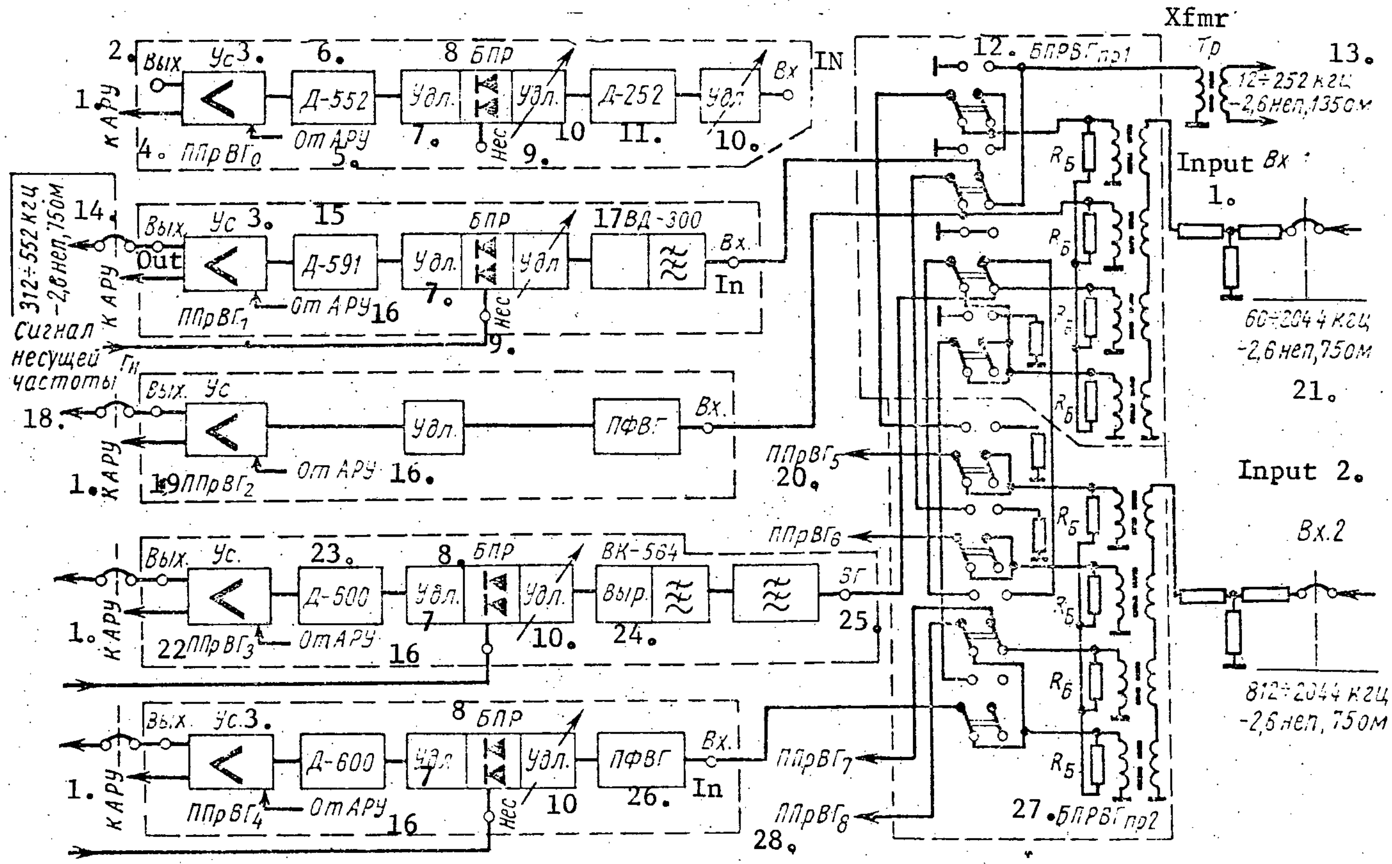


Figure 7.5.4. Block diagram of the USVP-2 standardized rack of secondary converters (transmit channel) [sic: apparently mislabeled, Figure 7.5.3 is the transmit channel].

[Key on page 525]

7.6. The STP Ternary Conversion Rack

Figures 7.6.1, 7.6.2.

Purpose

Intended for the conversion of five 300-channel groups from the 812 - 2,044 KHz frequency spectrum to the 2,108 - 8,254 KHz spectrum in the transmit channel and for the back conversion in the receive channel. Additionally, there is equipment in the rack which serves for amplifying the 120-channel group in the 1,556 - 2,044 KHz frequency spectrum, and combining this group with the converted 300-channel groups.

Electrical Characteristics

The input impedance at the input and output end of the transmit and receive channels		75 ohms
The nominal relative levels at the input and output of the channels:	Transmit	-4.1 Np
	Receive	-2.6 Np

Electrical Power Supply

Voltages:	Plate	206 volts ± 3%
	Thermistors	21.2 volts ± 3%
	Filament	220 VAC ± 3%
	Signaling	24 volts ± 10%
Current Consumption:	At the voltage of 206 v	0.92 a
	At the voltage of 21.2 v	0.50 a
	At the voltage of 220 VAC	90 VA
	At the voltage of 24 v	1.25 a

Note: The data on current consumption take into account the main and standby power supply equipment.

Equipment Complement

STP. Designed for one K-1920 system.

STP-1. Designed for 720 channels for the K-1920 system, or 1,020 channels for the R-600 radio relay link system.

Construction

The rack is a metal frame of sectional steel with equipment filling one side, having dimensions of 2,600 x 650 x 250 mm (without the protruding parts).

The individual electrical assemblies and parts of the assemblies are packaged in the form of notched, plug-in blocks. The blocks have a covered front groove and are mounted on special trays. Installed in the blocks are knife-type terminal blocks, and in the trays, knife-type terminal sockets.

Weight:	STP	400 kg	Cost:	STP	17,054 rubles
	STP-1	350 kg		STP-1	11,928 rubles.

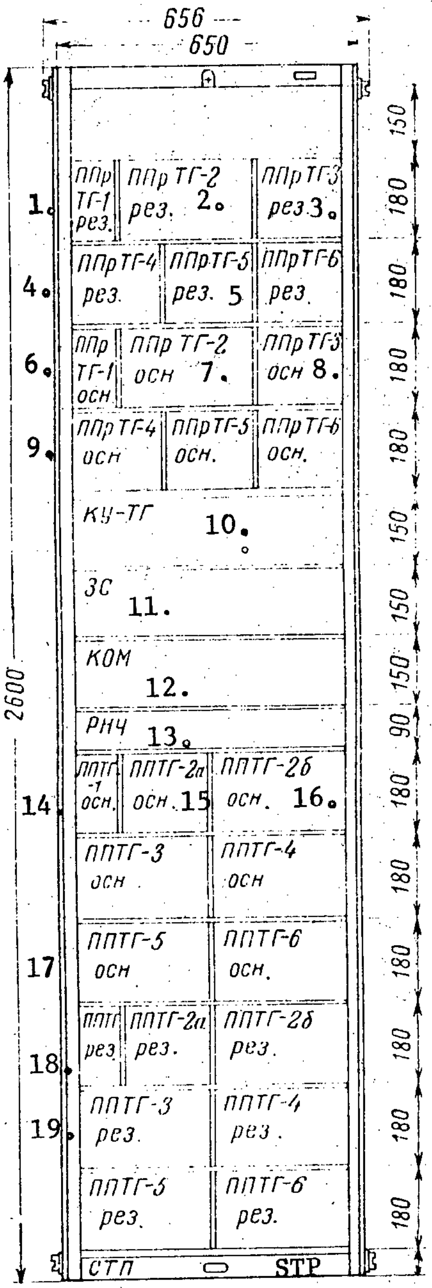


Figure 7.6.1.

The equipment placement in the STP ternary converter rack.

Key:

1. Standby ternary group converter panel 1, receive;
2. Standby ternary group converter panel 2, receive;
3. Standby ternary group converter panel 3, receive;
4. Standby ternary group converter panel 4, receive;
5. Standby ternary group converter panel 5, receive;
6. Main ternary group converter panel 1, receive;
7. Main ternary group converter panel 2, receive;
8. Main ternary group converter panel 3, receive;
9. Main ternary group converter panel 4, receive;
10. KU-TG [?ternary group monitor unit?];
11. Protection and signaling
12. Connecting panel;
13. RNCh [?carrier frequency distributor?];
14. Main ternary group converter panel 1, transmit;
15. Main ternary group converter panel 2a, transmit;
16. Main ternary group converter panel 2b, transmit;
17. Main ternary group converter panel 5, transmit;
18. Standby ternary group converter panel, transmit;
19. Standby ternary group converter panel 3, transmit.

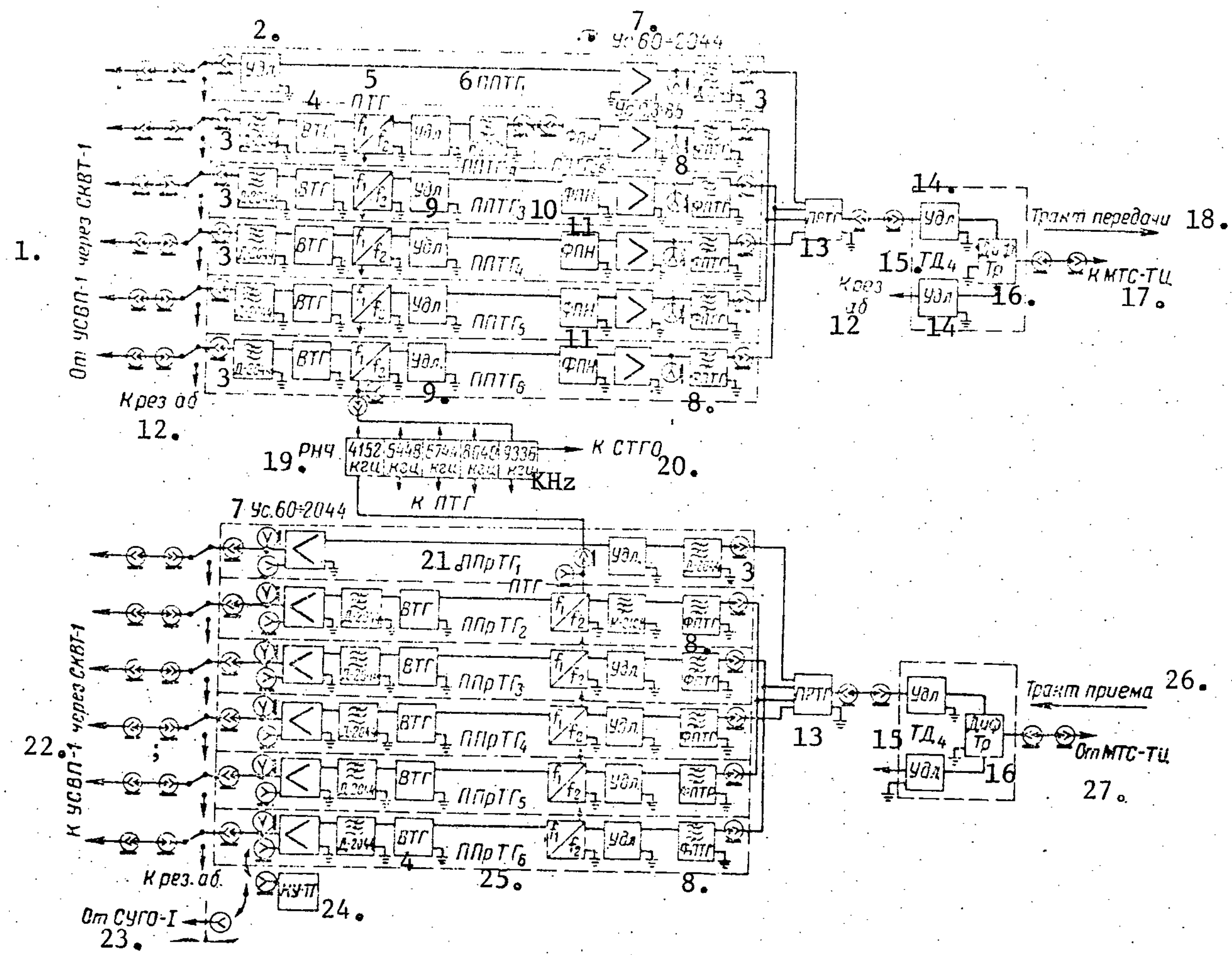


Figure 7.6.2. Block diagram of the ternary converters.

Key:
1. From the USVP-1 through the SKVT-1;
2. Pad;
3. D-2044 [KHz] filter;
4. VTG [?ternary group equalizer?];
5. PTG [unknown type of ternary group panel];
6. $PPTG_1$ [ternary group converter panel 1, transmit];
7. 60 - 2,044 KHz amplifier;
8. FPTG [?ternary group bandpass filter?];

[Key to Figure 7.6.2, continued]:

9. Pad;
10. $PPTG_3$ [ternary group converter panel 3, transmit];
11. FPN [unknown type of filter];
12. To standby ab. [expansion unknown];
13. PRTG [ternary group parallel operation unit];
14. Pad;
15. TD_4 [expansion unknown];
16. Differential transformer;
17. To the long distance telephone exchange--television center;
18. Transmit channel;
19. RNCh [?carrier frequency distributor?];
20. To the STGO;
21. $PPrTG_1$ [ternary group converter panel 1, receive];
22. To the USVP-1 through the SKVT-1;
23. From the SUGO-1;
24. KU-TG [?ternary group monitor?];
25. Ternary group converter panel 6, receive;
26. Receive channel;
27. From the long distance telephone exchange--television center.

7.7. The SIP Individual Conversion Rack (Taken out of Production)

Figure 7.7.1.

Purpose

Intended for the conversion of the individual voice frequency channels to to the 60 - 108 KHz frequency spectrum in the receive and transmit channels, as well as their back conversion, and also for increasing the levels of the converted frequencies in the receive channels of the equipment. The rack is designed for 12 voice frequency channels.

Electrical Power Supply

Voltages:

It is powered from regulated (or unregulated) current sources:

	Plate	206 (or 220) volts
	Filament	21.2 (or 24) volts
Current Consumption:	Plate	0.085 a (regulated) 0.085 a (unregulated)
	Filament	1.9 a (regulated) 2.52 a (unregulated)

Equipment Complement

Housed in the rack are the following: Six panels of converters, each for two channels; a panel of compensating networks; a panel of ballast resistors; a panel of fuses; and a signaling panel.

Construction

All of the panels are mounted on a standard frame made of steel channels with the equipment mounted on one side. The rack dimensions are 2,500 x x 646 x 410 mm.

Weight: 250 kg

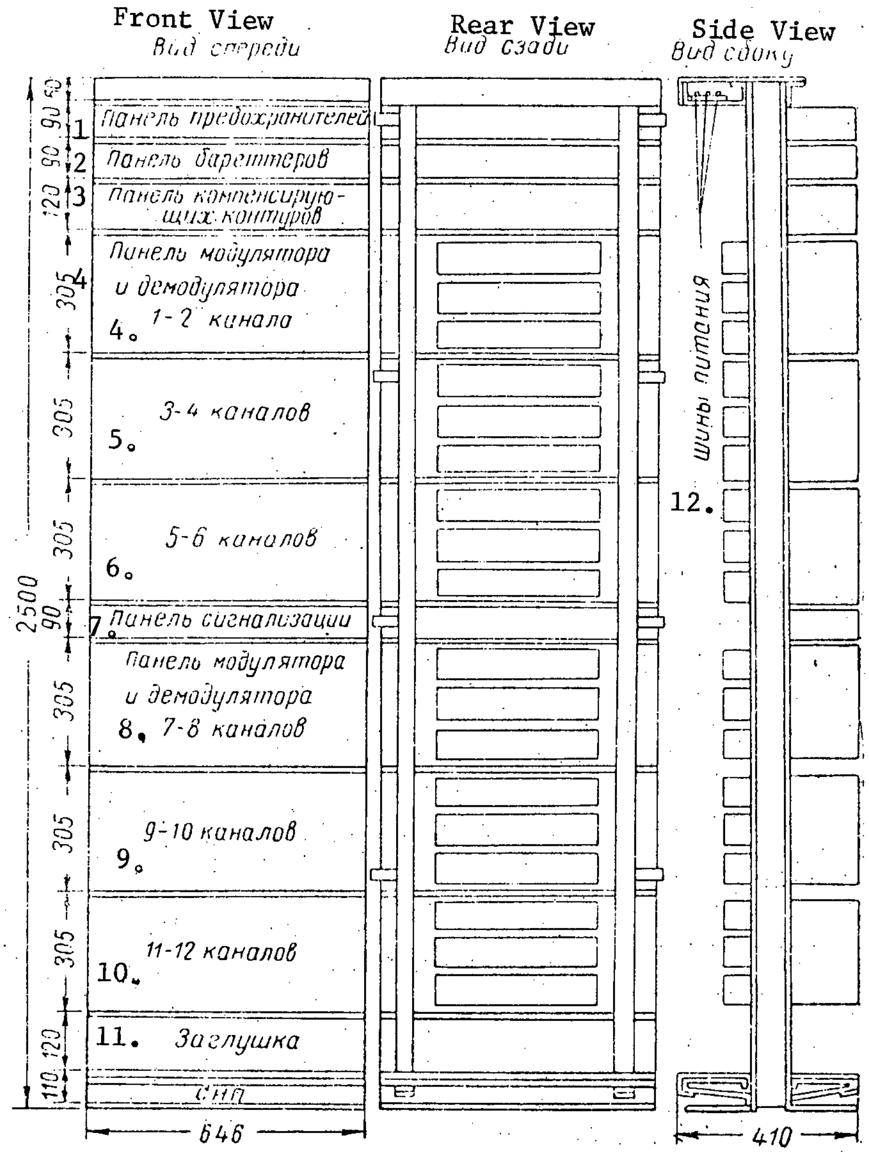


Figure 7.7.1. The equipment placement in the SIP rack of individual converters.

Key: 1. Fuse panel;
2. Ballast resistor panel;
3. Compensating network panel;
4. Panel of the demodulator and modulator of channels 1 - 2;
5. Of channels 3 - 4;

[Figure 7.7.1, Key continued]:

6. Of channels 5 - 6;
7. Signaling panel;
8. Panel of the modulator and demodulator of channels 7 - 8;
9. Of channels 9 - 10;
10. Of channels 11 - 12;
11. Blank filler panel;
12. Power buses.

SECTION 8. EQUIPMENT FOR THE SEGREGATION, INSERTION AND HIGH FREQUENCY THROUGH WORKING OF CHANNEL GROUPS

8.1. The SVK Channel Separation Rack

Figures 8.1.1, 8.1.2.

Purpose:

Intended for the segregation and insertion of four channels (9, 10, 11 and 12) in the V-12-2 or KV-12 12-channel high frequency multiplex systems. It is installed at attended repeater stations and is inserted in the circuit of the PS racks of the V-12-2 or the PKVO of the KV-12, in the break in the group channel between the outputs of the line amplifiers and the input to the D-88 or K-88 filter (depending on the transmit direction).

The SVK makes it possible to organize four two-way conversations in both one or two directions from an intermediate station.

Electrical Characteristics

The line spectrum segregated by the SVK equipment	68 - 84 KHz, 92 - 108 KHz
The nominal input impedance of the rack at the following connection points:	
PS V-12-2 or PKVO KV-12	135 ohms
Two- or four-wire section of a channel	600 ohms
The nominal relative level:	
-- At the input to a two-wire section of a channel	-0.4 Np
-- At the output of the differential system (the transmit channel in the four-wire section of a channel)	-1.5 Np
-- Ahead of the group section of the transmit route of four channels	-4.2 ± 0.05 Np
-- At the output of the group section of the receive route of four segregated channels	-1.2 Np
-- At the output of the voice frequency amplifier in the four-wire section of a channel	+0.5 Np
The voice frequency ringing frequency	2,100 Hz
The carrier frequency for the conversion of the 92 - 108 KHz spectrum to the 68 - 84 KHz spectrum	176 KHz
Individual carrier frequencies	96, 100, 104 and 108 KHz
The input impedance reflection factor for any channel with respect to 600 ohms	No more than 4% for frequencies of 300 - 3,400 Hz
The input impedance reflection factor with respect to 135 ohms	No more than 20%

Climatic Operational Conditions:

At temperatures of from +10 to +35° C, and a relative humidity of 85%.

Electrical Power Supply

Voltages:	Plate	206 ± 3%, volts
	Filament and signaling	1.2 ± 3%, volts
Current Consumption:	Plate	0.45 amps
	Filament and signaling	4.6 amps

Types of Vacuum Tubes Employed: 6ZhiPYe, 6P3Ye, and 10Zh1L (for the 4 KHz oscillator).

Construction

A standard rack made of sectional steel with equipment filling both sides. The rack dimensions are 2,500 x 650 x 535 mm.

Equipment Complement

Generator equipment. 4 KHz master oscillator, 4 KHz amplifier, 176 KHz amplifier panel, and panel of individual carrier frequency filters.

Group equipment units. Amplifiers for the A-B and B-A transmit directions, D-68 and K-108 crystal filters, a C-B amplifier, a C-A amplifier, a B-C amplifier and an A-C amplifier.

Individual equipment units. A differential system with a limiter, voice frequency amplifier and PTNV [voice frequency dial-ring receiver]; panel for the individual channels, voice frequency ringing generator, test amplifier; jackfield and intercom-callup unit; ringing relay set, power supply and signaling panel, neper meter panel with a generator for the following frequencies: 300, 400, 600, 800, 1,600, 2,100, 2,400, 3,000 and 3,400 Hz (fixed frequencies).

Note: For the isolation of four channels from the KV-12 system, in addition to the SVK rack, it is necessary to order the connection panel (RP2.240.004) with the complement of line amplifiers, 135:135 matching transformers and pads. The connection panel is mounted in the unoccupied positions in the SVK rack.

Weight: 350 kg

Cost: 3,020 rubles

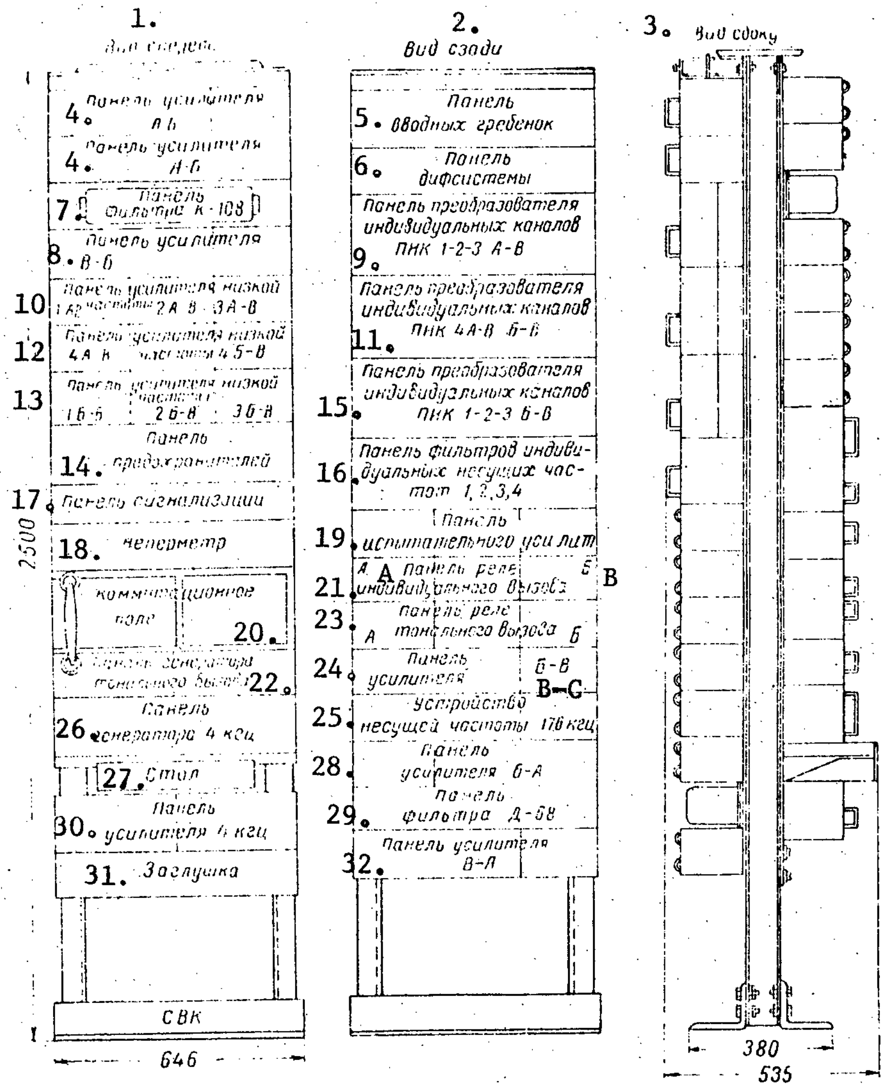


Figure 8.1.1. The placement of the equipment in the channel separation rack, the SVK.

Key:
1. View from the front;
2. View from the rear;
3. View from the side;
4. A-B amplifier panel;
5. Panel of input terminal blocks;
6. Differential system panel;
7. K-108 filter panel;
8. C-B amplifier panel;
9. PIK 1-2-3 A-C converter panel for the individual channels;
10. Low frequency amplifier panel: 1. A-C; 2. A-C; 3. A-C;
11. PIK 4 A-C B-C converter panel for the individual channels;
12. Low frequency amplifier panel: 4. A-C; 4. B-C;
13. Low frequency amplifier panel: 1. B-C; 2. B-C; 3. B-C;
14. Panel of fuses
15. PIK 1-2-3 B-C converter panel for the individual channels;
16. Panel of individual carrier frequency filters, 1, 2, 3 and 4;

[Key to Figure 8.1.1, continued]:

17. Signaling panel;
18. Neper meter;
19. Test amplifier panel;
20. Jackfield;
21. Panel of individual ringing relays;
22. Voice frequency ringing generator panel;
23. Panel of voice frequency ringing relays;
24. Amplifier panel;
25. 176 KHz carrier frequency unit;
26. 4 KHz generator panel;
27. Desk;
28. B-A amplifier panel;
29. D-68 filter panel;
30. 4 KHz amplifier panel;
31. Blank filler panel;
32. C-A amplifier panel.

[Key to Figure 8.1.2, page 537]:

1. From the high frequency equalizer of the intermediate station;
2. A-B amplifier;
3. K-108 [KHz] filter;
4. A-B through-working channels;
5. Power distributor;
6. Pad, a = 0.15 [nepers];
7. To the line amplifier of the PS SVK;
8. Bypass;
9. Pad, a = 0.15 [nepers];
10. Differential system;
11. HF bypass;
12. A-C receive;
13. Balancing network;
14. FKCh-92 [?92 KHz control frequency filter?];
15. Pad, a = 0.4 [nepers];
16. 23,000/135 [ohm] transformer;
17. Channel I, 108 KHz;
18. Pad, a = 0.1 [nepers];
19. C-B transmit;
20. 600/135 [ohm] transformer;
21. Pad, a = 0.7 [nepers];
22. Rejection filter for the four channels;
23. C-B amplifier;
24. Two-wire line connector;
25. Four-wire line connector;
26. Low frequency amplifier and voice frequency ring-dial receiver;
27. Demodulator;
28. FK [unknown type of filter];
29. Four-wire line connector;
30. Variable attenuator;

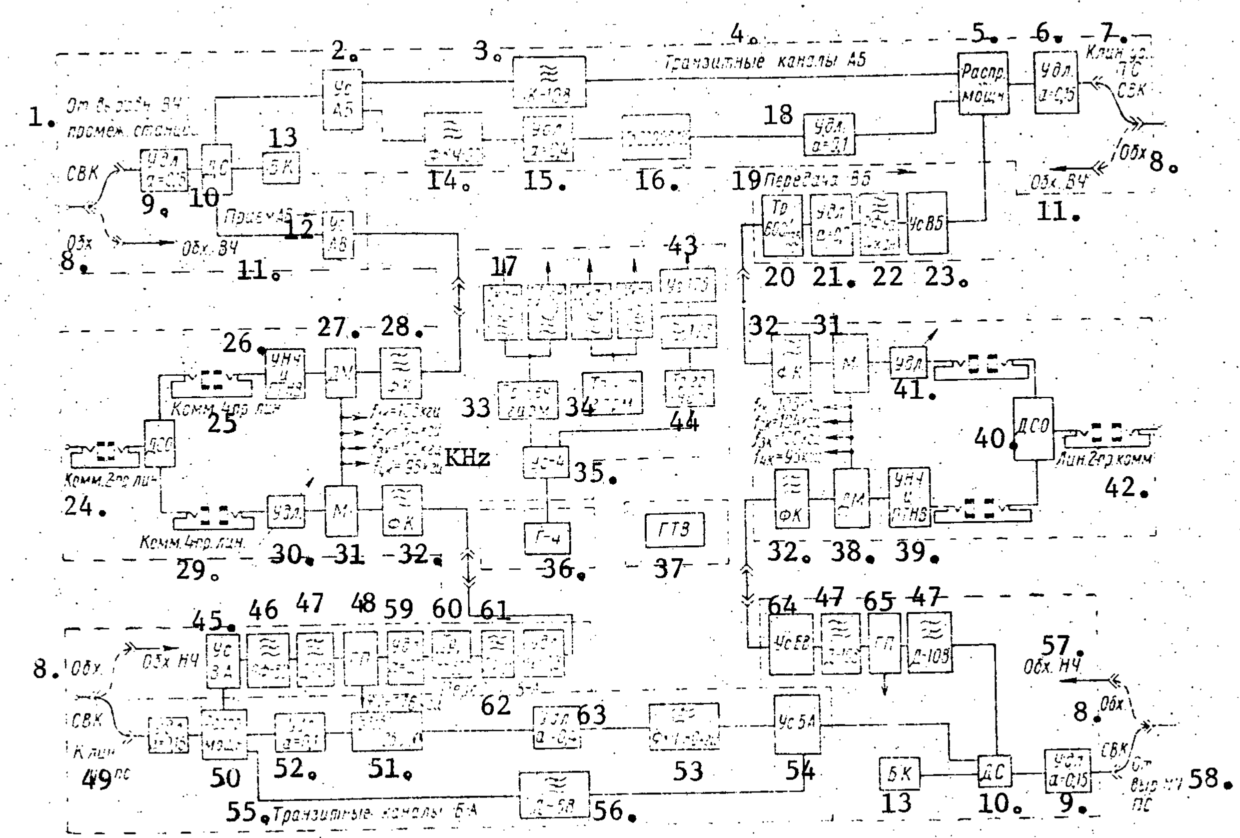


Figure 8.1.2. Block diagram of the channel separation rack, the SVK.

[Key, continued from preceding page 536]:

31. Modulator;
32. FK [?crystal filter?]
33. Transformer for the odd harmonics;
34. Transformer for the even harmonics;
35. 4 KHz amplifier;
36. 4 KHz generator;
37. Voice frequency ringing generator;
38. Demodulator;
39. Low frequency amplifier and voice frequency ring-dial receiver;
40. DSO [?terminal differential system?];
41. Variable attenuator;
42. Two-wire line connector;
43. 176 KHz amplifier;

[Key to Figure 8.1.2, continued]:

44. [?group carrier transformer?];
45. C-A amplifier;
46. 80 KHz rejection filter;
47. D-108 filter;
48. GP [expansion unknown];
49. To the line amplifier, PS [?intermediate station?];
50. Power distributor;
51. 135/25,000 [ohm] transformer;
52. Pad, a = 0.1 [nepers];
53. FKCh-80 KHz [?80 KHz control frequency filter?];
54. B-A amplifier;
55. B-A through-working channels;
56. D-68 filter;
57. High frequency bypass;
58. From the high frequency equalizer of the PS [?intermediate station?];
59. Pad, a = 0.7 [nepers];
60. 135/600 [ohm] transformer;
61. 96 KHz rejection filter;
62. C-A transmit;
63. Pad, a = 0.4 [nepers];
64. B-C amplifier;
65. GP [expansion unknown];
66. A-C amplifier.

8.2. The SVK-K Channel Segregation Rack

Figures 8.2.1, 8.2.2.

Purpose:

Intended for the segregation and insertion of four channels: 15, 16, 17 and 18 from the line spectrum of the K-24 and K-24-2 24-channel systems, or from the line spectrum of the K-60 or K-60p 60-channel systems.

The SVK-K rack can be installed at an attended repeater station both in the immediate vicinity of, and at a distance of up to 250 meters from the SPU.

Electrical Characteristics

The line spectrum split out by the SVK-K equipment	68.3 - 84 KHz
The input impedance of the rack at the points of its connection to the SPU and to the line	135 ohms

The levels at the input and output of the SVK-K rack at the points of its connection to the SPU and to the rack of cable entrance equipment (depending on the system and its operational mode) [see the Table].

Table

1. Система передачи	2. Работа без перекоса (без кпн)			3. Работа с перекосом (с кпн)				
					7. линейный спектр		9. выделенный спектр	
	4. Вариант работы	5. Линейный спектр частот кгц	6. Уровень передачи неп	4. Вариант работы	8. частоты спектра кгц	6. уровень передачи неп	8. частоты спектра кгц	6. уровень передачи кгц
К-24-2	I а	12÷108	—0,15	I б	12 108	—0,35 +0,15	68 84	—0,06 +0,02
	II а	12÷108	+0,2	II б	12 108	—0,7 +0,5	68 84	0,0 +0,2
К-60	I а	12÷252	—0,55	I б	12 252	—1,3 —0,1	68 84	—1,02 —0,94
	II а	12÷252	—0,2	—	—	—	—	—

Key: 1. Transmission system;
2. Operation without skewing [of the frequency response] (without KPN) [without ?preliminary slope networks?];
3. Operation with skewing (with KPN);
4. Operational variant;
5. Line frequency spectrum, KHz;
6. Transmit level, nepers;
7. Line spectrum;
8. Frequency spectrum, KHz;
9. Segregated spectrum.

Nominal relative levels:

At the input to a four-wire transmit section	-1.5 Np when loaded into 600 ohms
At the output of a four-wire receive section	+0.5 Np when loaded into 600 ohms
At the input of a two-wire channel section	-0.4 Np when loaded into 600 ohms
The individual carrier frequencies of the channels	72, 76, 80, and 84 KHz.
The isolation from perceptible crosstalk between the segregated channels	No less than 7.5 Np
The psophometric internal noise voltage of a segregated channel, measured at the point with a relative level of +0.5 Np	No higher than 0.4 mv psoph.
The voice frequency ringing frequency	2.100 Hz
The reflection factor of the input and output impedance of the rack with respect to 135 ohms	No more than 15% in the 12 - - 252 KHz frequency passband

Electrical Power Supply

Voltages:	Plate	206 ± 3%, volts;
	Filament	21.2 ± 3%, volts;
Current Consumption:	Plate	0.065 amps
	Filament	3 amps (together with the signaling)

Types of Semiconductor Devices and Vacuum Tubes Employed:

P13A, P4A, D7Zh, P401, 6Zh1PYe

Construction

A standard rack made of angle steel with equipment mounted on both sides. The rack dimensions are 2,500 x 648 x 380 mm.

Equipment Complement

Generator equipment: 4 KHz master oscillator, 4 KHz amplifier, 2,100 Hz voice frequency ringing generator.

Equipment for channel segregation: 68 - 84 KHz rejection filter; transmit distribution unit; A-B and B-A line amplifier.

Individual Equipment: variable attenuator, modulator, individual filters (the four-wire receive channel contains the following: demodulator, individual filter, low frequency amplifier and voice frequency ring-dial receiver), a jackfield and intercom-callup unit, power supply and signaling panel, and a neper meter panel with a generator at the following frequencies: 300, 400, 600, 800, 1,200, 1,600, 1,700, 2,400, 3,000 and 3,400 Hz (fixed frequencies).

Weight: 400 kg

Cost: 3,115 rubles

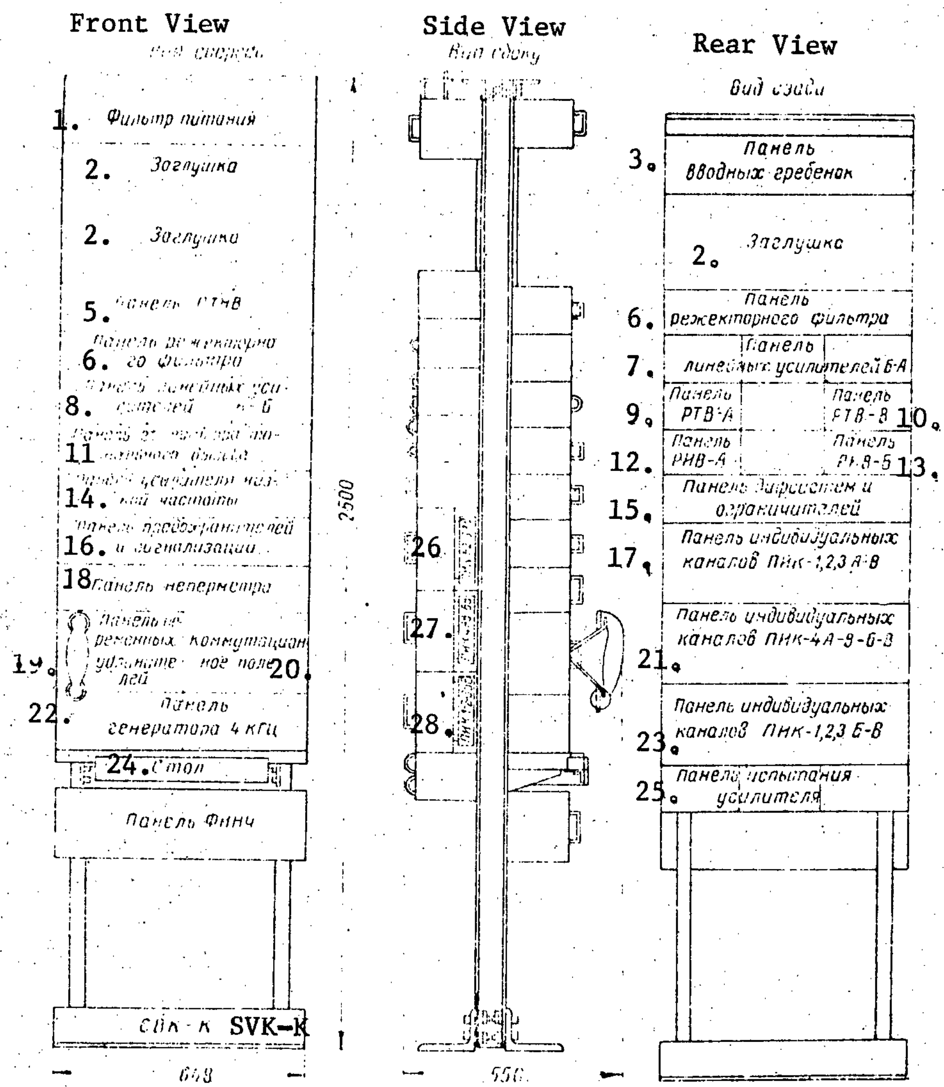


Figure 8.2.1. The placement of the equipment in the channel segregation rack, the SVK-K.

Key: 1. Power supply filter;
2. Blank filler panel;
3. Panel of input terminal blocks;
4. FINCh panel [individual carrier frequency filter panel];
5. PTNV panel [voice frequency ring-dial receiver panel];
6. Rejection filter panel;
7. Panel of B-A line amplifiers;
8. Panel of A-B line amplifiers;
9. A voice frequency ring receiver panel;
10. C voice frequency ring receiver panel;
11. Voice frequency ringing generator panel.

[Key to Figure 8.2.1, continued]:

12. "A" magneto ringing receiver panel;
13. "B" magneto ringing receiver panel;
14. Low frequency amplifier panel;
15. Panel of differential systems and limiters;
17. Panel of individual channels, PIK-1, 2, 3, A-C;
18. Neper meter panel;
19. Panel of variable attenuators;
20. Jackfield;
21. Panel of individual channels, PIK-4 A-C-B-C;
22. 4 KHz generator panel;
23. Panel of individual channels, PIK-1, 2, 3 B-C;
24. Desk;
25. Amplifier test panel;
26. PIK 1-2-3, A-C;
27. PIK 4 AC BC
28. PIK-1-2-3 BC.

[Key to Figure 8.2.2, page 543]:

1. From the output of the LUS-3 [line amplifier 3], [?from/with?] the PU-3 [?intermediate amplifier 3?];
2. Bypass;
3. SVK-K;
4. KPN [Acronym ambiguous: either 'preliminary', 'variable', or 'fixed' slope network];
5. Receive distribution unit;
6. Pad;
7. Us VK [unknown type of amplifier];
8. 68.3 - 84 KHz rejection filter;
9. RU Per [transmit distribution unit];
10. A-B line amplifier;
11. To line transformer;
12. PTNV [voice frequency ring-dial receiver];
13. Low frequency amplifier;
14. DP [?remote power??];
15. FK [?crystal filter?];
16. To the switchboard;
17. To the DSO [?terminal differential system?];
18. Modulator;
19. FK;
20. Individual carrier frequency filter, channel I, 84 KHz;
21. Individual carrier frequency filter, channel III, 76 KHz;
22. Modulator;
23. FK;
24. Demodulator;
25. To the switchboard;
26. Odd harmonic transformer;
27. Even harmonic transformer;

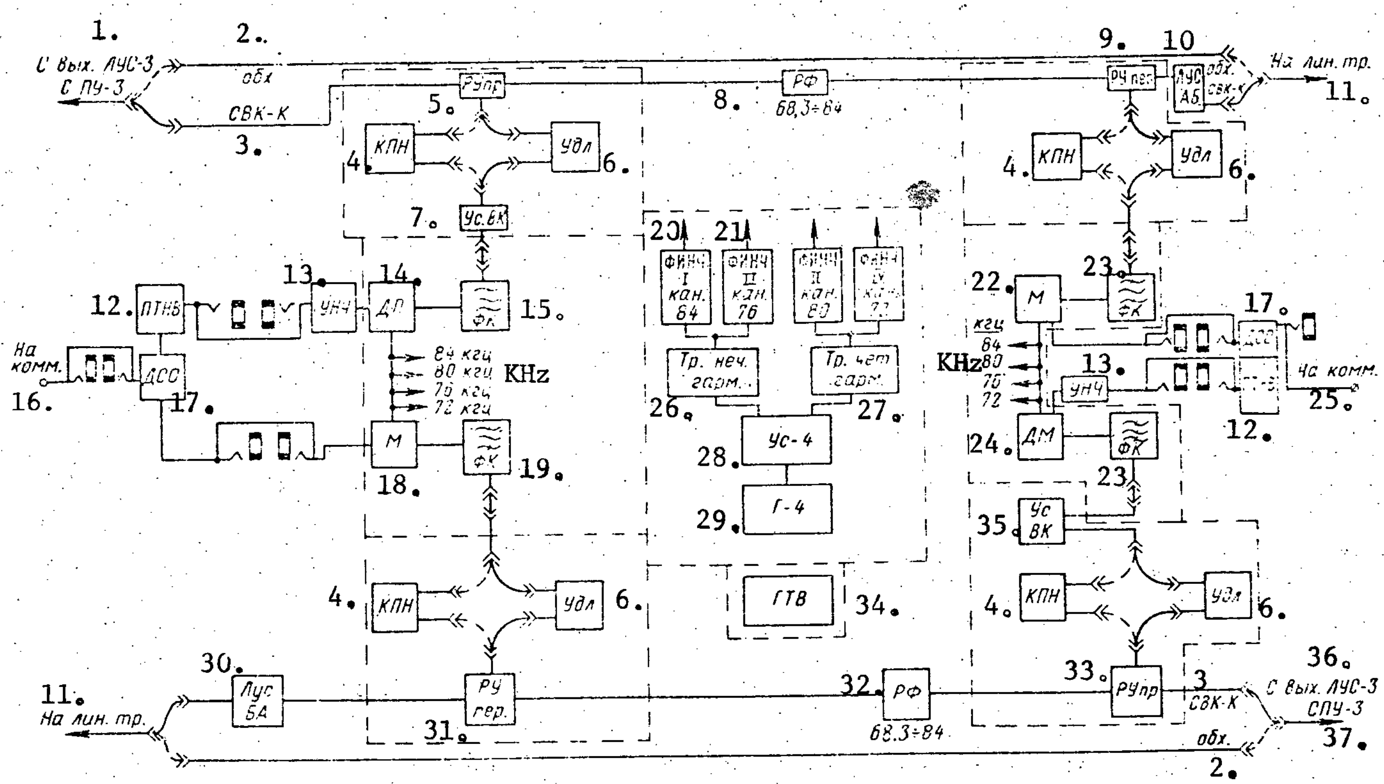


Figure 8.2.2. Block diagram of the AVK-K channel segregation rack.

[Key, continued from preceding page, 542]:

28. 4 KHz amplifier;
29. 4 KHz generator;
30. B-A line amplifier;
31. Transmit distribution unit;
32. 68.3 - 84 KHz rejection filter;
33. Receive distribution unit;
34. Voice frequency ringing generator;
35. Us VK [unknown type of amplifier];
36. From the output of the LUS-3 [line amplifier 3];
37. SPU-3.

8.3. The Equipment for the Segregation of 12-Channel Groups from the K-24, K-60 and R-600 Systems

Figures 8.3.1 - 8.3.5.

Purpose

Intended for the segregation and insertion of one or two of the lower 12-channel groups, occupying a passband of 12.3 - 59.4 KHz, or 12.3 - 107.7 KHz, as well as for the through working of the segregated groups of channels.

The equipment provides for the capability of the segregation and insertion of the following from these transmission systems: of one or two 12-channel groups in the 12.3 - 59.4 KHz or 12.3 - 107.7 KHz spectra from the K-60 and K-60p transmission systems, where these use the noninverted frequency spectrum; for the K-24-2 -- of one 12-channel group in the 12.3 - 59.4 KHz frequency spectrum; of one 12-channel group in the 60.6 - 107.7 frequency spectrum from an RRL [radio relay link] of the R-600 type (the spectrum of the zero secondary group).

The equipment provides for the following variants of segregation, insertion and through-working of the groups of channels:

Variant 1. The segregation and insertion of both one and two 12-channel groups in the line frequency spectrum with the transmission of the segregated in the same frequency spectrum:

a) To the segregation equipment of other systems (K-60, K-60p, K-24-2);

b) Via junction lines for use at an outlying terminal station of the K-24-2 type.

Notes: 1. The length of the junction line should be no more than 40 km.
2. SPUN K-24-2 amplifiers can serve as the amplifier equipment on the junction line.

Variant 2. The segreation and insertion of one or two 12-channel groups using the channels for operation at terminal ones (where the segregation equipment of individual converters is present at the station).

Variant 3. The organization of high frequency through-working of one of the segregated primary groups of one system to another in the 60 - 108 KHz frequency spectrum (for the through-working transmission of more than one group, equipment for primary group through-working, the STPG rack, must be provided in addition).

A provision is made in the equipment for the option of organizing broadcast through working in one of the segregated 12-channel groups in a passband of 24 - 36 KHz (when segregating one 12-channel group) and in a passband of 24 - 36 or 84 - 96 KHz (when segregating two 12-channel groups).

Note: Equipment for HF through-working of a broadcast channel is not included in the complement of the segregation equipment.

Electrical Characteristics

The nominal relative levels with respect to power at the inputs and outputs of the equipment racks correspond to the quantities given in the Table.

Table

Junction Connection Points in the Racks of the Segregation Equipment	Frequency KHz	Level Np
The input and output of the forward transmission channels for the case of segregation from the following HF systems:		
K-60	12 252	-1.3 -0.1
K-24-2	12 108	-0.35 +0.15
R-600	60.6 - 252	-2.1
The output of the segregation channel (receive) and the input of the insertion channel (transmit) for the case of SVPG operation:		
In accordance with the first variant	12 - 108	-0.15
The output of the receive channel for the case of operation in accordance with the second and third variants (two outputs)	60 - 108	-0.6
The input of the transmit channel when operating in accordance with the second and third variants (two outputs)	60 - 108	-4.5
The output of the receive channel at the point of the connection of the broadcast channel HF through-working equipment	24 - 36 84 - 96	-2.3 -2.3
The input of the channel at the point of the connection of the broadcast channel HF through-working equipment	24 - 36 84 - 96	-3.5 -3.5
The input of the panel of through-working filters, 60 - 108 KHz (PTF-60--108)	60 - 108	-0.6
The output of the PTF-60--108	60 - 108	-4.5

Note: The input impedance at the connection points for the segregation equipment is 135 ohms for the case of a balanced circuit.

The attenuation introduced by the forward transmission channel, along with the 12 - 252 KHz amplifier for the case of segregation from the K-24, K-60 and R-600 systems at the line control frequencies of 16, 64, 104 and 16, 112 and 248 KHz respectively, is:	0 ± 0.05 Np
The input impedance reflection factor at the input and output of the forward transmission channels, and the channels for the segregation and insertion of groups of channels, with respect to the 135 ohm resistance, is	15%

The reflection factor for the case of the segregation and insertion of a broadcast channel	10%
The suppression of forward transmission channel nonlinearity for the case of a level of 0.0 Np (with respect to power) at the output of the 12 - 252 KHz amplifier:	
a_{2h}	10 Np
a_{3h}	12.5 Np
The nonuniformity in the amplitude-frequency response of the forward transmission channel within the passband	No less than 0.12 Np
The inverse skewing network (KOP) inserted in the segregation receive channel:	
-- The attenuation of the KOP at 12 KHz	0.05 Np
-- The difference in the values of the attenuation for frequencies of 108 and 12 KHz	0.5 ± 0.02 Np
The forward predistortion network (KPP), inserted in the insertion transmission channel:	
-- The attenuation of the KPP at 108 KHz	0.05 Np
-- The difference in the values of the attenuation at frequencies of 12 and 108 KHz	0.5 ± 0.02 Np
The amount by which the attenuation of the FZ-16 [filter] in the passband of 16 ± 0.003 KHz exceeds the attenuation in the 12 - 15.7 KHz and 16.3 - 252 KHz passbands	No less than 3.0 Np
The psophometric noise power introduced by the segregation equipment into the following channels:	
Forward transmission channel	30 pw
For the insertion and segregation of 12 and 24 channels	80 pw
The protection against perceptible crosstalk between channels of the same type, of a transmit route and a receive channel for different routes, or on one route for different 12-channel groups	No less than 8.8 Np
The crosstalk attenuation between forward transmission channels going different directions at 252 KHz	No less than 10 Np
AGC using the 84.14 KHz control frequency in the receive channel for segregating 12-channel groups has a gain control range of	No less than ±0.4 Np

Climatic Operational Conditions

The equipment operates at temperatures of from +10 to +40°C at a relative humidity of 75%.

Electrical Power Supply

Voltages: Main circuits 21.2 ± 3%, volts
Signaling circuits 24 ± 10%, volts

Current Consumption:

Equipment Оборудование	21,2±3% в volts		24±10% в volts
	1. осн., а	2. рез., а	3. осн. и рез., а
SVPG-1 СВПГ-1	0,6	—	0,07
SVPG-2 СВПГ-2	0,6	—	0,07
SVPG-1P СВПГ-1П	1,4	—	1,13
SVPG-2P СВПГ-2П	1,7	—	1,13
SVPG-1PG СВПГ-1ПГ	1,7	2,0	2,8
SVPG-2PG СВПГ-2ПГ	2,0	2,0	2,8

Key: 1. Main, amps; 2. Standby, amps; 3. Main and standby, amps.

Equipment Complement

SVPG-1. The rack for segregating one 12-channel group.
SVPG-2. The rack for segregating two 12-channel groups.
SVPG-1P. The rack for segregating one 12-channel group, with conversion.
SVPG-2P. The rack for segregating two 12-channel groups, with conversion.
SVPG-1PG. The rack for segregating one 12-channel group, with conversion, and with generator equipment.
SVPG-2PG. The rack for segregating two 12-channel groups, with conversion, and with generator equipment.

In contrast to the SVPG-1 and SVPG-2 racks, which have equipment only for segregating and inserting 12-channel groups, in the SVPG-1P and SVPG-2P racks there are additonal panels for the conversion of the segregated groups and AGC panels using the 84.14 KHz control frequency.

Housed in the SVPG-1PG and SVPG-2PG racks, in addition to this equipment, are generator equipment panels: for the individual carrier frequencies of 64 . . . 108 KHz, the 120 KHz group carrier frequency, and the 84.14 KHz control frequency.

Note: The generator equipment is backed up 100% for the units in common.

Construction:

All rack types are made of sectional steel frames with panels mounted on one side. The rack dimensions are 2,600 x 650 x 250 mm.

Weight and Cost:

Equipment Оборудование	Weight, kg Вес, кг	Price, rubles Цена, руб.
СВПГ-1 (SVPG-1)	220	6750
СВПГ-2 (SVPG-2)	220	7073
СВПГ-1П (SVPG-1P)	280	8519
СВПГ-2П (SVPG-2P)	280	9860
СВПГ-1ПГ (SVPG-1PG)	350	14717
СВПГ-2ПГ (SVPG-2PG)	350	16269

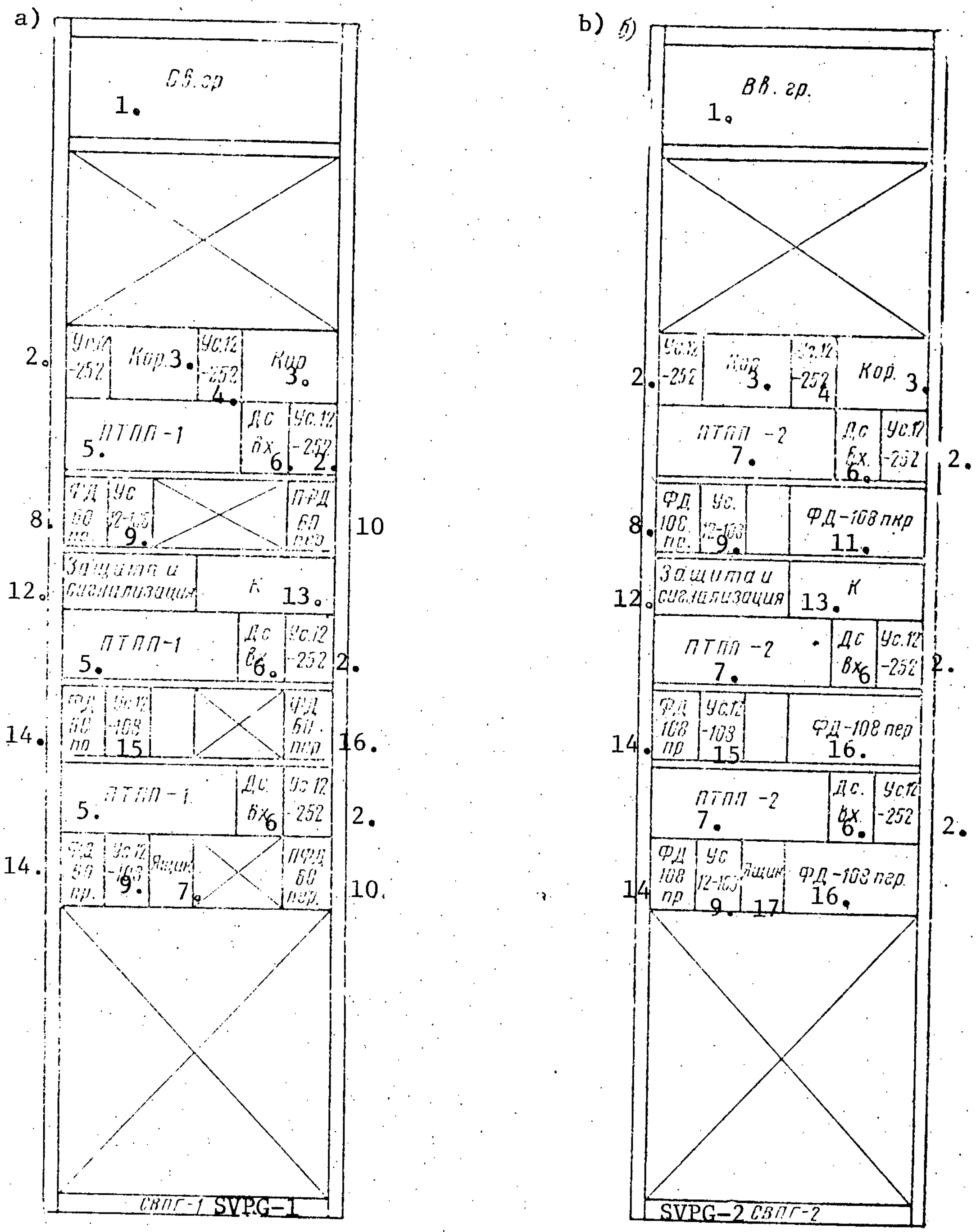


Figure 8.3.1. The placement of the equipment in the primary group separation rack:
a) SVPG-1; b) SVPG-2.

Key: 1. Input terminals;
2. 12 - 252 KHz amplifier;

[Key to Figure 8.3.1, continued]:

3. Corrective network;
4. 12 - 252 KHz amplifier;
5. PTPP-1 [forward transmission channel panel 1];
6. DS vkh [differential system, input];
7. PTPP-2 [forward transmission channel panel 2];
8. FD 60 pr [unknown type of 60 KHz receive filter];
9. 12 - 108 KHz amplifier;
10. PFD 60 per [unknown type of 60 KHz transmit filter];
11. FD-108 pkr [sic: pkr = per; unknown type of 108 KHz transmit filter];
12. Protection and signaling;
13. K [?connection panel?];
14. FD 60 pr [unknown type of 60 KHz receive filter];
15. 12 - 108 KHz amplifier;
16. FD 60 per [unknown type of 60 KHz transmit filter];
17. Box.

[Key to Figure 8.3.2 (Page 550)]:

1. Input terminal blocks;
2. 60 - 108 KHz through-working filter panel;
3. 12 - 232 [sic] KHz amplifier;
4. Corrector;
5. 12 - 252 KHz amplifier;
6. PTPP-1 [forward transmission channel panel 1];
7. Differential system, input;
8. 12 - 242 [sic] KHz amplifier;
9. FD-60 pr [unknown type of 60 KHz receive filter];
10. 12 - 108 KHz amplifier;
11. P [expansion unknown], receive;
12. P, transmit;
13. FD 60 per [unknown type of 60 KHz transmit filter];
14. KK-84.14 [?84.14 KHz control channel panel?];
15. U-ARU [unknown type of AGC unit];
16. FD 108 pr [unknown type of 108 KHz receive filter];
17. 12 - 108 KHz amplifier;
18. 60 - 108 KHz amplifier;
19. Protection and signaling panel;
20. K [?connection panel?];
21. PTPP-1 [forward transmission channel panel 1];
22. PTPP-2.

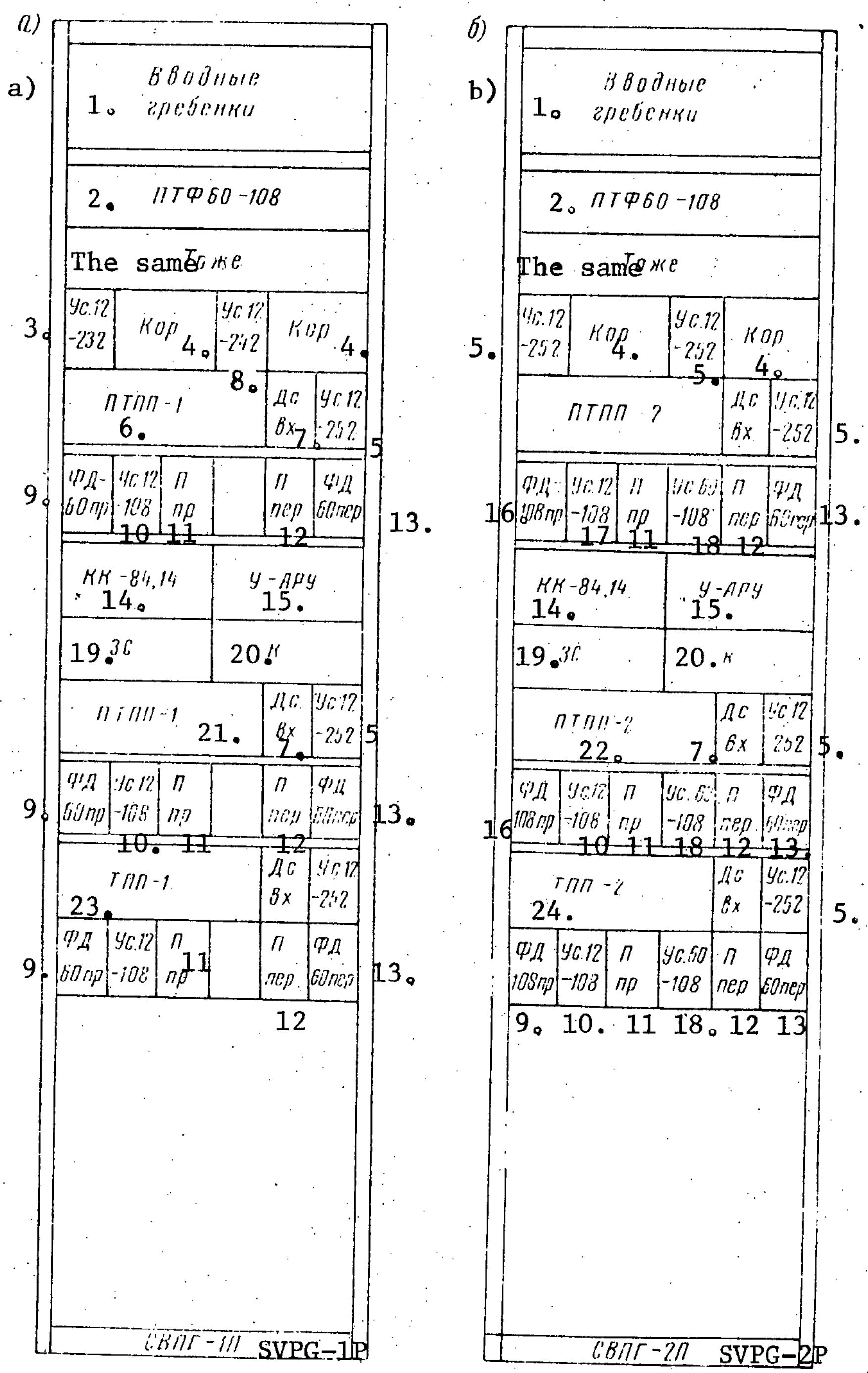


Figure 8.3.2. The equipment placement in the rack for primary group segregation:
a) SVPG-1P; b) SVPG-2P.

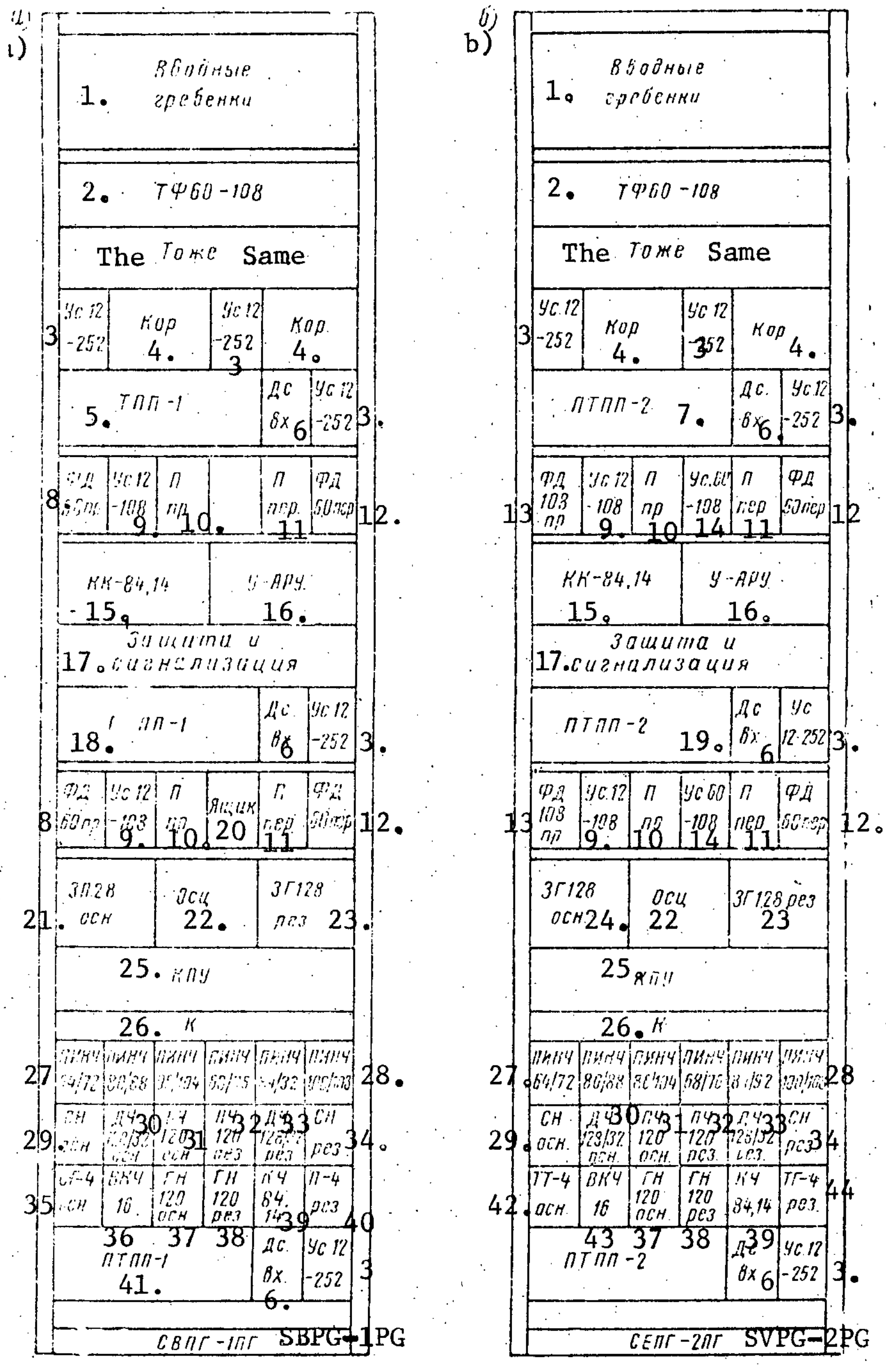


Figure 8.3.3. The equipment placement in the rack for the segregation of primary groups:
a) SVPG-1PG; b) SVPG-2PG.

[Key to Figure 8.3.3 (page 551)]:

1. Input terminal blocks;
2. 60 - 108 KHz through-working filter;
3. 12 - 252 KHz amplifier;
4. Corrector;
5. TPP-1 [forward transmission channel unit 1];
6. Differential system, input;
7. PTPP-2 [forward transmission channel panel 2];
8. FD 60 pr [unknown type of 60 KHz receive filter];
9. 12 - 108 KHz amplifier;
10. P [expansion unknown], receive;
11. P, transmit;
12. FD 60 per [unknown type of 60 KHz transmit filter];
13. FD 108 pr [unknown type of 108 KHz receive filter];
14. 60 - 108 KHz amplifier;
15. KK-84.14 [?84.14 KHz control channel?];
16. U-ARU [unknown type of AGC unit];
17. Protection and signaling;
18. PTPP-1;
19. PTPP-2 [for transmission channel panel 2];
20. Box;
21. ZG 128 osn. [128 KHz master oscillator, main unit];
22. Oscilloscope;
23. Standby 128 KHz master oscillator;
24. Main 128 KHz master oscillator;
25. KPU [expansion unknown];
26. K [connection unit?];
27. PINCh 64/72 [64/72 KHz individual carrier frequency panel];
28. 100/108 KHz individual carrier frequency panel;
29. Main SN [expansion unknown];
30. Main 128/32 KHz frequency divider;
31. Main 120 KHz frequency converter unit;
32. Standby 120 KHz frequency converter unit;
33. Standby 128/32 KHz frequency divider;
34. Standby SN;
35. Main SG-4 [?4 KHz sync generator?];
36. 16 KHz VKCh [unknown type of control frequency unit];
37. Main 120 KHz GN [?carrier generator?];
38. Standby 120 KHz GN;
39. 84.14 KHz control frequency panel;
40. Standby P-4 [expansion unknown];
41. PTPP-1;
42. Main TT-4 [expansion unknown];
43. 16 KHz VKCh;
44. Standby 4 KHz TG [harmonic transformer];

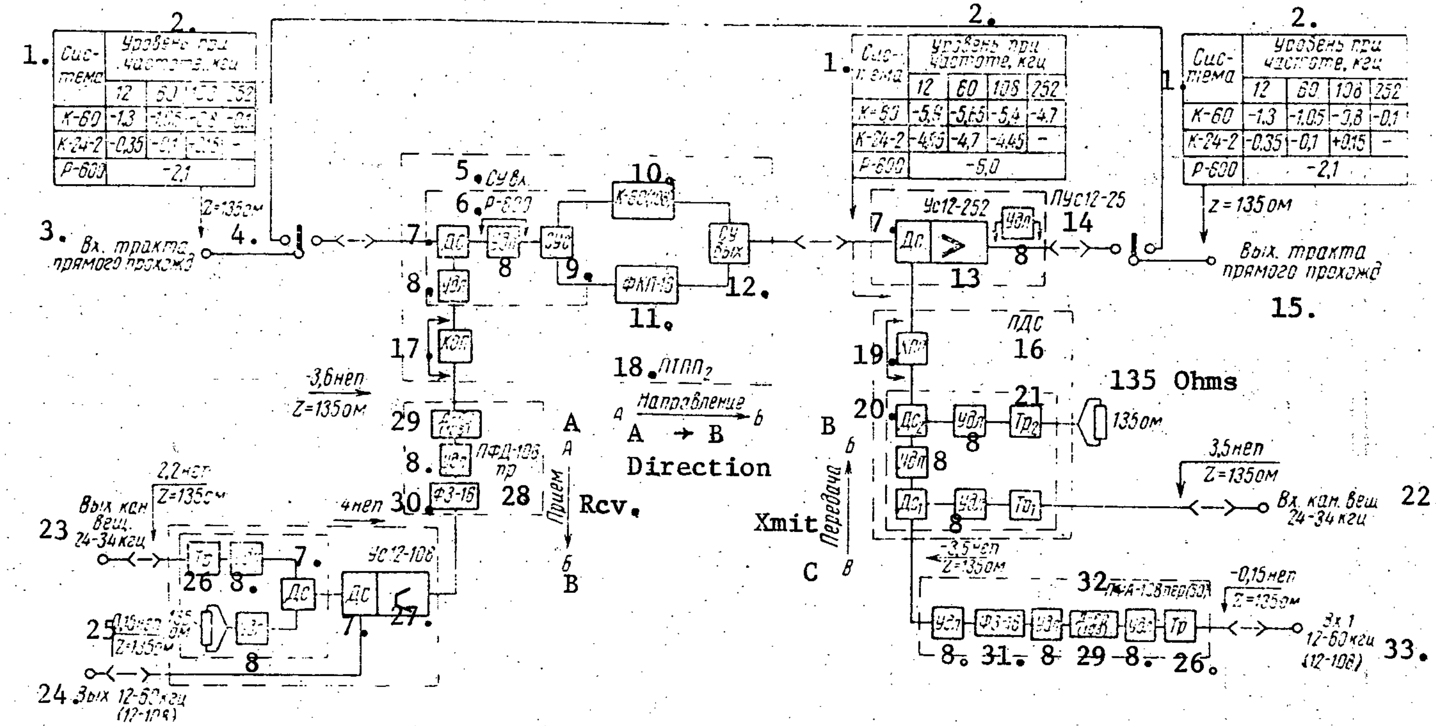


Figure 8.3.4. Block diagram of the SVPG-1/2 primary group segregation rack.

Key:
1. System;
2. The level for the following frequencies, KHz;
3. Input to the forward transmission channel;
4. Z = 135 ohms;
5. SU vkh. [?matching unit input?];
6. R-600;
7. Differential system;
8. Pad;
9. SUs [?matching unit amplifier?];
10. K-60 (or 108) KHz filter;
11. FKP-16 [unknown type of 16 KHz filter];
12. SU vykh. [?matching unit output?];
13. 12 - 252 KHz amplifier;
14. 12 - 25 [sic] KHz transmit amplifier;
15. Forward transmission channel output;
16. PDS [?differential system panel?];
17. KOP [inverse skewing network];
18. PTPP-2 [forward transmission channel panel 2];
19. KPP [forward predistortion network];
20. Differential system 2;

[Key to Figure 8.3.4, contined]:

21. Transformer 2;
22. Broadcast channel input, 24 - 34 KHz;
23. Broadcast channel output, 24 - 34 KHz;
24. 12 - 60 KHz (or 12 - 108 KHz) output;
25. 0.15 Np, Z=135 ohms;
26. Transformer;
27. 12 - 108 KHz amplifier;
28. PFD-108 pr [unknown type of 108 KHz receive filter panel];
29. D-60 (or 108) KHz filter;
30. FZ-16 [?16 KHz suppression filter?];
31. FZ-16;
32. PFA-108 per (60) [unknown type of 60 or 108 KHz transmit filter panel];
33. 12 - 60 KHz (or 12 - 108 KHz) input 1.

[Conclusion of Key for Figure 8.3.5 (page 555)]:

22. D-60 [KHz] filter;
23. For the SVPG-2P (or 2PG);
24. Transformer;
25. PUs 12 - 108 [12 - 108 KHz transmit amplifier];
26. To the motor;
27. To the motor;
28. To the receive channels;
29. 84.14 KHz control frequency output;
30. For the SVPG-1P (or 1PG);
31. Pulse generator;
32. Time delay relay;
33. RK_2 AR2 [expansion unknown];
34. 84.14 KHz control channel receiver;
35. A-B receive;
36. KPP [forward predistortion network];
37. For the SVGP-2P (or 2PG);
38. 135 ohms for the SVGP-1P (or 1PG);
39. 60 - 108 KHz input 1;
40. 24 - 34 and 86 - 96 KHz broadcast channel input;
41. BDS vkh [?differential system block input?];
42. PFD-60 per [unknown type of 60 KHz transmit filter unit];
43. 120 KHz carrier frequency.

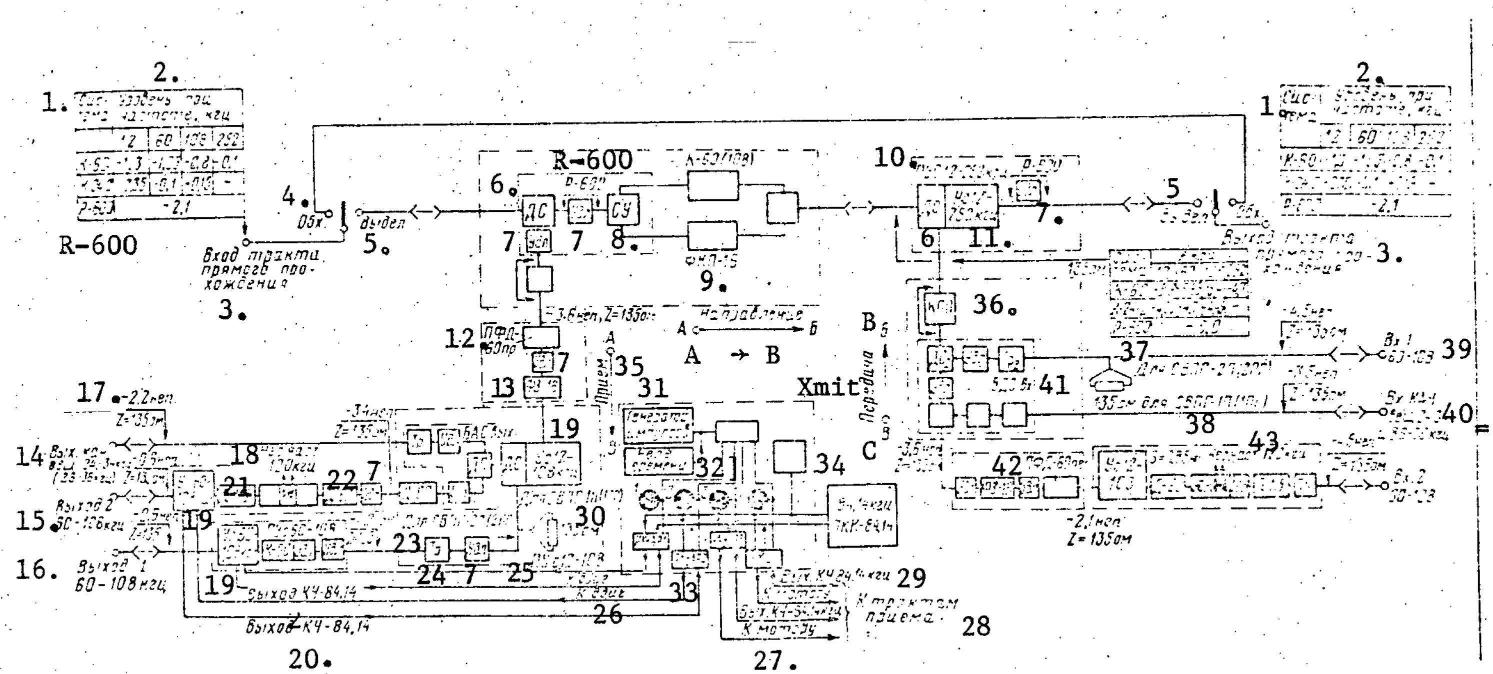


Figure 8.3.5. Block diagram of the SVPG-1P (or 2P), and SVPG-1PG (or 2PG) primary group segregation racks.

Key:

1. System;
2. Level at the following frequencies, KHz;
3. Input to the forward transmission channel;
4. Bypass terminal of the "bypass - segregation" switch;
5. "segregate" terminal;
6. Differential system;
7. Pad;
8. SU [?matching amplifier?];
9. FKP-16 [unknown type of 16 KHz filter];
10. 12 - 252 KHz transmit amplifier;
11. 12 - 252 KHz amplifier;

[concluded on page 554]

12. PFD 60 pr [unknown type of 60 KHz receive filter unit];
13. FZ-16 [?16 KHz suppression filter?];
14. Broadcast channel output, 24 - 34 KHz (or 26 - 36 KHz);
15. Output 2, 60 - 108 KHz;
16. Output 1, 60 - 108 KHz;
17. -2.2 Np, Z = 135 ohms;
18. Carrier frequency, 120 KHz;
19. 60 - 108 KHz amplifier;
20. 84.14 KHz control frequency output;
21. D-115 [KHz] filter;

8.4. The Equipment for Segregating 60-Channel Groups from the K-1920, K-300 and R-600 Multiplex Systems

Figures 8.4.1 - 8.4.6.

Purpose

Intended for the segregation and insertion of secondary, 60-channel groups in the K-1920 and K-300 systems, as well as the R-600 radio relay link equipment. The segregation and insertion of the 60-channel groups are accomplished in the trunk, attended repeater stations.

The complex of segregation equipment (SPPr-1, SPPr-2 and SVVG) provides for the following:

a) The segregation of one or two 60-channel groups from the K-1920 or R-600 systems, where these groups fall in line frequency spectra of 312.3 - 551.7 KHz or 312.3 - 799.7 KHz respectively;

b) The insertion (to replace the groups being split out) of one or two 60-channel groups;

c) The through working of unsegregated channel groups;

d) The conversion of the second and third secondary groups from the 312 - 799.7 KHz line frequency spectrum to the 312 - 552 KHz secondary group spectrum, as well as their back conversion.

e) The segregation and insertion of one, two or three 60-channel groups of the K-300 system.

The Function of the Individual Racks of the Segregation Equipment

SPPr-1. This forward transmission rack, in conjunction with the rack for the segregation of secondary groups (SVVG), is intended for the segregation and insertion of one or two 60-channel groups in the K-1920 or R-600 system, as well as for providing for the through working of unsegregated groups.

The SPPr-1 racks provide for the following:

SPPr-1-1: The segregation and insertion of a second secondary group in the 312.3 - 551.7 KHz spectrum;

SPPr-1-2: The segregation and insertion of second and third secondary groups in the 312.3 - 799.7 KHz range, i.e., with the loss of one channel in the third group.

K-60 terminal equipment is employed for the transmission of segregated via junction lines in the 12 - 252 KHz spectrum, where this equipment is also used for the conversion of the segregated groups to 12-channel groups. USPP equipment, in conjunction with the SUGO, can also be employed for the same purposes.

The SPPr-1 contains two main sections: the forward transmission channel, and the receive (branching) channel and the transmit (insertion) channel.

The nominal relative levels (with respect to power). At the inputs and outputs of the forward transmission channel:

For the case of segregation from the K-1920 system	-1.4 Np
For the case of segregation from the R-600 system	-2.1 Np
At the output of the segregation channel (receive channel)	-2.6 Np
At the input to the insertion channel (transmit channel)	-4.1 Np

SPPr-2. The forward transmission rack, in conjunction with the secondary group segregation rack (SVVG), is intended for the segregation and insertion of one, two or three 60-channel groups in the K-300 system, as well as for providing through-working for unsegregated groups.

The SPPr-2 rack provides for the following:

SPPr-2-1: The segregation and insertion of the first secondary group in the 60.3 - 299.7 KHz spectrum;

SPPR-2-2: The segregation and insertion of the first and second secondary groups in the 60.3 - 551.7 KHz spectrum;

SPPr-2-3: The segregation and insertion of the first, second and third secondary groups in the 60.3 - 799.7 KHz spectrum, with the loss of one channel.

The same equipment as for the case of SPPr-1 utilization can be employed for the transmission of segregated groups via junction lines, as well as for their subsequent conversion to 12-channel groups, at a segregation point. The SPPr-2 contains two main sections: the forward transmission channel, and the receive (branching) and transmit (insertion) channels.

The nominal relative levels (with respect to power). Installed in the SPPr-2 rack is the equipment for four segregation channels: two A-B direction segregation channels, and two B-A direction channels. The level at the inputs and outputs of the forward transmission channels is -1.5 Np at 1,300 KHz, and -2.6 NP at 60 KHz.

SVVG. The rack for the segregation of secondary groups is used for the segregation and insertion of groups to replace from one to three secondary groups segregated from the K-300 system, and one or two secondary groups from the K-1920 and R-600 systems. (The SVVG rack works in conjunctions with the SPPr-1 or SPPr-2 rack).

The SVVG rack converts the spectrum of three 60-channel groups to the 60 - - 804 KHz spectrum in the following manner:

The first secondary group (312.3 - 551.7 KHz) is converted with a 612 KHz carrier to the 60.3 - 299.7 KHz spectrum;

The second secondary group (312.2 - 551.7 KHz) is segregated without conversion;

The third secondary group (312.3 - 551.7 KHz) is converted with a 1,116 KHz carrier to the 564.3 - 803.7 KHz spectrum.

Back conversion to the 312 - 552 KHz spectrum is accomplished in the receive channel. Housed in the rack is the equipment for the automatic control of the levels of the 60-channel groups by means of the 411.86 KHz control frequency, with a gain control range of ± 0.4 Np. The generator equipment of the rack rpovides for the derivation of the 612 and 1,116 KHz carriers, and has 100% backup.

The nominal relative levels (with respect to power):

At the input and output of the transmission channel	-4.1 Np
At the input and output of the receive channel	-2.6 Np

Climatic Operational Conditions

The equipment is intended for operation in a room at a temperature of +10 -- -- +40° C, and a relative humidity of up to 75% (a relative humidity of 85% is also permitted at a temperature of +25° C).

Electrical Power Supply

Voltages:

-- SPPr-1:
- Main circuits — 220 ± 3% VAC
- Thermostats and signaling circuits — 24 ± 10% VDC

-- SPPr-2, SVVG:
- Main circuits — 21.2 ± 3%, volts
- Thermostats and signaling circuits — 24 ± 10%, volts

Current and Power Consumption:

Equipment	220 VAC watts	21.2 volts amps	24 volts amps
SPPr-1	230	-	2.0
SPPr-2	-	0.16	2.0
SVVG, main power	-	.4	2.3
The same, standby power	-	1.5	1.0

Equipment Complement

SPPr-1. A forward transmission rack;
SPPr-2. A forward transmission rack;
SVVG. The secondary group segregation rack.
Additionally, the following can be included in the equipment complement of the stations:
SUGO-1. Standardized rack of generator equipment (see section 6).
SGP K-60p. Group conversion rack (see section 4).
USPP. Rack of standardized conversion equipment (see section 7).
STPG and STVG-M. Rack for through-working of primary and secondary groups (see section 8).
SLUK-OP K-60p. Line equipment rack (see section 4).
SIP-60 and STV-DS-60. Individual conversion racks (see section 7).

Note: The composition and number of the racks at a segregation station depend on the nature of the groups being segregated, their conversion and the variants of the use of the segregated groups.

Construction:

The racks are made of sectional steel frames with blocks mounted on one side. The dimensions of the racks are 2,600 x 650 x 250 mm.

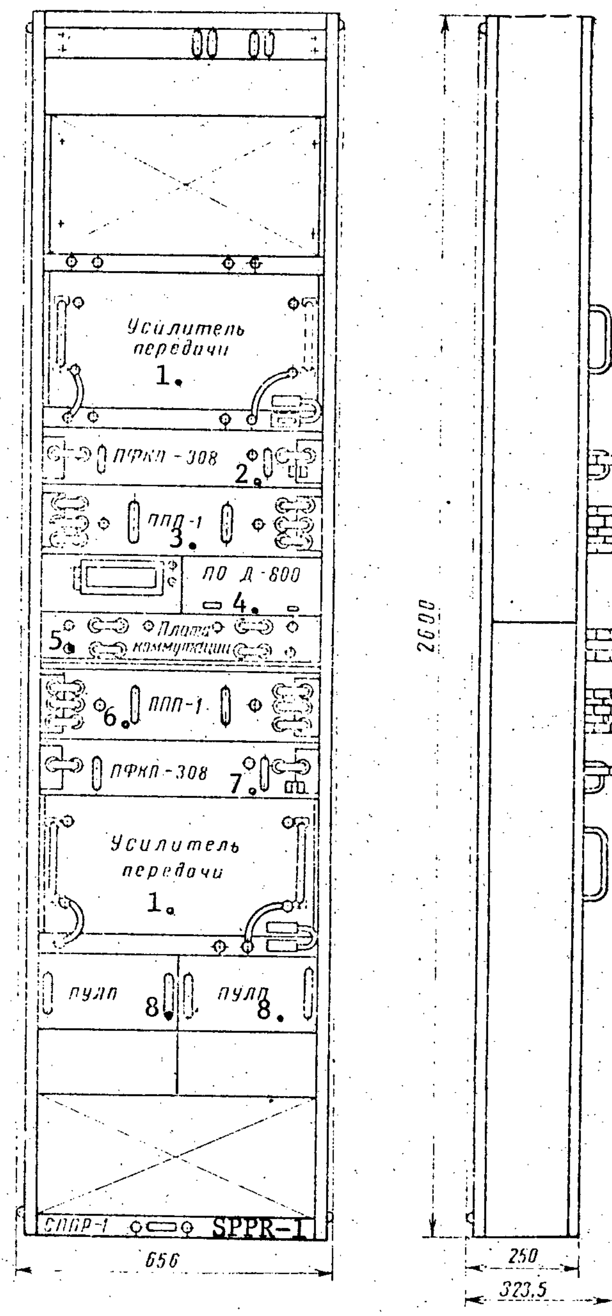
Weight:

SPPr-1	300 kg
SPPr-2	250 kg
SVVG	300 kg

Cost:

SPPr-1	5,600 rubles
SPPr-2	7,500 rubles
SVVG	8,975 rubles

Figure 8.4.1. →



The placement of the equipment in the SPPr-1 forward transmission rack of the equipment for the segregation of 60-channel groups.

Key:

1. Transmit amplifier;
2. PFKP-308 [unknown type of 308 KHz filter unit];
3. PPP-1 [expansion unknown];
4. PO D-800 [unknown type of D-800 filter];
5. Connection panel;
6. PPP-1;
7. PFKP-308;
8. PULP [expansion unknown].

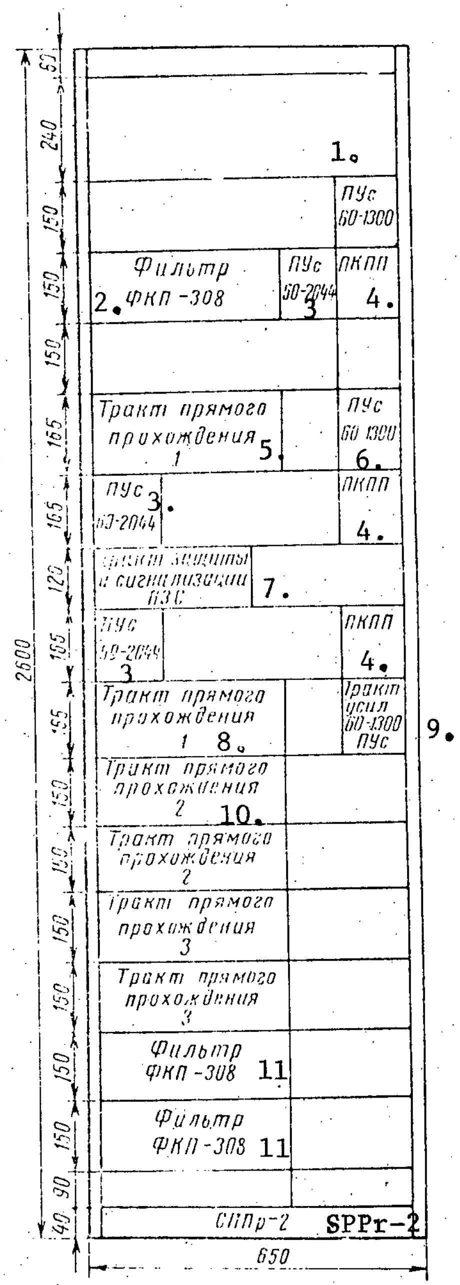


Figure 8.4.2.

The placement of the equipment in the SPPr-2 forward transmission rack of the equipment for segregating 60-channel groups.

Key: 1. 60 - 1,300 [KHz] transmit amplifier;
2. FKP 308 filter;
3. 60 - 2,044 [KHz] transmit amplifier;
4. PKPP [?forward predistortion network panel?];
5. Forward transmission channel panel 1;
6. 60 - 1,300 [KHz] transmit amplifier;
7. Protection and signaling channel, PZS [sic];
8. Forward transmission channel 1;
9. 60 - 1,300 [KHz] transmit amplifier channel;
10. Forward transmission channel 2;
11. FKP-308 filter.

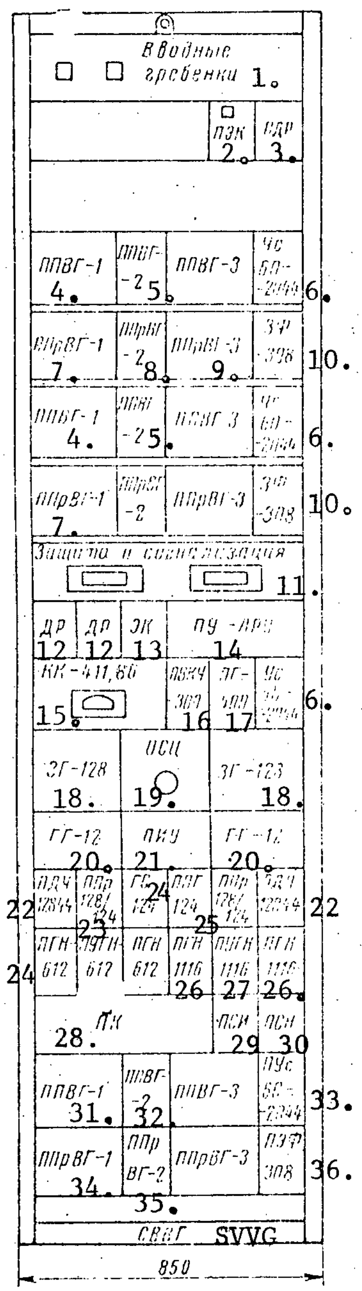


Figure 8.4.3.

The placement of the equipment in the rack for segregating secondary groups, the SVVG.

Key:

1. Input terminal blocks;
2. PEK [?panel of shielded terminal blocks?];
3. PDR [expansion unknown];
4. PPVG-1 [secondary group conversion panel 1, transmit];
5. Secondary group conversion panel, transmit];
6. 60 - 2,044 KHz amplifier;
7. Secondary group conversion panel 1, receive;
8. Secondary group conversion panel 2, receive;
9. Secondary group conversion panel 3, receive;
10. 308 KHz suppression filter;
11. Protection and signaling;
12. DR [expansion unknown];
13. EK [?shielded terminals?];
14. PU ARU [?AGC switcher?];
15. 411.86 KHz control channel;
16. PVKCh-300 [unknown type of 300 KHz control frequency unit];
17. PG-400 [?400 KHz generator panel?];
18. 128 KHz master oscillator;
19. Oscilloscope;
20. 12 KHz harmonic generator;
21. PIU [?crosstalk test unit?];
22. 12844 PDCh [?12,844 KHz frequency divider panel?];
23. 128/124 PPr [expansion unknown];
24. GS 124 [?124 KHz sync generator?];
25. PPG 124 [expansion unknown];
26. 1,116 KHz PGN [group carrier panel];
27. 1,116 KHz group carrier switcher;
28. PK [?connection panel?];
29. PSI [expansion unknown];
30. PSN [expansion unknown];

[Key to Figure 8.4.3, continued]:

31. PPVG-1 [secondary group conversion panel 1, transmit];
32. Secondary group conversion panel 2, transmit;
33. 60 - 2,044 KHz transmit amplifier;
34. Secondary group conversion panel 1, receive;
35. Secondary group conversion panel 2, receive;
36. PEF 308 [expansion unknown].

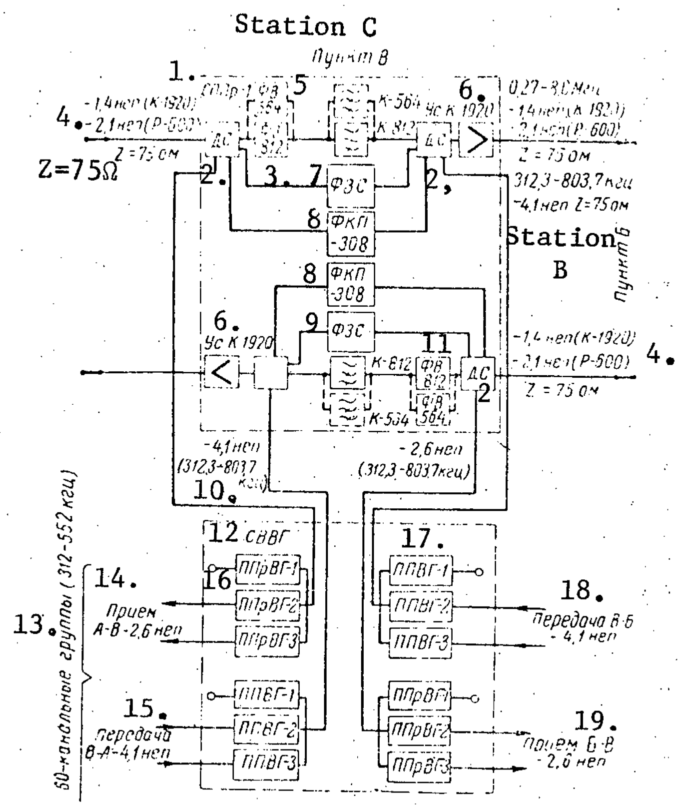


Figure 8.4.4. Block diagram for the segregation of 60-channel groups from the K-1920 and R-600 multiplex systems at station C (for the cases of segregating the second and third secondary groups). When segregating only group II, the FV-812 and K-812 [filters] are replaced by the FV-564 and K-564. For the case of segregation from the R-600, there is no FZS.

Key: 1. SPPr-1 [forward transmission rack for the segregation and insertion of one or two 60-channel groups];
2. DS [differential system];
3. FV-812 [unknown type of 812 KHz filter];
4. -1.4 Np (K-1920), -2.1 Np (R-600);
5. FV-564 filter;
6. K-1920 amplifier;
7. FZS [unknown type of filter];
8. FKP-308 [unknown type of 308 KHz filter];

[Key to Figure 8.4.4, continued]:

9. FZS;
10. -4.1 Np (312.3 - 803.7 KHz);
11. FV-812 filter;
12. SVVG [secondary group segregation rack];
13. 60-channel groups (312 - 552 KHz);
14. A-C, receive, -2.1 Np;
15. C-A, transmit, -4.1 Np;
16. PPrVG-1 [secondary group conversion panel 1, receive];
17. PPVG-1 [secondary group conversion panel 1, transmit];
18. C-B, transmit, -4.1 Np;
19. B-C, receive, -2.6 Np.

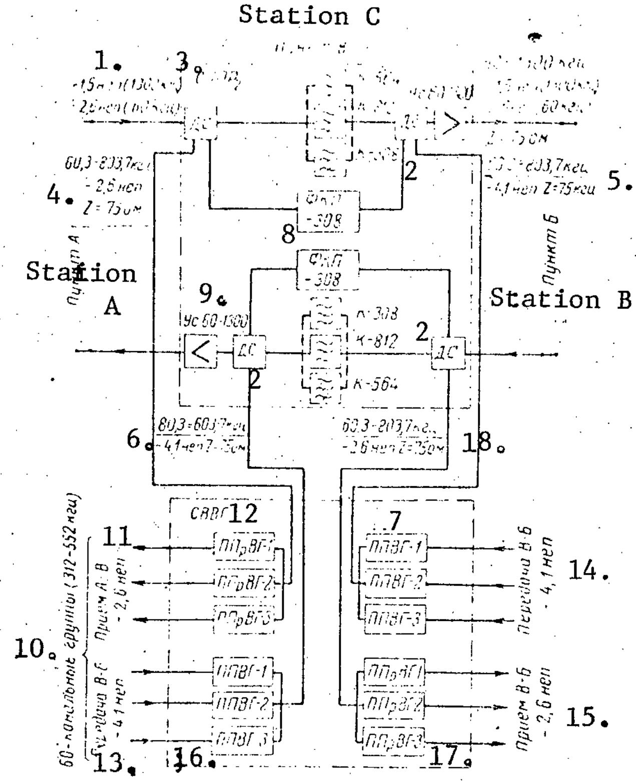


Figure 8.4.5. Block diagram for segregation at station C of 60-channel groups from the K-300 system when segregating groups I - III. When segregating group I (VG-1), the K-812 filter is replaced by a K-308 filter, and there is no FKP-308 filter. When segregating groups I and II (VG-1 and VG-2), a K-564 filter is installed.

Key: 1. -1.5 Np (1,300 KHz), -2.6 Np (60 KHz);
2. Differential system;
3. SPPr2 [forward transmission rack of the equipment for segregating 60-channel groups];

[Key to Figure 8.4.5, continued]:

4. 60.3 - 803.7 KHz, -2.6 Np, Z = 75 ohms;
5. 60.3 - 803.7 KHz, -4.1 Np, Z = 75 KHz [sic];
6. 80.3 - 603.7 KHz, -4.1 Np, Z = 75 ohms;
7. PPVG-1 [secondary group conversion panel 1, transmit];
8. FKP-308 [unknown type of 308 KHz filter panel];
9. 60 - 1,300 KHz amplifier;
10. 60-channel groups (312 - 552 KHz);
11. A-C receive, -2.6 Np;
12. SVVG [secondary group segregation rack];
13. C-B, transmit, -4.1 Np;
14. C-B, transmit, -4.1 Np;
15. C-B, receive, -2.6 Np;
16. PPVG-3 [secondary group conversion panel 3, transmit];
17. PPrVG-3 [secondary group conversion panel 3, receive];
18. 60.3 - 803.7 KHz, -2.6 Np, Z = 75 ohms.

[Key to Figure 8.4.6 (page 565)]:

1. First group, -4.1 Np, 312 - 552 KHz;
2. D-591 filter;
3. Equalizer;
4. PVG [secondary group converter];
5. Pad;
6. D-300 filter;
7. 612 KHz carrier (from the generator equipment);
8. Second group, -4.1 Np;
9. 1,116 KHz carrier (from the generator equipment);
10. PFVG-2 [?secondary group bandpass filter 2?], 312 - 552 KHz;
11. Block for the parallel operation of secondary groups (BPRVG);
12. C-B transmit;
13. PPVG-1 [secondary group conversion panel 1, transmit];
14. 612 KHz carrier;
15. Second group;
16. 1,116 KHz carrier;
17. Third group;
18. 60 - 2,044 KHz amplifier;
19. Block for the parallel operation of secondary groups;
20. B-C transmit;
21. PVG [secondary group converter];
22. PPrVG-1 [secondary group conversion panel 1, receive].

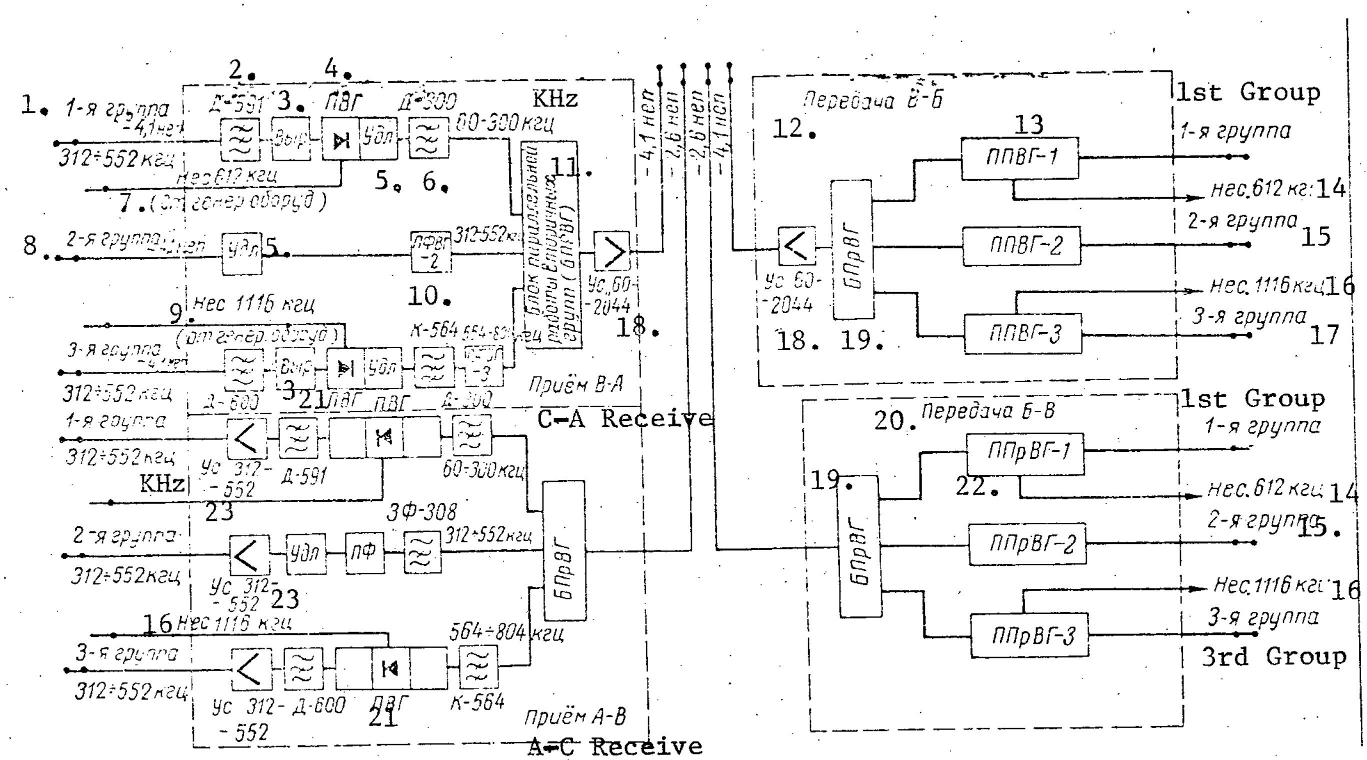


Figure 8.4.6. Block diagram of the SVVG conversion equipment of the equipment for segregating 60-channel groups.

[Key on preceding page, 564]

8.5. The STPG Primary Group Through-Working Rack

Figures 8.5.1, 8.5.2.

Purpose

Intended for transferring the 12-channel groups in the 60 - 108 KHz spectrum from one transmission system to another with a sharp suppression of the adjacent groups of telephone channels and control frequencies, which fall within the transmitted passband.

The STPG blocks are inserted between the output terminals of the receive equipment for a 12-channel group, and the input terminals of the transmit equipment of this group.

The equipment can be used for the following systems: K-1920, R-600, K-60, K-60p, K-24, K-24-2, K-300, KV-12, V-12 and V-12-2.

The Nominal Relative Levels

At the receive output for a 12-channel group	-0.6 Np for all systems
At the transmit equipment input	-4.8 Np for the V-12, KV-12 and K-24 systems (with the SIP individual equipment racks); -4.5 Np for all other systems with the SIO type individual equipment rack.

Equipment Complement

STPG. Supplied as a set with two panels for primary group through-working and two panels of suppression filters. In all, eight through-working panels and eight panels of suppression filters can be installed in the rack. Additionally, a panel of connecting jacks is mounted in the rack. The through-working and filter panels can also be installed in free locations of the LATs [line equipment shop] racks.

Construction

The rack frame is made of sectional steel. The dimensions of the rack are 2,600 x 644 x 250 mm. The dimensions of a panel are 124 x 582 x 276 mm.

Weight:

STPG with four panels (one set of panels)	150 kg
STPG with 16 panels (four sets of panels)	350 kg
Panels	15 kg

Cost:

STPG with four panels	1,358 rubles
STPG with 16 panels	5,480 rubles

Note: At the present time, a new primary group through working rack with a corrective network, the STPG-K, has been developed. In contrast to the STPG racks, the STPG-K racks have blocks of amplitude corrective networks for equalizing the variable amplitude-frequency characteristics of the 12-channel routes, something which makes it possible to organize 9 to 10 HF transits without voice frequency retransmission. The presence of an amplitude trunk corrector (KAM) required the insertion of a special transistorized amplifier in the through-working panel circuitry. It is planned that the STPG-K rack will be supplied as an equipment set with two sets for duplex HF through working (main and standby sets). To bring the equipment complement of the rack up to the maximum capacity of 4 duplex HF transits, sets for one duplex HF transit will be supplied. ZF-64 and ZF-104 suppression filters will be supplied on special order to suppress the line control frequencies in the primary groups of the HF systems. At the present time, the STPG-K rack is being supplied with the full equipment complement (for four duplex HF transits).

Electrical Power Supply (for the STPG-K)

Voltages:

Amplifiers	21.2 ± 3%, volts;
Signaling	24 ± 10%, volts.

Current Consumption:

Amplifiers	360 ma
Signaling	500 ma

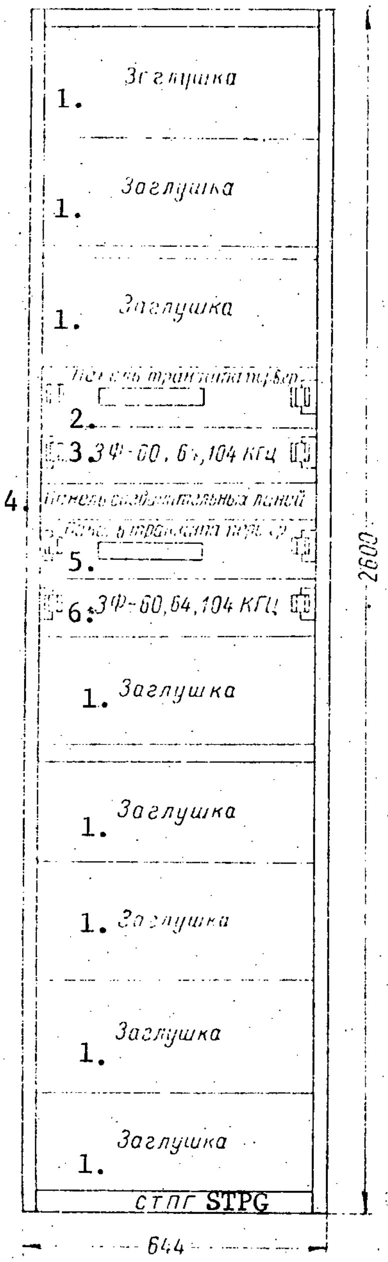
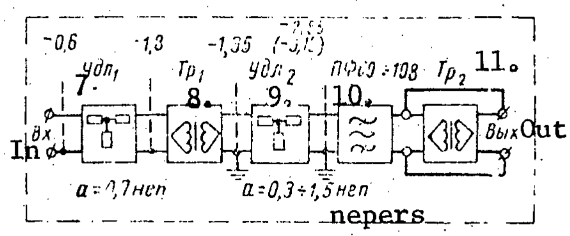


Figure 8.5.1. The placement of the equipment in the primary group through-working rack, the STPG.

Key: 1. Blank filler panel;
2. Primary group through-working panel;
3. 60, 64 and 104 KHz suppression filters;
4. Junction line panel;
5. Primary group through working panel;
6. 60, 64 and 104 KHz suppression filters.



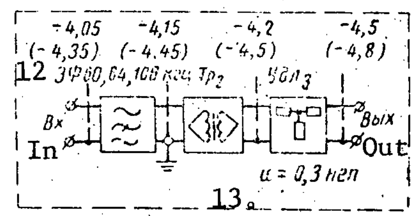


Figure 8.5.2. Block diagram of the through-working panel for 12-channel groups (for the case of through-working of the primary groups from the K-1920 or R-600 equipment, the suppression filter panel is not installed in the K-60, while transformer Tr2 is inserted in the TPG [primary group through-working] panel).

Key:

7. Pad 1;
8. Transformer 1;
9. Pad 2;
10. 60 - 108 KHz bandpass filter;
11. Transformer 2;
12. 60, 64 and 106 [sic] KHz suppression filters;
13. Pad 3, a = 0.3 nepers.

8.6. The STVG and STVG-M Secondary Group Through-Working Racks

(The STVG rack has been taken out of production)

Figures 8.6.1, 8.6.2.

Purpose

Intended for the transmission of secondary (60-channel) groups from the output of the receive section of the group equipment of one transmission system to the input of the transmit section of the group equipment of another system in the 312 - 552 KHz frequency spectrum.

Nominal Relative Levels

At the output of the receive equipment	-2.6 Np
At the input to the transmit equipment	-4.1 Np

Equipment Complement

STVG. Supplied as a set with two panels of input terminal blocks, one panel for junction lines and two panels for through-working of the secondary groups. Some 10 through-working sets can be installed in the rack.

The through-working set consists of two through-working panels. Supplemental through-working sets are supplied on separate order.

STVG-M. Supplied as a set with two panels of input terminal blocks, one panel for junction lines, two panels for secondary group through working, two panels of crystal suppression filters (FZK 308/556) and a protection and signaling panel. Some five through-working sets can be installed in the rack. A through-working set consists of two through-working panels and two suppression filter panels. Where there is no need to use the suppression filter panels, the capacity of the rack is increased correspondingly. Additionally, through-working complexes are supplied on separate order.

Note: The STVG-M rack is being manufactured at the present time, and the STVG racks have been taken out of production.

Electrical Power Supply

The STVG-M is powered from the 220 volts AC mains, or with 24 volts DC.

Note: Electrical power supply of the rack is needed for thermostat control of the filters and signaling (no provision is made for the power supply for the STVG rack).

Current and Power Consumption (with the full STVG-M complement)

Voltage, volts	Current and Power Consumed
220 volts AC	435 VA
24 volts DC ± 10%	14.0 amps, main circuits 1.2 amps, signal circuits

Construction

Racks made of sectional steel. The dimensions of the racks are 2,600 x 644 x x 250 mm. The dimensions of the through-working and suppression filter panels are 99 x 582 x 245 mm.

Weight and Cost

Equipment	Weight, kg	Price, rubles
STVG-M	150	2,300
STVG	120	–
TVG panel	10	–

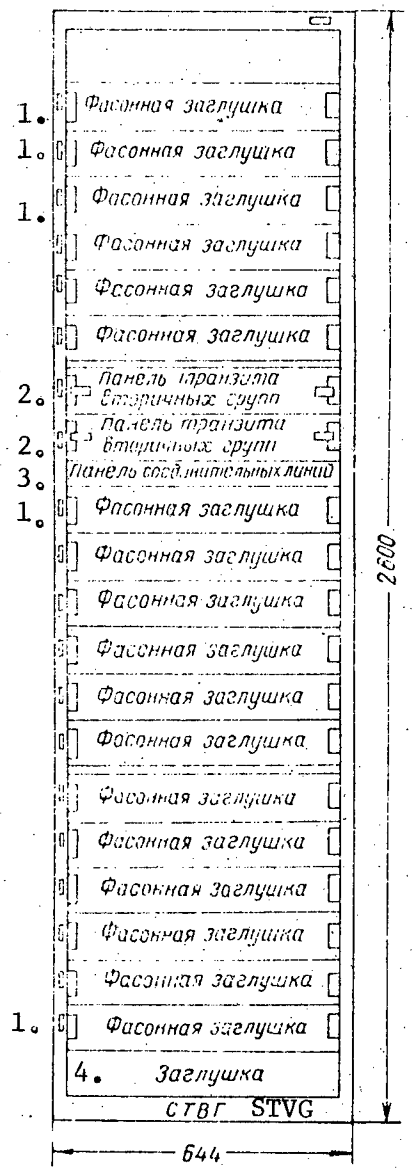


Figure 8.6.1.

The placement of the panels in the through-working rack for secondary groups, STVG.

Key:

1. Shaped filler panel;
2. Secondary group through-working panel;
3. Panel of junction lines;
4. Blank filler panel.

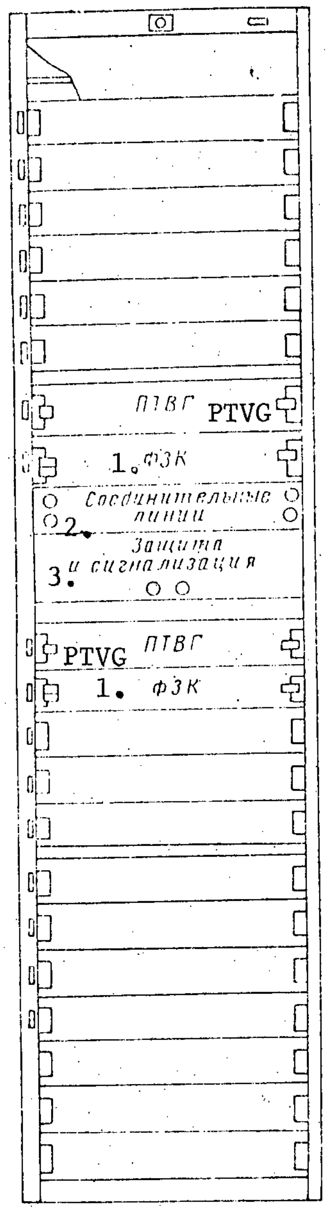


Figure 8.6.2.

The placement of the panels in the rack for secondary group through-working, the STVG-M.

Key:

PTVG = Secondary group through working panel;

1. Crystal suppression filter;
2. Junction lines;
3. Protection and signaling.

SECTION 9. WIRE BROADCAST EQUIPMENT

9.1. The SVO Wire Broadcast Equipment

Figures 9.1.1 - 9.1.4.

Purpose: Intended for the organization of broadcast service via steel, open wire, intra-oblast' communications circuits.

Type of Line: Open wire steel circuits with a conductor diameter of 4 mm.

Communications System: Two-wire, single-band.

Electrical Characteristics

Line frequency spectrum	28.7 - 34.7 KHz
The effectively transmitted passband	100 - 6,000 Hz
The length of a repeater section corresponds to the following attenuation at the highest frequency: Maximum	6.7 Np (roughly a section length of 33 - 40 km)
Minimum	2.5 Np (roughly a section length of 15 - 18 km)
The broadcast channel is designed for operation through	Six amplifier sections
The input impedance of the transmitting station from the: Input end	600 ohms
Output end	800 ohms
The input and output impedance of an intermediate station	800 ohms
The input impedance of a receiving station	800 ohms
The nominal relative power level at the output of a repeater station when loaded into 800 ohms	+2.0 Np
The least level at the amplifier input for the following stations: Repeater and receiver stations	-4.7 Np
Transmitting stations	0 Np
The control frequency level	1.5 Np lower than the transmit level
The AGC system	Electrical, single frequency, flat and slope type
The AGC control frequency and the demodulation frequency for the case of a transition to nch [low frequency]	34.7 KHz

The nonlinear distortion factor at frequencies above 100 Hz	No more than 2%

Climatic Operational Conditions

The equipment can operate in temperatures of from +10 to +40° C, and a relative humidity of up to 80%.

Electrical Power Supply

Voltages:

The equipment is powered from DC or AC with local supplies or remotely using DC:

Plate	220 ± 10% volts or 206 ± 3% volts
Filaments	24 ± 10% volts, or 21.2 ± 3% volts
AC voltage	127/220 volts from the mains (there are power supplies at all stations)
Remote power	180 volts at the terminals of the station being powered.

Current Consumption

-- Transmitting station (PSVO):

Plate	0.12 a
Filaments	1.6 a
Signaling	0.55 a

-- Receiving station (OSVO):

Plate	0.11 a
Filaments	0.975 a
Signaling	0.55 a

-- Repeater station with independent power (USVO):

Plate	0.15 a
Filaments	1.5 a
Signaling	0.55 a

-- Repeater station with remote power (USVO):

Power for the amplifiers	0.075 a
Signaling	0.3 a

Type of Vacuum Tubes Employed: 6Zh1PYe and 12Zh3L

Equipment Complement

PSVO. Transmitting station. It converts the low frequency spectrum to a high frequency spectrum. It is designed for the transmission of broadcast programs in 10 directions (circuits) and consists of the PSVO station using one rack, five line filters (space is reserved for the installation of five more filters, and the compressor.

OSVO. Receiving station. It converts the HF line spectrum to the low frequency spectrum, and consists of the OSVO station using one rack, a line filter and an expander.

USVO. Amplifier station with independent power. It amplifies the line spectrum, as well as the low frequency spectrum for local broadcast service. It provides for the capability of branching out HF broadcast programs. It is put together as a set with one rack, mounted in which, besides the amplifier equipment, are two line filters (space is reserved for the installation of two more), the expander, and the D-26 filter, which is intended for joint operation with the VS-3 equipment.

USVO with DP. Amplifier station with remote power. It amplifies the HF line spectrum in the 28.7 - 34.7 KHz frequency range, and is put together in one cabinet, mounted in which, besides the amplifier equipment, are the following: two line filters, remote power receive block, supplemental D-26 filter for installation at the VS-3-2/3 amplifier stations for the case of combined operation. Additionally, a provision is made for the option of installing remote power supply transmit blocks: five blocks at the transmitting station, three blocks at the amplifier station and one block at the receive station with DP [remote power supply].

Construction

PSVO, USVO. Rack frames made of sectional steel with chassis trays. The dimensions are 2,600 x 650 x 250 mm.

OSVO. Rack frame made of sectional steel with chassis trays. The dimensions are 1,600 x 650 x 250 mm.

USVO with DP. It is housed in a cabinet which can be desk mounted or secured in a stand. The dimensions are 436 x 680 x 340 mm.

Weight and Cost

Equipment / Оборудование	Weight, kg / Вес, кг	Price, rubles / Цена, руб.
PSVO ПСВО	200	4000
QSVO ОСВО	110	2500
USVO УСВО	141	8500
USVO with remote power УСВО с ДП	58	3000

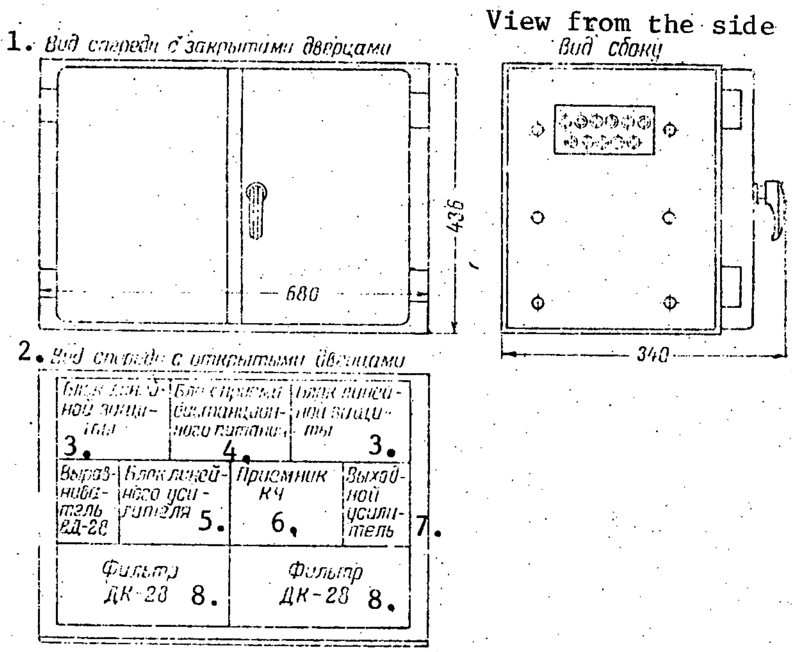


Figure 9.1.1. The placement of the equipment in the amplifier station with remote power, USVO, of the SVO equipment.

Key:
1. View from the front with the doors closed;
2. View from the front with the doors open;
3. Line protection block;
4. Remote power receive block;
5. Line amplifier block;
6. Control frequency receiver;
7. Output amplifier;
8. DK-28 filter;
9. VD-28 equalizer.

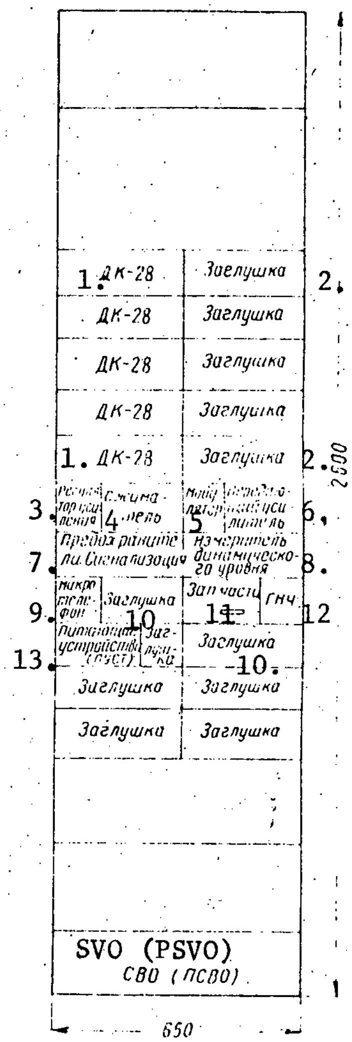


Figure 9.1.2. The placement of the equipment in the PSVO transmitting station of the SVO equipment.

[Key to Figure 9.1.2]:

1. DK-28 filter;
2. Blank panel;
3. Gain control;
4. Compressor;
5. Modulator;
6. Transmitting amplifier;
7. Fuses and signaling
8. Dynamic level meter;
9. Telephone handset;
10. Filler panel;
11. Spare parts;
12. GNCh [?carrier frequency generator?];
13. Power supplies (PUST).

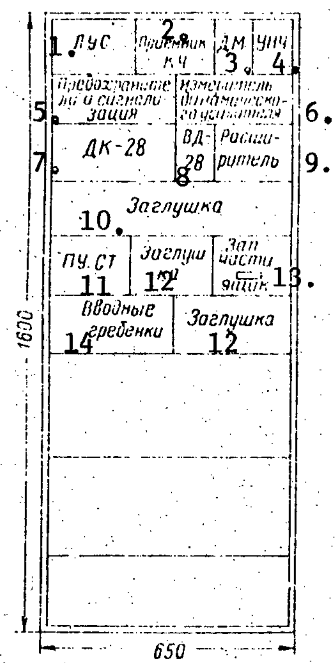


Figure 9.1.3. The placement of the equipment in the OSVO receiving station of the SVO equipment.

Key: 1. PUS [unknown type of amplifier];
2. Control frequency receiver;
3. Demodulator;
4. Audio amplifier;
5. Fuses and signaling;
6. Dynamic amplifier [sic] meter;
7. DK-28 filter;
8. VD-28 equalizer;
9. Expander;
10. Blank panel;
11. Power supply units;
12. Blank panel;
13. Spare parts box;
14. Input terminal blocks.

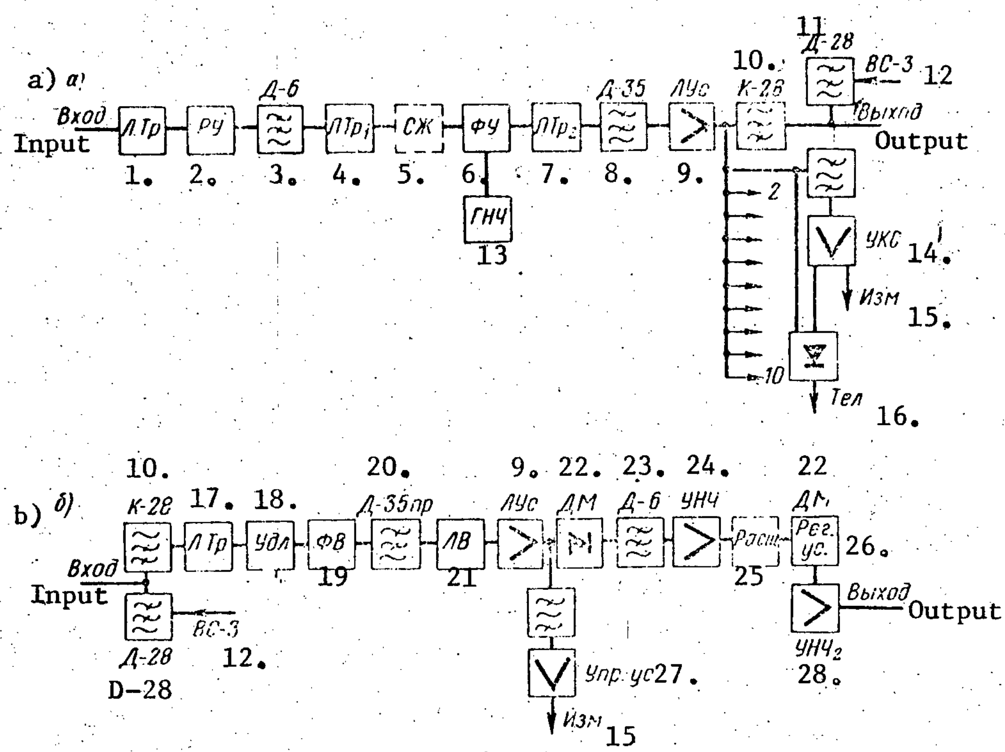


Figure 9.1.4. Block diagram of the broadcast equipment for steel circuits (SVO): a) Transmitting station; b) Terminal station.

[Key to Figure 9.1.4.]:

1. Line transformer;
2. Gain control;
3. D-6 filter;
4. Line transformer 1;
5. Compressor;
6. FU [expansion unknown];
7. Line transformer 2;
8. D-35 filter;
9. Line amplifier;
10. K-28 filter;
11. D-28 filter;
12. VS-3;
13. GNCh [?carrier frequency generator?];
14. UKS [?monitor signal amplifier?];
15. Meter;
16. Telephone;
17. Line transformer;
18. Pad;
19. FV [?filter-equalizer?];
20. D-35 pr [?D-35 receive filter?];
21. LV [?line equalizer?];
22. Demodulator;
23. D-6 filter;
24. Audio amplifier;
25. Expander;
26. Gain control;
27. Control amplifier;
28. Audio amplifier 2.

9.2. The AV-2 Broadcast Equipment (Taken out of production)

Figures 9.2.1 - 9.2.5.

Purpose

Intended for forming a broadcast channel from the doubled individual channels of multichannel HF telephony systems of the V-12, V-12-2, KV-12, K-24 and K-60 systems, as well as multiplex systems for coaxial cable and radio relay links in which a standard 12-channel block is employed.

The HF channels used for broadcasting are channels 4 and 5 of the 12-channel block.

Note: In the K-60, K-60p, V-60, K-300, RRL and K-1920 transmission system, the AV-2 equipment is being used temporarily and is being replaced by the AV-2/3 equipment.

Electrical Characteristics

Line frequency spectrum	88.7 - 95.94 KHz

The effectively transmitted passband	60 - 7,300 Hz
The maximum relative power level:	
At the input to the transmitting channel	0 Np
At the input to the HF amplifier	-3.2 ± 0.3 Np
At the output of the transmitting channel	-2.15 ± 0.5 Np
At the input to the receive unit	-2.5 Np
At the output of the receive unit	2.0 ± 0.1 Np
The harmonic factor of the receive channel should not exceed:	
At frequencies of 60 - 100 Hz	1.0 %
Above 100 Hz	0.5 %
The nonuniformity in the amplitude-frequency response of the transmit and receive channels should not exceed the following	0.3 Np for the transmit channel; 0.2 Np for the receive channel
The psophometric noise voltage of the transmit and receive channels at the point with a +2 Np level (at the output of the low frequency [audio] amplifier)	No more than 0.7 mv psoph.
The isolation between different sets of the AV-2 rack	No less than 9.8 Np at 7,000 Hz
The input impedance at the input end of the transmitting channel	600 ohms
The reflection factor	No more than 10% in the 60 - 7,300 Hz spectrum.
The scalar output impedance of the receive channel	50 ohms in the 60 - 7,300 Hz spectrum
The control frequency level at the output of the transmit channel	-6.3 ± 0.1 Np into a load of 60 ohms
The dynamic level measurement range (the integration time of the meter is 20 msec)	-2.0 -- +3 Np

Climatic Operational Conditions

The equipment can operate at a temperature of from +10 to +40° C, and a relative humidity of up to 80%.

Electrical Power Supply

Voltages:	Plate	$220 \pm 10\%$ v (unregulated) or $206 \pm 3\%$ v (regulated)
	Filament	$24 \pm 10\%$ v (unregulated) or $21.2 \pm 3\%$ volts (regulated).

Current Consumption:

Terminal station	Plate	0.5 a
	Filament	5.0 a

-- Intermediate station:	Plate	0.15 a
	Filament	5.0 a

Type of Vacuum Tubes Employed:

For the case of a regulated voltage, 10Zh1L;
For the case of an unregulated voltage, 10Zh1L and 12Zh1L.

Equipment Complement

AVO-2. Terminal station. It consists of one rack, in which the following can be mounted:

-- Two sets of transmitting equipment;

-- Two sets of receiving equipment;

-- Dynamic level meter.

Space is reserved for two sets of compressors-expanders. The PIEL instrument is supplied on special order.

Two types of terminal equipment have been produced:

-- A rack with one receive set;

-- A rack with one transmit set.

The following have been produced to fill out the equipment complement of the racks: a transmit set for one broadcast channel and a receive set for one broadcast channel.

Construction:

The rack frame is made of sectional steel. The dimensions are 2,500 x 648 x 380 mm.

Weight:

AVO-2 300 kg (two transmission sets + two receive sets).

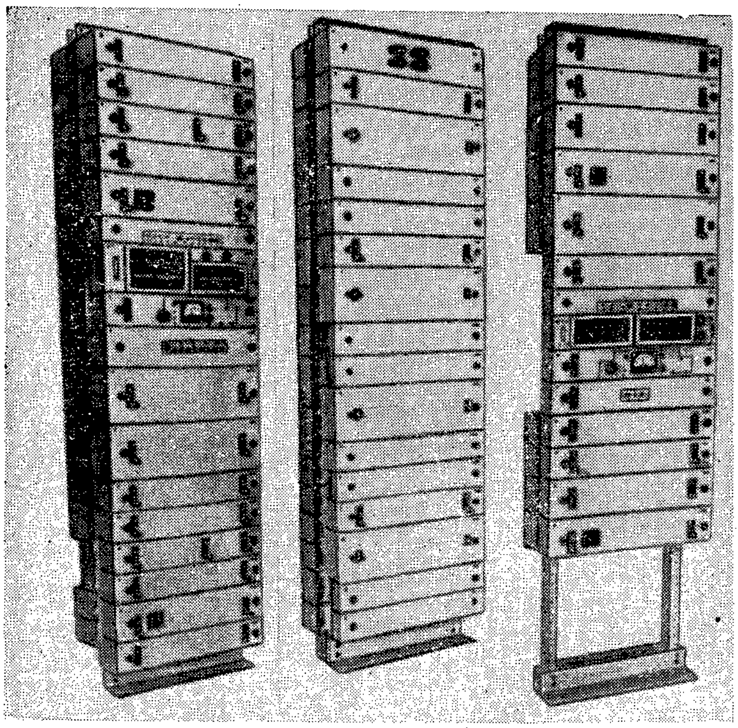


Figure 9.2.1. Exterior view of the AV-2 equipment.

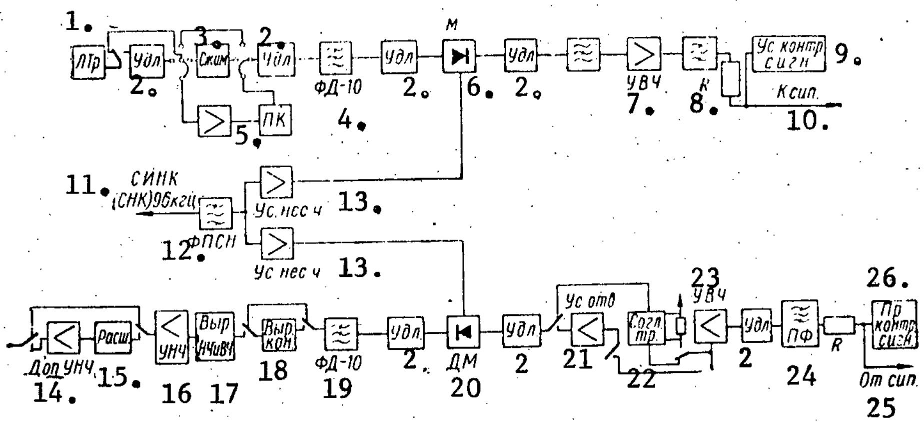


Figure 9.2.2. Block diagram of the AV-2 broadcast equipment rack.

Key: 1. Line transformer;
2. Pad;
3. Compressor;
4. FD-10 filter;
5. PK [?trimmer corrective network?];
6. Modulator;
7. High frequency amplifier;
8. Resistor;

[Key to Figure 9.2.2, continued]:

9. Control signal amplifier;
10. To the sip [?individual conversion equipment rack?];
11. SINK (or SNK), 96 KHz;
12. FPSN [unknown type of carrier frequency filter];
13. Carrier frequency amplifier;
14. Supplemental low frequency amplifier;
15. Expander;
16. Low frequency amplifier;
17. High frequency and low frequency equalizer;
18. Equalizing network;
19. FD-10 filter;
20. Demodulator;
21. Branching amplifier;
22. Matching transformer;
23. High frequency amplifier;
24. Bandpass filter;
25. From the sip;
26. Control signal receiver.

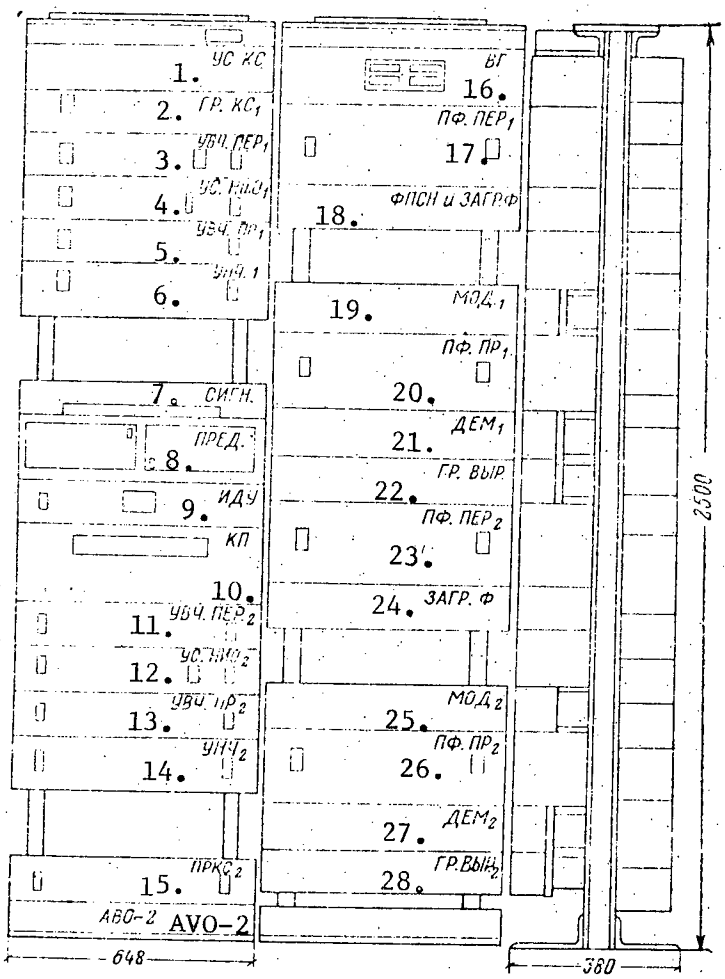


Figure 9.2.3.

The placement of the equipment in the AVO-2 broadcast unit using doubled channels having two receive sets and two transmit sets.

Key:

1. Control signal amplifier;
2. GR KS_1 [expansion unknown];
3. High frequency amplifier, transmit, 1;
4. US NiO_1 [unknown type of amplifier];
5. High frequency amplifier, receive, 1;
6. Low frequency [audio] amplifier, 1;
7. Signaling panel;
8. Fuse panel;
9. IDU [dynamic level meter];
10. KP [?monitor panel?];
11. High frequency amplifier, transmit, 2;
12. US NIO_2 [unknown type of amplifier];
13. High frequency amplifier, receive, 2;

[Key to Figure 9.2.3, continued]:

14. Low frequency [audio] amplifier 2;
15. $PRKS_2$ [?control signal receiver 2?];
16. VG [?input terminal blocks?];
17. Bandpass filter, transmit, 1;
18. FPSN [unknown type of carrier frequency filter] and suppression filter;
19. Modulator 1;
20. Bandpass filter, receive, 1;
21. Demodulator 1;
22. GR. VYR. [unknown type of equalizer];
23. Bandpass filter, transmit, 2;
24. Suppression filters;
25. Modulator 2;
26. Bandpass filter, receive, 2;
27. Demodulator 2;
28. GR. VYR_2 [unknown type of equalizer, 2].

[Key to Figure 9.2.4, page 583]:

1. USKS [?control signal amplifier?];
2. High frequency amplifier, transmit, 1;
3. USN [?carrier amplifier?];
4. Signaling;
5. Fuses;
6. Dynamic level meter;
7. KP [?monitor panel?];
8. VG [input terminal blocks?];
9. Bandpass filter, transmit, 1;
10. FPSN [unknown type of carrier filter] and suppression filter;
11. Modulator 1.

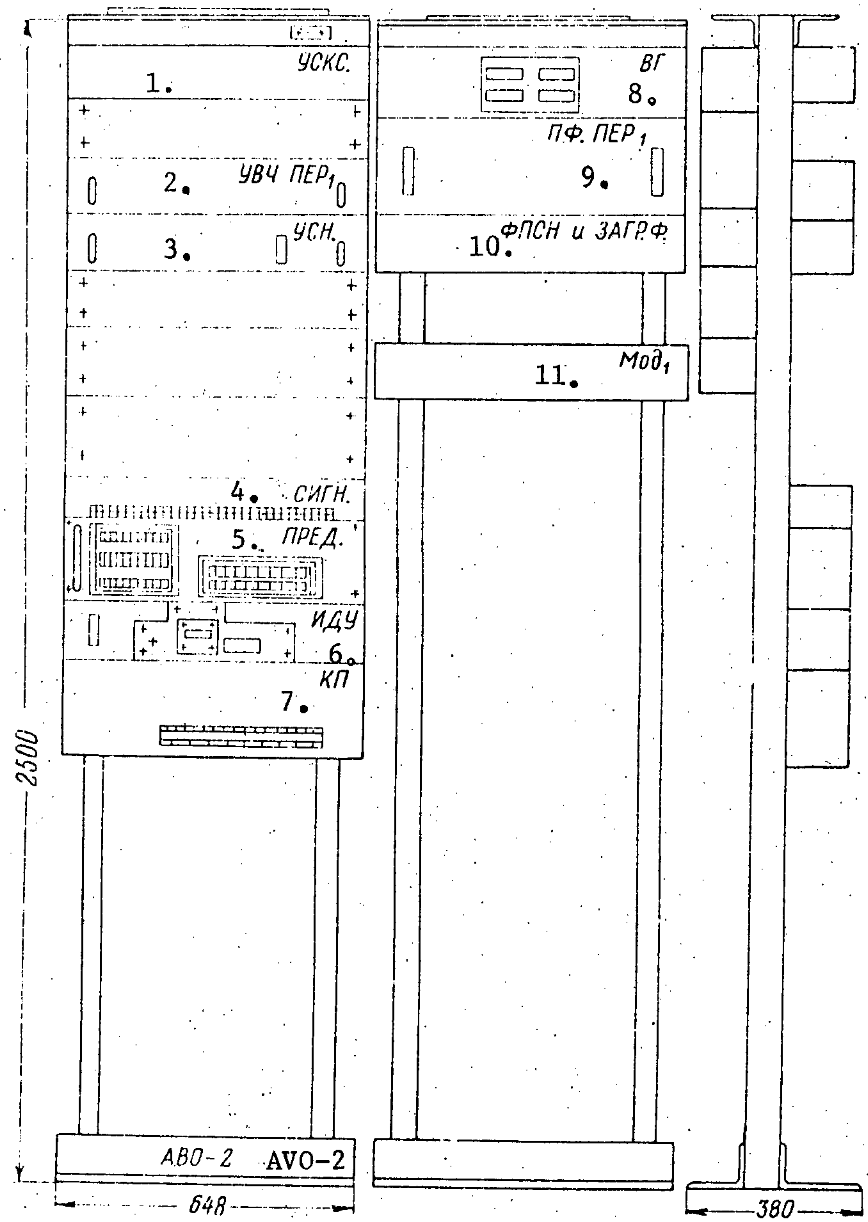


Figure 9.2.4. The placement of the equipment in the AVO-2 broadcast equipment using doubled channels, consisting of one transmission set.

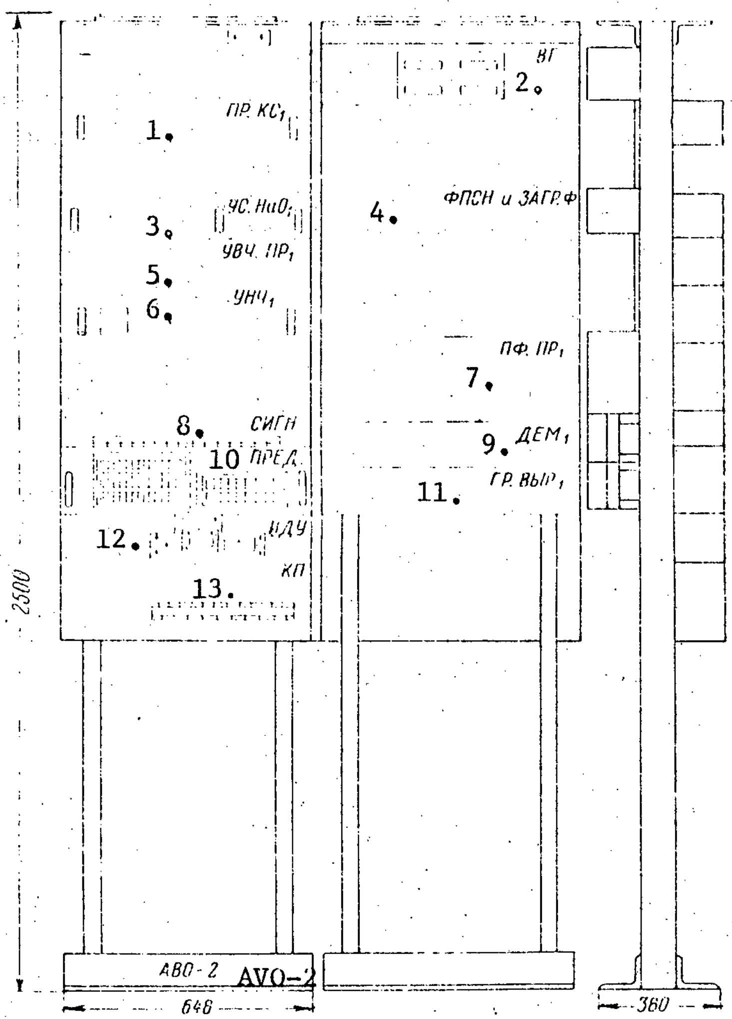


Figure 9.2.5. The placement of the equipment in the AVO-2 broadcast equipment using doubled channels, consisting of one receive set.

Key: 1. PR KS_1 [?control signal receive 1?];
2. VG [?input terminal blocks?];
3. US NiO_1 [unknown type of amplifier];
4. FPSN [unknown type of carrier filter] and suppression filter(s);
5. High frequency amplifier, receive, 1;
6. Low frequency [audio] amplifier 1;
7. Bandpass filter, receive, 1;
8. Signaling;
9. Demodulator 1;
10. Fuses;
11. GR. VYR_1 [?group equalizer?];
12. IDU [dynamic level meter];
13. KP [?monitor panel?].

9.3. The AV-2/3 Broadcast Equipment

Figures 9.3.1 - 9.3.7.

Purpose

Intended for organizing broadcast channels via combined telephone channels of multichannel HF telephony systems for cable, radio relay and open wire communications lines, and provides for the following:

-- The formation of a broadcast channel in the combined passband of two or three channels of transmission systems;
-- The retransmission of broadcast channels in high and audio frequency spectra at terminal stations, low frequency retransmission station stations of of HF systems, and at stations for the segregation of telephone channel groups;
-- The branched through-working of broadcast channels in the HF and audio frequency spectra from one transmission system to several other systems;
-- The segregation of broadcast programs at an attended repeater station, as well as at retransmission and through-working points of broadcast channels;
-- The segregation and insertion of broadcast programs at through-working points for primary groups in the 60 - 108 KHz spectrum;
-- The segregation of broadcast programs from the 12 - 60 KHz and 108 - 156 KHz line spectra of the primary groups of cable and radio relay communications link transmission systems (K-24, K-60, K-1920, etc.);
-- The segregation of broadcast programs from the lower (36 - 84 KHz) and the upper (92 - 143 KHz) groups of the line spectrum of 12-channel transmission systems for open wire communications lines.

Electrical Characteristics

High frequency channels used for the formation of the broadcast channel	The fourth and fifth channels of the main 12-channel group are used for the doubled channel; for a tripled channel, the fourth, fifth and sixth channels of the main 12-channel group are used.
The bandwidth of a broadcast channel:	
A doubled channel	89.6 - 95.95 KHz
A tripled channel	86.0 - 95.95 KHz
The effectively transmitted audio frequency passband of a broadcast channel	
of a doubled channel	50 - 6,000 Hz
of a tripled channel	50 - 10,000 Hz
The communications range	5,000 km for class one broadcast channels using HF transmission systems, with the appropriate selection of the channels.

The nominal relative power level at the 135 ohm outputs of the transmitting station when 800 Hz is fed to the input at a level of 1.0 Np	-3.5 ± 0.1 Np
The same, at the high impedance outputs for a load of 67 ohms	-4.5 ± 0.1 Np
The crosstalk attenuation between two 135 ohm outputs in a frequency range of 60 - 108 KHz should be no less than	6 Np
The same, between the high impedance outputs	8.5 Np
The reflection factor of the input impedance of the station with respect to 600 ohms should not exceed	10%
The same, at the 135 ohm outputs, with respect to 135 ohms (The high impedance outputs should not have an output impedance of less than 1,700 ohms)	10%
The nominal relative level of a broadcast signal at the main output of the receiving station:	
When a frequency of 95 KHz at a power level of -1.5 Np is fed to the input	$+1.0 \pm 0.05$ Np
The same, at both supplemental outputs	-1.0 ± 0.05 Np
The control range in the HF channel of the receiving station	2.2 Np in steps of 0.1 ± 0.05 Np each
The control range in the low frequency channel:	
UNCh-1 [audio amplifier 1]	Within limits of from +0.15 to -0.45 Np.
UNCh-2	Within limits of from 0 Np to -0.8 Np
The reflection factor of the input impedance of the receiving station with respect to 135 ohms	No more than 15%
The isolation between sets installed in the AV-2/3 rack	8.5 Np
The dynamic level meter (IDU) provides for measurement in a frequency range of	0.05 - 10 KHz
The measurement error of the IDU should not exceed	0.05 Np
The integration time of the meter	20 msec for a readout pre cision of 85%
The input impedance of the power distributor in a frequency range of 12 - 150 KHz	135 ohms

The nominal relative level at the input to the frequency conversion block	-3.3 Np
The gain in each direction of the HF branching block with the pads inserted	1.9 ± 0.1 Np when the gain control at the input is cut out, and the continuous control is set in the center position.
The range of continuous control for each route	± 0.5 Np with a precision of 0.1 Np
The control range at the input to the block	With a range of 1.3 Np in steps of 0.1 Np each
The gain of the 12 - 150 US [amplifier] block for the case of a 135 ohm input	No less than 3.0 Np with the capability of reducing it by no less than 2.2 Np in steps of 0.1 KHz [sic] each.

Electrical Power Supply

Voltages: 21.2 ± 3%, volts. The remote unit can also be powered from the AC mains.

Note: The AV-2/3 equipment is transistorized.

Current Consumption:

Transmitting station	0.77 a
Receiving station	1.18 a
The 12 - 150 KHz amplifier block	0.15 a
The HF branching block	0.08 a
The common rack devices	0.09 a

Climatic Operational Conditions

At temperatures of from +10 to +40° C, with a relative humidity of up to 80%.

Equipment Complement and Function

AV 2/3-ST. The rack with the set of blocks of common rack devices. It is intended for the mounting of the necessary transmitting or receiving broadcast equipment sets, as well as supplemental devices.

Included in the AV 2/3 rack complement are:

-- Dynamic level meter, IDU, for monitoring the audio frequency broadcast transmission level, and the sensitivity of the measurements can be changed to 4.0 and 2.0 Np with a meter integration time of 20 msec, and an error of 85%;
-- The intercom-callup unit, PVU, for service talkback;
-- Two control and signaling blocks for remote and local insertion of supplemental rack devices, as well as checking and monitoring their operation;
-- The main fuse block, which simultaneously provides for signaling of the presence of a regulated voltage, and the blowing of fuses;

-- Two power distribution units, RM, for connection into program segregation channels, and for the connection of the AV 2/3 receive sets.

Note: The following can be installed in the AV-2/3 ST rack when additionally ordered:
The AV 2/3-3 Per [transmit] or AV 2/3-3 Pr [receive] or the AV 2/3-2 Per, or the AV 2/3-2 Pr, or the AV 2/3-3 PrU, or the AV 2/3-2 PrU and one of the following products: AV 2/3 -- BChP or a set of relays for the SIO. (The rack can also be supplied both without the BChP and the relays for the SIO.)

AV 2/3-3 Per; AV 2/3-2 Per. Transmitting station sets for tripled and doubled channels respectively. They are intended for the conversion of the 0.05 - - 6.4 KHz audio frequency spectrum to the 89.6 - 95.95 KHz spectrum (AV 2/3-2) or the 0.05 - 10 KHz spectrum to the 86 - 95.95 KHz spectrum (AV 2/3-3). The conversion is accomplished with a frequency of 96 KHz, which is fed from the generator equipment of the LATs [line equipment shop] (there is no generator in the AV 2/3 equipment). Each set is connected by its own high impedance output terminals to the input of the primary group channel through a transformer, which is mounted in the SIO. When inserting a broadcast program at the through-working connection of the primary group, the output of the set is connected to the corresponding terminals of the through-working block of the 12-channel groups. The set can simultaneously transmit the broadcast program to several (up to five) HF systems. High impedance (1,700 ohms) outputs are provided in the set for the parallel connection to the V-12-2 system, as well as to the HF systems at 12-channel through working points.

Included in the complement of a set are:

-- Audio frequency gain control for controlling the level fed to the input of the transmitting station;
-- A junction line equalizer for equalizing the amplitude-frequency distortions introduced into the channel by junction lines (RVA - LATs);
-- A compressor to assure that the broadcast signal exceeds the noise;
-- A predistortion network, intneded for decreasing the noise in the broadcast channel, and a through signal generator to obtain either 11 KHz (AV 2/3-3) or 7.2 KHz (AV 2/3-2) signals;
-- A phase difference [sic] unit for converting the 0.05 - 10 KHz (or 0.05 - - 6.4 KHz) spectrum to the 86 - 95.95 KHz (or 89.6 - 95.95 KHz) high frequency spectrum, and suppressing the unused sideband.
-- A suppression filter (FZ-96) for the supplemental suppression of the 96 KHz carrier frequency residue;
-- An HF amplifier and limiter block for amplifying signals in a range of 86 - 96 KHz, and protecting the channels of multichannel systems against broadcast signal peaks;
-- An FDK filter, 96 - 85 (96 - 88)KHz, for the protection of the broadcast channel against telephone channel signals. D-96 and K-85 filters are used for a tripled channels, and D-96 and K-88.8 filters are used for a doubled one;
-- An HF branching block for simultaneously feeding branched, through-working broadcast channels to several (up to five) HF systems;

-- An audio monitor block to monitor the transmission of the broadcast program at the output of the transmit channel;
-- A control and signaling block for the remote and manual control of the transmitting set, and control of the signaling.

Note: The transmitting stations are supplied with a relay set for cutting out the carrier frequencies, and with a transformer for the SIO, or without them.

AV-2/3-3Pr, AV 2/3-2Pr and AV 2/3-3PrU, AV 2/3-2PrU. Sets of receive stations for tripled and doubled channels respectively and sets of simplified receive stations.

They are intended for the conversion of the broadcast program line spectra transmitted in the doubled and tripled channels of HF systems to the 50 - - 6,400 Hz or 50 - 10,000 Hz audio frequency spectrum. Each set provides for the segregation of the broadcast channel line spectrum from the frequency spectrum of the primary group, as well as from the line spectrum of the second 12-channel group of the K-24, K-60 and R-600 (60 - 108 KHz) systems. When a frequency conversion block (BChP) is present, the complex can segregate a broadcast channel from the line spectrum of other primary groups.

AV 2/3-3 Pr. The set for the reception of broadcast programs in tripled channels and the segregation of broadcast programs transmitted in tripled channels from a primary group spectrum, and from the line frequency spectrum of the second 12-channel group.

AV 2/3-2 Pr. The same, for doubled broadcast channels.

AV 2/3-3 PrU. The simplified receiving set for a tripled broadcast channel does not contain the FDK filter in the high frequency section of the channel, and is intended for the segregation of a program in the HF retransmission and through working broadcast channels.

AV 2/3-2PrU. The same as for doubled broadcast channels. When receiving broadcast programs at terminal stations of HF systems, the receiving sets are connected by high impedance terminals to the output of the receive channel of the primary group of the HF system through the winding of a transformer mounted in the SIO [rack of individual conversion equipment].

When segregating broadcast programs from the line frequency and primary group frequency spectra at the intermediate stations of HF systems, at 12-channel through-working stations, as well as at stations for the HF retransmission and through-working of broadcast channels, the receiving set is connected to the units of the program segregation channel. The receiving sets have two pairs of additional terminals for branching out broadcast programs in the audio spectrum. There is the capability at the input to the sets for deriving the various input impedances: 135 ohms for connection to an SIO; 1,700 ohms for a bridging connection to a cable circuit; 16,000 ohms for a bridging connection to open wire circuits.

Included in the complement of the receiving set are:

-- Level gain control at the input to the set;
-- Corrector block for equalizing the amplitude-frequency distortions of the broadcast channel;
-- FDK 95-85 or FDK 96-88.8 filter;
-- Phase resonance unit [sic];
-- HF receive amplifier for amplifying the broadcast transmission level in the 84 - 96 KHz spectrum;
-- Low frequency amplifier for the preamplification of the low frequency broadcast channel, incoming from the FRU [phase control unit];
-- Low frequency amplifier for the amplification of the low frequency signal in the 0.05 - 10 KHz spectrum;
-- Restoring network and through signal receiver to compensate for the amplitude frequency distortions introduced by the predistortion network of the transmitting set and to amplify the through signal;
-- Expander to restore (expand) the dynamic transmit range at the receive end of the channel; also, a receiving set signaling and control block for the capability of remote or manual control of the receive set and signaling control.

Note: Receiving stations are supplied with and without the BChP [frequency conversion block], as well as with the set of relays for cutting out the carrier frequencies and a transformer for the SIO, or without these.

AV 2/3-BChP. The frequency conversion block. The BChP is intended for segregating broadcast programs from the 12 - 60 KHz and 108 - 156 KHz line spectra of the primary groups of HF systems for multiplexing cable circuits and radio relay links, as well as from the lower (36 - 84 KHz) or upper (96 - 144 KHz) groups of the line spectrum of 12-channel transmission systems for open wire circuits. The conversion for doubled or tripled broadcast channels is assured by means of switching in the block circuitry.

The block is supplied separately and is inserted in the receiving station channel following the gain control. The frequencies for conversion in the various operational modes are produced by means of division and multiplication of the main 96 KHz carrier frequency, which is fed to the set from outside.

Included in the complement of the BChP block are:

-- Generator equipment, intended for deriving the carrier frequencies;
-- Main channel equipment, in which the spectrum conversion is accomplished.

The operational modes of the BChP block. The block converts the broadcast channel frequency spectra to the frequency spectrum of the second 12-channel group of the following line spectra:

Multiplex Системы уплотнений System	1. 12-канальная группа	2. Режим работы БЧП	3. Линейный спектр канала, кгц		Несущие частоты преобразования, кгц 4.	
			Tripled строенного	Doubled сдвоенного	первичного 5.	вторичного 6.
Кабельные и радио-релейные 8.	I	I (I V)	24,05 ÷ 35,0	24,05 ÷ 31,2	120	—
	III	III	133 ÷ 143,95	135,8 ÷ 143,95	144	—
	III инверсн. 7.	III–II	120,05 ÷ 131,0	120,05 ÷ 127,2	216	—
Воздушные 9.	нижняя 10.	Н	—	48,05 ÷ 55,2	432	400
	верхняя 11.	В	—	120,8 ÷ 127,95	448	400

Key: 1. 12-channel group;
2. Operational mode of the frequency conversion block;
3. Line spectrum of the channel, KHz;
4. Conversion carrier frequencies, KHz;
5. Primary;
6. Secondary;
7. Inverted;
8. Cable and radio relay systems;
9. Open wire systems;
10. Lower;
11. Upper.

AV 2/3-Us 12--150. The 12 - 150 KHz amplifier block. It is intended for providing the requisite signal level at the inputs to the AV 2/3 receive sets. The block can be supplied separately, and is installed at the receiving station (up to two blocks) or in a remote unit.

Included in the complement of the block are:

-- The unit for bridging connection to the output of the SPU K-24 or SPU K-60;
-- Gain control;
-- D-150 filter;
-- Us 12 - 150 [KHz] amplifier.

AV 2/3-TrF-3-I. Through working filter of the first group for segregating a tripled broadcast channel with a passband of 24.05 - 35.0 KHz.

AV 2/3-TrF-2-I. The same, for a doubled channel, with a passband of 24.05 - 31.2 KHz.

AV 2/3-TrF-3-II. Through working filter of the second group for the segregation of a tripled broadcast channel with a passband of 85 - 95.95 KHz.

AV 2/3-TrF-2-II. The same, for a doubled channel with a passband of 88.8 - 95.95 KHz. The filters are intended for segregating broadcast programs at stations for HF retransmission and through-working of broadcast channels, organized in the primary groups in the 12 - 60 or 60 - 108 KHz spectrum.

The filters are designed for operation between load impedances of 135 ohms, and are supplied with AV-2/3-Us 12--150 block.

AV 2/3-VCh razv. The high frequency branching block. Intended for splitting out broadcast channels into several (up to five) HF systems. The block is inserted in the transmitting set and can be supplied separately to provide for through-working at receive stations and in a remote unit.

AV 2/3-vyn. ustr. The remote unit cabinet. Intended for installation at remote repeater stations, where the segregation, through-working or branching out of broadcast channels is realized.

Included in the remote unit complement are:

-- Power supply block for the conversion of the 220 volts AC to 21.2 or 24 volts DC;
-- Control and signaling block;
-- Differential transformer and input unit (10 x 2 terminal strips and blocks for the connection of the power supply leads). The differential system is intended for providing trhough-working at the main R-600 stations, and takes the form of a power distributor, designed for a frequency range of 12 - 150 KHz.

Note: The remote unit panel is supplied with the following products: AV 2/3-Us. 12--150 and AV 2/3-vch razv., and one of the following products: AV 2/3-PrF-3-II or AV 2/3-TrF-2-II, or AV 2/3-TrF-3-I or AV 2/3-TrF-2-I.

The Relay and Differential Transformer Set for the SIO Rack

Intended for installation in the old SIO racks, and serves for the cutting out of the carrier frequencies in the telephone channels, which are occupied by broadcast channels. The set of relays is made structurally on a panel, on which three RS-6 type relays are mounted with internal wiring. The differential transformer is intended for insertion of the broadcast channel into the group telephone channel.

Construction

The AV 2/3-ST rack frame is made of sectional steel with mounting trays. Shelves and bases are arranged along the height of the rack, on which the blocks are mounted, which are connected to the rack circuitry by open notched connection blocks. Located in the upper part of the rack are the input terminal blocks and power distribution assemblies (two units).

Up to four sets of transmitting or receiving stations in any combination can be installed in the rack.

The remote unit is structurally made in the form of a box, which can be mounted on a stand or in a standard type rack.

The rack dimensions are 2,600 x 650 x 290 with the protruding parts; the remote unit is 436 x 640 x 303 mm

The Weight and Cost of the Equipment

Equipment Оборудование	Weight Вес, кг kg	Price Цена, руб. rubles
AV АВ 2/3-3 Пер Per [trans.]	28	1000
AV АВ 2/3-2 Пер Per	28	1000
AV АВ 2/3-3 Пр Pr [receive];	28	850
АВ 2/3-2 Пр	28	850
AV АВ 2/3-3 ПрУ PrU [rcv., simplified];	27	750
АВ 2/3-2 ПрУ	27	750
1. Стойка АВ 2/3	90	990
2. АВ 2/3-ТрФ-3-II	10	360
АВ 2/3-ТрФ-2-II	10	360
АВ 2/3-ТрФ-3-I	10	215
АВ 2/3-ТрФ-2-I	10	235
3. АВ 2/3-вч разв.	4	210
4. АВ 2/3-вын. устр.	19	300
5. АВ 2/3-БЧП	4	480
6. Комплект реле и дифф. тр. для СИО	1	29

Key:
1. The AV 2/3 rack
2. The AV 2/3-TrF-3-II;
3. The AV 2/3-vch razv. [HF branching];
4. The AV 2/3-vyn. ustr. [remote unit];
5. The AV 2/3-BChP [frequency conversion block];
6. The set of relays and differential transformer for the SIO.

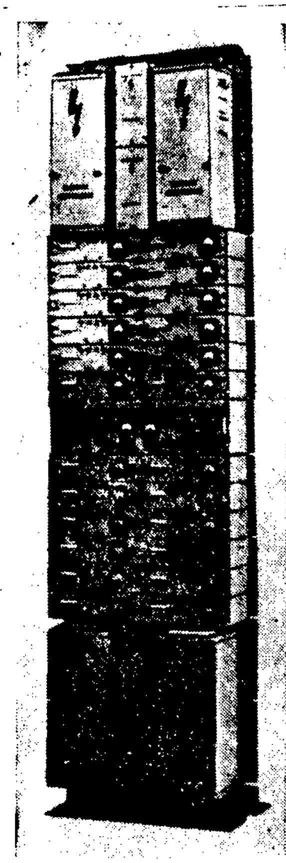


Figure 9.3.1. →

Exterior view of the AV-2/3 broadcast equipment.

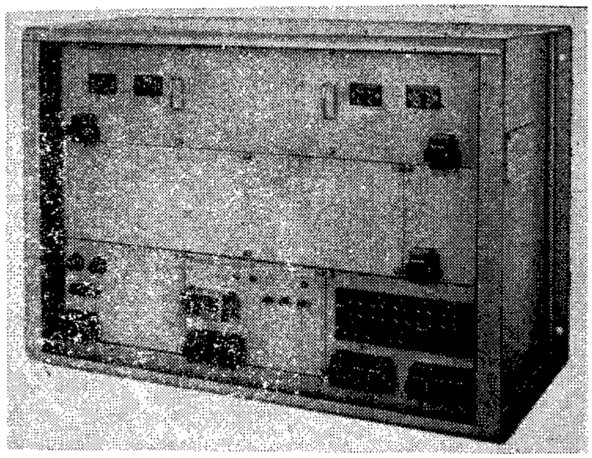


Figure 9.3.2. Exterior view of the remote unit of the AV-2/3 broadcast equipment.

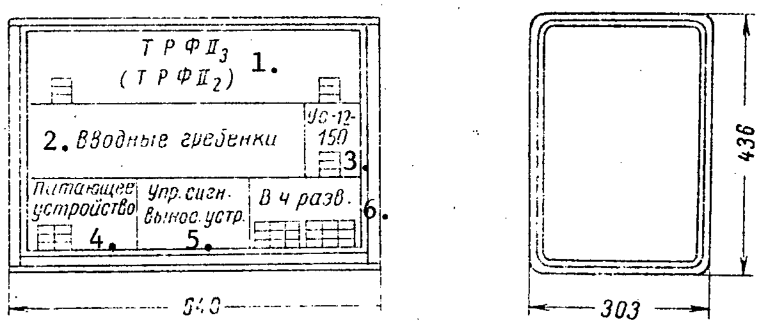


Figure 9.3.3. The placement of the equipment in the remote unit of the AV-2/3 broadcast equipment.

Key: 1. $TRFII_3$ (or $TRFII_2$) [through working filters for broadcast channel segregation];
2. Input terminal blocks;
3. 12 - 150 KHz amplifier;
4. Power supply;
5. Remote unit, signaling and control;
6. High frequency branching unit.

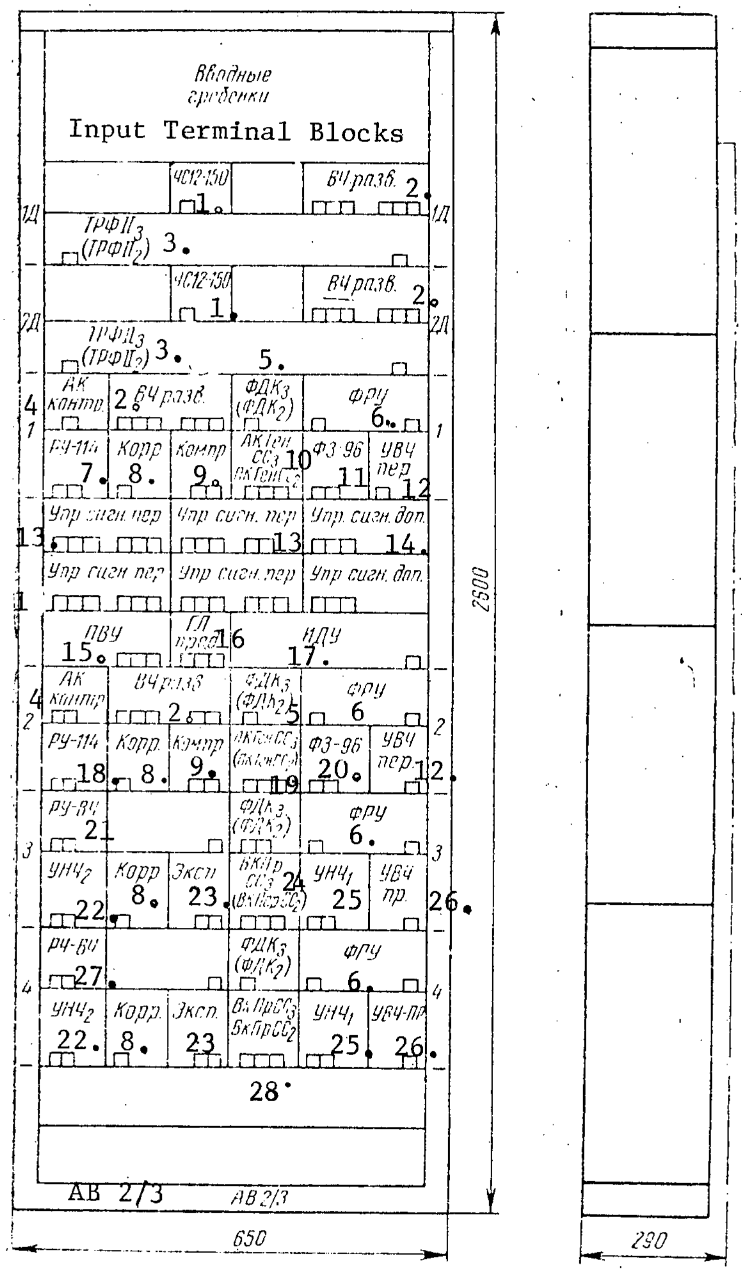


Figure 9.3.4. The placement of the equipment in the AV-2/3 broadcast equipment rack.

Key: 1. 12 - 150 KHz amplifier;
2. High frequency branching;
3. TRFII$_3$ (or TRFII$_2$) [through working filters for broadcast channel separation];
4. Audio monitor;

[Key to Figure 9.3.4, continued]:

5. FDK$_3$ or FDK$_2$ [filter for protecting the broadcast channel from the telephone channels];
6. FRU [variously expanded in the text: phase difference, phase resonance or phase control unit];
7. RU-114 [?114 KHz level control?];
8. Equalizer;
9. Compressor;
10. AK Gen SS$_3$, PK Gen SS$_2$ [unknown types of service communications generator units];
11. 96 KHz suppression filter;
12. Transmit high frequency amplifier;
13. Transmit signaling and control block;
14. Supplemental signaling and control block;
15. PVU [intercom-callup unit];
16. Master fuse panel;
17. IDU [dynamic level meter];
18. RU-114;
19. PK Gen SS$_3$ (or PK Gen SS$_2$) [unknown types of service communications generator units];
20. 96 KHz suppression filter;
21. RU-vch [?High frequency level control?];
22. Low frequency amplifier 2;
23. Expander;
24. VKPr SS$_3$ (or VK Per SS$_2$) [unknown types of receive (or transmit-'Per') service communications units];
25. Low frequency amplifier 1;
26. High frequency receive amplifier;
27. RCh-VCh [expansion unknown];
28. [unknown types of receive service communications units].

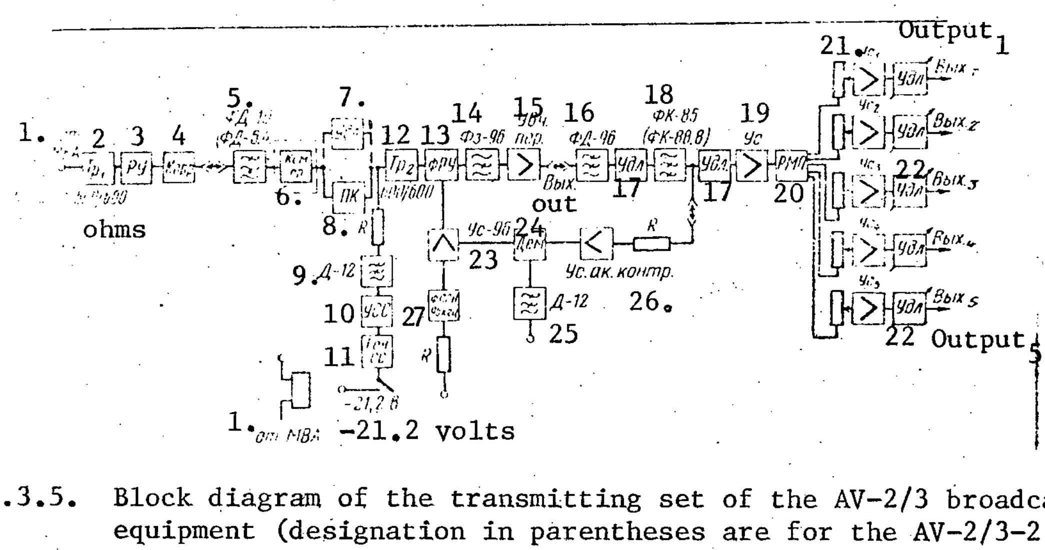


Figure 9.3.5. Block diagram of the transmitting set of the AV-2/3 broadcast equipment (designation in parentheses are for the AV-2/3-2, and those without parentheses are for the AV-2/3-3).

[Key to Figure 9.3.5 (page 596)]:

1. From the MBA [?local broadcast control room?];
2. Transformer 1, 600/600 ohms;
3. Level control;
4. Equalizer;
5. FD-10 filter (or FD-6.4);
6. Compressor;
7. Pad;
8. PK [?equalization trimmer network?];
9. D-12 filter;
10. Service communications amplifier;
11. Service communications generator;
12. Transformer 2, 600/600 ohms;
13. FRU [variously rendered in the text: phase difference, phase resonance or phase control unit - acronym and text ambiguous];
14. 96 KHz suppression filter;
15. High frequency transmit amplifier;
16. 96 KHz low pass filter;
17. Pad;
18. FK-85 (or FK-88.8) filter;
19. Amplifier;
20. RMO [unknown type of power distribution unit];
21. Amplifier 1;
22. Variable attenuator;
23. 96 KHz amplifier;
24. Demodulator;
25. D-12 filter;
26. Audio monitor amplifier.

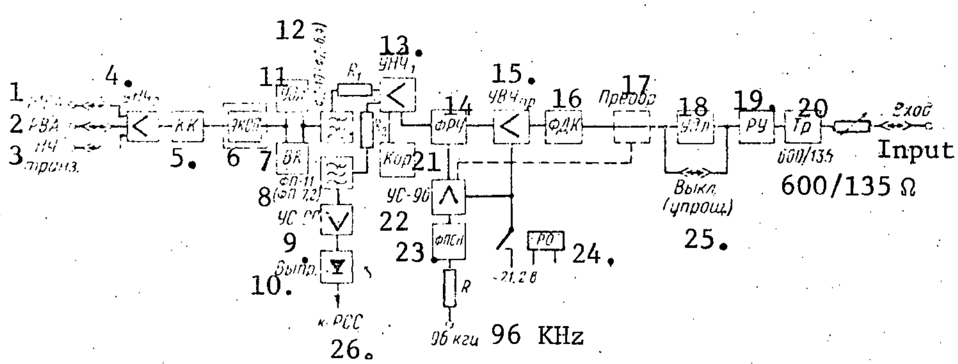


Figure 9.3.6. Block diagram of the receiving set of the AV-2/3 broadcast equipment. (The designations in parentheses are for the AV-2/3-2, and those without parentheses are for the AV-2/3-3).

Key: 1. MVA [?local broadcast control room?];
2. RVA [expansion unknown];
3. Low frequency through-working;
4. Low frequency amplifier 2;

[Key to Figure 9.3.6, continued]:

5. KK [acronym ambiguous: either corrective network or cosine corrector];
6. EKSP [expansion unknown];
7. VK [expansion unknown];
8. FP-11 filter (or FP-7.2);
9. Service communications amplifier;
10. Rectifier;
11. Pad;
12. FD-10 filter (or FD-6.4);
13. Low frequency amplifier 1;
14. FRU [acronym and text ambiguous: phase difference, phase resonance or phase control unit];
15. High frequency receive amplifier;
16. FDK filter;
17. Converter;
18. Pad;
19. Level control;
20. Transformer;
21. Equalizer;
22. 96 KHz amplifier;
23. FPSN [unknown type of carrier filter];
24. RO [expansion unknown];
25. Cutout (simplified);
26. To the RSS [unknown type of talkback unit].

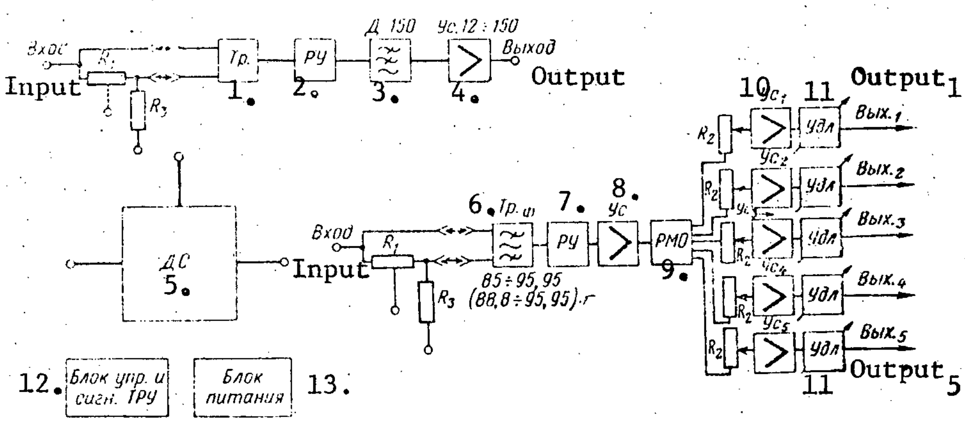


Figure 9.3.7. Block diagram of the remote unit of the AV-2/3 broadcast equipment (the designations in parentheses are for the AV-2/3-2, and those without parentheses are for the AV-2/3-3).

Key: 1. Transformer;
2. Level control;
3. D-150 filter;
4. 12 - 150 KHz amplifier;
5. Differential system;

[Key to Figure 9.3.7, continued]:

6. Tr. F [through-working filter];
7. Level control;
8. Amplifier;
9. RMO [unknown type of power distribution unit];
10. Amplifier 1;
11. Variable attenuator;
12. TRU [?ground temperature referenced AGC?] signaling and control block;
13. Power supply block.

9.4. The KVM-2 Low Capacity Broadcast Rack

Figure 9.4.1, 9.4.2.

Purpose

Intended for the transmission and reception of broadcast programs via inter-city broadcast channels from a radio broadcast control room, as well as for the through working of broadcast programs.

The KVM provides for the following capabilities: monitoring broadcast programs, the on-line substitution of standby channels for working ones, changing the broadcast configuration during downtimes, the insertion of talkback units in the broadcast channel (when preparing for operation) and a normal generator, as well as the transmission of service traffic via talkback cahnnels during operation; observing the proper operating condition of the broadcast channels using through signaling (SS) circuit lights. The equipment of the KVM rack makes it possible to simultaneously transmit four outgoing broadcast programs via 24 broadcast channels and to receive three incoming broadcast channels from any of 24 return channels.

Electrical Characteristics

The range of working frequencies	50 - 10,000 Hz
The nominal level (maximum value of the dynamic level) of all incoming and outgoing channels at the points where they are brought into the equipment	0 Np
The nominal level of outgoing, local junction lines to the broadcasting control room (RVA) and to remote line equipment shops at the point where they leave the equipment	+2.0 Np
The nominal input impedances of the equipment (looking into the station)	600 ± 60 ohms
The psophometric noise and crosstalk voltage at the outputs of the broadcast channel below the nominal value of the output level of the given channel	9 Np below

Electrical Power Supply

Voltages:	Amplifiers, generator, dynamic level meter	21.2 v ± 3%
	Signaling and relay circuits	24 v ± 10 %

Current Consumption:	Main circuits	2 a
	Signaling and relay circuits	5 a

Note: In the rack complement, there are two power supply filters for reducing the ripple for the case of power from common power sources.

Climatic Operational Conditions

At temperatures of from +5 to +35° C and a relative humidity of 80%.

Equipment Complement

Included in the equipment complement of the KVM rack are: broadcast amplifiers (line and separating types); service conversation and communications amplifiers; amplifiers for the monitor circuits and dynamic level measurement; switching devices for the organization of outgoing and incoming broadcast programs, as well as through signaling circuits; power supply filters; backup amplifiers.

There is a set of the following auxiliary devices in the rack: monitor unit (loudspeaker with amplifier and dynamic level meter); loudspeaker and communications amplifier, which are inserted in all return channels; telephone handset and amplifier for talkback via broadcast channels prior to the start of broadcasting; a generator; and a broadcast program meter.

For communications via local lines, there is a telephone communications block in the rack which permits the insertion of three local junction lines. The circuit permits communications with subscribers of central battery, local battery or automatic telephone exchanges.

Construction

The rack is made of sectional steel with trays, and the overall dimensions are 2,600 x 650 x 250 mm.

In the center part of the rack, above the small desk, there are located the switching elements, which are made in plug-in blocks. Used in the rack construction are two types of plug-in blocks: the first for the amplifier blocks, in which the plug connectors are mounted on the front panel, and the second with plug connectors mounted on the rear apron. The rack is designed for operator control from one side.

Weight: 210 kg Cost: 10,750 rubles

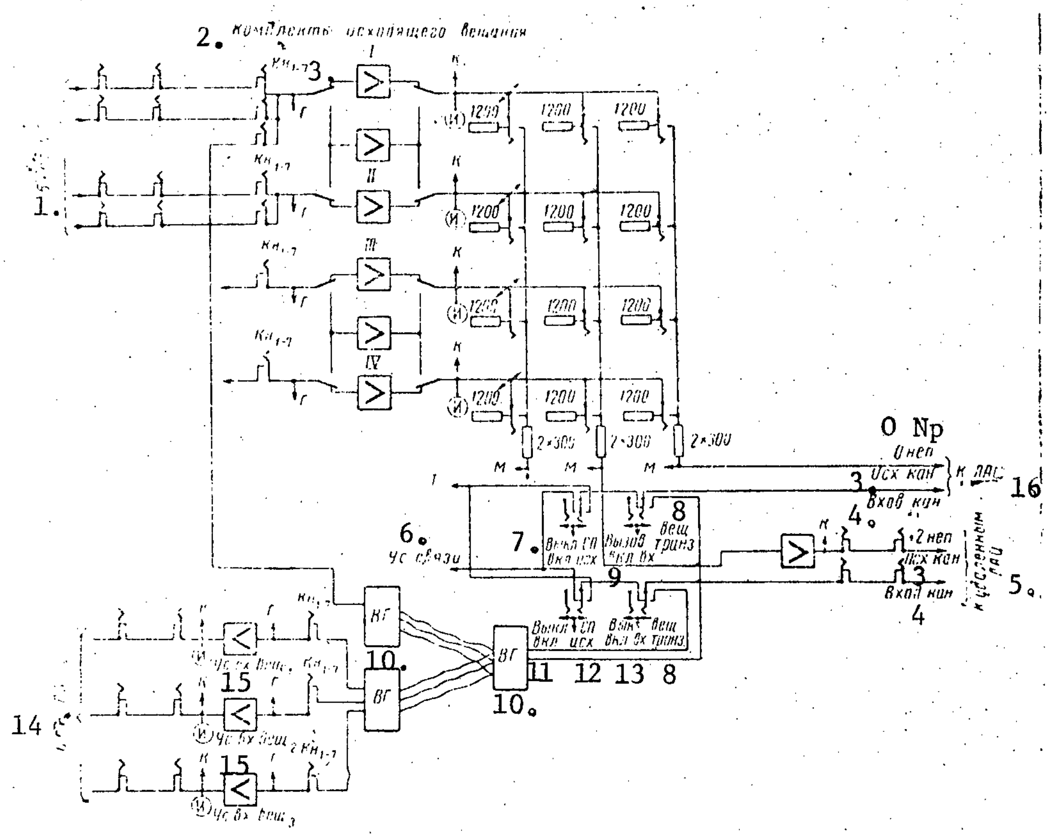


Figure 9.4.1. Simplified schematic of the KVM-2 low capacity broadcast rack.

Key: 1. Junction line input;
2. Outgoing broadcast complexes;
3. Outgoing channel;
4. Channel input;
5. To remote line equipment shops;
6. Communications amplifier;
7. Switch out junction line; switch-in outgoing;
8. Broadcast through working;
9. Ringing, switch-in incoming;
10. VG [?input terminal block?];
11. Vykl, vkl [switch-out, switch-in];
12. SL, iskh [junction line, outgoing];
13. Vykh vkl., vkh. [switch-out, switch-on, incoming];
14. Outgoing junction lines;
15. Broadcast input amplifier;
16. To the line equipment shop;

И = Meter
Н = Monitor.

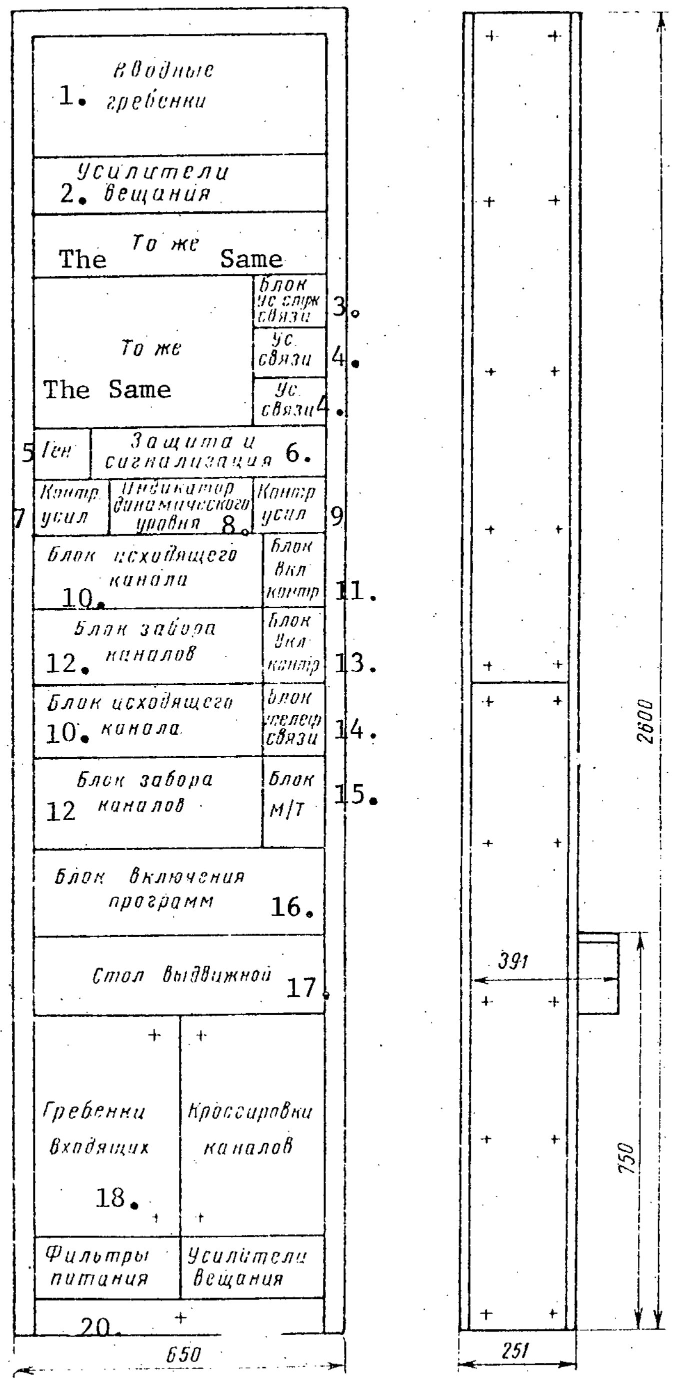


Figure 9.4.2. The placement of the equipment in the KVM-2 low capacity broadcast rack.

Key: 1. Input terminal blocks;
2. Broadcast amplifiers;

[Key to Figure 9.4.2, continued]:

3. Service communications amplifier block;
4. Communications amplifier;
5. Generator;
6. Protection and signaling;
7. Monitor amplifier;
8. Dynamic level meter;
9. Monitor amplifier;
10. Outgoing channel block;
11. Monitor tie-in block;
12. Channel partitioning block;
13. Monitor tie-in block;
14. Telephone communications block;
15. Telephone handset block;
16. Program insertion block;
17. Slide-out desk;
18. Cross-connection terminal strips for incoming channels;
19. Broadcast amplifiers;
20. Power supply filters.

9.5. The UKRLV Equipment for Multiplexing Cable and Radio Relay Links With Broadcast Channels

Figures 9.5.1 - 9.5.4.

Purpose:

Intended for the formation of eight broadcast channels in one direction and four telephone channels for service communications on radio relay links, equipped with R-600 equipment or on balanced cable circuits up to 120 km long (additionally, one broadcast channel is formed in the return direction). When the equipment works through cable lines, the K-60p equipment is used at the terminal stations, and the SPUN K-60p or NUP-60p-4 equipment is used at the unattended repeater stations (on 4 x 4 or 1 x 4 cables respectively).

Electrical Characteristics

Range of working frequencies	12 - 252 KHz (the general principle for the structuring of multichannel HF multiplex systems is observed in the equipment).
The line spectrum of eight broadcast channels	74 - 252 KHz
The effectively transmitted channel bandwidth:	
Broadcasting	50 - 10,000 Hz
Telephony	300 - 3,400 Hz

The same, for the return broadcast channel	74 - 84 KHz
The same, for four service communications telephone channels	20 - 60 KHz
Carrier frequencies:	
For transmission into the line from station A to station B	12 KHz
Of the broadcast channels	84, 108, 132, 156, 180, 204, 228 and 252 KHz (for channels 1 - 8 respectively)
Of the return broadcast channel	84 KHz
For the service communications telephone channels	24, 36, 48 and 60 KHz
The greatest value of the maximum broadcast channel level at the output of the group equipment when working:	
Through a cable	-5.0 Np
Through the R-600	0 Np
The least value of the maximum broadcast channel level at the input to the group equipment when working:	
Through a cable	-5.2 Np
Through the R-600	-5.0 Np
The output level of a broadcast channel	+1.73 Np
The input level of a telephone channel	0 Np
The output level of a telephone channel	-0.4 Np
The maximum attenuation of a low frequency junction line (determined with the inclusion of the amplitude equalizer for 10 KHz)	2.0 Np

Climatic Operational Conditions:

At temperatures of from +5 to +40° C, and a relative humidity of 60 - 80%.

The Electrical Power Supply

Voltages:

The equipment is powered from the AC mains at 220 volts, or from DC sources:

Main circuits	21.2 volts, ± 3%
Signaling circuits	24 volts, ± 10%
Ringing circuits	60 volts, AC

Current Consumption:

DC	2.3 amps (maximum, without taking signaling into account).

Equipment Complement

The UKRLB equipment consists of two racks, A and B. Rack A is the transmitting rack and converts the low frequency broadcast channel signals, speech and ring signals of telephone channels, incoming from the RVA [broadcasting control room], to HF group spectrum signals. Rack A accomplishes the transmission into the line of the 12 KHz frequency for synchronizing the master oscillator of rack B. Accomplished in the receive section of rack A is the conversion of the HF signals of the return broadcast channel to low frequency broadcast signals.

Rack B is the receive rack, and accomplishes the back conversion of the HF signals, incoming from the line, to low frequency signals, as well as the conversion of low frequency signals of the return broadcast channel to HF signals, and their transmission into the line to station A.

The racks have individual and group broadcast channel equipment as well as service communications channels, rectifiers (main and standby) for powering the equipment from the AC mains, generator equipment, and a protection and signaling block. The dynamic level meter provides for measuring levels from -2.3 up to +0.35 Np with an instrument integration time of 10 msec.

Construction

Racks A and B are made of sectional steel with trays and consists of two frames (an upper and a lower one). The input devices are housed in the upper part of the rack. The blocks in the frames are installed in the trays and slide freely into the frame. The height of all blocks is 120 mm, and that of the rectifier, 145 mm. The equipment is designed around semiconductor devices. The rack dimensions are 2,600 x 650 x 250 mm.

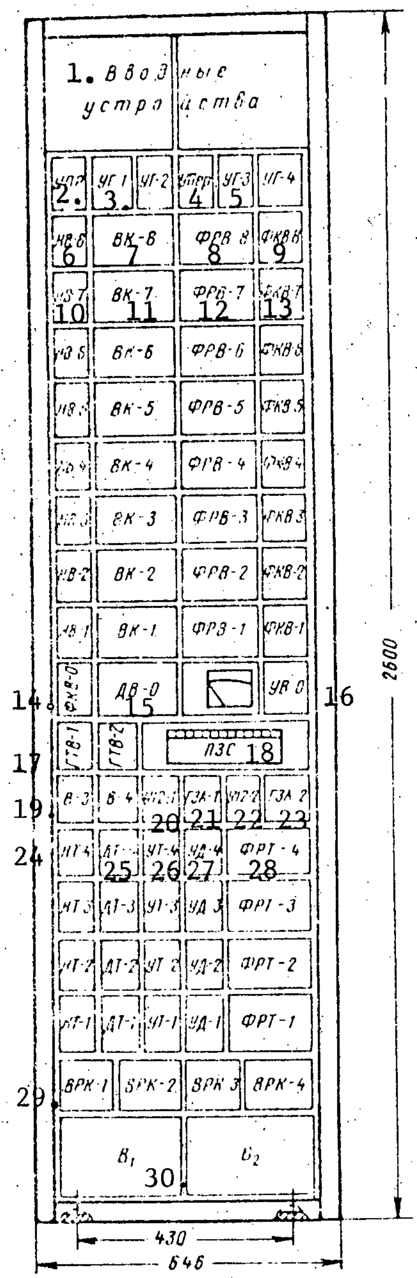


Figure 9.5.1.

The placement of the equipment in rack A of the UKRLV equipment.

Key:
1. Input devices;
2. UPR [expansion unknown];
3. UG-1 [?group amplifier 1?];
4. UPer [?transmit amplifier?];
5. UG-3 [?group amplifier 3?];
6. NV-8 [expansion unknown];
7. VK-8 [expansion unknown];
8. FRV-8 [unknown type of filter];
9. FKV-8 [unknown type of filter];
10. NV-7;
11. VK-7 [expansion unknown];
12. FRV-7;
13. FKV-7;
14. FKV-0;
15. DV-0 [expansion unknown];
16. UV-0 [expansion unknown];
17. GTV-1 [voice frequency ringing generator 1];
18. PZS [protection and signaling panel];
19. V-3 [expansion unknown];
20. Illegible;
21. G3A-T [expansion unknown];
22. U12-2 [expansion unknown];
23. G3A-2 [expansion unknown];
24. NT-4 [expansion unknown];
25. DT-4 [expansion unknown];
26. UT-4 [expansion unknown];
27. UD-4 [expansion unknown];
28. FRT-4 [expansion unknown];
29. VRK-1 [expansion unknown];
30. V1 [rectifier 1].

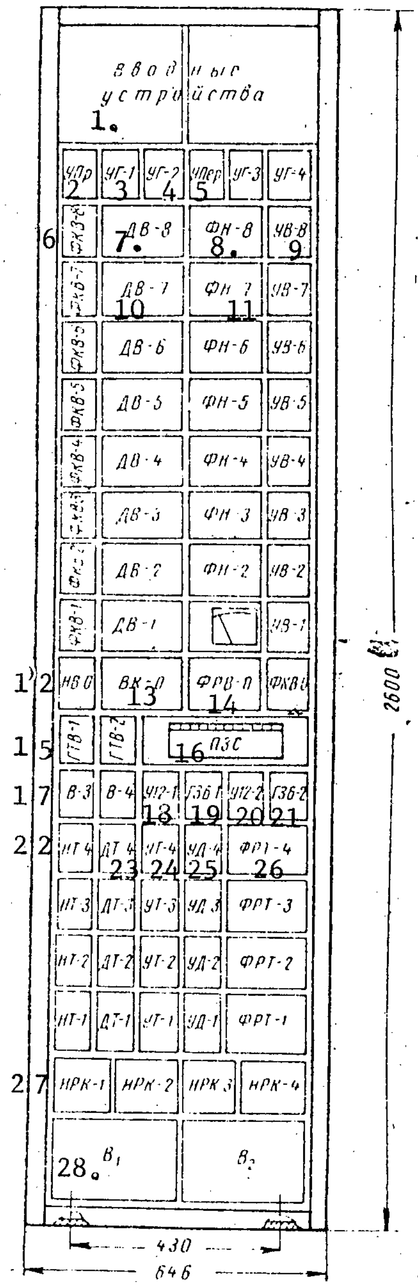


Figure 9.5.2.

The placement of the equipment in rack B of the UKRLV equipment.

Key:
1. Input devices;
2. UPr [?receive amplifier?];
3. UG-1 [? group amplifier 1?];
4. UG-2;
5. UPer [?transmit amplifier?];
6. FKV-8 [unknown type of filter];
7. DV-8 [expansion unknown];
8. FN-8 [expansion unknown];
9. UV-8 [expansion unknown];
10. DV-7;
11. FN-7;
12. NV-0 [expansion unknown];
13. VK-0 [expansion unknown];
14. FRV-0 [unknown type of ?broadcast? filter];
15. GTV-1 [voice frequency ringing generator 1];
16. PZS [protection and signaling panel];
17. V-3 [?rectifier 3?];
18. U12-1 [expansion unknown];
19. G3B-1 [expansion unknown];
20. U12-2;
21. GZB-2 [expansion unknown];
22. NT-4;
23. DT-4;
24. UT-4 [expansion unknown];
25. UD-4 [expansion unknown];
26. FRT-4 [unknown type of filter];
27. NRK-1 [expansion unknown];
28. V_1 [rectifier 1].

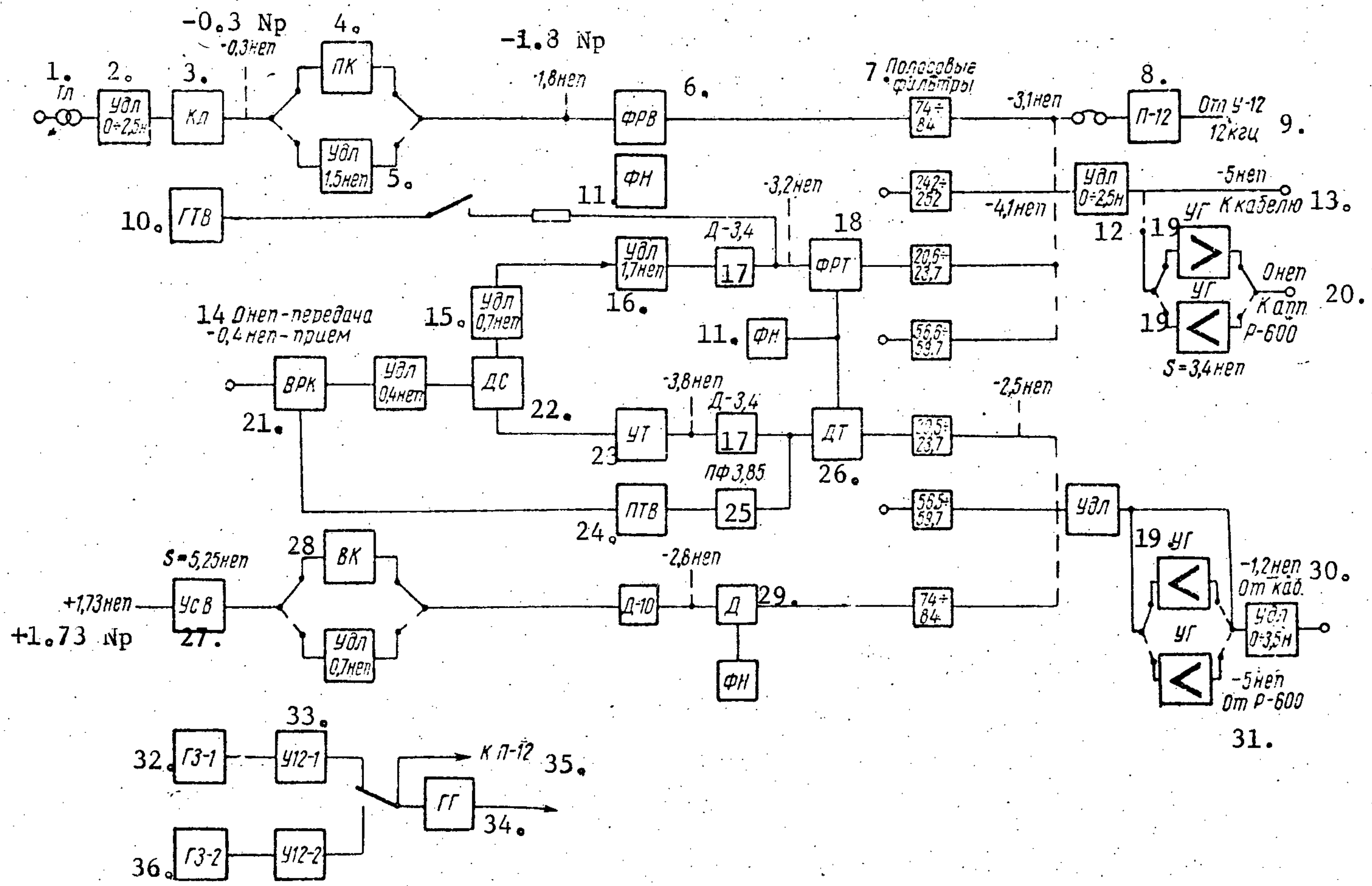


Figure 9.5.3. Block diagram of rack A of the UKRLV equipment.

Key:
1. [?T1 - telephone?];
2. 0 - 2.5 Np pad;
3. Kl [?key?];
4. PK [?trimmer network?];
5. 1.5 Np pad;
6. FRV [unknown type of broadcast filter];
7. Bandpass filters;
8. P-12 [expansion unknown];
9. From the U-12, 12 KHz;

[Key to Figure 9.5.3, continued]:

10. Voice frequency ringing generator;
11. FN [expansion unknown];
12. 0 - 2.5 Np pad;
13. -5 Np, to the cable;
14. 0 Np: transmit; -0.4 Np, receive;
15. 0.7 Np pad;
16. 1.7 Np pad;
17. D-3.4 [KHz] filter;
18. FRT [unknown type of filter];
19. UG [?group amplifier?];
20. 0 Np to the R-600 equipment;
21. VRK [expansion unknown];
22. Differential system;
23. UT [?telephone amplifier?];
24. PTV [?voice frequency ring receiver?];
25. 3.85 KHz bandpass filter;
26. DT [?differential transformer?];
27. UsV [?broadcast amplifier?];
28. VK [?equalizing network?];
29. D [demodulator];
30. -1.2 Np, from the cable;
31. -5 Np, from the R-600;
32. GZ-1 [master oscillator 1];
33. Unknown type of amplifier;
34. Harmonic generator;
35. To the P-12 [expansion unknown];
36. GZ-2 [master oscillator 2].

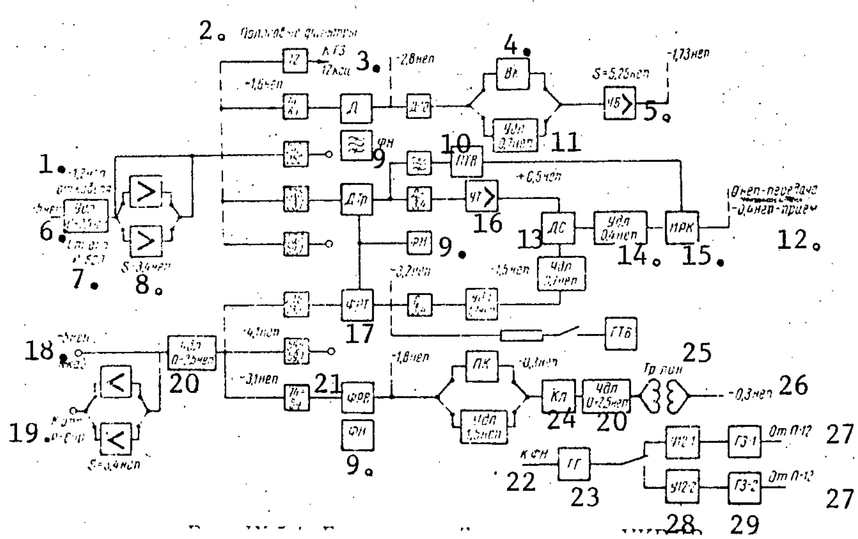


Figure 9.5.4. Block diagram of [rack] B of the UKRLV equipment.

Key: 1. -1.2 Np from the cable;
2. Bandpass filters;

[Key to Figure 9.5.4, continued]:

3. 12 KHz [?to the GZ (master oscillator)];
4. VK [?equalizing network?];
5. Broadcast amplifier;
6. 0 - 3.5 Np pad;
7. From the R-600 equipment;
8. Gain = S = 3.4 Np;
9. FN [?carrier filter?];
10. PTV [?voice frequency ring receive?];
11. 0.7 Np pad;
12. 0 Np for transmit, -0.4 Np for receive;
13. Differential system;
14. 0.4 Np pad;
15. IRK [expansion unknown];
16. UT [?telephony amplifier?];
17. FRT [unknown type of filter];
18. -5 Np, to the cable;
19. To the R-600 equipment;
20. 0 - 2.5 Np pad;
21. FRV [unknown type of filter];
22. To the FN [?carrier filter?];
23. GG [harmonic generator];
24. KL [expansion unknown];
25. Line transformer;
26. -0.3 Np;
27. From the P-12 [expansion unknown];
28. U12-2 [expansion unknown];
29. GZ-2 [master oscillator 2].

SECTION 10. POWER DISTRIBUTION EQUIPMENT

10.1. The SARN Rack of Automatic Voltage Regulators

Figures 10.1.1 - 10.1.5.

Purpose

Intended for stabilizing the voltages in the filament and plate circuits, as well as for the power supply circuits of semiconductor equipment, and the switching and distribution of the power in the LATs [line equipment shop] (SARN-I, SARN-II, SARN-IM, SARN-IIM, SARN-III, SARN-IV and the SARN-V), and also for stabilizing the remote power supply voltage for the NUP [unattended repeater] equipment (SARN-IM with RNDP, SARN-III, and the SARN-IV).

Voltage regulation is accomplished by means of carbon pile regulators of the RUN-131A type; used in the SARN-III, SARN-IV and SARN-V are carbon pile regulators having an increased power capacity of the RUN151 and RUN-153 types.

At the present time, the SARN-I and SARN-II racks have been taken out of production and the modernized SARN-IM and SARN-IIM respectively are being used. Provided in the racks being produced are devices for automatically shunting the carbon pile regulators when the input voltages fall off and removing the shunting when the input voltages increase.

The shunting and de-shunting of the carbon pile regulators is accomplished by means of semiconductor voltage relays. In the SARN-IM racks with RNDP, and the SARN-III and SARN-IV racks, one of the plate voltage regulators is adapted for remote power supply of the NUP equipment.

The values of the switched and regulated voltages of the SARN-M are given in Table 10.1.1.

Table 10.1.1.

Connection Point	Voltages, volts				
At the input to the SARN-M racks	24 VDC ±10%	220 VDC ±10%	220 VDC ± 10%, (for the SARN-1M with RNDP)	-	80 VAC (16 - 25 Hz)
At the output of the SARN-M racks	21.2 VDC ±3%	206 VDC ±3%	206 - 320 VDC (for the SARN-1M with RNDP) ±3%	24 VDC; 220 VDC (reg.) ±10%	80 VAC (16 - 25 Hz)

The same voltages are swtiched in the SARN-III and SARN-IV racks as in the SARN-M racks. Besides this, the SARN-III and SARN-IV racks provide for the connection of the following: regulated DC remote power voltage (one RUN each in each type of rack) from 206 to 320 volts with a precision of ± 3%; single phase 220 VAC at a frequency of 50 Hz. In the SARN-V racks, the 21.2 volts ± ± 3% regulated, the 22 - 26.4 volts regulated, and the unregulated 24 volts are switched at the output.

Equipment Complement

Housed in each rack are the following panels: fuses, plate regulators, filament regulators, knife switches, measurement panel, and output terminals.

The System and Load Control Range of the RUN's [Carbon Pile Regulators]

The SARN and SARN-M

The filament regulators have manual control with load ranges of 7.5 a, 13.0 a, and 18 a, while the plate regulators have a load control range of 0.3 a, 1.6 a, and 2.3 a.

The remote power supply regulators have automatic regulation with load control ranges of from 0.3 a up to 2.3 a.

The SARN-III and SARN-IV

The filament regulators (21.2 volts) have manual control for loads from 5.8 a to 35.8 a, the filament regulators (24 volts) with loads from 5.8 a to 35.5 a, the plate regulators for loads from 0.65 a to 3.65 a, and the remote power regulators handle loads of from 0.65 a up to 3.65 a.

The number of regulators in the SARN racks is shown in Table 10.1.2.

Table 10.1.2.

	Стойки / Racks	Regulators / Регуляторы: Plate (анодный РУН-131-А) RUN-131-A	Filament (накальный РУН-131-А) RUN-131-A	1) дистанционного питания РУН-131-А	2) умощненный анодный РУН-153	3) умощненный накальный РУН-151
SARN-I	САРН-I	3	3	—	—	—
	САРН-II	2	4	—	—	—
	САРН-IМ	3	3	—	—	—
	САРН-IIМ	2	4	—	—	—
RNDP	САРН-IМ с РНДП	2	3	1	—	—
	САРН-III	—	—	—	3	3
	САРН-IV	—	—	—	2	4
SARN-V	САРН-V	—	—	—	—	6

Key: 1. For the remote power, RUN-131-A;
2. Higher power type, plate regulator, RUN-153;
3. Higher power type, filament regulator, RUN-151.

Note: The current used by the electromagnet coils and the filament regulators is 0.75 - 0.8 a, and that for the plate regulators and remote power is 0.15 a.

Construction

SARN, SARN-M. Racks of sectional steel with equipment filling both sides. The dimensions are 2,510 x 526 x 515 mm.

SARN-III, SARN-IV. Racks of sectional steel with equipment filling both sides. The racks are enclosed at the rear by two double folding doors. Between the upper and lower doors there are two knife switches and one multisection rotary switch for bringing in the filament and plate voltages. The dimensions are 2,600 x 550 x 473 mm.

The SARN-V has dimensions of 2,6b0 x 650 x 473 mm.

Climatic Operational Conditions

At temperatures of from +5 to +40° C and a relative humidity of 80% (for the SARN-V, 65 ± 15%).

Weight: 300 kg (each rack)

Cost:

SARN-1M	1,117 rubles
SARN-1M with RNDP	1,177 rubles
SARN-IIM	1,177 rubles
SARN-III	2,847 rubles
SARN-IV	2,847 rubles
SARN-V	2,265 rubles

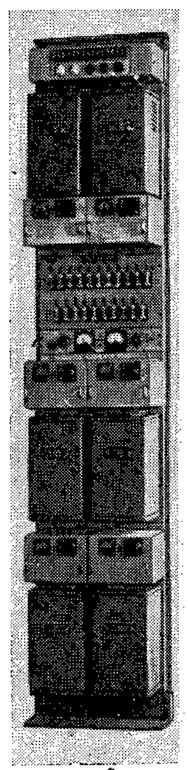
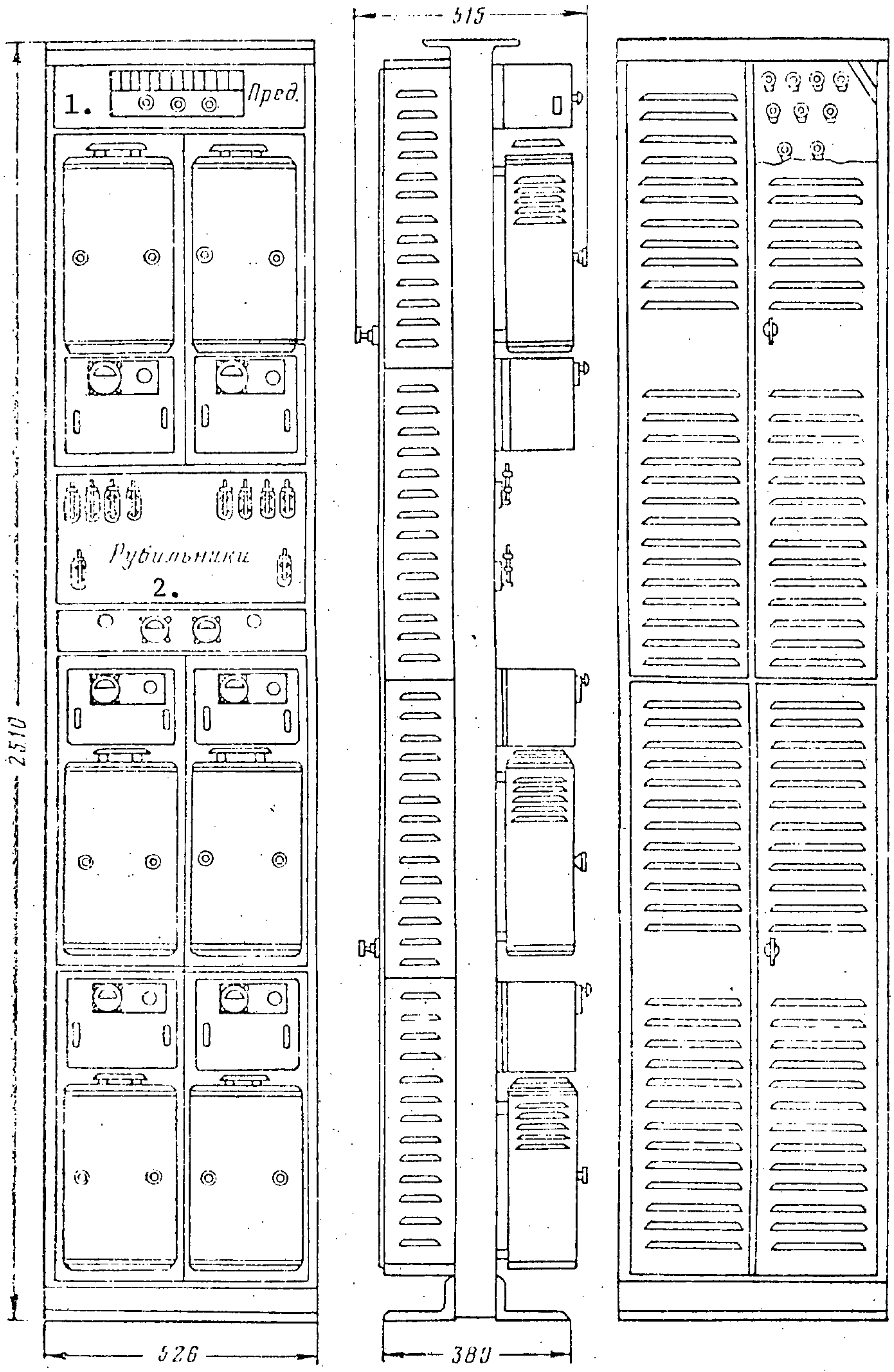


Figure 10.1.1.

Exterior view of the SARN rack.



10.1.2. The placement of the equipment in the SARN rack of automatic voltage regulators.

Key: 1. Fuses;
2. Knife switches.

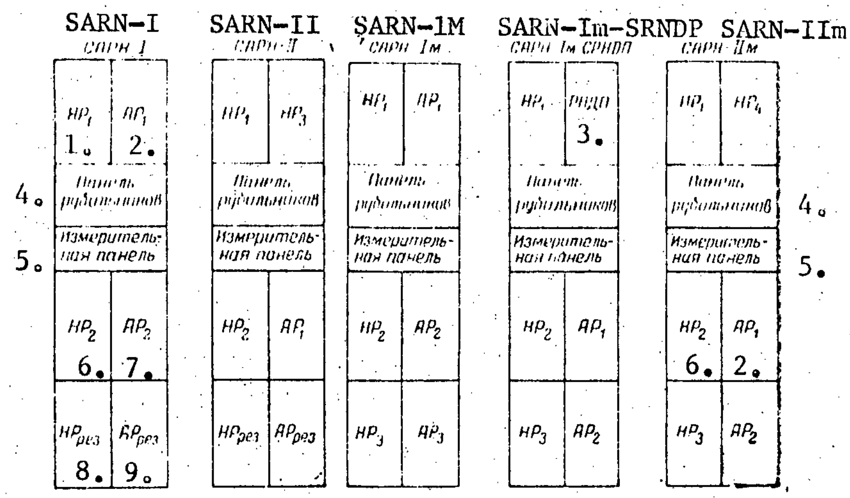


Figure 10.1.3. The arrangement of the filament and plate voltage regulators in the following racks: SARN-I, SARN-II, SARN-IM, SARN-IM with RNDP and SARN-IIM

Key: 1. Filament regulator 1;
2. Plate regulator 1;
3. RNDP [remote power voltage regulator];
4. Panel of knife switches;
5. Metering panel;
6. Filament regulator 2;
7. Plate regulator 2;
8. Standby filament regulator;
9. Standby plate regulator.

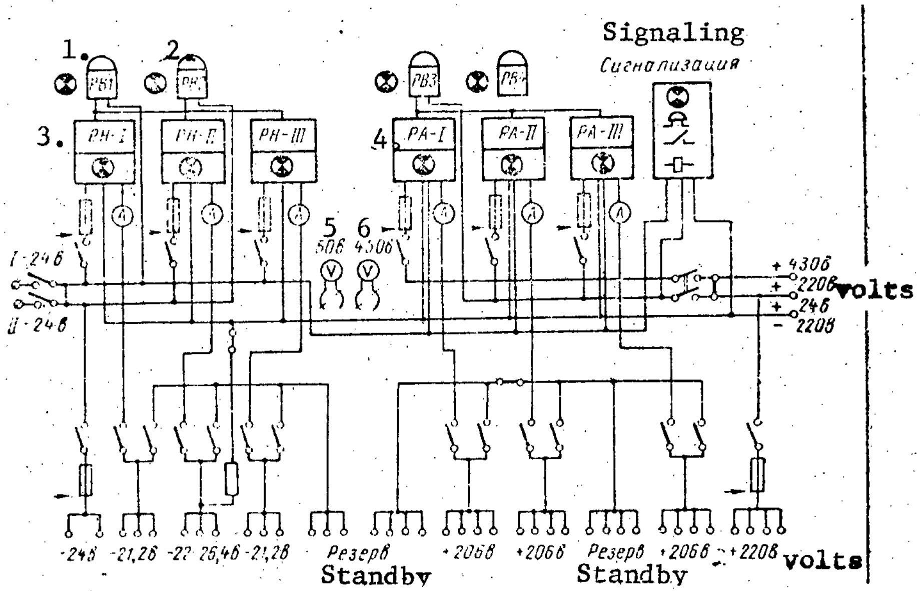


Figure 10.1.4. Simplified schematic of the SARN-III rack.

Key: 1. RV_1 [expansion unknown];
2. RV_2;
3. RN-I [filament regulator I];
4. RA-I [plate regulator I];
5. 50 volts;
6. 450 volts.

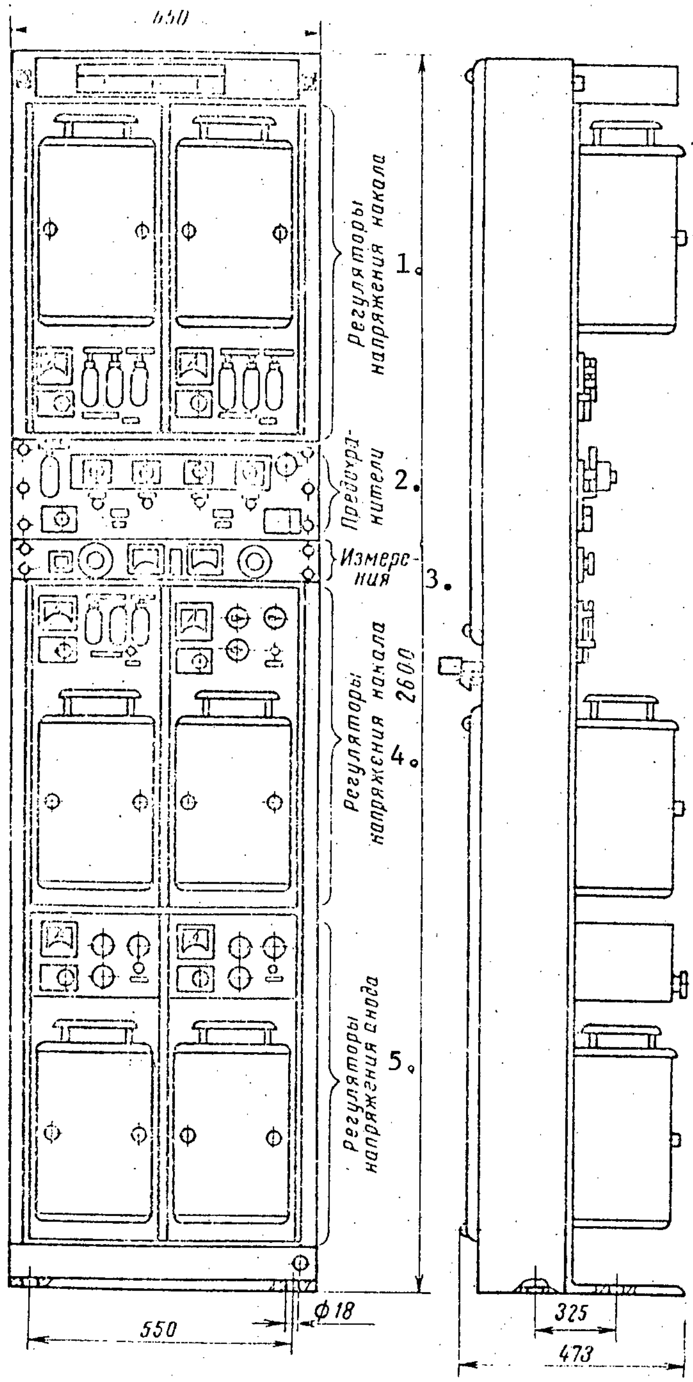


Figure 10.1.5. The placement of the equipment in the SARN-III rack of automatic voltage regulators.

Key: 1. Filament voltage regulators;
2. Fuses;
3. Metering;
4. Filament voltage regulators;
5. Plate voltage regulators.

10.2. The SP Power Supply Rack

Figures 10.2.1, 10.2.2.

Purpose:

Intended for switching the power supply feeders for the power fed to the line equipment shop from the generator control room, and for distributing the voltages over the rows of equipment through the protective devices.

Capacity:

Power for up to 10 rows of equipment in the line equipment shop:

-- For powering the tube circuits with voltages of: 24, 130 and 220 volts;
-- For powering the telegraph circuits with the following voltages: 40, 60 and 80 volts;
-- For powering ringing circuits.

The Number of Outputs to the Equipment of Line Equipment Shops and the Load

Voltage, v	Number of Outputs	Load, amps
-24	10	25
+130 or 220	10	5.0
Power driven magnetor ringe	20	2.0
±80	20	2.0
±60	20	2.0
±40	20	2.0
Ringing battery	20	2.0

Construction:

The frame is of angle steel with the panels filling one side. The rack dimensions are 2,500 x 526 x 472 mm.

Approximate Weight: 125 kg

Cost: 342 rubles

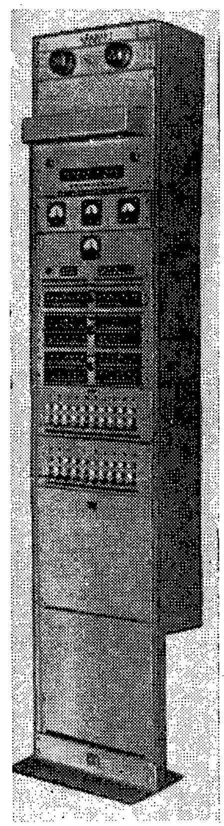


Figure 10.2.1.

Exterior view of the SP rack

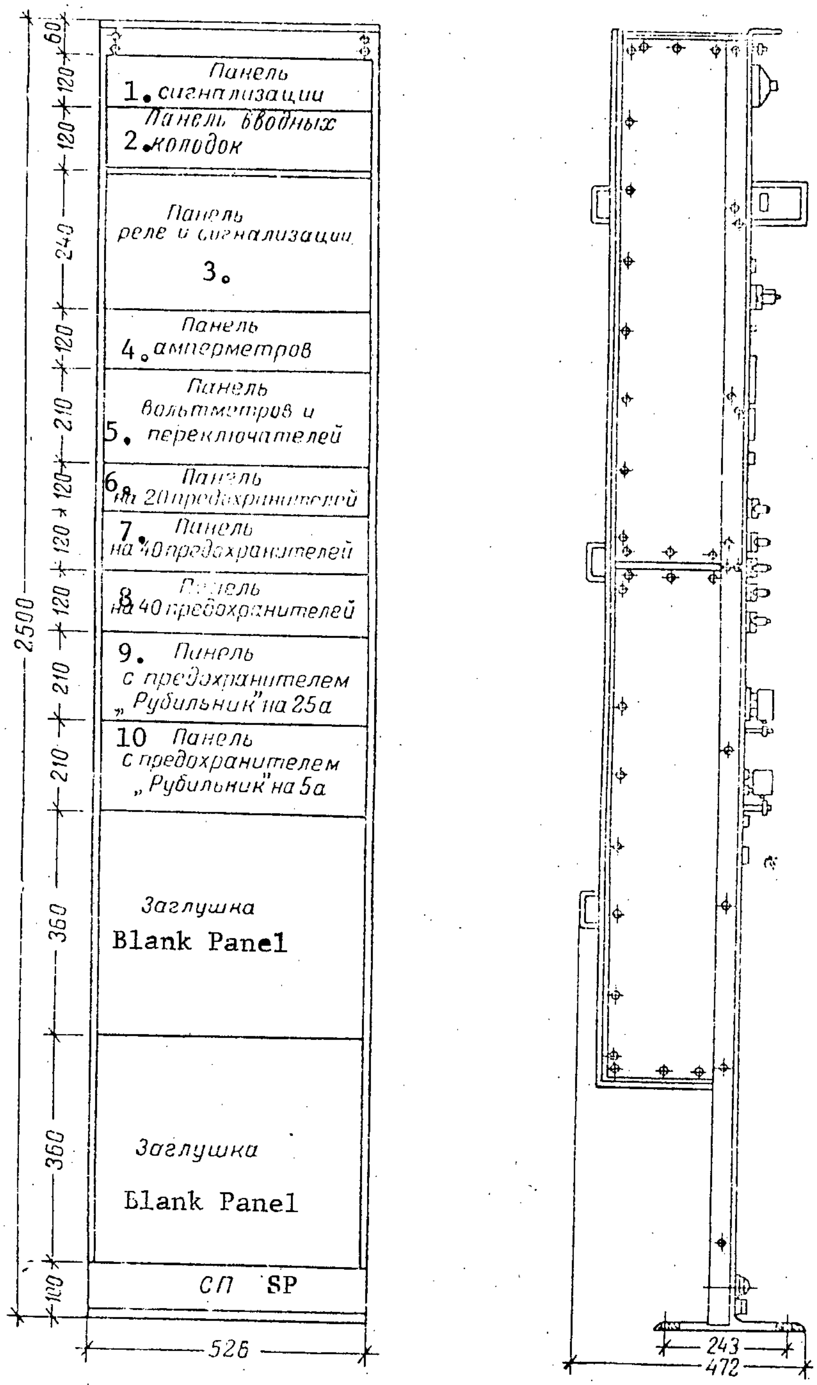


Figure 10.2.2. The placement of the equipment in SP power supply rack.

Key:
1. Signaling panel;
2. Panel of input terminal blocks;
3. Signaling and relay panel;
4. Panel of ammeters;
5. Panel of voltmeters and switches;
6. Panel of 20 fuses;
7. Panel of 40 fuses;
8. Panel of 40 fuses;
9. Panel with a 25 amp "knife switch" breaker;
10. Panel with a 5 amp "knife switch" breaker.

10.3. The SPDP-M K-60 Remote Power Transmission Rack and PPDP-M Remote Power Receive Panel

Figures 10.3.1. - 10.3.3.

Purpose of the Rack:

Intended for providing 220 - 450 volts DC to the multiplex equipment of unattended repeater stations for non-coil-loaded balanced cables with cord-styroflex and cord-paper insulation (the K-24-2 and K-60 equipment).

The rack equipment performs the following functions:

- -- Switching the remote power circuits;
- -- Regulating the voltage of the power supply;
- -- Switching the power on and off to each remote power circuit;
- -- Signaling a break in the remote power circuit or the burning out of filaments of the NUP equipment tubes;
- -- Signaling an overload or current short circuit in excess of 30% in the remote power supply circuit;
- -- Providing for normal operation of the remote power circuits at currents of from 0.1 amps up to 0.3 amps via two-cable trunks;
- -- Powering supervisory loads and measurement equipment.

The carbon pile voltage controllers (RUN's) are designed to handle six remote power circuits each with a nominal current of 0.275 amps in each remote power circuit. A current in excess of 1.8 amps should not flow through an RUN. A voltage of 24 v is used to power the signaling and control circuits.

Capacity:

The SPDP-M K-60 rack is put together as a set of 6, 12 or 24 remote power transmission panels, where the number of carbon pile regulators is one, two and four respectively.

The remote power transmission racks are installed at terminal stations and attended repeater stations.

The receive panels for the remote power are installed in the unattended repeater stations of the K-24-2 or K-60 equipment.

Purpose of the Panel:

The remote power receive panels for the equipment of K-24-2 and K-60 NUP's are intended for connecting the remote power circuits of the low and high frequency repeater amplifiers, as well as for power supervisory loads and measurement equipment at the NUP's, and are designed for:

- -- Powering loads of from 0.1 to 0.2 amps;
- -- A voltage, fed to the panel from the OUP [attended repeater], of 140 or 160 volts DC.

The Remote Power Supply System: "Wire-wire", "wire-ground".

The Number of NUP's Which Can Be Powered:

Up to six NUP's in a "wire-wire" or "wire-ground" circuit configuration, where these NUP's run in one direction from the OUP.

Type of Remote Power Transmission Line:

The individual cores of high frequency circuits, using decoupling devices at the center points of the quads.

Equipment Complement

SPDP-M K-60. Four panels of carbon pile regulators of the RUN-131-A-2 type, 24 remote power transmit panels, and two fuse panels.

PPDP-M. Relays, toggle switches, rheostats, selenium rectifier, etc.

Construction:

A STDP-M K-60 rack in a standard frame has dimensions of 2,500 x 648 x 506 mm.

The dimensions of the remote power transmission panel are 88 x 644 x 190 mm.

The dimensions of the remote power receive panel are 118 x 644 x 190 mm.

Weight: 400 kg (when filled to capacity).

Cost:

5,097 rubles for 24 panels;
2,994 rubles for 12 panels;
1,958 rubles for 6 panels.

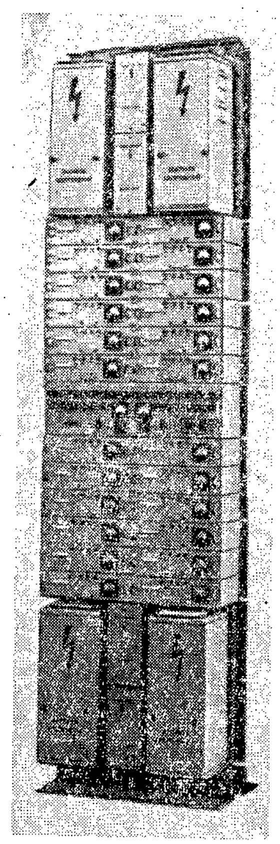


Figure 10.3.1. Exterior view of the SPDP-M K-60 remote power transmission rack.

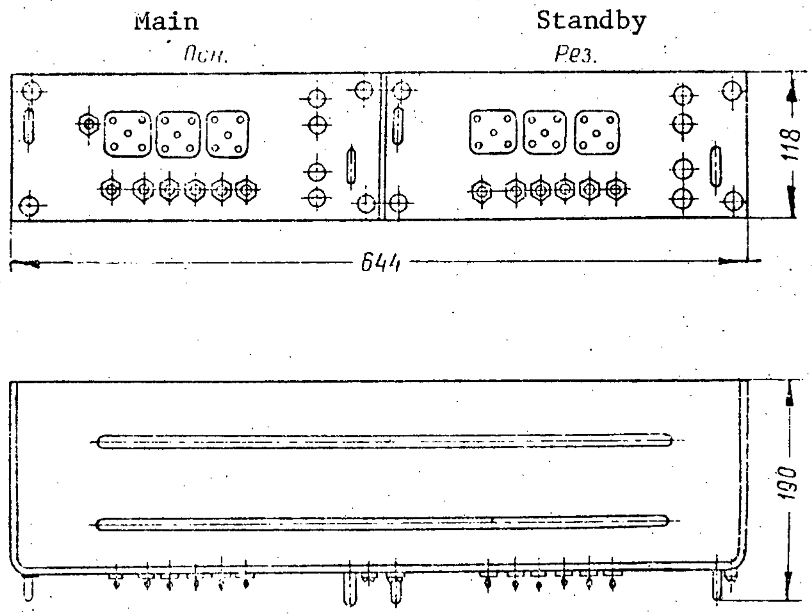


Figure 10.3.2. The PPr-DP remote power receiving panel.

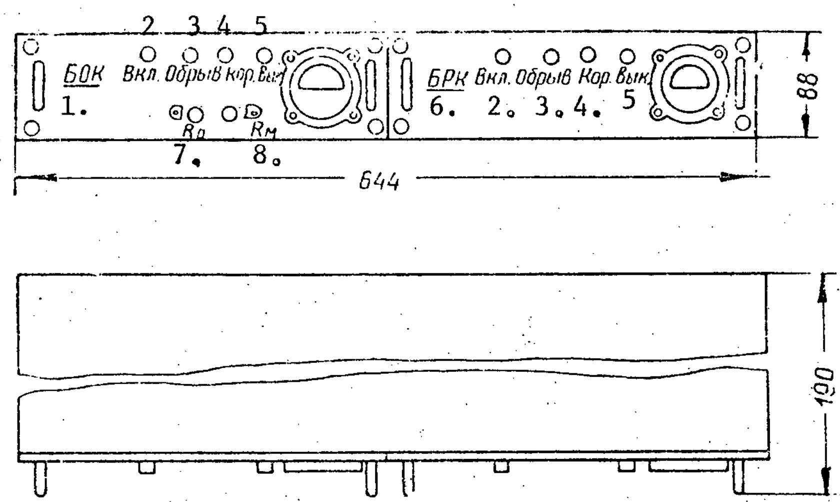


Figure 10.3.3. The PPer-DP remote power transmission panel.

Key: 1. BOK [?main monitor block?];
2. "On" light;
3. "Circuit Break" light;
4. Kor [expansion unknown];
5. "Off" light;
6. BRK [?standby monitor block?];
7. R_D [?some type of meter setting pot?];
8. R_M "

10.4. The SPPT Semiconductor, Direct Current Converter Rack

Figures 10.4.1, 10.4.2.

Purpose

Intneded for series insertion in the remote power supply circuit in place of a voltage step-up storage battery to increase the remote power supply voltage from 220 to 450 volts with a maximum load current of up to 4.5 amps. The SPPT rack can be used as an independent power supply.

Electrical Characteristics

The SPPT rack is powered from a 24 volt storage battery, the voltage of which can fluctuate from 22.7 to 28.6 volts. The regulation of the input voltage is assured by means of dropping resistors inserted by means of VR-2 type voltage relays.

The connecting devices of the rack provide for the series insertion and disconnection of converters, obtaining any specified voltage from 0 to 270 volts (in steps of 30 volts each), and the capability of switching out any converter without disrupting the remote power circuit.

Equipment Complement

Depending on the amount of equipment in the rack (DC voltage converters and control panels), the racks are produced by the factory in three variants:

SPPT-2. . . three control panels. . . nine converter panels
SPPT-4. . . two control panels. . . . six converter panels
SPPT-5. . . one control panel . . . . three converter panels

Located on the front face of the SPPT-2 rack are:

Panel of input terminal blocks;
Panel of voltage relays (VR-2), intended for the automatic insertion or disconnection of dropping resistors, with fluctuations in the 24 volt input voltage.. The voltage relay is transistorized and is connected in parallel with the storage battery through resistors;
Three control panels of the PU type, which provide for manual or automatic insertion of the converter panels into the remote power circuit;
Measurement panel;
ive DC converter panels of the PPT type, intented for the conversion of 18 - 24 volts DC to 30 - 45 volts DC.
The output power of a PPT is 135 watts.
Mounted on the back side of the rack are:

Fuse panels;
Three panels of dropping resistors of the PGS type, which can be switched in or out of the PPT circuit by means of the voltage relays, with fluctuations in the 24 volt input voltage;
Four DC converters of the PPT type.

In all types of SPPT racks (SPPT-2, SPPT-4 and SPPT-5), the wiring is provided for nine converters with the option of filling out the SPPT-4 and SPPT-5 racks with PU, PGS or PPT panels, which the plant supplies as separate products.

Construction

The SPPT racks have panels mounted on both sides. The rack dimensions are 2,600 x 658 x 570 mm.

Weight and Cost

Equipment Оборудование	Weight, kg Вес, кг	Price, rubles Цена, руб.
СППТ-2 SPPT-2	285	2179
СППТ-4 SPPT-4	232	1822
СППТ-5 SPPT-5	180	1397

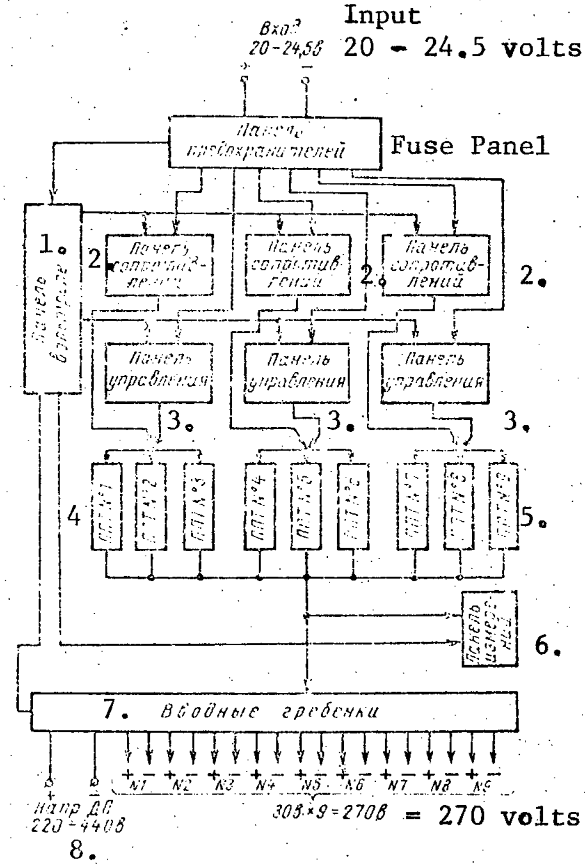


Figure 10.4.1. Block diagram of the SPPT-2 direct current converter rack.

Key: 1. Panel of voltage relays;
2. Panel of resistors;
3. Control panel;
4. PPT No. 1 [DC converter No. 1];
5. DC converter No. 9;
6. Metering panel;
7. Input terminal blocks;
8. 220 - 440 v. remote power supply.

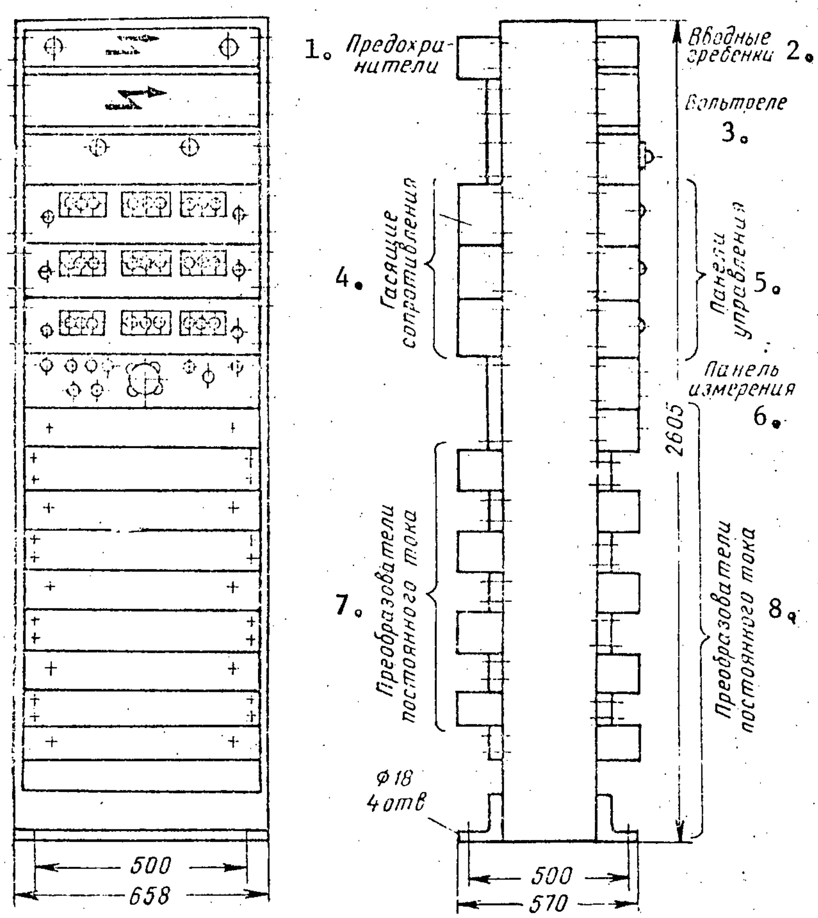


Figure 10.4.2. The placement of the equipment in the SPPT-2 rack of direct current converters.

Key: 1. Fuses;
2. Input terminal blocks;
3. Voltage relays;
4. Dropping resistors;
5. Control panels;
6. Metering panel;
7. DC converters;
8. DC converters.

10.5. The SEP Electrical Power Supply Rack

Figures 10.5.1., 10.5.2.

Purpose:

Intended for stabilizing, converting and switching DC voltages, which provide local and remote power for equipment. It is employed for local and remote power supply for trunks, balanced single-quad cable, which is multiplexed with K-24-2 and K-60 equipment with amplifiers at the NUP's [unattended repeater stations] of the K-24--2m, K-60p-2m and K-60p-4 types.

Electrical Characteristics

The SEP rack is powered from 24 volts, which fluctuate within limits of from 22.7 to 31.2 volts. Fed to the rack is the AC mains voltage at 220 volts to provide power for auxiliary loads.

The SEP rack provides for the following: regulation of the DC voltage at 21.2 volts ± 3%; conversion of the regulated 21.2 volts to 206 volts DC ± 3%; and conversion of the regulated 21.2 volts to a DC voltage of from 50 to 450 volts ± 7%.

The Voltages and Loads Which Can Be Connected

Input Circuits:

24 volts unregulated	One 80 amp input to two RUN-151 carbon pile regulators
24 volts ± 10%:	
The signal circuits of segregation equipment	One 3.6 amp output
Repeater amplifiers	One 3.5 amp output
SEP rack	One 1.5 amp output
24 volts unregulated for emergency lighting	Two outputs of 3 amps each
220 volts AC for powering auxiliary equipment	One 5 amp output

Output Circuits:

The regulated voltage of 21.2 v ± 3%:	
The filament circuits of repeater amplifier tubes	Two outputs at 1.8 v [sic] each
For the filament circuit of segregation equipment tubes	Two outputs of 3.7 amps each
Remote signaling and remote control equipment	One output at 1.5 amps.
DC voltage from 50 to 450 v + 7% for remote power	Four outputs of 0.13 amps each
DC voltage at 206 v ± 3% for powering plate circuits	Two outputs at 0.65 amps each.

Equipment Complement

Three types of SEP racks are manufactures: SEP, SEP-2, and SEP-4.

Located on the front side of the rack are the following:

Panel with two type RUN-151 carbon pile regulators, designed for a load current of from 5 to 35 amps, intended for regulating the 21.2 volts $\pm 3\%$, which powers the main circuits of the rack;
The measurements panel for monitor measurements of the voltages at the input and output of the individual assemblies of the rack;
The control panel for the plate voltage converters (PAP);
The control panel for the remote power supply voltage converters (PPU-3);
Direct current amplifier panel for stabilization precision and facilitating the setting of the RUN-151;
Six panels (for the SEP and SEP-2 racks) of remote power supply voltage converters (PPU-3), which convert the 21.2 volts $\pm$ 3% to a DC voltage from 50 to 450 volts $\pm$ 7%;

The maximum output power of each PPU-3 is 60 watts at a current of 130 ma. Of the six PPU-3 panels mounted in the SEP rack, four are operational and two are standby. A provision is made for automatically switching over the operational PPU-3 (in case it is damaged) to the standby.

In contrast to the PPU-2 converters previously employed, the PPU-3 converter provides a greater output power and stabler operation; moreover, a provision is made in the PPU-3 circuitry for the capability of reversing the polarity of the output voltage to determine the location of a circuit break in emergency cases.

Located on the back of the rack are the following:

Panel of input and output terminals (there are also terminals on the panel for the connection of the emergency lighting main);
Knife switch panel for cutting on the power (-24 volts) to the SEP;
Panel of fuses;
Three plate supply voltage converters (PAP), which convert the 21.2 volts $\pm$ 3% to 206 volts DC $\pm$ 3%;

The PAP output power is 135 watts with a load current of 0.65 amps. Of the three PAP's which are installed, one is a stnadby. A provision is made for automatically switching the working PAP (in case it is damaged) over to the standby.

Construction

The SEP rack is made with panels mounted on two sides, while the SEP-2 and SEP-4 racks are made with panels mounted on one side (with the exception of the panel of input terminals). The dimensions of the racks are 2,605 x 650 x 650 mm, those of the PPU-3 panel are 160 x 644 x 120 mm, and those of the PAP panel are 129 x 648 x 140 mm.

Weight: 300 kg. Approximate Cost: 2,650 rubles

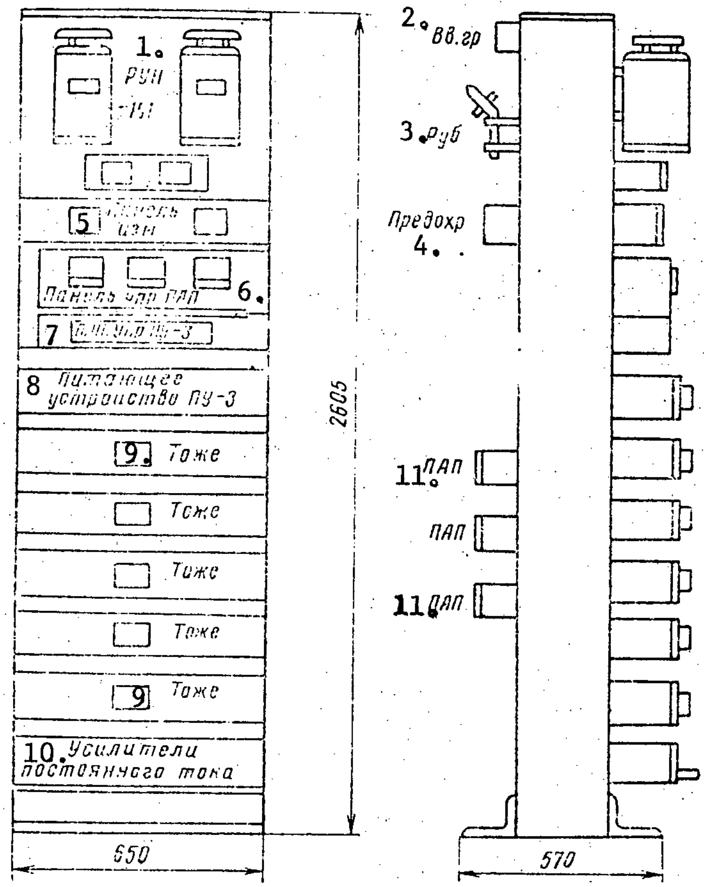


Figure 10.5.1. The placement of the equipment in the SEP electrical power supply rack.

Key: 1. RUN-151 carbon pile regulators;
2. Input terminal blocks;
3. Knife switch;
4. Fuses;
5. Metering panel;
6. Plate supply voltage converter control panel;
7. PU-3 power supply for plate voltage converter control;
8. PU-3 power supply;
9. The same;
10. DC amplifiers;
11. PAP [plate supply voltage converters].

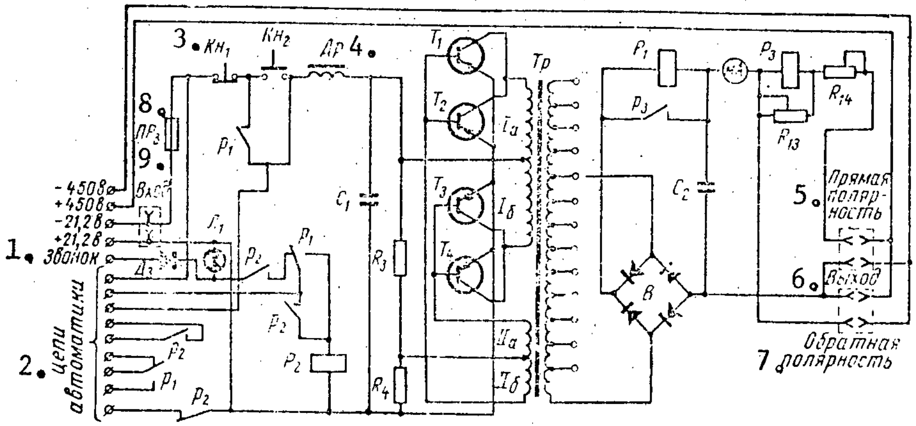


Figure 10.5.2. The schematic of the PPU-3 converter control panel.

Key: 1. Alarm;
2. Automation circuits;
3. Pushbutton switch 1;
4. Choke;
5. Forward polarity;
6. Output;
7. Reverse polarity;
8. Fuse 3;
9. Input.

10.6. The SPAV (SPAV-I, SPAV-II) Segregation Equipment Power Supply Rack Figures 10.6.1. - 10.6.3.

Purpose

Intended for supplying the requisite power to the SVVG and SPPR-1 segregation equipment racks (SPAV-I) or the SVVG, SPPR-1, USPP and SUGO segregation, standardized, conversion and generator equipment racks (SPAV-II).

The voltage at the equipment input is 220 volts ± 3% at a frequency of 43.5 - - 51 Hz, and as follows at the output for: SPAV-I -- two outputs of 21.2 volts ± 3% for a load current from 0.8 to 8.8 amps and two outputs at 24 volts ± 10% for a load current from 0 to 8.8 amps; for the SPAV-II -- five outputs at 21.2 volts ± 3% for a load current of from 0.8 to 8.8 amps, and two outputs at 24 volts ± 10% for a load current of from 0 to 8.8 amps.

Transistorized regulators are employed for voltage stabilization. The conversion from 21.2 volts to 24 volts is accomplished by means of resoldering taps in the transformers of the rectifier. The precise setting of the output voltage is accomplished by means of a variable resistor. The signaling panel (KS) provides for the following: signaling the presence and loss of the 220 VAC, as well as signaling the loss of the 21.2 volt and 24 volt output voltages.

Equipment Complement	SPAV-I	SPAV-II
Voltage monitoring and signaling panel (KS)	1	1
VS-24 rectifier panel	2	2
VS-21.2 rectifier panel	2	5

Construction

The rack frame is made of sectional steel. The dimensions are 2,600 x 640 x 250 mm. The panels of rectifiers are made notched, plug-in types. The connection of the rectifiers is accomplished by means of two 16-contact terminal blocks. The signaling and voltage monitor panel is mounted on hinges and consits of two half-panels.

Weight and Cost

Rack Стойка	Weight, kg Вес, кг	Cost, rubles Стоимость, руб.
СПАВ-I SPAV-I	300	6500
СПАВ-II SPAV-II	400	6500

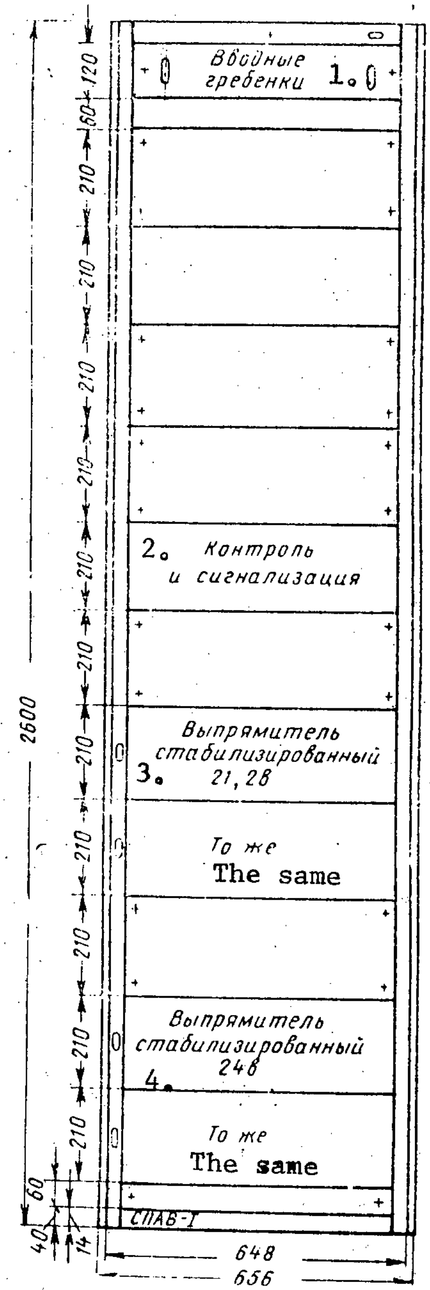


Figure 10.6.1. The placement of the equipment in the SPAV-I power supply rack for segregation equipment.

Key: 1. Input terminal blocks;
2. Monitoring and signaling;
3. 21.2 volt regulated rectifier;
4. 24 volt regulated rectifier.

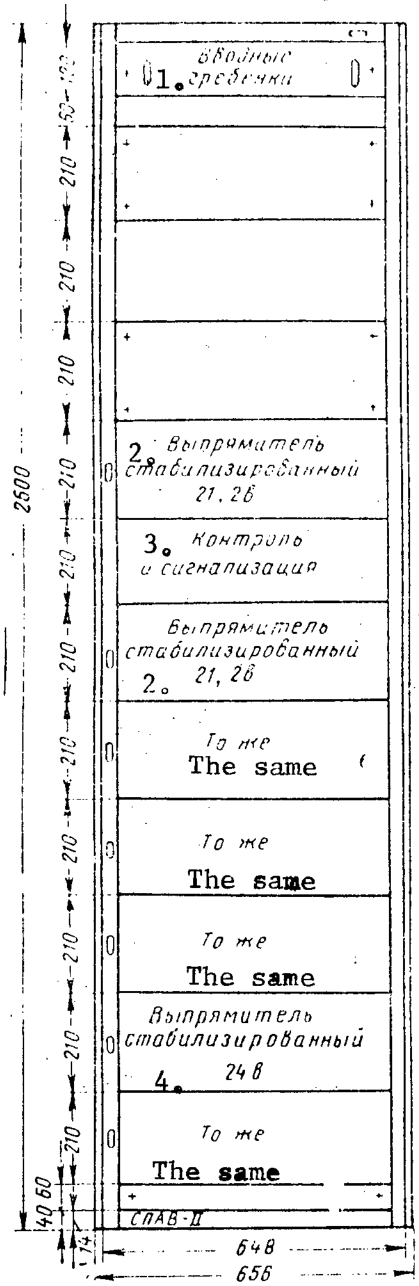


Figure 10.6.2. The placement of the equipment in the SPAV-II power supply rack for segregation equipment.

Key: 1. Input terminal blocks;
2. 21.2 volt regulated rectifier;
3. Monitoring and signaling;
4. 24 volt regulated rectifier.

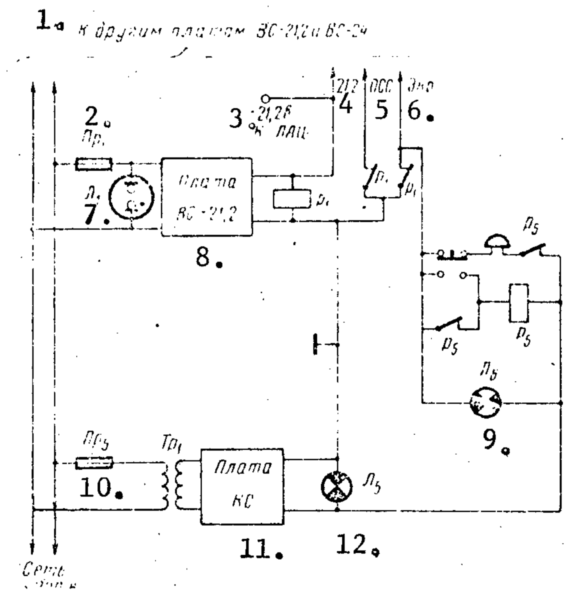


Figure 10.6.3. Simplified schematic of one regulated rectifier panel (VS-21.2) and the signaling and monitor panel (KS) of the SPAV-I and SPAV-II racks.

Key: 1. To the other VS-21.2 and VS-24 panels;
2. Fuse 1;
3. -21.2 volts, to the line equipment shop;
4. 21.2 volts;
5. OSS [expansion unknown];
6. Shield;
7. Light 1;
8. VS-21.2 panel;
9. Light 6;
10. Fuse 5;
11. KS panel
12. Light 5.

Note: The remaining VS-21.2 and VS-24 panels have a similar circuit.

SECTION 11. AUXILIARY EQUIPMENT

11.1. The UKVSS Standardized Service Communications Switching and Callup Equipment

Figures 11.1.1, 11.1.2.

Purpose:

Intended for the organization of operational telephone service via cable (balanced and coaxial) and radio relay links.

Equipment Complement

The standardized service communications rack. It is installed at OP's [terminal stations], OUP's [attended repeater stations], and PP's [intermediate stations]. The UKRM (or RKM) control console. It is installed in UKM (or RKM) rooms. The intercom-callup unit (PVU). It is installed in NUP's [unattended repeater stations] in the VKS or SV-NUP racks (for the K-1920).

Types, Quantity and Function of the Service Communications Links

Trunk service (MSS) [trunk service communications link]: One. It is organized via the channels of HF multiplexed circuits using a four-wire configuration and is intended for intercommunications between the technical personnel of terminal and repeater stations.

Station-to-station (PSS): Two. It is organized via the channels of voice frequency, physical or phantom circuits of the balanced pairs of a cable using a four-wire configuration;

PSS_1 - with callup by voice, is intended for service communications between the technical personnel of terminal, retransmission and attended repeater stations (OUP's);
PSS_2 - with selective ringing, is intended for service communications of the UKRM with the RKM and KU [expansions unknown].

Sectional (USS) [sectional service communications link]: Two. It is organized via the channels of voice frequency, physical or phantom circuits of balanced pairs of a cable using a four wire configuration with selective callup. It is intended for the communications of unattended repeater stations with the technical personnel of the nearest OUP.

Note: Organized on coaxial cable trunks are similar service communications links. Sectional service communications links can be organized using a two-wire configuration with coil-loaded pairs.

Types of Service Communications Racks

SS-1. Intended for the organization of service communications on coaxial cable trunks. The rack has sets for the connection of UKRM (or RKM) control consoles.

SS-2. The same, but without the sets for the connection of the UKRM (or RKM) control boards.

SS-3. Intended for the organization of service communications on balanced cable trunks. The rack has sets for the connection of UKRM (or RKM) control consoles.

SS-4. The same, but without the sets for the connection of the UKRM (or RKM) control consoles.

Equipment Complement of the Racks and Control Boards

Equipment	SS-1	SS-2	SS-3	SS-4	UKRM Control Board	RKM Control Board
MSS set	1	1	1	1	-	-
PSS_1 set	1	1	1	1	-	-
PSS_2 set	1	1	1	1	4	2
USS set	2	2	2	2	-	-
Transmit amplifiers	8	4	8	4	-	-
Amplifier with loudspeaker	1	1	1	1	1	1
Voice frequency ringing generator for 15 frequencies	1	1	1	1	1	1
Selective call receiver	4	4	4	4	4	2
Operator's telephone set network set	2	2	2	2	1	1
Transition networks (PU's) [hybrid terminal station of a four-wire circuit]	2	-	2	-	-	-
Direct subscriber set	3	3	3	3	10	5
Set of RSL relays [line connector relays]	1	1	1	1	1	1
Set of automatic telephone exchange relays	1	1	1	1	1	1
Service line set without relays	3	3	3	3	-	-
Junction lines	4	4	4	4	-	-
Power supply unit	1	1	-	-	1	1
Control panel	1	1	1	1	1	1
Protection and signaling panel	1	1	1	1	1	1

Electrical Power Supply

Voltages: SS-1, SS-2, and UKRM (or RKM) control board — 220 volts AC
SS-3; SS-4 — DC: filaments -24 volts; plates 206 volts.

Current and Power Consumption:

SS-1	300 VA
SS-2	300 VA
SS-3	Filaments from 1.2 to 4 amps; plates, from 0.1 to 2 amps;
SS-4	Filaments from 1.2 to 4 amps; plates, from 0.1 to 2 amps
UKRM (or RKM) board	70 VA.

Construction

The racks have a lightweight frame of sectional steel with equipment filling one side. The rack dimensions are 2,600 x 644 x 350 mm.
The control board is mounted on a desk. The control board dimensions are 1,420 x 644 x 372 mm.

Weight: Rack	350 kg	Cost:	SS-1	2,372 rubles
Control board	100 kg		SS-2	2,170 rubles
			SS-3	2,160 rubles
			SS-4	1,985 rubles

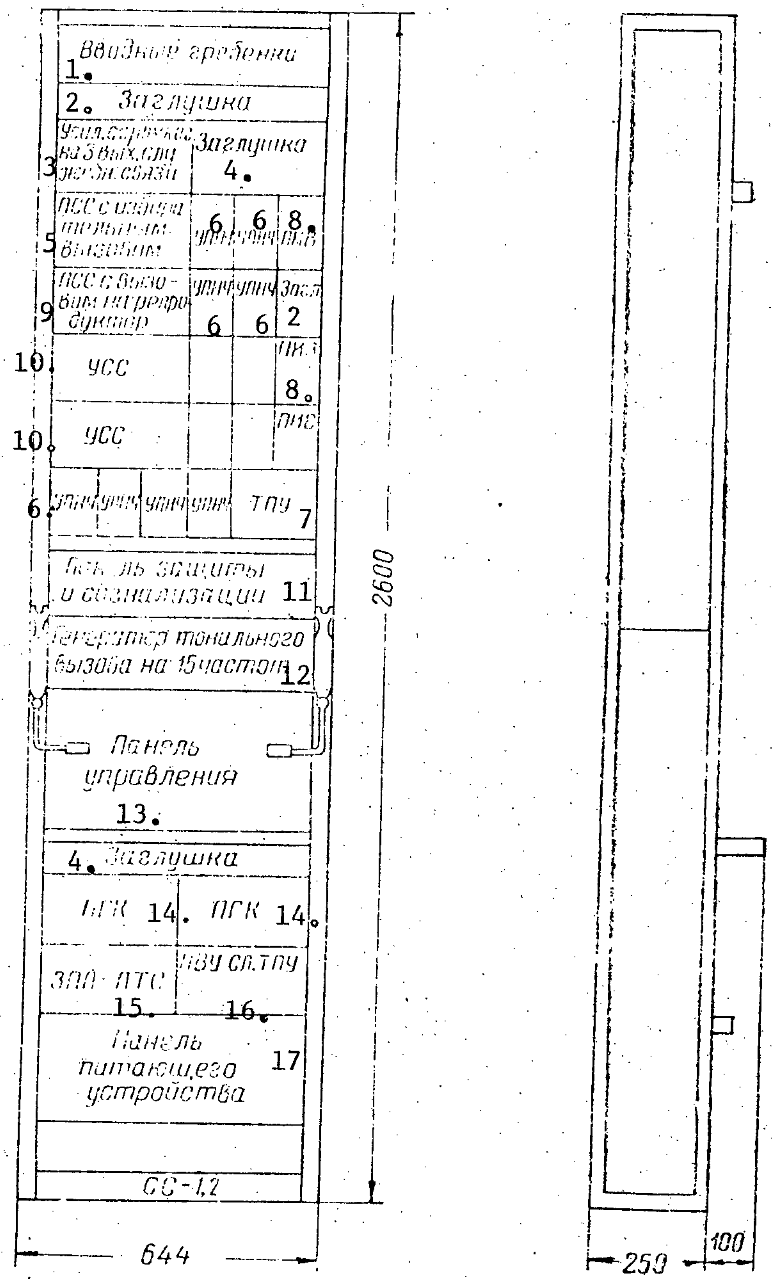


Figure 11.1.1. The placement of the equipment in the SS-1, 2 service communications rack for coaxial cable.

[Figure 11.1.1, continued]:

Note: Installed at the present time in the third panel in place of the blank filler panel are PSS (or MSS) blocks with PIV [selective calling].

Key:
1. Input terminal blocks;
2. Blank filler panel;
3. Amplifier with loudspeaker for three service communications link outputs;
4. Blank filler panel;
5. PSS [station-to-station service communications] with selective calling;
6. UPNCh [?low frequency transmit amplifier?];
7. TPU [expansion unknown];
8. PIV [selective call receiver];
9. PSS with loudspeaker callup;
10. USS [sectional service communications link];
11. Protection and signaling panel;
12. Voice frequency ringing generator for 15 frequencies;
13. Control panel;
14. PGK [expansion unknown];
15. ZPA - ATS [expansion unknown; ATS = automatic telephone exchange];
16. PVU SL, TPU [PVU = intercom-callup unit, SL = junction line, TPU expansion unknown];
17. Power supply panel.

[Key to Figure 11.1.2 (page 636)]:

1. Input terminal blocks;
2. Blank filler panel;
3. Amplifier with loudspeaker for three service communications outputs;
4. Blank filler panel;
5. Station-to-station service communications link with selective callup;
6. UPNCh [?low frequency transmit amplifier?];
7. PIV [selective call receiver];
8. Station-to-station service communications with selective callup;
9. PIV;
10. Station-to-station service communications with loudspeaker callup;
11. Sectional service communications;
12. Protection and signaling panel;
13. Voice frequency ringing generator;
14. Control panel;
15. PGK [expansion unknown];
16. 3 PA - ATS [expansion unknown];
17. Intercom-callup unit and TPU [expansion unknown];
18. TPU.

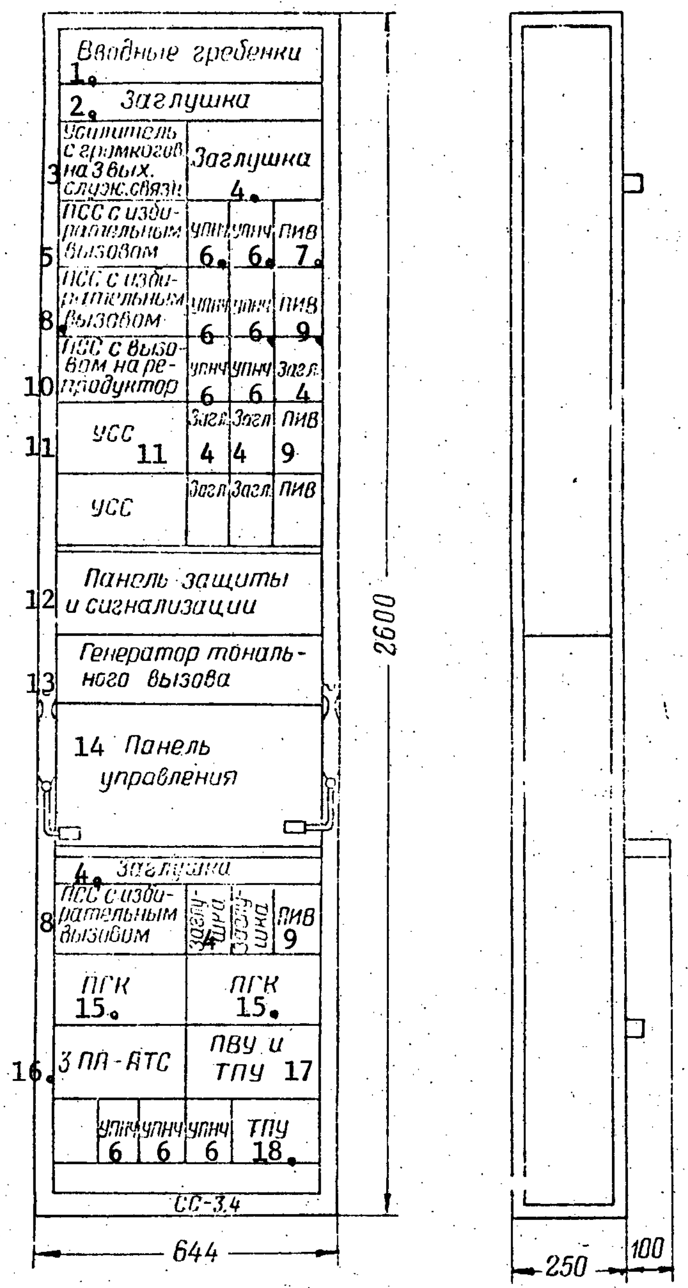


Figure 11.1.2. Placement of the equipment in the SS-3, 4 service communication rack for balanced cables.

Notes: 1. Installed at the present time in the third panel in place of the blank filler panel are PSS (or MSS) blocks with PIV [selective callup].
2. The blocks indicated here are not installed in panels 6, 13 and 16. USS blocks with PIV are installed in the sixth and seventh panels.

[Key on preceding page, 635]

11.2. The SSS-1 -- 8 Standardized Service Communications Equipment Figures 11.2.1 - 11.2.9.

Purpose:

Intended for providing operational service telephone communications on cable communications trunks, multiplexed with the K-60, K-300 and K-1920 systems, as well as on radio relay links. It is installed at terminal and attended repeater stations.

The Number and Function of the Service Communications Links

The service communications equipment provides for the organization of the following types of service communications on trunks:

Trunk service communications (MSS);
Station-to-station service communications (PSS-1 and PSS-2);
Sectional service communications (USS).

Trunk service communications is intended for servicing channels between terminal and through working stations, and the points where channel groups are segregated. It is organized via a four-wire HF channel.

Station-to-station service communications is intended for servicing the group channels of transmission systems between terminal and intermediate attended stations, for URKM-RKM communications on a retransmission section, as well as for GS, TTs, and RKM [expansions unknown] communications on radio relay links. It is organized four-wire voice frequency channels on cable lines and via HF channels on radio relay links.

Sectional service communications is intended for communications between technicians and linemen from NUP's with the adjacent OP's or OUP's on cable lines and on sections of a junction cable for radio relay links. It is organized on cable lines for four- and two-wire voice frequency channels.

Note: The USS circuit is designed for permanent inclusion of the low frequency amplifiers with outputs for:
a) Trunks, multiplexed with the K-1920 transmission system - through a differential system to the two-wire channel;
b) Trunks, multiplexed with the K-24 or K-60 transmission system - to a four-wire channel.

The Callup System via Service Communications Channels

Via a PSS_1 channel: selective and circular calls.
Via PSS_2, MSS and USS channels: selective callup.

The selective calling system is based on the use of frequency selection. The callup system which has been worked out provides for sending ringing signals at 23 frequencies in a frequency range from 540 to 3,180 Hz with an interval of 120 Hz. Used for sending the callup signals is a multifrequency generator, while used for their reception is a selective call receiver (installed inside the relay panel), which is tuned to one specific frequency. The voice frequency ringing generator is common to the operator's position of the switchboard.

For sending the call, the generator is equipped with a pushbutton keyboard, which contains 24 pusbuttons, of which 22 serve for sending an individual call, one pushbutton serves for sending out a circular call, and one button is for ringing an NUP via the USS circuits.

A frequency of 2,100 Hz has been adopted for circular callup, and 1,020 Hz for calling an NUP.

The receiver for individual selective callup, which is installed in the relay set panel, is an independent instrument for each service communications circuit.

The individual selective callup via the service communications circuits provides for the appearance of visual and audible signals at the station being called, with the subsequent blocking of signals until the called station answers. To have monitoring of the passage of the call at the calling station, a provision is made for sending a receipt signal in the return direction at a frequency of 420 Hz. Circular selective ringing via the PSS-1 circuit assures automatic connection of the loudspeaker and the appearance of a visual signal with the subsequent blocking of signals until the called station answers.

Callup via the sectional service communications channel from an NUP to an OUP is realized by means of remote control equipment, with the subsequent duplication of the ringing in the service communications rack or by voice. Callup from an OUP to an NUP is accomplished with a 1,020 Hz voice frequency.

Climatic Operational Conditions

At temperatures of from +10 to +40° C, and a relative air humidity of no more than 75%.

Electrical Power Supply

Voltages	SSS-1, SSS-2, SSS-6, SSS-7, SSS-8	21.2 volts and 24 volts
	SSS-3, SSS-4, SSS-5	21.2 volts and 24 volts, or from a power supply working from the AC mains at 220 v.

Current Consumption

Rack (Стойка)	21.2 V. amps (21,2 в, а)	24 volts amps (24 в, а)	127/220 VAC [VA] (~127/220)
SSS-1 CCC-1	0,1	0,8	—
CCC-2	0,18	0,82	--
CCC-3	0,14	1,16	1,54
CCC-4	0,22	1,28	1,54
CCC-5	—	—	—
CCC-6	0,04	0,76	—
CCC-7	0,15	0,65	—
SSS-8 CCC-8	0,2	0,7	—

Note: The current consumption for the remote control equipment, located in the SSS-3 and SSS-4 racks, amounts to roughly 0.4 amps AC. For the SSS-7 and SSS-8 racks, the remote control equipment current consumption should be additionally taken into account.

Equipment Complement

Included in the equipment complement for service communications are: racks for terminal and intermediate amplifiers stations for cable trunks, of the K-300, K-1920 and K-60 systems as well as radio relay links. The requisite equipment set for service communications for various cable and radio relay links is given in Table 11.2.1. The service communications equipment complement has been worked out for eight types of racks (see Table 11.2.1.).

Function of the Service Communications Equipment Components

The MSS, PSS-1 and PSS-2 Sets with Selective Call Receivers. They are intended for use at terminal and attended amplifier stations. The sets are made in a similar manner, both in terms of structure and circuitry. A provision is made in each set for the capability of individual and circular callups, and an output to the equipment handset. The set contains a transition unit [four-wire circuit hybrid terminal station] for the insertion of the set in a through circuit. The transition unit has three inputs, of which two are used for the connecting of the set to the channel, while the third is used for the connection of the speech and callup instruments. Each set has an individual ring receiver (PIV), tuned to the corresponding frequency. A circular callup block is provided for the PSS-1.

There are two PSS relay sets (one of which is shown in the PSS-3 schematic) in PSS-2 sets with an output to the RKM [expansion unknown].

The USS set. Itended for use at attended repeater stations. The set is inserted in both a two-wire and a four-wire channel (by means of a differential system).

The TsB [central battery] Direct Line Set. Intended for the capability of inserting three direct subscribers of a central battery system.

The Set for a Direct Line with an ATS [automatic telephone exchange]. Intended for the capability of connecting in one direct line with a municipal ATS.

The Junction Line Set (RSL) [line connector relays]. Intended for the capability of conducting two-way conversations between the operational personnel of line equipment shops and the KM [expansion unknown] service of an amplifier station.

The Callup Unit Set (UV). Intended for obtaining the alternating ringing current at 80 - 90 volts, which is used for calling central battery subscribers.

The Service Line Set. Intended for the connection of three service lines.

The Operator's Headset Network Complex. Intended for connecting the microphone and headset to four-wire and two-wire circuits. A provision is made in the service communications rack for two operator's headset networks, a main and a standby one (the latter does not have components for connection to a direct ATS line).

The Through-Working Transition Unit Set. Intended for installation in service communications racks with an output to RKM (SSS-2, SSS-4, SSS-8).

The Circular Callup Block. Intended for transmitting a circular callup, which is provided only via a PSS-1 channel, and is accomplished in a manner similar to that for an individual ring at the 2.100 Hz frequency.

Table 11.2.1.

Оборудование Equipment	1. Система К-300		2. Система К-1920		Радиорелейная линия ССС-5	Для 1×4 кабеля ССС-6	3. Система К-60	
	ОП ОУП без РКМ ССС-1	ОУП с РКМ ССС-2	ОП и ОУП без РКМ ССС-3	ОУП с РКМ ССС-4			ОП и ОУП без РКМ ССС-7	ОУП с РКМ ССС-8
	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
12. Комплект МСС с ПИВ	1	1	1	1	—	1	1	1
13. Комплект ПСС-1 с ПИВ	1	1	1	1	1	1	1	1
14. Комплект ПСС-2 с ПИВ	1	1	1	1	1	—	1	1
15. Комплект ПСС-3 /ок/ с ПИВ	—	1	—	1	—	—	—	1
16. Комплект УСС с ПИВ	—	—	2	2	1	—	2	2
17. Комплект прямой линии ЦБ	3	3	3	3	3	3	3	3
18. Комплект прямой линии АТС	1	1	1	1	1	1	1	1
19. Комплект соед. линии (РСЛ)	1	1	1	1	1	1	1	1
20. Комплект устр. вызова (УВ)	1	1	1	1	1	1	1	1
21. Комплект служ. линии	3	3	3	3	3	3	3	3
22. Соед. линий (комплекты, оканчивающиеся гнездами)	4	4	4	4	4	4	4	4
23. Комплект гарнит. контура	2	2	2	2	2	2	2	2
24. Комплект трансл. перех. устр.	—	1	—	1	—	—	—	1
25. Блок циркул. вызова	1	1	1	1	1	1	1	1
26. Блок переход. устр.	1	2	1	2	2	1	—	—
27. Плата защиты и сигнализации	1	1	1	1	1	1	1	1
28. Плата управления	1	1	1	1	1	1	1	1
29. Блок на два усилителя приема	2	2	3	3	—	1	3	3
30. Блок на два усил. передачи	2	6	3	7	—	4	3	5
31. Генератор тонального вызова	1	1	1	1	1	1	1	1
32. Усилитель служ. связи с громкоговорителем	1	1	1	1	1	1	1	1
33. Питающее устройство	—	—	1	1	1	—	—	—
34. Плата телемеханики								1
35. Плата управл. телемеханики	—	—	—	—	—	—	1	1

[Key on following page]

[Key to Table 11.2.1.]:

1. The K-300 System;
2. The K-1920 System;
3. The K-60 System;
4. Terminal station, attended repeater station without RKM [expansion unknown], SSS-1;
5. Attended repeater station with RKM, SSS-2;
6. Terminal station and attended repeater station without RKM, SSS-3;
7. Attended repeater station with RKM, SSS-4;
8. Radio relay link, SSS-5;
9. For 1 x 4 cable, SSS-6;
10. Terminal station and attended repeater station without RKM, SSS-7;
11. Attended repeater station with RKM, SSS-8.
12. MSS [trunk service communications link] complex with PIV [selective call receiver];
13. PSS-1 [station-to-station service communications link] complex with PIV;
14. PSS-2 complex with PIV;
15. PSS-3 /ok/ [?/terminal/?] complex with PIV;
16. USS [sectional service communications link] complex with PIV;
17. Central battery direct line complex;
18. Automatic telephone exchange direct line complex;
19. Junction line (RSL) [junction line relay] complex;
20. Callup unit complex (UV);
21. Service line complex;
22. Junction lines (complexes, terminated with jacks);
23. Operator's headset network complex;
24. Through-working transition unit complex;
25. Circular callup block;
26. Transition unit block;
27. Protection and signaling panel;
28. Control panel;
29. Block consisting of two receive amplifiers;
30. Block consisting of two transmit amplifiers;
31. Voice frequency ringing generator;
32. Service communications amplifier with loudspeaker;
33. Power supply unit;
34. Remote control equipment panel;
35. Control panel for the remote control equipment.

The Transition Unit Block. Intended for connecting a service communications set to a through circuit.

The Protection and Signaling Panel. Intended for current distribution for the 24 volts or 21.2 volt supply voltage among the individual panels located in the service communications rack.

Control Panel. Intended for the mounting of all of the switching devices (switches, pushbuttons, jacks, signal lights).

The Block of Two Receive Amplifiers. Intended for compensating for the line attenuation in a frequency range of 0.3 - 3.4 KHz on the section adjacent to the OUP, as well as for equalizing the amplitude-frequency errors introduced the NUP amplifiers.

The Corrector. Intended for compensating and unforeseen amplitude-frequency distortions in an amplifier (in place of the 0.5 neper pad).

The Amplifier. Main parameters:

-- Maximum gain at 3.4 KHz	5.2 Np
-- Maximum gain at 0.3 KHz	0.5 Np
-- Measurement level at the output	+0.5 Np
-- The reflection factor for the input and output impedance from the nominal value of 600 Ω does not exceed	10%

The Block of Two Transmit Amplifiers. Intended for compensating for the attenuation introduced by the service communications equipment, and providing for a set output signal level. The transmit amplifier is designed for the amplification of speech currents in a frequency range of 0.3 - 3.4 KHz. The amplifier gain can be varied in steps of 0.1 Np each within a range of from 1.8 Np up to 2.3 Np. The nonuniformity in the frequency response of the gain in the 0.3 - 3.4 KHz range is no more than $\pm$ 0.05 Np. The amplitude characteristic is linear within 0.05 Np up to the output level of the amplifier of +1.3 Np (with respect to power). The input and output impedance of the amplifier is 600 ohms with a reflection factor of no more than 10%.

The Voice Frequency Ringing Generator. Intended for the derivation of the callup frequencies. The generator permits obtaining the 420 Hz acknowledgment frequency, and 23 fixed frequencies with nominal values of (in Hertz): 540, 660, 780, 900, 1020, 1140, 1260, 1380, 1500, 1620, 1740, 1860, 1980, 2100, 2220, 2340, 2460, 2580, 2700, 2820, 2940, 3060 and 3180. The nominal voltage output level of the generator into a load of 600 ohms is 0 Np.

The Service Communications Amplifier with Loudspeaker. Intended for the amplification of speech currents incoming via service communications circuits, and reproducing them with a loudspeaker.

Power Supply. Intended for powering the equipment of the service communications connecting and amplifier racks for K-1920 trunks with and without RKM (SSS-3, SSS-4), as well as for a radio relay link (SSS-5).

Note: For the improved K-1920 system (K-1920U), the SS-K is being developed, which can replace the SSS-3 and SSS-4.

The Remote Control Unit. Intended for making calls via a service communications channel from an NUP to an OUP (SSS-7, SSS-8). There is also the control panel for the remote control unit (for the K-60 systems, the SSS-7 and SSS-8 racks).

Construction

The OP and OUP service communications equipment is structurally packaged in the form of panels, mounted in racks made of sectional steel with a slide-out desk. The service communications equipment is housed in individual plug-in and non-plug-in type (on hinges) panels.

Weight and Cost

Equipment	Weight, kg	Price, rubles	Equipment	Weight, kg	Price, rubles
SSS-1	200	5,200	SSS-5	200	5,550
SSS-2	200	6,300	SSS-6	200	4,850
SSS-3	200	6,100	SSS-7	200	5,600
SSS-4	200	7,300	SSS-8	200	6,200

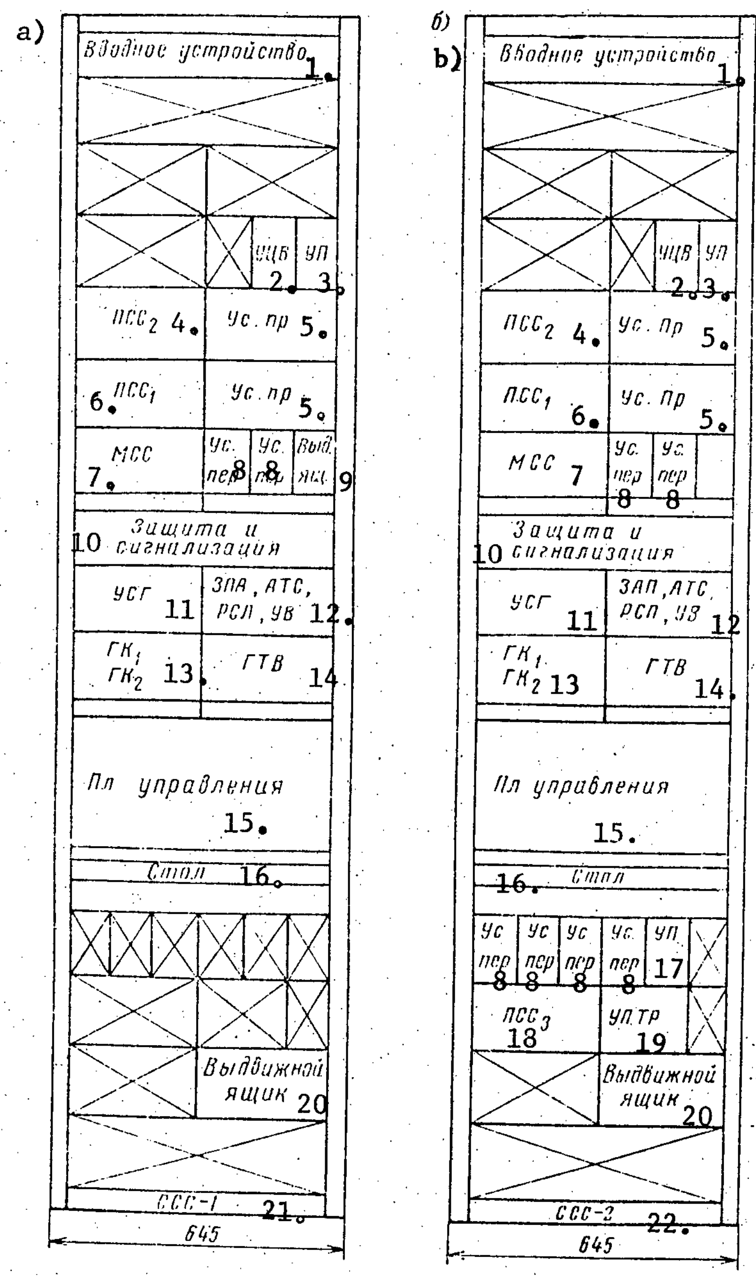


Figure 11.2.1. The placement of the equipment in the standardized service communications racks:
a) The SSS-1; b) The SSS-2.

[Key on next page, 644]

[Key to Figure 11.2.1.]:

1. Input unit;
2. UTsV [circular callup unit];
3. UP [expansion unknown, possibly 'transmit amplifier'];
4. PSS_2 [station-to-station service communications link 2];
5. Receive amplifier;
6. PSS_1;
7. MSS [trunk service communications];
8. Transmit amplifier;
9. Slide-out box;
10. Protection and signaling;
11. USG [service communications amplifier with loudspeaker];
12. ZPA [expansion unknown], ATS [automatic telephone exchange], RSL [line connector relay], and UV [ringup unit];
13. GK_1, GK_2 [Operators' headset networks 1 and 2];
14. Voice frequency ringing generator;
15. Control panel;
16. Desk;
17. UP;
18. Station-to-station service communications unit 3;
19. UPTR [expansion unknown];
20. Slide-out box;
21. SSS-1;
22. SSS-2.

[Key to Figure 11.2.2 (page 645)]

1. Input unit;
2. Sectional service communications link 2;
3. Receive amplifier for the USS_1, USS_2 [sectional service communications links 1 and 2];
4. USS_1;
5. Us pbr [expansion unknown; possible error for Us per = transmit amplifier];
6. Circular ringup unit;
7. UP [expansion unknown];
8. Us per [transmit amplifier];
9. Station-to-station service communications link 2;
10. Receive amplifier for station-to-station service communications link 2;
11. Receive amplifier for station-to-station service communications link 1;
12. Receive amplifier for station-to-station service communications link 1;
13. MSS [trunk service communications link];
14. Transmit amplifier for PSS_1;
15. Transmit amplifier for PSS_2;
16. Slide-out box;
17. Protection and signaling;
18. Service communications amplifier with loudspeaker;
19. ZPA [expansion unknown], ATS [automatic telephone exchange], RSL [line connector relays], UV [ringup unit];
20. GK [operator's headset network panel];
21. Voice frequency ringing generator;

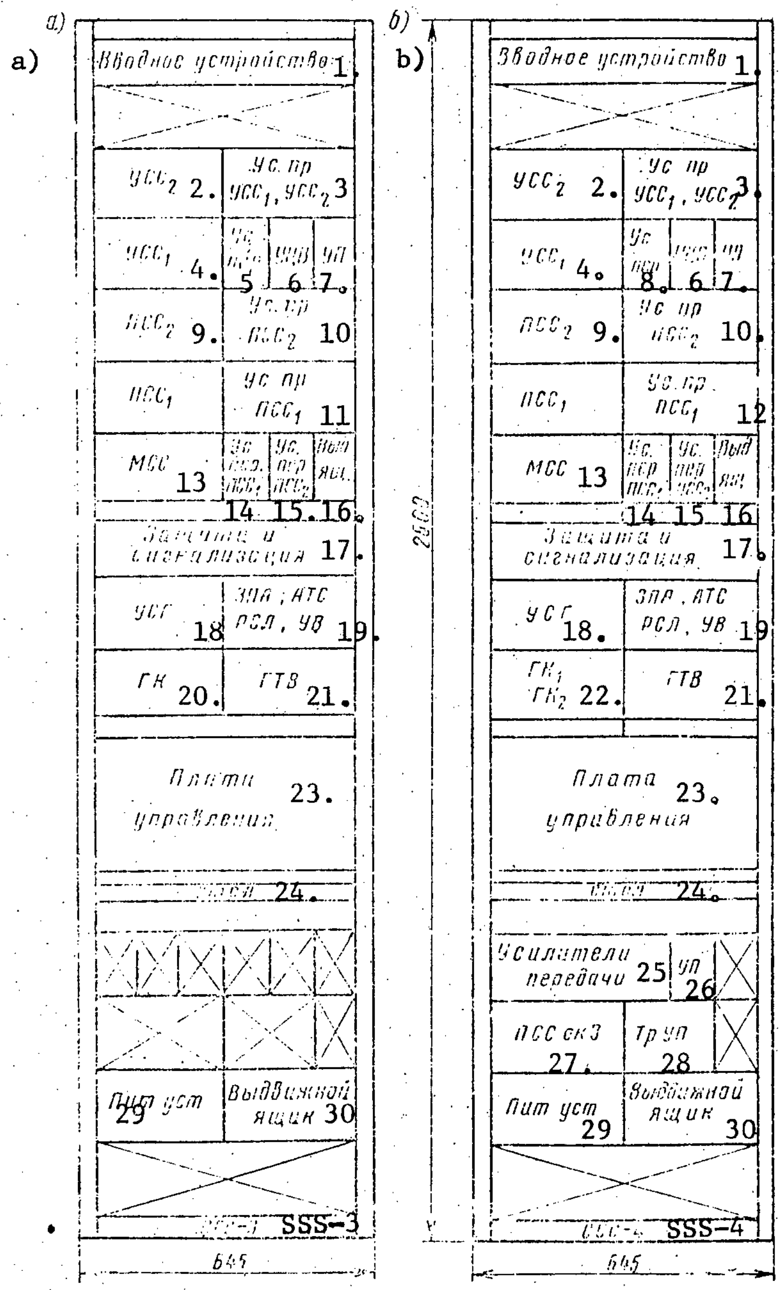


Figure 11.2.2. The placement of the equipment in the standardized service communications racks: a) SSS-3; b) SSS-4.

[Key, continued from preceding page, 644]:

22. GK_1, GK_2 [operators' headset networks];
23. Control panel;
24. Desk;
25. Transmit amplifier;
26. UP [expansion unknown];
27. PSS ok 3 [unknown type of station-to-station service communications link];
28. UP transformer;
29. Power supply
30. Slide-out box.

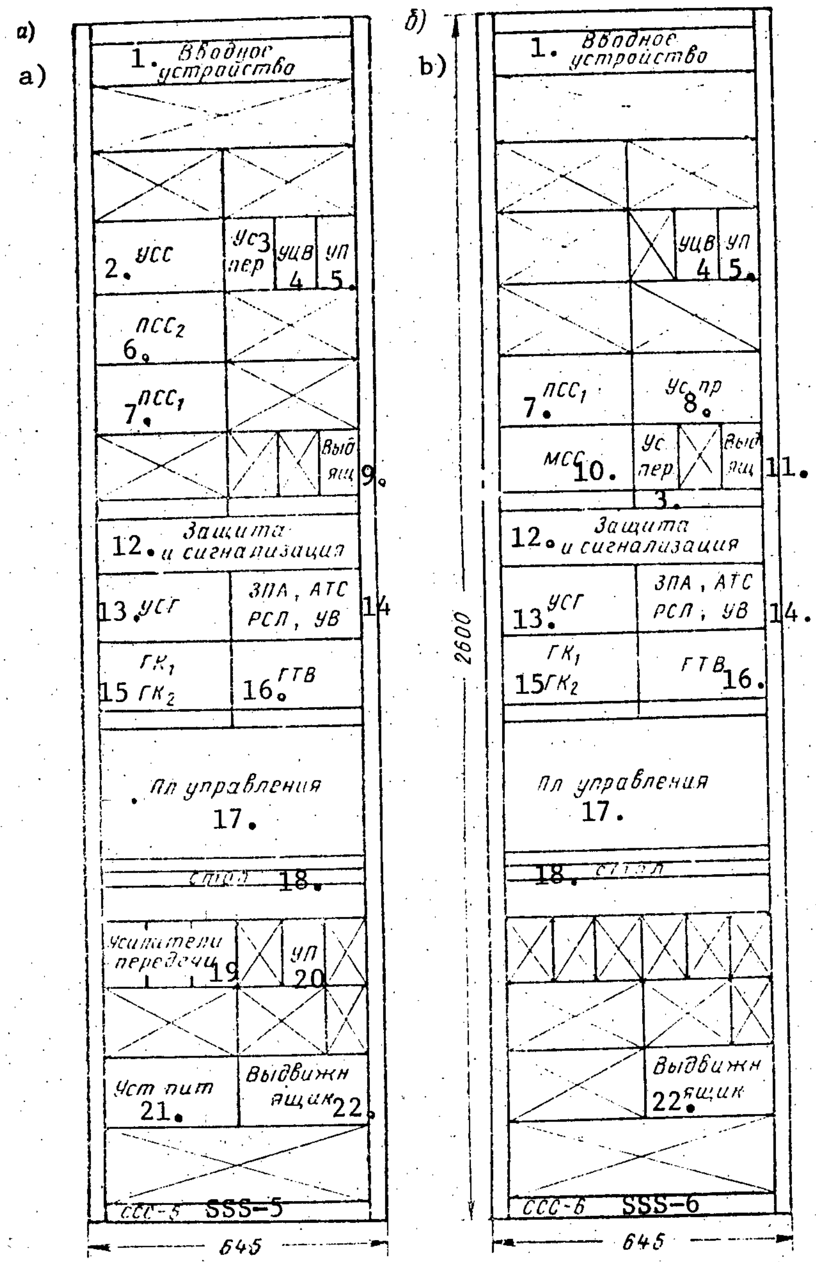


Figure 11.2.3. The placement of the equipment in the standardized service communications racks:
a) The SSS-5; b) The SSS-6.

Key: 1. Input unit;
2. USS [sectional service communications link];
3. Transmit amplifier;
4. Circular ringup unit;
5. UP [expansion unknown];
6. PSS_2 [station-to-station service communications link 2];

[Key to Figure 11.2.3., continued]:

7. PSS_1;
8. Receive amplifier;
9. Slide-out box;
10. MSS [trunk service communications link];
11. Slide-out box;
12. Protection and signaling;
13. Service communications amplifier with loudspeaker;
14. ZPA [expansion unknown]; ATS [automatic telephone exchange]; RSL [line connector relays]; UV [ringup unit];
15. Operators' headset networks 1 and 2;
16. Voice frequency ringing generator;
17. Control panel;
18. Desk;
19. Transmit amplifiers;
20. UP [expansion unknown];
21. Power supply;
22. Slide-out box.

[Key to Figure 11.2.4, page 648]

1. Input unit;
2. PSS_2 [station-to-station service communications link 2];
3. Receive amplifier;
4. PSS_1;
5. MSS [trunk communications link];
6. Transmit amplifier;
7. Circular ringup unit;
8. Protection and signaling;
9. Service communications amplifier with loudspeaker;
10. ZPA [expansion unknown]; ATS [automatic telephoen exchange]; RSL [line connector relays]; UV [ringup unit];
11. Operators' headset networks 1 and 2;
12. Voice frequency ringing generator;
13. Control panel;
14. Desk;
15. USS_2 [sectional service communications link 2];
16. Receive amplifier;
17. Slide-out box;
18. UP [expansion unknown] transformer.

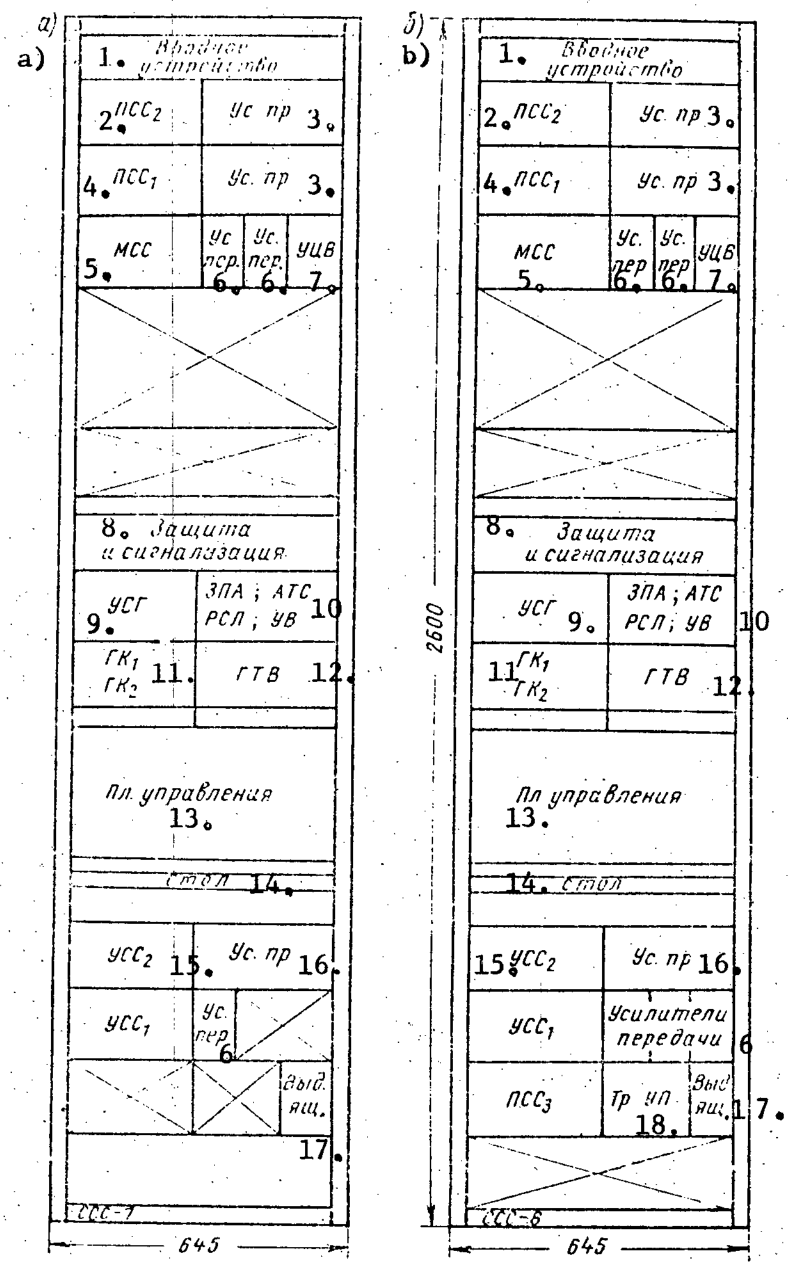


Figure 11.2.4. The placement of the equipment in the standardized service communications racks:
a) SSS-7; b) SSS-8.

[Key on preceding page, 647]

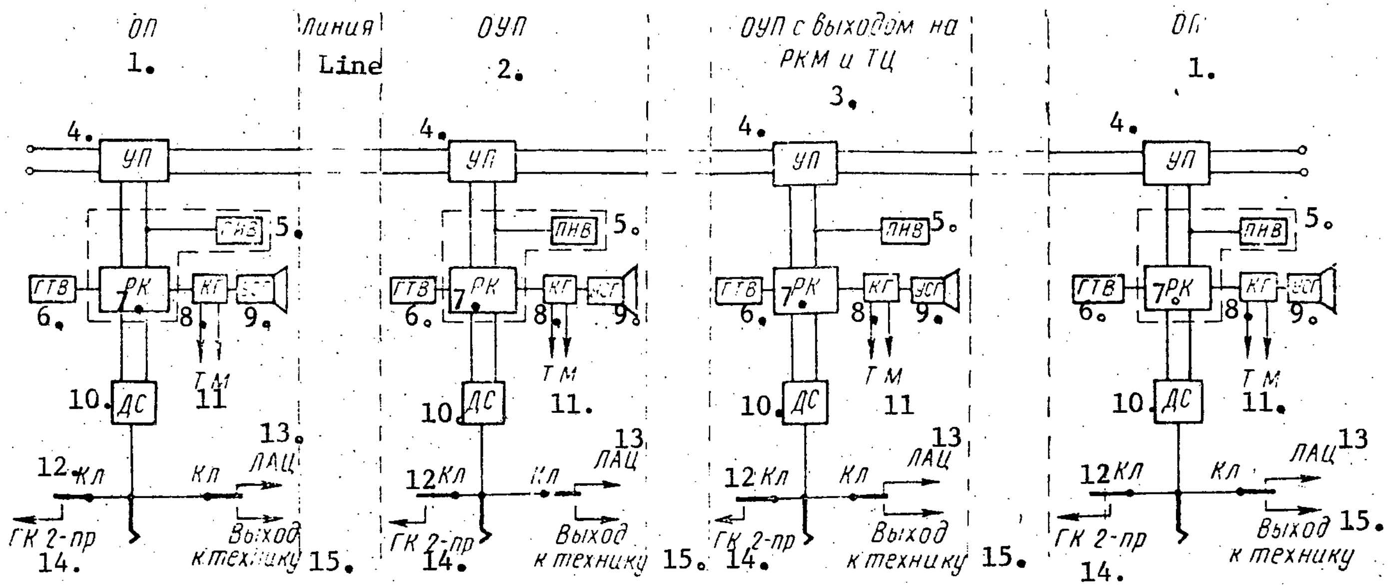


Figure 11.2.5. Block diagram of trunk service communications, MSS.

Key:
1. OP [terminal station];
2. OUP [attended repeater station];
3. OUP with output to RKM [expansion unknown] and TTs [?television center?];
4. UP [expansion unknown];
5. PIV [selective callup receiver];
6. Voice frequency ringing generator;
7. RK [expansion unknown];
8. KG [expansion unknown];
9. USG [service communications amplifier with loudspeaker];
10. Differential system;
11. T, M [expansion unknown];
12. Key;
13. Line equipment shop;
14. Two-wire operator's headset network;
15. Output to technical equipment.

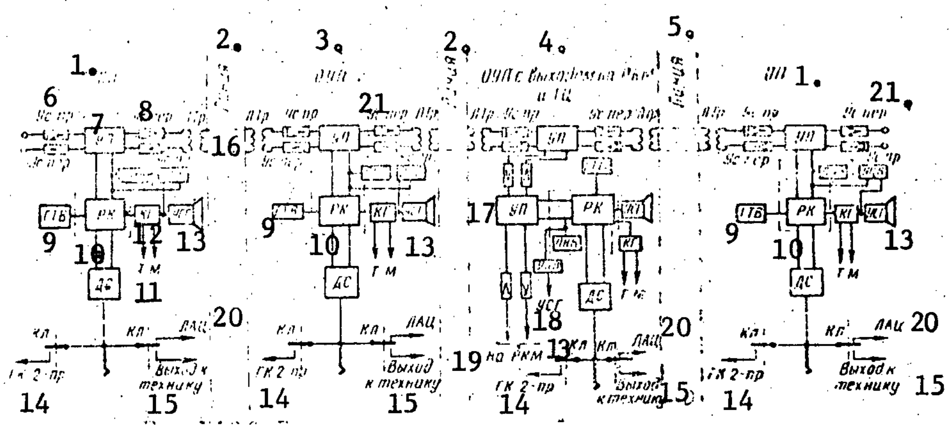


Figure 11.2.6. Block diagram of station-to-station service communications, PSS-1.

Key: 1. OP [terminal station];
2. Line;
3. OUP [attended repeater station];
4. OUP with output to an RKM [expansion unknown] and TTs [?television center?];
5. Line;
6. Receive amplifier;
7. UP [expansion unknown];
8. Transmit amplifier;
9. GTV [voice frequency ringing generator];
10. RK [expansion unknown];
11. T, M [expansion unknown];
12. KG [expansion unknown];
13. USG [service communications amplifier with loudspeaker];
14. Two-wire operator's headset network;
15. Output to technical devices;
16. Line transformers;
17. UP;
18. USG [service communications amplifier with loudspeaker];
19. To the RKM [expansion unknown];
20. LATs [line equipment shop];
21. Transmit amplifier;

УЦВ = Circular ringup unit;

ПИВ = Selective ringing receiver.

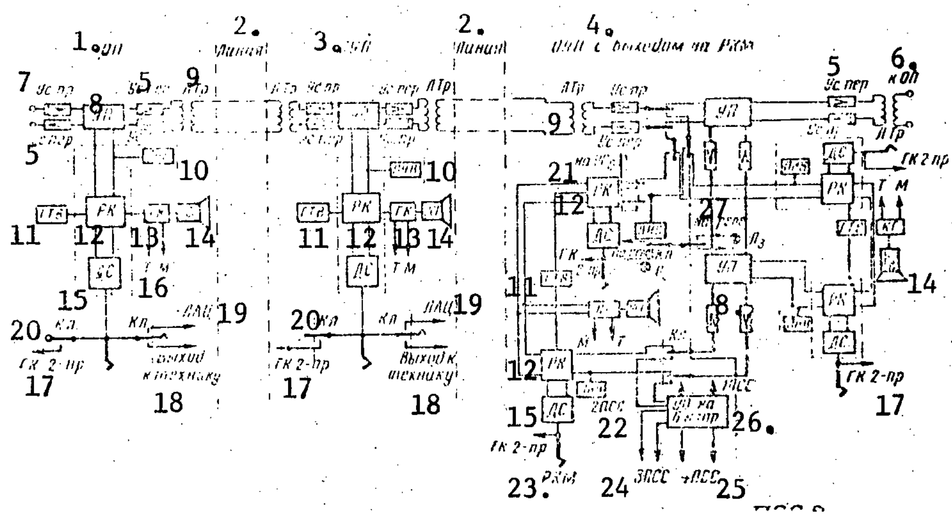


Figure 11.2.7. Block diagram of PSS-2 station-to-station service communications.

Key: 1. OP [terminal station];
2. Line;
3. OUP [attended repeater station];
4. OUP with output to an RKM [expansion unknown];
5. Transmit amplifier;
6. To a terminal station;
7. Receive amplifier;
8. UP [expansion unknown];
9. Line transformer;
10. PIV [selective ring receiver];
11. GTV [voice frequency ringing generator];
12. RK [expansion unknown];
13. GK [expansion uncertain, GK = operator's headset network in text, but this is probable error; contrast with keyed item 12 in Figure 11.2.6.];
14. USG [service communications amplifier with loudspeaker];
15. DS [differential system];
16. T, M [expansion unknown];
17. Two-wire operator's headset network;
18. Output to technical devices;
19. LATs [line equipment shop];
20. Kl [key];
21. To the UP_b [expansion unknown];
22. 2 PSS;
23. RKM [expansion unknown];
24. 3 PSS;
25. 4 PSS;
26. UP [expansion unknown] for six directions.

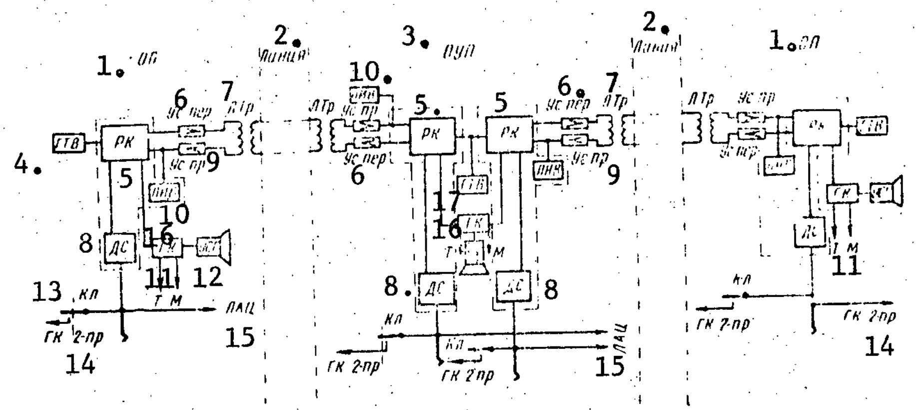


Figure 11.2.8. Block diagram of USS sectional service communications using a four-wire channel.

Key:
1. Terminal station;
2. Line;
3. Attended repeater station;
4. Voice frequency ringing generator;
5. RK [expansion unknown];
6. Transmit amplifier;
7. Line transformer;
8. Differential system;
9. Receive amplifier;
10. PIV [selective callup receiver];
11. T, M [expansion unknown];
12. USG [service communications amplifier with loudspeaker];
13. Kl [key];
14. Two-wire operator's headset network;
15. Line equipment shop;
16. GK [expansion unknown; see item 13, Figure 11.2.7.];
17. Voice frequency ring generator;

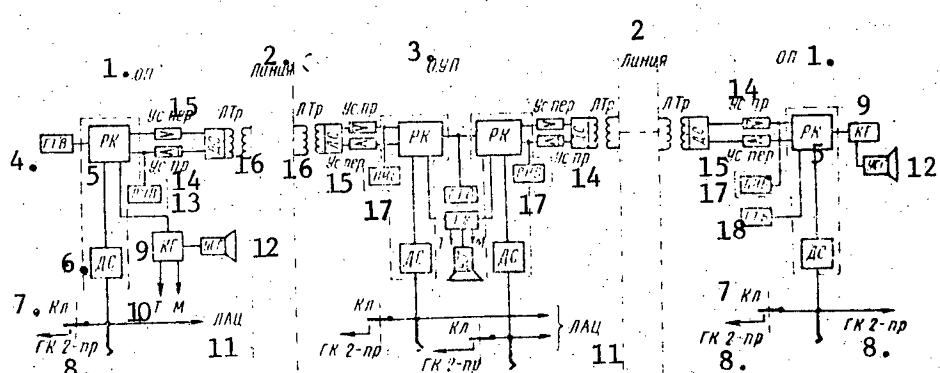


Figure 11.2.9. Block diagram of USS sectional service communications using a two-wire channel.

Key:
1. Terminal station;
2. Line;
3. Attended repeater station;
4. Voice frequency ring generator;
5. RK [expansion unknown];
6. Differential system;

[Key to Figure 11.2.9, continued]:

7. K1. [key];
8. Two-wire operator's headset network;
9. KG [expansion unknown];
10. T, M [expansion unknown];
11. Line equipment shop;
12. USG [service communications amplifier with loudspeaker];
13. PIV [selective callup receiver];
14. Receive amplifier;
15. Transmit amplifier;
16. Line transformer;
17. PIV;
18. GTV [voice frequency ring generator].

11.3. The SS-N Service Communications Panel

Figures 11.3.1, 11.3.2.

Purpose

Intended for the organization of service conversations from NUP's [unattended repeater stations] via four-wire voice frequency channels organized on balanced cables.

Basic Technical Data

The panel is connected in parallel with the outputs of the A-B and B-A low frequency amplifiers of the SPUN racks of the K-24 and K-60 HF systems. The panel makes the following possible:

-- Conversations via a four-wire voice frequency channel from an NUP in the A-B and B-A directions;
-- Monitoring conversation via a four-wire voice frequency channel by means of a loudspeaker, as well as a telephone handset or TMG-1 operator's headset.

The attenuation introduced into the transmit channel by the panel does not exceed 0.2 Np.

The panel is powered both from a KBSL-05 battery (two units at 9 volts), which are present in the equipment set, as well as from a 21.2 volts remote power supply.

The current consumption is 10 ma.

Construction

All of the components of the SS-N set are housed in a steel panel, which can be mounted in the VKS rack at NUP's by means of four M5 x 12 screws, included in the set. Connection to the common rack wiring is accomplished by means of jacks and four-pin U-links, installed in the panel. The right side of the front panel is used as a compartment for storing the handset, spare parts, adapters and two power cords.

The panel dimensions are 90 x 570 x 160 mm.

Weight: 5 kg. Cost: 46 rubles.

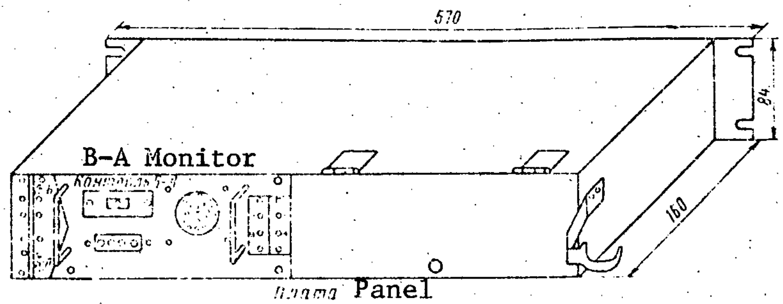


Figure 11.3.1. The SS-N service communications panel.

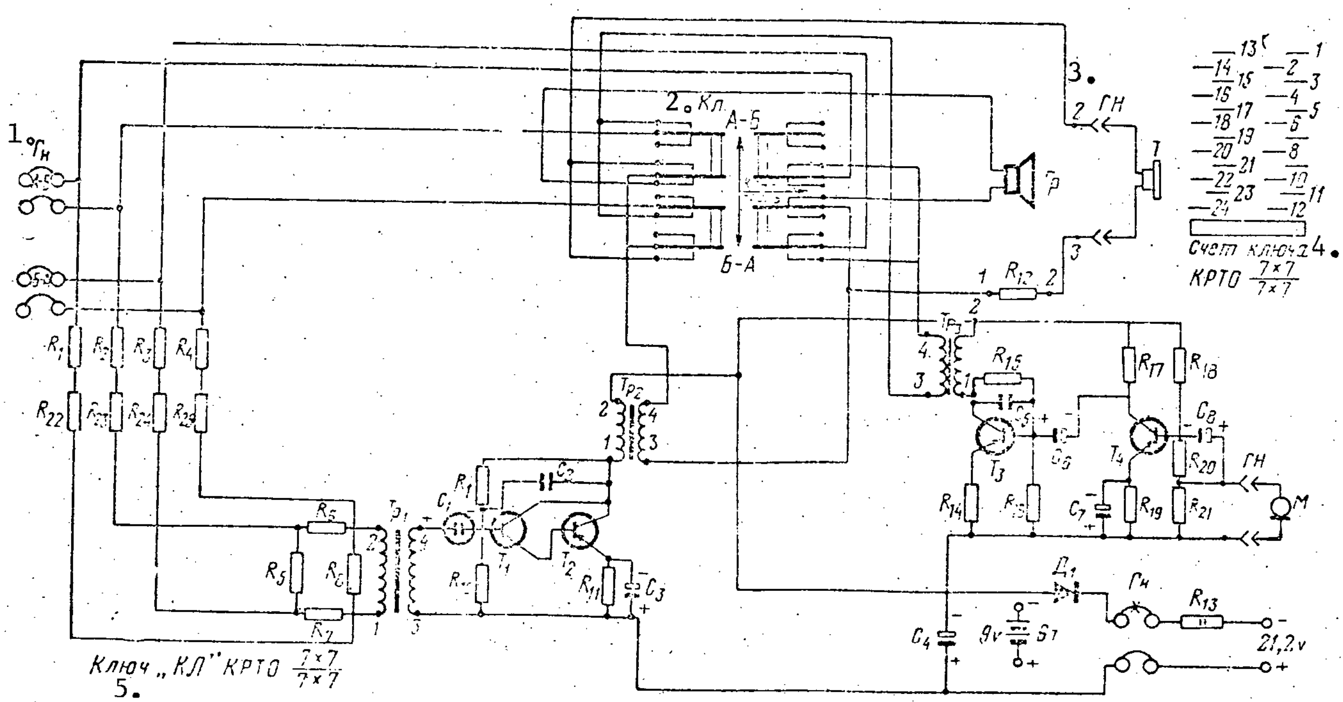


Figure 11.3.2. Schematic of the SS-N service communications panel.

Key: 1. Jack, A-B;
2. Key;
3. Jack;
4. Terminal number of the key switch, KRTO $\frac{7 \times 7}{7 \times 7}$;
5. Switch "KL" [key] KRTO $\frac{7 \times 7}{7 \times 7}$.

11.4. The ODGTS Oblast'-Wide Duplex Conference Call Equipment

Figure 11.4.1.

Purpose

Intended for realizing two-way group telephone communications and circular transmissions via four-wire and two-wire communications channels. The equipment for connecting in a transmitting room, 10 four-wire channels, 5 two-wire channels, 2 service lines and 2 lines for municipal telephone network subscribers of a central battery ATS [automatic telephone exchange]. The joint operation of two and more cabinets is provided to increase the capacity of the unit.

The equipment consists of a cabinet, installed at an LATS [line equipment shop] and a desk top console, installed in the transmitting room.

Electrical Characteristics

The nominal relative level at the equipment input	+0.5 Np
The level at the output	-1.5 Np
The effectively transmitted passband	300 - 3,400 Hz
The callup system via DGTS [duplex conference call]	Magneto ringer type, at a frequency of 50 Hz, or with direct current.

Electrical Power Supply

Voltages:	Plate	220 volts ± 10% or 206 volts ± 3%	
	Filament	24 volts ± 10% or 21.2 volts ± 3%	
Current consumption:	Plate	0.4 amps	}The demand for electricity is figured for 6 hours of operation in a 24 hour period.
	Filament	7.0 amps	

Type of vacuum tubes used: 6Zh1P and 6Zh9P

Composition

ODGTS Cabinet. Installed at the line equipment shop of MTS's [long distance telephone exchanges, and the capacity is 10 four-wire channels, and 5 two-wire channels.

Transmitting room console. Installed in the transmitting room.

Equipment Complement

The ODGTS cabinet is put together as a set consisting of:

Input terminal blocks;
Signaling and fuse panels;
Four blocks of amplifiers (two microphone, one standby and one line amplifier);
Two distributor panels;
Four amplifier blocks (mixer unit, 800 Hz generator and two amplifiers for two-wire lines);

- Connection panels;
- PVU [intercom-callup panels];
- Operator console;
- Relay panels;
- Compartment for storing spare parts and the PIEL-3 portable instrument.

The ODGTS console is put together as set consisting of:

- Two MD-46 microphones;
- A dynamic loudspeaker with a power capacity of up to one watt with an input impedance of 6 ohms.

Construction

ODGTS cabinet: Consists of a frame of shaped U-section sheet steel 2 mm thick. All of the panels and blocks are located on the front. The cabinet is a sloped type with dimensions of 2,500 x 650 x 250 mm (670 mm with the desk).

ODGTS console: Manufactured from sheet steel 1 mm thick having dimensions of 200 x 550 x 250 mm.

Weight and Cost

Оборудование Equipment	Вес, кг Weight, kg	Цена, руб. Price, rubles
Шкаф Cabinet	200	3141
Пульт Console	10	

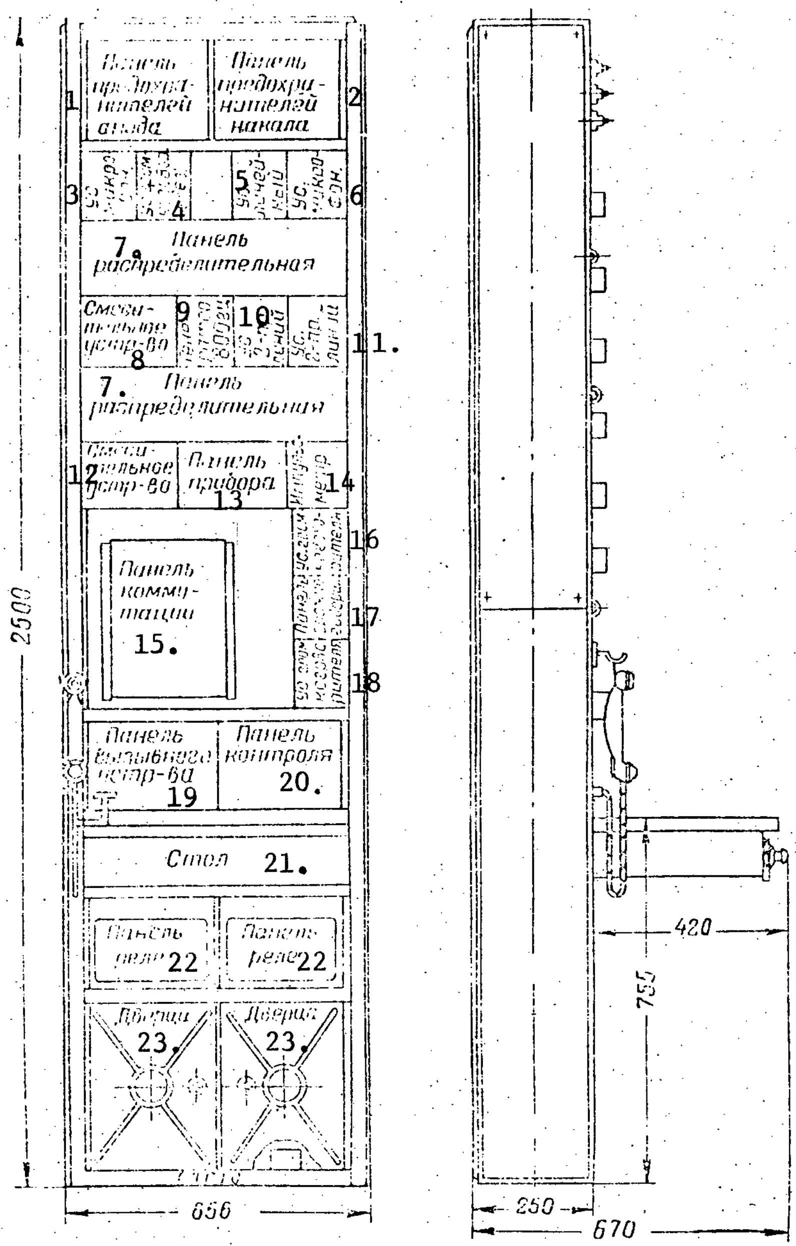


Figure 11.4.1. The placement of the equipment in the oblast'-wide duplex conference call equipment cabinet, the ODGTS.

Key:
1. Panel of plate fuses;
2. Panel of filament fuses;
3. Microphone amplifier;
4. Loudspeaker amplifier (standby);
5. Line amplifier;
6. Microphone amplifier;
7. Distribution panel;
8. Mixer unit;
9. 800 Hz generator;
10. Two-wire line amplifier;

[Key to Figure 11.4.1, continued]:

11. Two-wire line amplifier;
12. Mixer unit;
13. Meter panel;
14. Pulse meter;
15. Connection panel;
16. Loudspeaker amplifier;
17. Loudspeaker panel;
18. Loudspeaker amplifier;
19. Callup unit panel;
20. Monitor panel;
21. Desk;
22. Relay panel;
23. Doors.

11.5. The SZF Rack of Suppression Filters for Multiplexing Open Wire Circuits (Taken out of production)

Figures 11.5.1 - 11.5.4.

Purpose

Intended for eliminating the coupling between the output and input in the equipment of multiplexed circuits due to the existence of parallel circuits, strung on one pole line. The number and type of blocking filters are established in accordance with the "Instruktsiya po skreshchivaniyu telefonnykh tsepey vozdushnykh liniy svyazi" ["Instructions on the Transposition of Telephone Circuits of Open-Wire Communications Lines"] (Svyaz'izdat Publishers, 1968):

-- Filter ZF_1, intended for insertion in copper circuits;
-- Filter ZF_2, the same for steel circuits;
-- Filter ZF_3, the same, for telegraph wires;
-- Filter ZF_4, for steel, multiplexed circuits (not given in this equipment set; since 1964, the ZF_4 has been included in the complement of the SZF rack).

Construction

The filter panels are mounted in the rack on one side. One of the following types of filters is located on one panel:

ZF_1 filters	1 unit
ZF_2 filters	5 units
ZF_3 filters	3 units

The rack dimensions are 2,500 x 530 x 410 mm.

Approximate weight (for the average equipment complement) 250 kg

The Composition of the SZF Equipment Racks (According to Factory Numbers)

Заводские номера Factory Numbers	Number of Количество плат Boards		
	ZF_1 ЗФ₁	ZF_2 ЗФ₂	ZF_3 ЗФ₃
Zh Ж-330-00-61	—	3	2
Ж-330-00-62	1	4	2
Ж-330-00-63	1	3	1
Ж-330-00-64	1	1	1
Ж-330-00-65	1	3	2
Ж-330-00-66	—	—	2
Ж-330-00-67	1	2	1
Ж-330-00-68	1	4	—
Ж-330-00-69	1	—	—
Ж-330-00-70	1	2	3
Ж-330-00-71	1	1	3
Ж-330-00-72	—	2	2
Ж-330-00-73	—	1	—
Ж-330-00-74	1	2	—
Zh Ж-330-00-75	1	1	—

Note: At the present time, the given type of racks have been taken out of production.

The Composition of the Equipment of the SZF Racks Being Produced at the Present Time, According to Factory Numbers

RP2.000.119 (in the complement of which the RP2.000.117 rack is included): two panels are mounted in the rack:
-- A panel of two ZF_1 filters and one ZF_4 filter;
-- A panel of five ZF_2 filters and three ZF_3 filters;

RP2.000.120 (in the complement of which the RP2.000.118 rack is included): two panels are mounted in the rack:
-- A panel with one ZF_1 filter and one ZF_4 filter;
-- A panel with three ZF_2 filters and three ZF_3 filters.

Note: To expand the capacity of the SZF racks, the panels of filters are supplied as separate products.

Construction

The rack is made of channel steel. The dimensions are 2,500 x 648 x 300 mm, with the protruding parts.

The overall dimensions of the RP2.140.561 and RP2.140.563 panels with the ZF_1 and ZF_4 filters are 478 x 644 x 165 mm; for the RP2.140.781 and RP2.140.782 with the ZF_2 and ZF_3 filters, they are 298 x 644 x 200 mm.

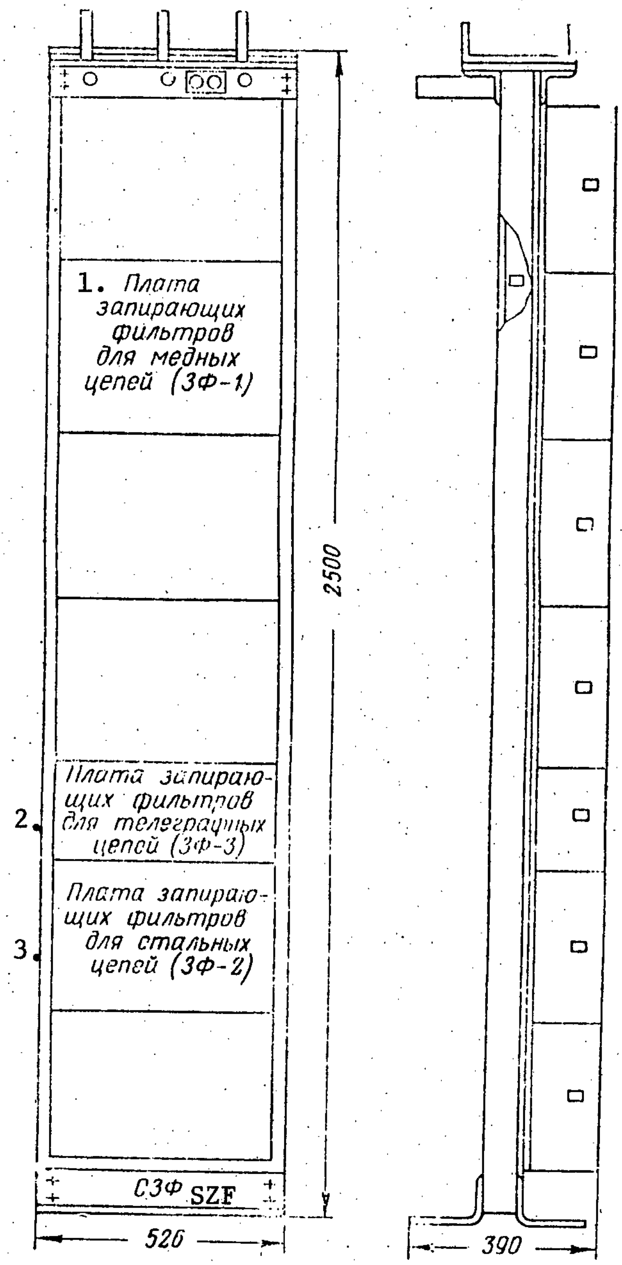


Figure 11.5.1. The placement of the equipment in the SZF rack of suppression filters.

Key: 1. Panel of suppression filters for copper circuits (ZF-1);
2. Panel of suppression filters for telegraph circuits (ZF-3);
3. Panel of suppression filters for steel circuits (ZF-2).

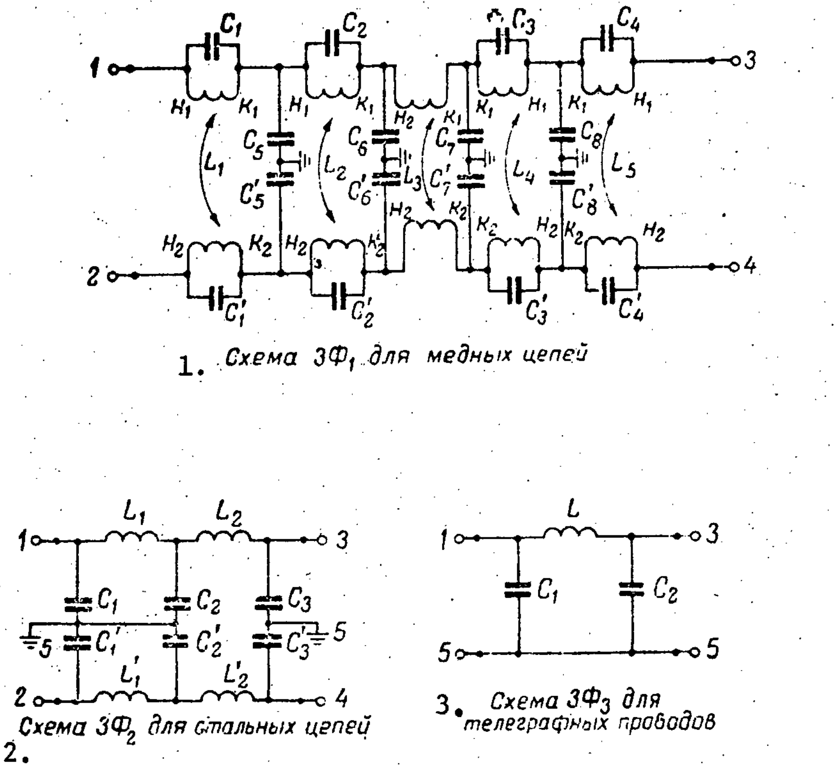


Figure 11.5.2. Schematics of the SZF suppression filters

Key: 1. The schematic of the ZF_1 for copper circuits;
2. The schematic of the ZF_2 for steel circuits;
3. The schematic of the ZF_3 for telegraph wires.

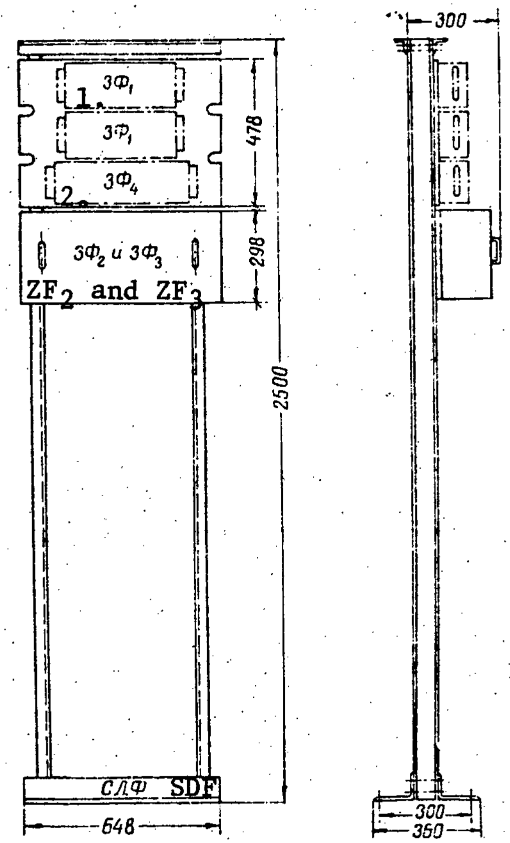


Figure 11.5.3. The placement of the equipment in the new series SZF rack of suppression filters.

Key: 1. ZF_1;
2. ZF_4.

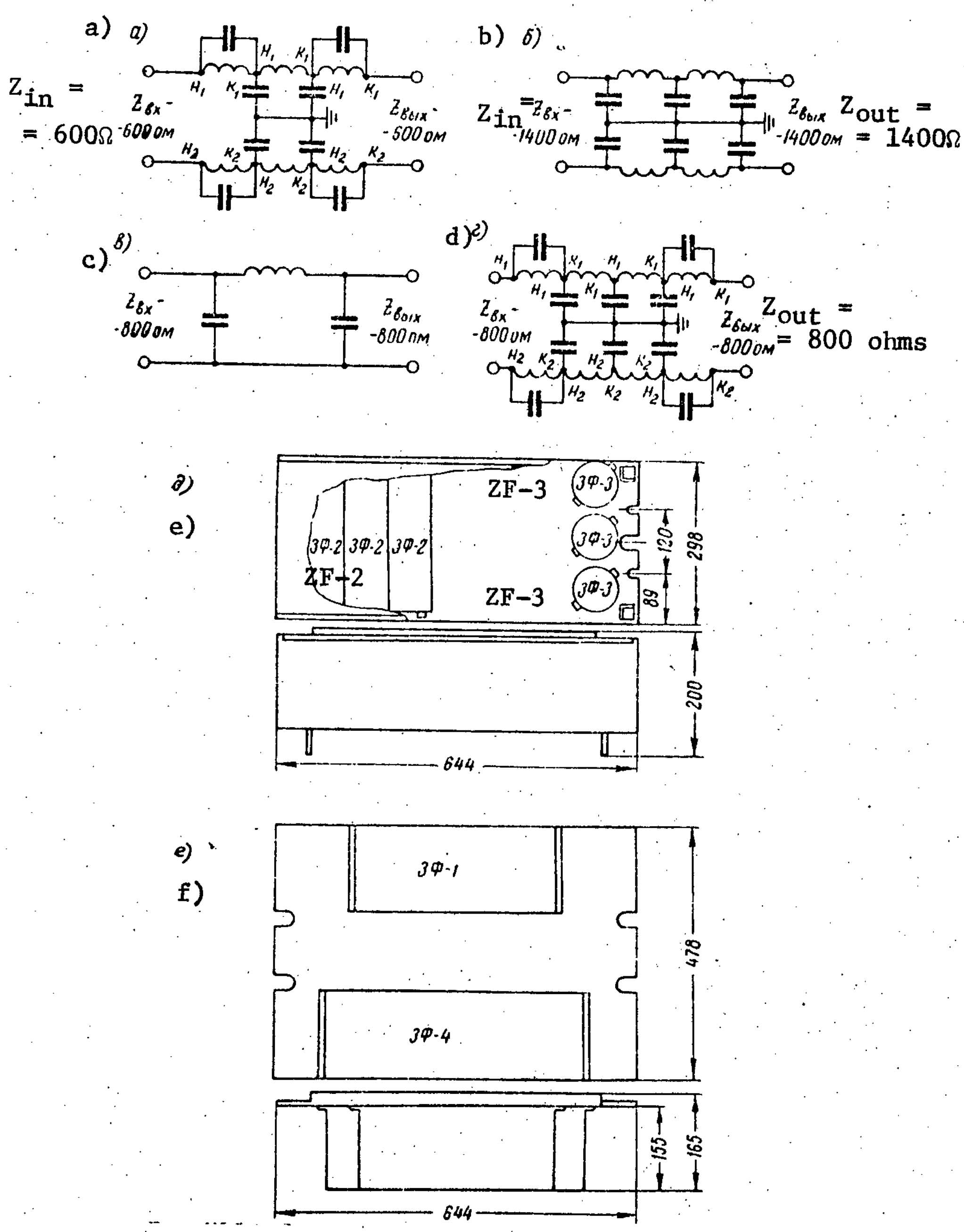


Figure 11.5.4. The schematics and construction of the ZF suppression filters:
a) ZF_1
b) ZF_2
c) ZF_3
d) ZF_4
e) The $ZF_{2,3}$ panel;
f) The $ZF_{1,4}$ panel.

11.6. The SZF-K Rack of Blocking Filters for the FKZ-84.14 and FKZ-104.14 KHz Filters (Taken out of Production)

Figure 11.6.1.

Purpose

Intended for supplemental suppression of the 84.14 and 104.14 KHz monitor and measurement frequencies. Converter blocks can also be installed in the rack for the rack of primary converters (SPP) of the 1961 production series.

Equipment Complement

The following can be installed in the rack:

-- One panel with five type FKZ-104.14 KHz filters;
-- Up to 25 filters of the FKZ-84.14 KHz type;
-- Five blocks of transmit converters (PPPG);
-- Five blocks of receive converters (PPrPG);
-- One 312 - 552 KHz amplifier block.

Electrical Characteristics

The attenuation of the FKZ-104.14 KHz filter:

In the passband	0.08 Np with a nonuniformity of 0.03 Np
In the stop-band	4.6 Np

The attenuation of the FKZ-84.14 KHz filter:

In the passband	0.1 Np with a nonuniformity of 0.02 Np
In the stop-band	2 Np

The reflection factor of the input and output of the FKZ-84.14 and FKZ-104.14 KHz filters (for the nominal input and output impedance of the filter of 135 ohms)	20%

The Nominal Relative Power Levels

At the input to the FKZ-84.14 KHz and at the output of the FKZ-104.14 KHz [sic]	-0.6 Np
At the output of the FKZ-84.14 KHz	-0.7 Np
At the output of the FKZ-104.14 KHz	-0.5 Np

Construction

A light steel frame with equipment filling one side. The FKZ-84.14 KHz filters are mounted at the top with 10 units to a row (10 + 10 + 5). Mounted below is a panel of FKZ-104.14 KHz filters. Mounted even further below that are the PPPG and PPrPG blocks. The rack dimensions are 2,600 x 644 x 250 mm. The dimensions of the FKZ-104.14 KHz panel (of five filters) are 245 x 650 x x 155 mm.

Weight:

Rack without the panels	70 kg

Rack with the panels	300 kg
The FKZ-104.14 KHz panels	16 kg
The FKZ-84.14 KHz filters	1.5 kg

Note: At the present time, the ZF-104.14 KHz blocking filter is included in the equipment complement of the USPP rack.
A provision is made in the SIO rack for the insertion of a K-140 Hz filter during seventh channel reception and transmission in place of the ZF-84.14 KHz filter in the SIO rack, and during sixth channel reception, the ZF-3.86 KHz filters are inserted. These filters are inserted in the equipment circuitry of the SIO-24p and SIP-60 (and are included in the equipment complement).

The K-140 Hz and ZF-3.86 KHz filters are to be ordered supplementally for the SIO-24 equipment.

The dimensions of the filter panels are 180 x 642 x 88 mm. Placed on a panel are six filters: four K-140 Hz filters and two ZF-3.86 KHz filters.

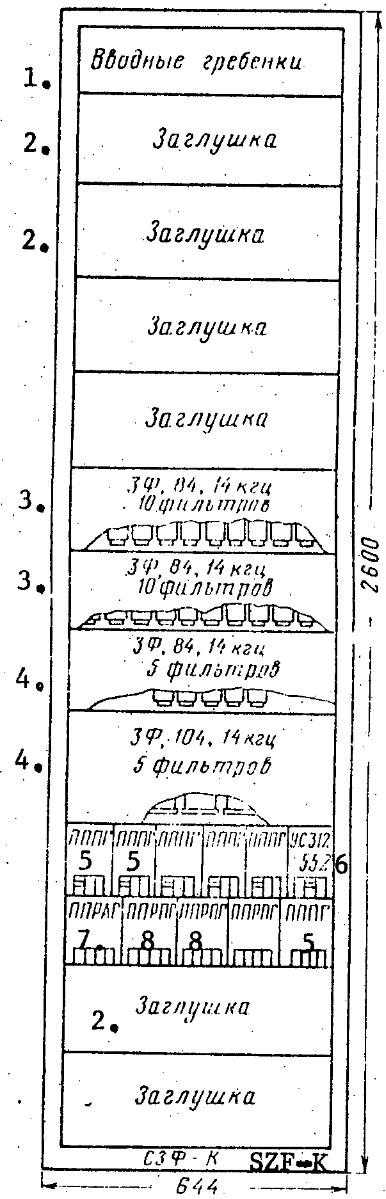


Figure 11.6.1. The placement of the equipment in the SZF-K rack of blocking filters.

Key: 1. Input terminal blocks;
2. Blank panel;
3. 84.14 KHz blocking filters, 10 filters;
4. 84.14 KHz blocking filters, 5 filters;
5. PPPG [group transmit converter panel];
6. 312 - 552 KHz amplifier;
7. PPRAG [expansion unknown, possible misprint for PPrPG];
8. PPRPG [group conversion receive panel].

11.7. The STV Voice Frequency Ringing Rack (Taken Out of Production)

Figures 11.7.1, 11.7.2.

Purpose

Intended for sending and receiving a voice frequency callup at frequencies of 500 or 1,000 Hz, modulated with 20 Hz.

Composition

The rack is supplied as a set for 2, 4, 8, 12, 16 and 24 voice frequency ringing receivers. Regardless of the number of receivers, each rack is supplied as a package with two or three voice frequency ringing generators (depending on the order). Moreover, all rack variants have the following:

- Panel of isolating fuses;
- Intercom-callup unit panel, monitor and test devices, and connecting jacks;
- Signaling panel;
- Panel of input terminal blocks.

Electrical Power Supply

Voltages (regulated or unregulated):

Plate	206 ± 3% v, or 220 ± 10%, v.
Filament	21.2 ± 3%, v., or 24 ± 10%, v.

Current Consumption:

Стойки Racks	Накал, *а* Filament, amps		Анод, *а* Plate, amps	
	стаб. regulated	нестаб. unreg.	стаб. regulated	нестаб. unreg.
СТВ-2 STV-2	0,64	0,84	0,02	0,02
СТВ-4	0,96	1,26	0,047	0,047
СТВ-8	1,6	2,1	0,083	0,083
СТВ-12	3,25	3,98	0,11	0,11
СТВ-16	3,88	4,78	0,155	0,155
СТВ-24 STV-24	5,8	6,96	0,238	0,238

Weight:

Rack Стойка	Вес, *кг* Weight, KG
СТВ-2 STV-2	120
СТВ-4	150
СТВ-8	200
СТВ-12	250
СТВ-16	300
СТВ-24 STV-24	400

Construction:

Standard racks with equipment filling both sides. The dimensions are 2,500 x x 648 x 410 mm.

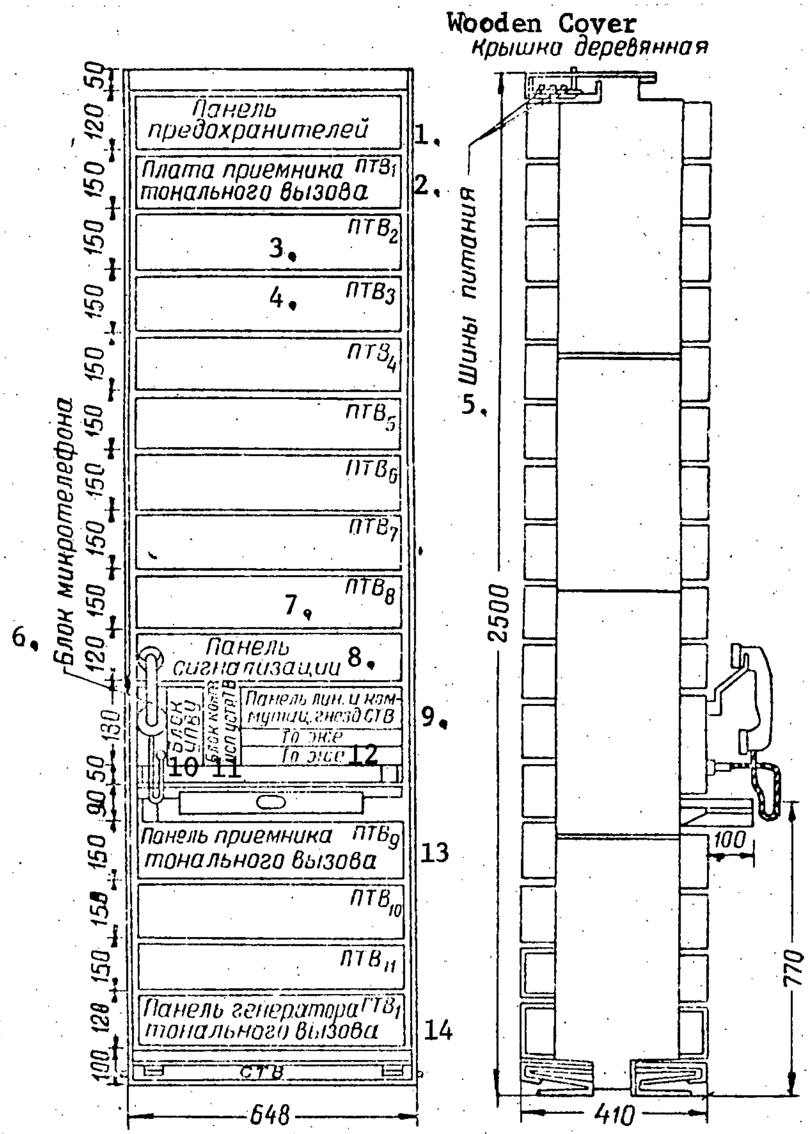
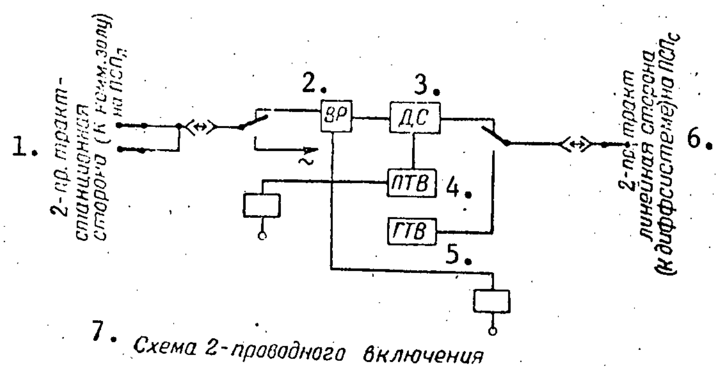


Figure 11.7.1. The placement of the equipment in the STV voice frequency ringing rack.

Key:
1. Panel of fuses;
2. Voice frequency ring receiver panel 1, PTV_1;
3. Voice frequency ring receiver panel 2;
4. PTV_3;
5. Power buses;
6. Telephone handset block;
7. Voice frequency ring receiver panel 8;
8. Signaling panel;

[Key to Figure 11.7.1, continued]:

9. Line and switching panel, STV jacks;
10. UPVU [?intercom-callup unit control?] block;
11. Block of monitor and test devices;
12. The same;
13. Voice frequency ring receiver panel 9, PTV_9;
14. Voice frequency ring generator panel 1, GTV_1.



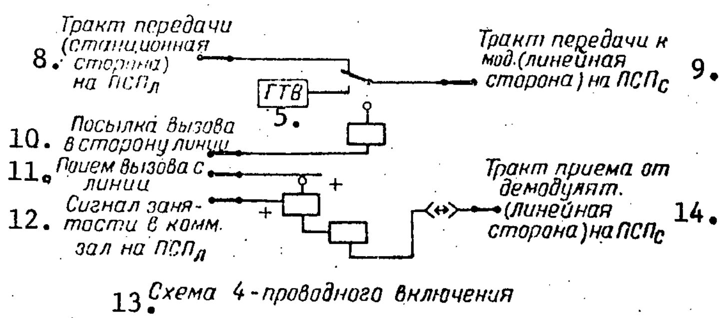


Figure 11.7.2. Block diagrams of the variants of the connection of the STV rack.

Key: 1. Two-wire channel, station end (to the switching room) at the PSP_L [expansion unknown];
2. VR [expansion unknown];
3. Differential system;
4. Voice frequency ring receiver;
5. Voice frequency ring generator;
6. Two-wire channel, line end (to the differential system) at the PSP_S [expansion unknown];
7. Circuit for a two-wire connection;
8. Transmit channel (station end) at the PSP_L [expansion unknown];
9. Transmit channel to the modulator (line end) at the PSP_S;
10. Ring transmission into the line;
11. Ring reception from the line;
12. Busy signal in the manual switch room at the PSP_L;
13. Schematic of a four-wire connection;
14. Receive channel from the demodulator (line end) at the PSP_S.

11.8. The SDS Rack of Differential Systems (Taken Out of Production)

Figures 11.8.1, 11.8.2.

Purpose

Intended for housing the differential systems which serve for providing a transition for the telephone channels from a four-wire system to a two-wire one. They are installed at terminal stations.

Composition: The rack is put together as a set for 12, 24, 36, 48, 60 and 102 differential systems.

Construction

A standard rack with equipment filling one side when up to 48 differential systems are installed, and with equipment filling both sides when more than 48 differential systems are installed. Three differential systems are mounted on each panel. The rack dimensions are 2,500 x 646 x 410 mm.

Weight

Rack Стойка	Вес, кг Weight, kg
СДС-12 SDS-12	50
СДС-24	100
СДС-36	150
СДС-48	200
СДС-60	250
СДС-102 SDS-102	400

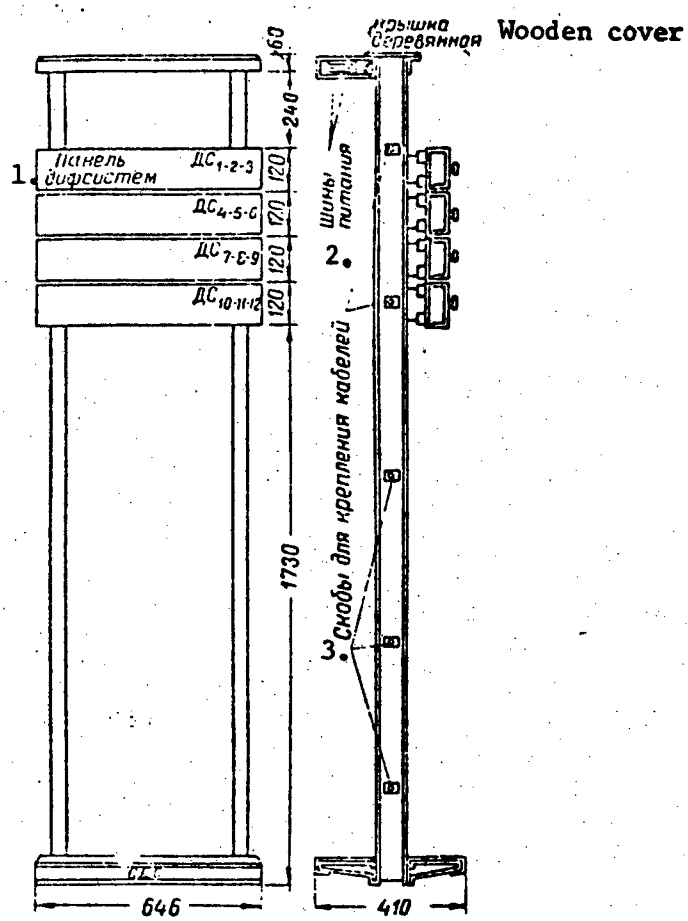
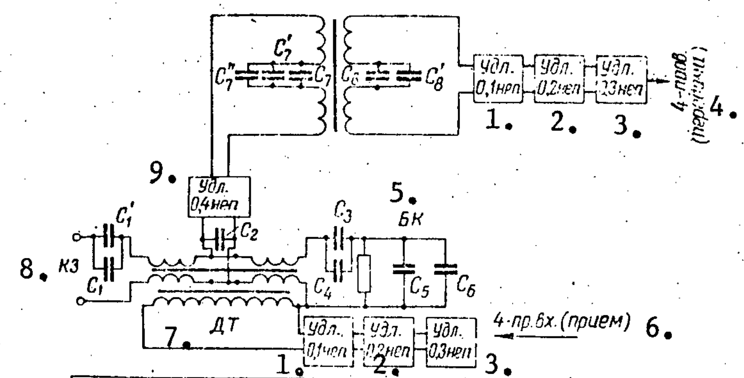


Figure 11.8.1. →

The placement of the equipment in the rack of differential systems, the SDS.

Key: 1. Panel of differential systems, DS 1-2-3;
2. Power buses;
3. Clamps for securing cables.



10. Обозначение конденсаторов	C_1	C_1'	C_2	C_3	C_4	C_5	C_6	C_7	C_7'	C_7''	C_8	C_3'
11. Емкость, мкф	1,0	1,0	0,05	1,0	0.5	0,01	0,02	0,5	1,0	1,0	0,25	0,25

Figure 11.8.2. Schematic of the differential systems of the SDS rack.

Key:
1. 0.1 Np pad;
2. 0.2 Np pad;
3. 0.3 Np pad;
4. Four-wire (transmit);
5. BK [balancing network];
6. Four-wire input (receive);
7. DT [differential transformer];
8. KZ [expansion unknown];
9. 0.4 Np pad;
10. Designation of the capacitors;
11. Capacitance, microfarads.

11.9. The SDK-2 Channel Division Rack

Figures 11.9.1 - 11.9.3.

Purpose

Intended for splitting wideband channels with an effective transmitted passband of 300 - 3,400 Hz into two narrow channels having a bandwidth of 300 - 1,700 Hz (in one retransmission section).

One of the narrow channels derived in the division is called channel A, and can be multiplexed with audio frequency telegraphy.

The second channel is derived by means of preliminary conversion and is called channel B, and is not subjected to secondary multiplexing.

Electrical Characteristics

The effectively transmitted bandwidth of the narrowed channel, A or B	300 - 1,700 Hz
The nominal relative voice frequency level in the four-wire section of a channel:	
At the input	-1.5 Np
At the output	+0.5 Np

The nominal residual attenuation of a channel at 800 Hz	0.8 Np
The nonlinear distortion factor in a channel when 420 Hz at a level of 0 Np is fed to the connection terminals	No more than 2%
The immunity to perceptible crosstalk between the channels	No less than 7.5 Np
The psophometric internal noise voltage at the point with a relative level of +0.5 Np	No more than 0.25 mv psophometric
The stability of the channels for the case of a residual attenuation of 0.8 Np at 800 Hz	No less than 0.6 Np
The input impedance of the equipment at the individual equipment end	600 ohms
The reflection factor	10%
The working frequency of the voice frequency ring receiver	1,600 or 1,200 Hz
The frequency of the voice frequency ringing generator	1,600 Hz, 1000/20 Hz or 500/20 Hz

Electrical Power Supply

Voltages: 21.2 volts ± 35 (regulated) or 24 volts ± 10% (unregulated).

Current Consumption:

SDK-2-6	0.65 a
SDK-2-12	1.5 a (or 2.5 a when rining via all 24 channels).

The Equipment Complement of the SDK-2 Racks

Two types of racks are manufactured:

SDK-2-6 . . . . for 12 narrow channels;
SDK-2-12 . . . for 24 narrow channels.

The following are installed in the rack:

Power supply filter panel;
PTNV [voice frequency dial-ring receiver] panel (two panels are required for the SDK-2-12);
Panel of voice frequency ringing relays (two units for the SDK-2-12);
Block of individual ringing relays (two units for the SDK-2-12);
Panel of differential systems;
Fuse and signaling panel;
Neper meter;
Switching field;
Three panels of modulators and demodulators (six panels for the SDK-2-12);
Low frequency amplifier panel (two panels for the SDK-2-12);
GTV [voice frequency ringing generator] panel, 1.6 KHz;
GTV panel for 1000/20 or 500/20 Hz;
Panel of 3.7 KHz oscillators.

Construction

A standard rack with equipment filling both sides. The rack dimensions are 2,500 x 648 x 525 mm.

Approximate Weight and Cost

Оборудование Equipment	Вес, кг Weight, kg	Цена, руб. Price, rubles
SDK-2-6 СДК-2-6	300	2444
SDK-2-12 СДК-2-12	350	4163

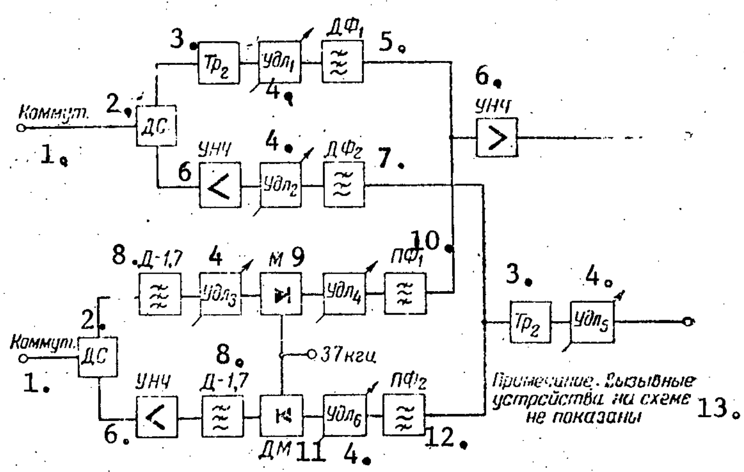


Figure 11.9.1. Block diagram of the SDK-2 channel division rack.

Key:
1. Switchboard;
2. Differential system;
3. Transformer 2;
4. Variable attenuator;
5. Filter DF_1;
6. Low frequency amplifier;
7. Filter DF_2;
8. Filter D-1.7 [KHz];
9. Modulator;
10. Bandpass filter PF_1;
11. Demodulator;
12. Bandpass filter PF_2;
13. Note: The ringing devices are not shown in the schematic.

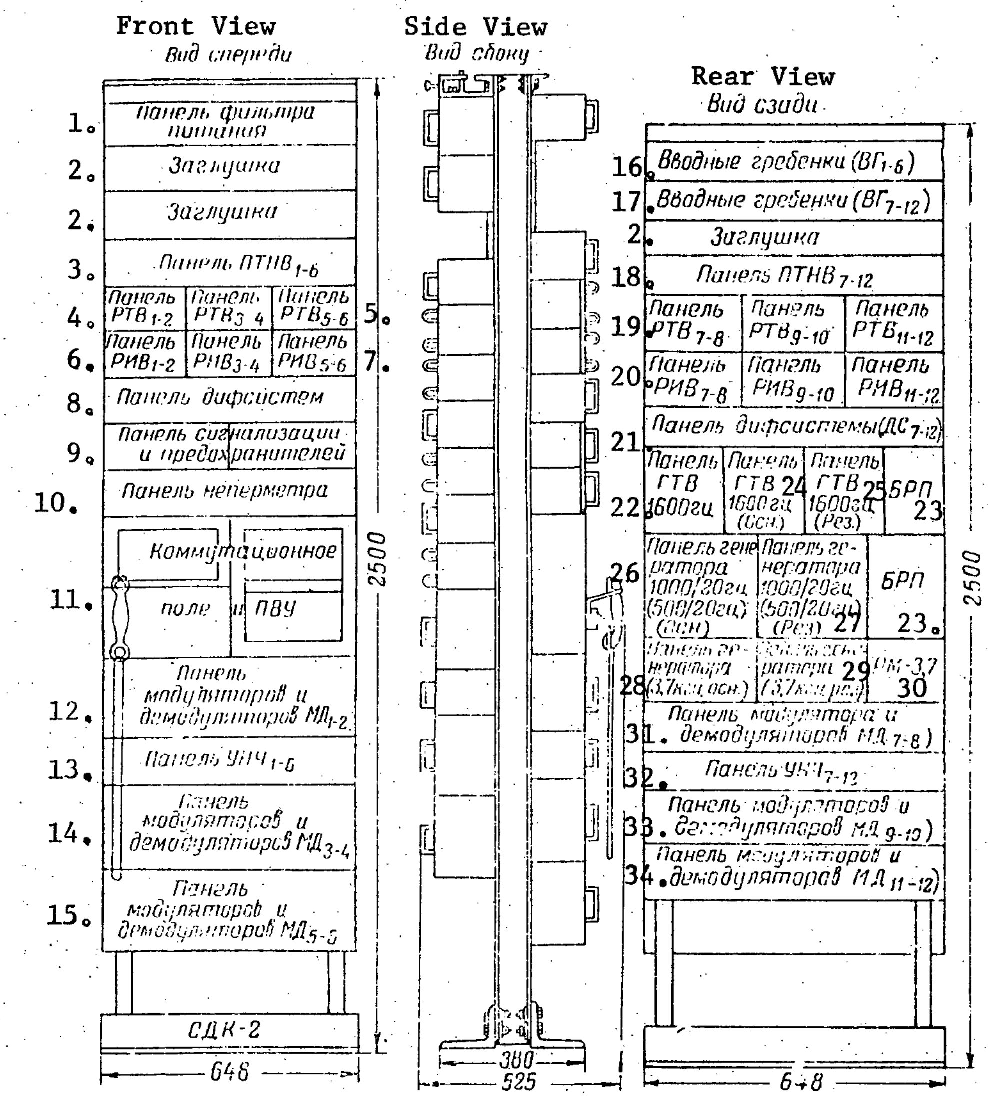


Figure 11.9.2. The placement of the equipment in the SDK-2 channel division rack (for 12 channels).

Key: 1. Power supply filter panel;
2. Blank filler panel;
3. Panel for voice frequency ring-dial receivers 1--6;
4. Voice frequency ring receiver panel 1 - 2;
5. Voice frequency ring receiver panel 5 - 6;
6. Selective ring receiver panel 1 - 2;
7. Selective ring receiver panel 5 - 6;
8. Panel of differential systems;
9. Signaling and fuse panel;
10. Neper meter panel;
11. Connecting field and intercom-callup unit;

[Key to Figure 11.9.2, continued]:

12. Panel of modulators and demodulators, MD_{1-2};
13. Low frequency amplifier panel, 1 - 6;
14. Panel of modulators and demodulators, MD_{3-4};
15. Panel of modulators and demodulators, MD_{5-6};
16. Input terminal blocks (VG 1 - 6);
17. Input terminal blocks (VG 7 - 12);
18. Panel of voice frequency ring-dial receivers, 7 - 12;
19. Voice frequency ring receiver panel, 7 - 8;
20. Selective ring receiver panel, 7 - 8;
21. Differential system panel (DS 7 - 12);
22. 1,600 Hz voice frequency ringing generator panel;
23. BRP [expansion unknown];
24. 1,600 Hz voice frequency ringing generator panel (main);
25. 1,600 Hz voice frequency ringing generator panel (standby);
26. 1000/20 Hz (or 500/20 Hz) generator panel (main);
27. 1000/20 Hz (or 500/20 Hz) generator panel (standby);
28. Generator panel (3.7 KHz, main);
29. Generator panel (3.7 KHz, standby);
30. RM-3.7 [3.7 KHz power distributor];
31. Modulator and demodulator panel, MD_{7-8};
32. Low frequency amplifier panel, 7-12;
33. Modulator and demodulator panel, MD_{9-10};
34. Modulator and demodulator panel, MD_{11-12}.

[Key to Figure 11.9.3 (page 676)]:

1. Power supply filter panel;
2. Blank filler panel;
3. Panel of voice frequency ring-dial receivers, 1 - 6;
4. Panel of voice frequency ring receivers, 1 - 2;
5. Panel of voice frequency ring receivers, 5 - 6;
6. Panel of selective ring relays, 1 - 2;
7. Panel of selective ring relays, 5 - 6;
8. Panel of differential systems, 1 - 6;
9. Fuse panel;
10. Signaling panel;
11. Neper meter panel;
12. Connection field;
13. Intercom-callup unit;
14. Modulator and demodulator panel, MD 1-2;
15. Panel of low frequency amplifiers, 1 - 6;
16. Modulator and demodulator panel, MD 3-4;
17. Modulator and demodulator panel, MD 5-6;
18. Panel of input terminal blocks;
19. 1,600 Hz voice frequency ring generator panel (main);

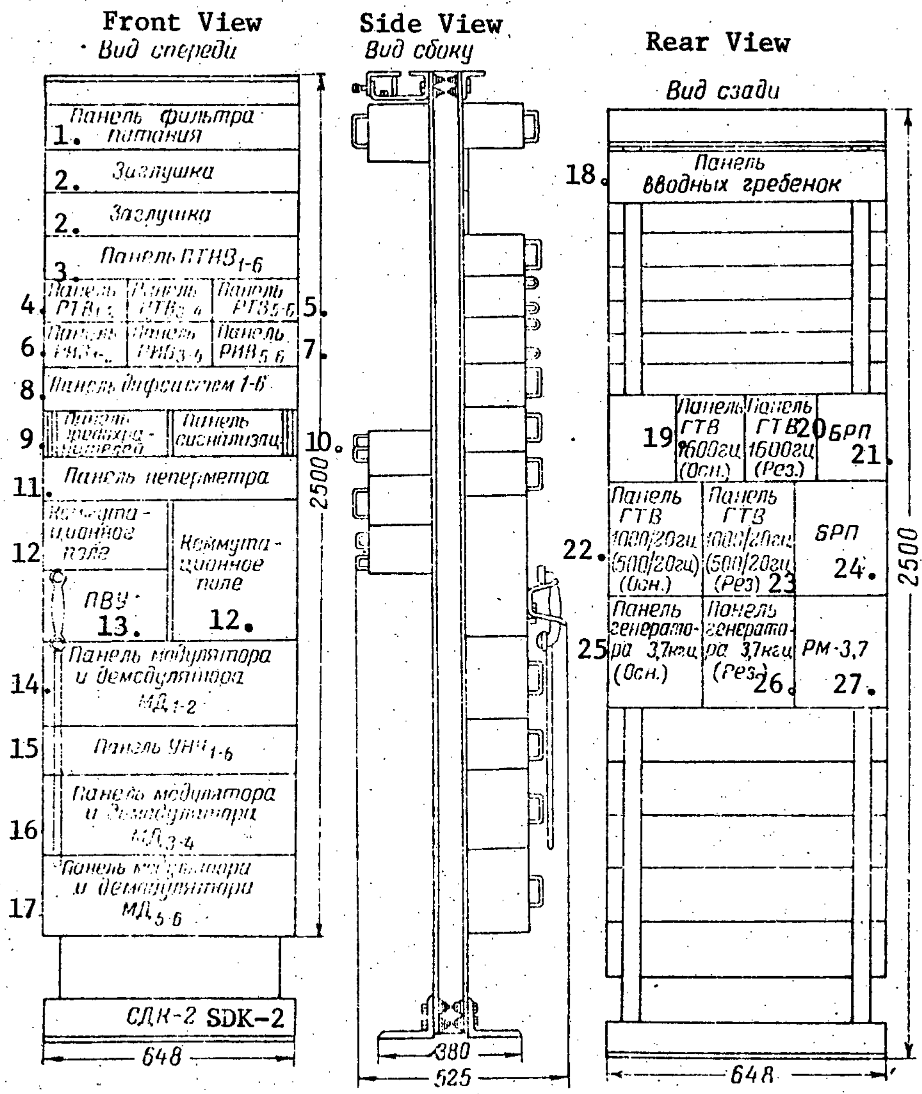


Figure 11.9.3. The placement of the equipment in the channel division rack, SDK-2 (for six channels).

[Key, continued from page 675]:

20. 1,600 Hz voice frequency ringing generator panel (standby);
21. BRP [expansion unknown];
22. 1,000/20 Hz or 500/20 Hz voice frequency ringing generator panel (main);
23. 1,000/20 Hz or 500/20 Hz voice frequency ringing generator panel (standby);
24. BRP;
25. 3.7 KHz generator panel (main);
26. 3.7 KHz generator panel (standby);
27. RM-3.7 [3.7 KHz power distributor].

11.10. The Rack for Monitoring Primary Groups (SKPG)

Figures 11.10.1, 11.10.2.

Purpose

Intended for the periodic automatic monitoring of the levels of the group control frequencies of the 12-channel groups of multichannel equipment.

Composition

The equipment is produced in six variants:

SKPG for 25 primary groups
SKPG for 50 primary groups
SKPG for 75 primary groups
SKPG for 100 primary groups
SKPG for 125 primary groups
SKPG for 150 primary groups

Equipment Complement

The following panels are mounted in the rack:

-- Monitor unit, which consits of a switcher and a receiver. The switcher automatically connects a 12-channel group to the receiver every six seconds for 100 milliseconds.

The receiver consists of an 84.14 KHz crystal filter, a tuned two-stage amplifier and a fault sensor;

-- Protection and signaling.

There is one monitor unit housed in the SKPG rack for 25 groups, two in the one for 50 groups and four monitor units in the rack for 100 groups.

Electrical Characteristics

The monitor-measurement frequency	84.14 KHz
The monitor unit is connected to the channel at a point where the 84.14 KHz frequency level is	-3.5 Np (with respect to power)
The monitor unit signals a level change in the 84.14 KHz current of	± 0.45 Np (with an error of ± 0.10 Np). The connection of the monitor unit is realized using a two-wire circuit.

Electrical Power Supply

Voltages:

Tube filaments through a step-down transformer	220 volts AC
Plate	206 volts
Relay and signaling circuits	24 volts (a standby voltage of -24 v is provided for signaling).

Current and Power Consumption

Напряжение, в Voltage, v.	25-group rack Стойка на 25 гр., а amps	50-group rack Стойка на 50 гр., а amps	100-group rack Стойка на 100 гр., а amps
AC ~ 220 ± 3%	8,5 вт W	17 вт W	34 вт W
DC = 206 ± 3%	0,04 а	0,07 а	0,1 а
DC = 24 ± 10%	3,0 а	3,0 а	3,0 а

Type of Tubes Employed: 6Zh1PYe

Construction:

Rack with equipment filling one side, with dimensions of 2,500 x 644 x 280 mm.

Weight (for 25 groups): 120 kg

Cost:	For 25 groups	1,900 rubles
	For 50 groups	3,200 rubles
	For 100 groups	6,000 rubles

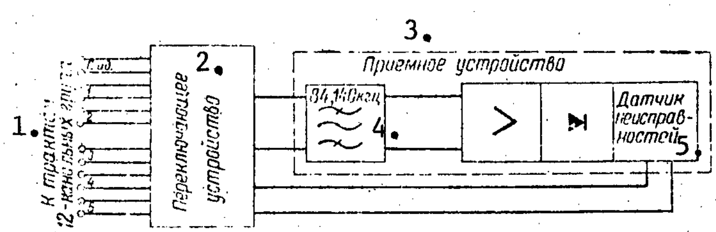


Figure 11.10.1. Block diagram of the panel for primary group monitoring.

Key: 1. To the trunks of the 12-channel groups;
2. Switcher;
3. Receiver;
4. 84.14 KHz;
5. Fault sensor.

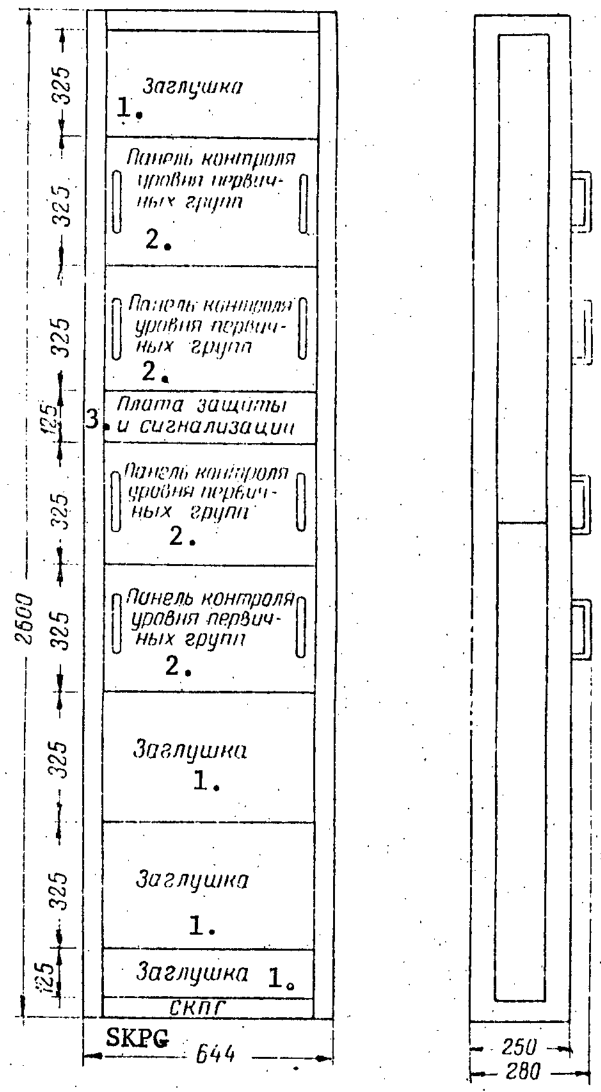


Figure 11.10.2. The placement of the equipment in the SKPG primary group monitoring rack.

Key: 1. Blank panel;
2. Panel for monitoring the level of the primary groups;
3. Protection and signaling panel.

11.11. The SARUG Automatic Group Level Control Rack

Figures 11.11.1 - 11.11.3.

Purpose

Intended for periodic automatic gain control for primary and secondary groups to assure the requisite stability of the residual attenuation of the channels at the end of a route, and to maintain the nominal transmit levels at stations and for group through-working from one system to another. It is employed in the V-12-2, KV-12, K-24-2 and K-60 systems, and is designed for joint operation with the SIO-12, SIO-24, SIO-24p and SIP-60 individual equipment racks, as well as generator equipment of the old type, the SINK and SNK, or the new generator equipment, the SUGO.

The automatic level control devices for secondary groups are installed at terminal stations, where the secondary group is terminated and it is distributed to primary groups. Where several through-working sections are present on a secondary group route, AGC can also be provided at through working stations for the secondary group.

The automatic primary group level control devices are installed at terminal stations, where the primary group route is terminated and is distributed to the channels. Where two or more through-working sections are present on the route of a primary group, AGC can also be provided at through working stations for the primary group, if there is a need for it.

Electrical Characteristics

The range of automatic and manual control for the primary and secondary groups	$\pm$ 0.4 Np
The nominal relative levels in the control channel:	
Of the primary groups	- 0.6 Np
Of the secondary groups	- 2.6 Np
The nominal values of the input and output impedances:	
Of the primary groups (input and output are balanced)	135 ohms
Of the secondary groups (input and output are unbalanced)	75 ohms
The attenuation of nonlinearity in the control channel:	
Of the primary group:	
With respect to the second harmonic	No less than 8.5 Np
With respect to the third harmonic	No less than 10.5 Np
Of the secondary group:	
With respect to the second harmonic	No less than 9 Np
With respect to the third harmonic	No less than 11 Np
The crosstalk attenuation between channels of the same type	$\geq$ 9 Np

Electrical Power Supply

The SARUG rack is desgined around semiconductor devices (transistors), and is powered from DC sources.

Voltages:	Transistor circuits	21.2 volts ± 3%
	Signaling and thermostat circuits	24 vclts ± 10%

Current Consumption

Оборудование Equipment	21,2 в ± 3% стаб., а 21.2 v. ± 3% regulated, amps	24 в ± 10% нестаб., а 24 v. ± 10%, unreg. amps
SARUG-1 САРУГ-1	1,8	2,8
SARUG-2 САРУГ-2	2,6	3,6
SARUG-3 САРУГ-3	4,4	3,6

Equipment Complement

The SARUG rack is manufactured in three variants.

SARUG-1. Contains equipment for controlling one secondary and five primary groups;
SARUG-2. Contains equipment for controlling two secondary and ten primary groups.
SARUG-3. Contains equipment for controlling two secondary and 25 primary groups. The SARUG-1 and SARUG-2 racks can be equipped up to full capacity. The following are ordered separately to expand the racks:
KARUG-P. The set of automatic level control blocks for five primary groups.
KARUG-V. The set of automatic control blocks for one secondary group.
Where necessary, the following are ordered separately: the panel of ZF-3860 Hz and K-140 Hz filters.

Construction

The rack frame is made of sectional steel with trays for mounting notched and unnotched panels.

The rack dimensions are 2,600 x 650 x 250 mm

Weight and Cost

Equipment	Оборудование	Weight, kg Вес, кг	Cost, rubles Стоимость, руб.
SARUG-1	САРУГ-1	300	5 500
	САРУГ-2	340	7 600
	САРУГ-3	400	10 200
KARUG-P	КАРУГ-П	—	1 050
KARUG-V	КАРУГ-В	—	1 200

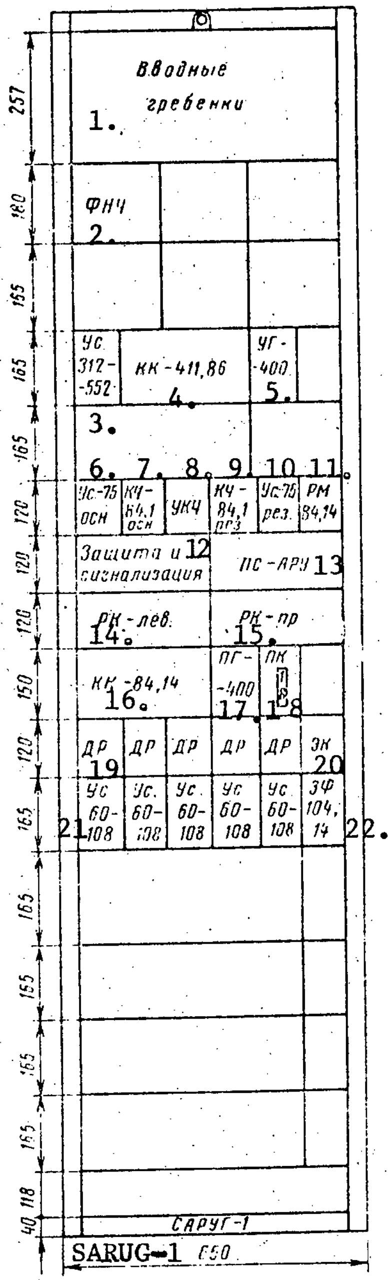


Figure 11.11.1.

The placement of the equipment in the SARUG-1 automatic gain control rack.

Key:

1. Input terminal blocks;
2. FNCh [low pass filter];
3. 312 - 552 KHz amplifier;
4. 411.86 KHz control frequency channel;
5. UG-400 [expansion unknown];
6. Main 76 KHz amplifier;
7. Main 84.1 KHz control frequency block;
8. Control frequency amplifier;
9. 84.1 KHz standby control frequency block;
10. Standby 76 KHz amplifier;
11. 84.14 KHz power distributor;
12. Protection and signaling;
13. PS-ARU [unknown type of AGC unit];
14. RK [expansion unknown], left;
15. RK, right;
16. 84.14 KHz control channel;
17. PG-400 [expansion unknown];
18. PK [trimmer network?];
19. DR [expansion unknown];
20. EK [?shielded terminal strip?];
21. 60 - 108 KHz amplifier;
22. 104.14 KHz suppression filter.

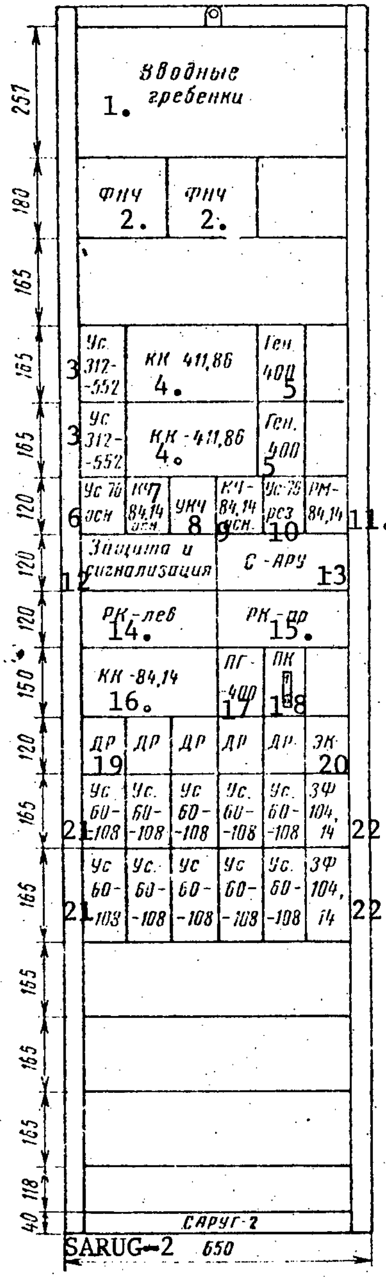


Figure 11.11.2.

The placement of the equipment in the SARUG-2 automatic group gain control rack.

Key:

1. Input terminal blocks;
2. Low pass filters;
3. 312 - 552 KHz amplifier;
4. 411.86 KHz control channel;
5. Gen-400 [?400 Hz generator?];
6. Main 76 KHz amplifier;
7. Main 84.14 KHz control frequency block;
8. UKCh [control frequency amplifier];
9. Main 84.14 KHz control frequency block;
10. Standby 76 KHz amplifier;
11. 84.14 KHz power distributor;
12. Protection and signaling;
13. S-ARU [unknown type of AGC unit];
14. RK [expansion unknown], left;
15. RK, right;
16. KK-84.14 [84.14 KHz control frequency channel];
17. PG-400 [expansion unknown];
18. PK [?trimmer equalization network?];
19. DR [expansion unknown];
20. EK [?shielded terminal strip?];
21. 60 - 108 KHz amplifier;
22. 104.14 KHz suppression filter.

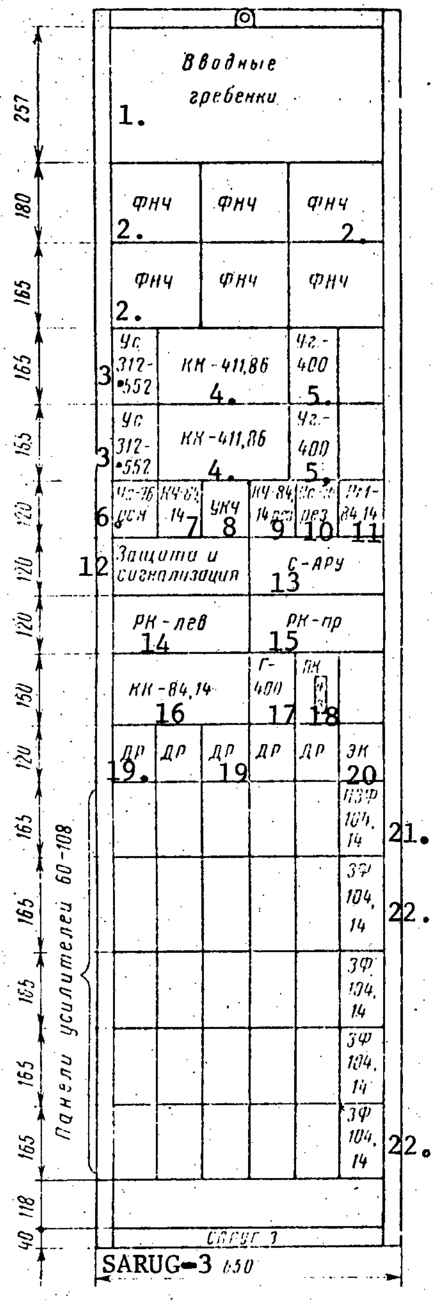


Figure 11.11.3.

The placement of the equipment in the SARUG-3 automatic group gain control rack.

Key:

1. Input terminal blocks;
2. Low pass filters;
3. 312 - 552 KHz amplifier;
4. 411.86 KHz control channel;
5. Ug-400 [expansion unknown];
6. Main 76 KHz amplifier;
7. 84.14 KHz control frequency unit;
8. UKCh [control frequency amplifier];
9. Standby 84.14 KHz control frequency unit;
10. Standby 76 KHz amplifier;
11. 84.14 KHz power distributor;
12. Protection and signaling;
13. S-ARU [unknown type of AGC unit];
14. RK [expansion unknown], left;
15. RK, right;
16. 84.14 KHz control channel unit;
17. G-400 [400 (?KHz?) generator?];
18. PK [?trimmer equalization network?];
19. DR [expansion unknown];
20. EK [?shielded terminal strip?];
21. 104.14 KHz suppression filter panel;
22. 104.14 KHz suppression filter.

11.12. The SPO Radio Relay Link Transition Equipment Rack

Figures 11.12.1, 11.12.2.

Purpose

The transition equipment rack, in conjunction with the K-60 equipment, is intended for multiplexing the telephone trunk of a R-60/120 radio relay link with 120 telephone channels (two groups of 60 channels each), and is installed at the terminal stations of radio relay links.

The rack provides for the reception of two 60-channel groups from the line with a line spectrum of 12 - 252 KHz, and the transmission of a combined 120-channel group in a spectrum of 12 - 552 KHz to the input of the terminal radio relay station (RRS), as well as the reception of a 120-channel group of a terminal RRS in a 12 - 552 KHz spectrum, and its transmission via two pairs of a balanced cable in the 12 - 252 KHz range.

Equipment Complement

The rack is fitted out with the equipment for one or two radio relay link trunks. The set for the second trunk is stipulated when ordering. When the K-60 equipment and the radio relay station are housed in rooms remote from each other, a provision is made at the SPO for the installation of two sets of generator equipment: a main and a standby. Each of them feeds one or two pairs of frequency converters.

Switching from the main set to the standby is accomplished automatically when the carrier frequency level drops by 30% (for the case of colocation of the K-60 equipment and the radio relay link station, the generator equipment, as well as the converter blocks for transmit and receive, and also the panels of amplifiers with single frequency control, are not installed).

The Nominal Input Impedance:

From the K-60 equipment end	135 ohms
From the radio relay link end	180 ohms

Construction

The equipment is housed in one rack with dimensions of 2,500 x 650 x 250 mm. The rack frame is made of 2 mm, shaped U-section steel with a size of 30 x 30 mm.
A PVU [intercom-callup unit] block is installed in the rack to carry on service conversations inside the building.

Electrical Power Supply

The SPO is powered from 220 volts AC, $\pm 3\%$. Installed in the SPO are two power supply blocks, which provide power to the equipment of each radio relay link trunk:

Plate. . . . . 206 volts; Filament. . . . . 6.3 volts.

The following power supply variants are provided:

-- For multiplexing one radio relay link trunk;
-- For multiplexing two radio relay link trunks;
-- When multiplexing a telephone trunk with one 60-channel group;

-- When the RRS [radio relay station] and long distance telephone exchange are located together.

The power demand is 220 VA when multiplexing with one telephone trunk.

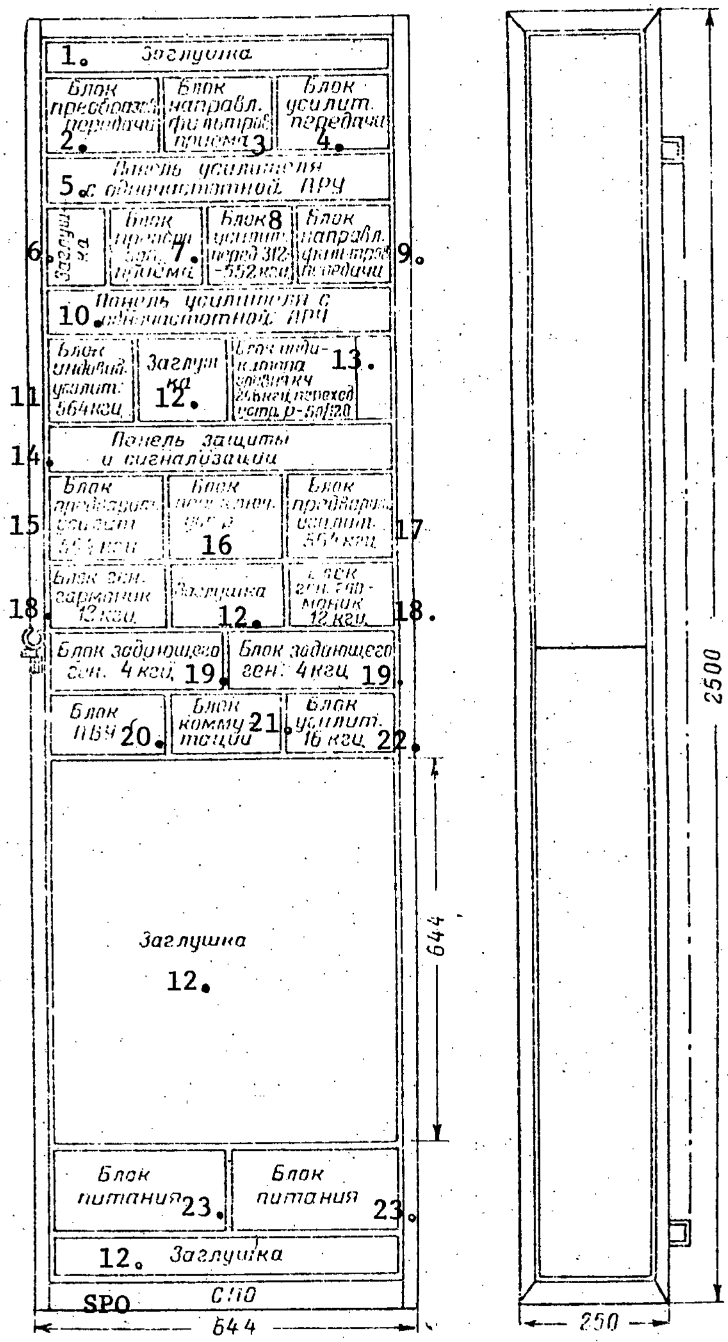


Figure 11.12.1. The placement of the equipment in the SPO radio relay link transition equipment rack.

Key: 1. Blank filler panel; 2. Transmit converter block;

[Key to Figure 11.12.1, continued]:

3. Block of receive, routing filters;
4. Block of transmit amplifiers;
5. Single frequency AGC amplifier panel;
6. Blank filler panel;
7. Receive converter block;
8. 312 - 552 KHz transmit amplifier block;
9. Block of transmit routing filters;
10. Amplifier panel with single frequency AGC;
11. 564 KHz individual amplifier block;
12. Blank filler panel;
13. 248 KHz control frequency level meter and R-60/120 transition unit block;
14. Protection and signaling panel;
15. 564 KHz preamplifier block;
16. Switcher block;
17. 564 KHz preamplifier block;
18. 12 KHz harmonic generator block;
19. 4 KHz master oscillator block;
20. Intercom-callup unit block;
21. Connection block;
22. 16 KHz amplifier block;
23. Power supply block.

[Key to Figure 11.12.2, page 688]

1. Jack II;
2. Jack I;
3. 0.2 Np; 135 ohms;
4. From the MTS [long distance telephone exchange];
5. Amplifier with single frequency AGC;
6. Intercom-callup block;
7. Connection-switching block;
8. Power supply block I;
9. 16 KHz amplifier;
10. Protection and signaling panel;
11. Input terminal blocks;
12. Power supply block II;
13. GN-2 [jack II];
14. Receive converter block;
15. 312 - 552 KHz transmit amplifier;
16. Jack 4;
17. KCh-1 [control frequency 1];
18. f = 564 KHz;
19. Individual amplifiers, f = 564 KHz;
20. Trunk I;
21. Individual amplifiers, f = 564 KHz;
22. 12 - 252 KHz transmit amplifier;
23. Transmit converter;
24. (b) The terminal radio relay station and long distance telephone exchange are located together.

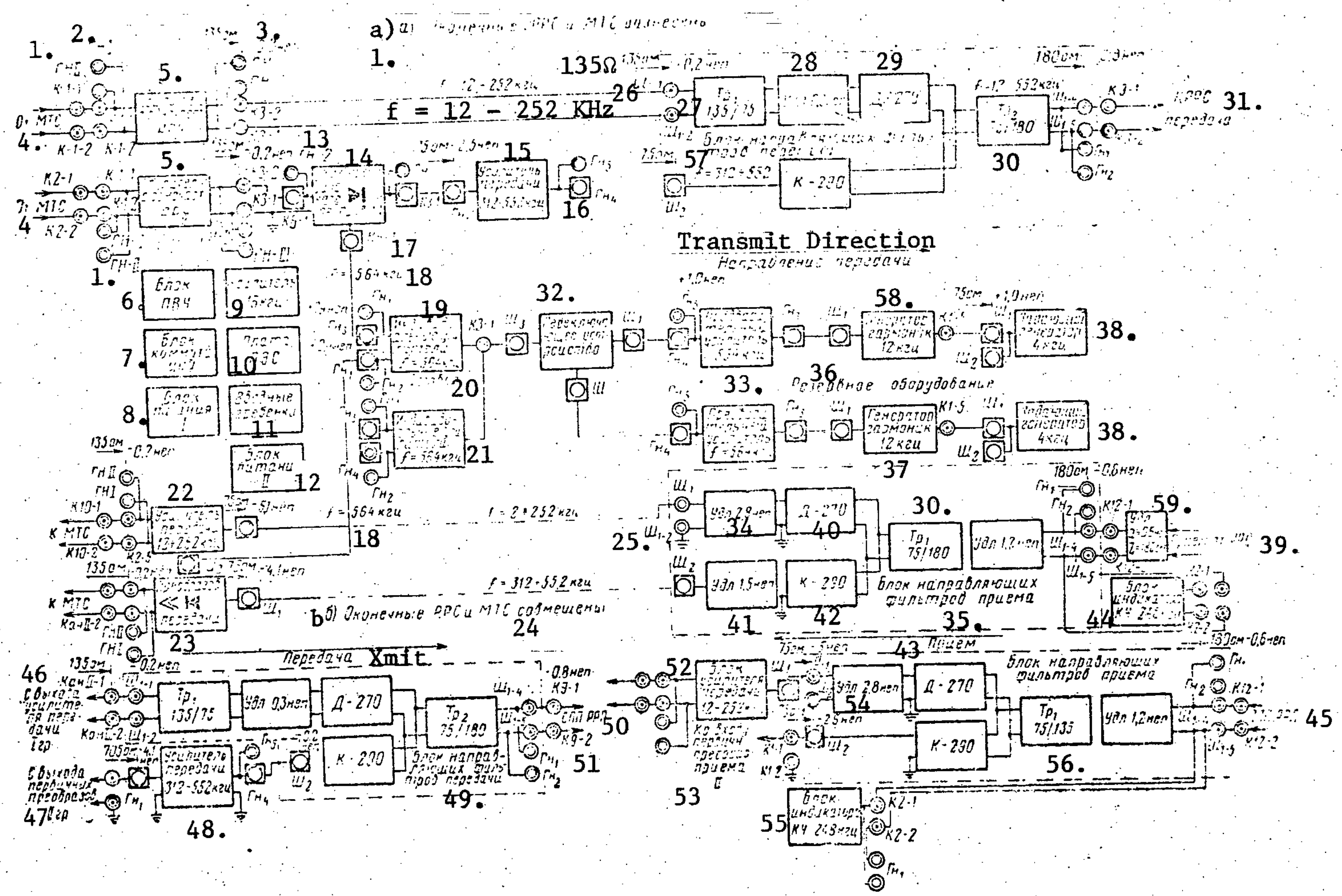


Figure 11.12.2. Block diagram of the SPO rack of transition equipment.

[Key on pages 687 and 689]

[Key to Figure 11.12.2, contined from page 687]

25. Sh1-2 [socket 1 - 2];
26. Socket 1 - 1;
27. 135/75 ohm transformer 1;
28. 0.3 Np pad;
29. D-270 filter;
30. 75/180 ohm transformer 2;
31. To the RRS [radio relay station], transmit;
32. Switcher;
33. 554 KHz preamplifier;
34. 2.8 Np pad;
35. Block of receive routing filters;
36. Standby equipment;
37. 12 KHz harmonic generator;
38. 4 KHz master oscillator;
39. Receive, from the radio relay station;
40. D-270 filter;
41. 1.5 Np pad;
42. K-390 filter;
43. Receive;
44. 248 KHz control frequency meter block;
45. OPP [expansion unknown], RRL [radio relay link];
46. From the output of the transmit amplifier, group I;
47. From the output of the primary converters, group II;
48. 312 - 552 KHz transmit amplifier;
49. Block of transmit routing filters;
50. SPP [expansion unknown], RRL [radio relay link];
51. K9-2 [expansion unknown];
52. 12 - 252 KHz transmit amplifier block;
53. To the input of the primary receive converters, II;
54. 2.8 Np pad;
55. 248 KHz control frequency meter block;
56. 75/135 Ohm transformer 1;
57. Block of transmit routing filters;
58. 12 KHz harmonic generator;
59. Pad, a = 0.6 Np, Z = 180 ohms.

11.13. The SLUR Racks of Line Amplifiers for Radio Relay Links

Figures 11.13.1 - 11.13.3.

Purpose

Intended for providing for the joint operation of K-1920 coaxial systems and radio relay links of the R-600 system over distances of up 70 km.

Equipment Complement

Two types of SLUR-1 and SLUR-2 line amplifier racks are manufactured.

SLUR-1. Installed at the terminal stations of radio relay links;
SLUR-2. Installed at the junction stations of radio relay links.

Electrical Characteristics

Nominal relative levels:

SLUR-1:

-- Transmit channel	at the input	-2.1 or -4.1 Np
	at the output	-1.6 Np
-- Receive channel	at the input	-1.6 Np
	at the output	-2.5 or 2.6 Np

SLUR-2. First Variant:

-- Transmit channel	at the input	-4.1 Np
	at the output	-2.5 Np
-- Receive channel	at the input	-2.1 Np
	at the output	-2.6 Np

SLUR-2. Second Variant:

-- Transmit channel	at the input	-2.1 Np
	at the output	-2.5 Np
-- Receive channel	at the input	-2.1 Np
	at the output	-2.5 Np

Electrical Power Supply

Voltages:	Filament and plate circuits	220 volts AC, ± 3%
	Signaling and filter thermostat circuits	24 volts ± 10%

Note: When an STO rack is present at a station, a voltage of -24 v is fed from the PU-24 power supply.

Power Consumption:

For the SLUR-1:	220 volts AC	295 VA
	24 volts DC	150 watts
For the SLUR-2:	220 volts AC	295 VA
	24 volts DC	115 watts

Construction

The racks have a metal frame made of sectional steel with equipment filling one side. The dimensions of the racks are 2,600 x 650 x 250 mm.

Weight: 300 kg (each rack); Cost: 5,200 rubles (each rack).

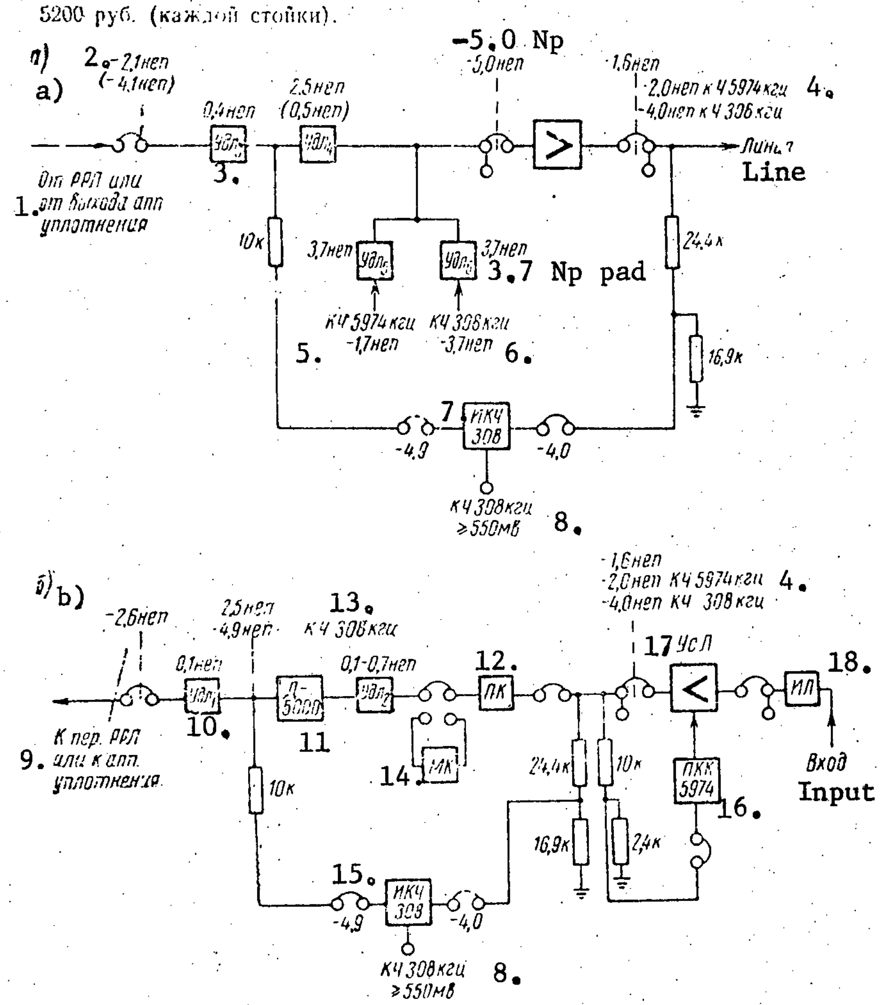


Figure 11.13.1. Block diagram of the SLUR-1 rack of line amplifiers for radio relay links: a) Transmit channel; b) Receive channel.

Key:
1. From the radio relay link, or from the output of the multiplex equipment;
2. -2.1 Np (or -4.1 Np);
3. Pad 3, 0.4 Np;
4. -2.0 Np, 5974 KHz control frequency; -4.0 Np, 306 KHz control frequency;
5. -1.7 Np, 5974 KHz control frequency;
6. -3.7 Np, 308 KHz control frequency
7. 308 KHz control frequency meter;
8. 308 KHz control frequency, $\geq$ 550 millivolts;
9. To the radio relay link transmitter, or to the multiplex equipment;
10. Pad 1, 0.1 Np;
11. D-5000 filter;
12. PK [?equalization trimmer network?];

[Key to Figure 11.13.1, continued]:

13. 308 KHz control frequency;
14. MK [?trunk compensation network?];
15. 308 KHz control frequency meter;
16. 5,974 KHz control channel receiver;
17. Line amplifier;
18. IL [?phantom line?].

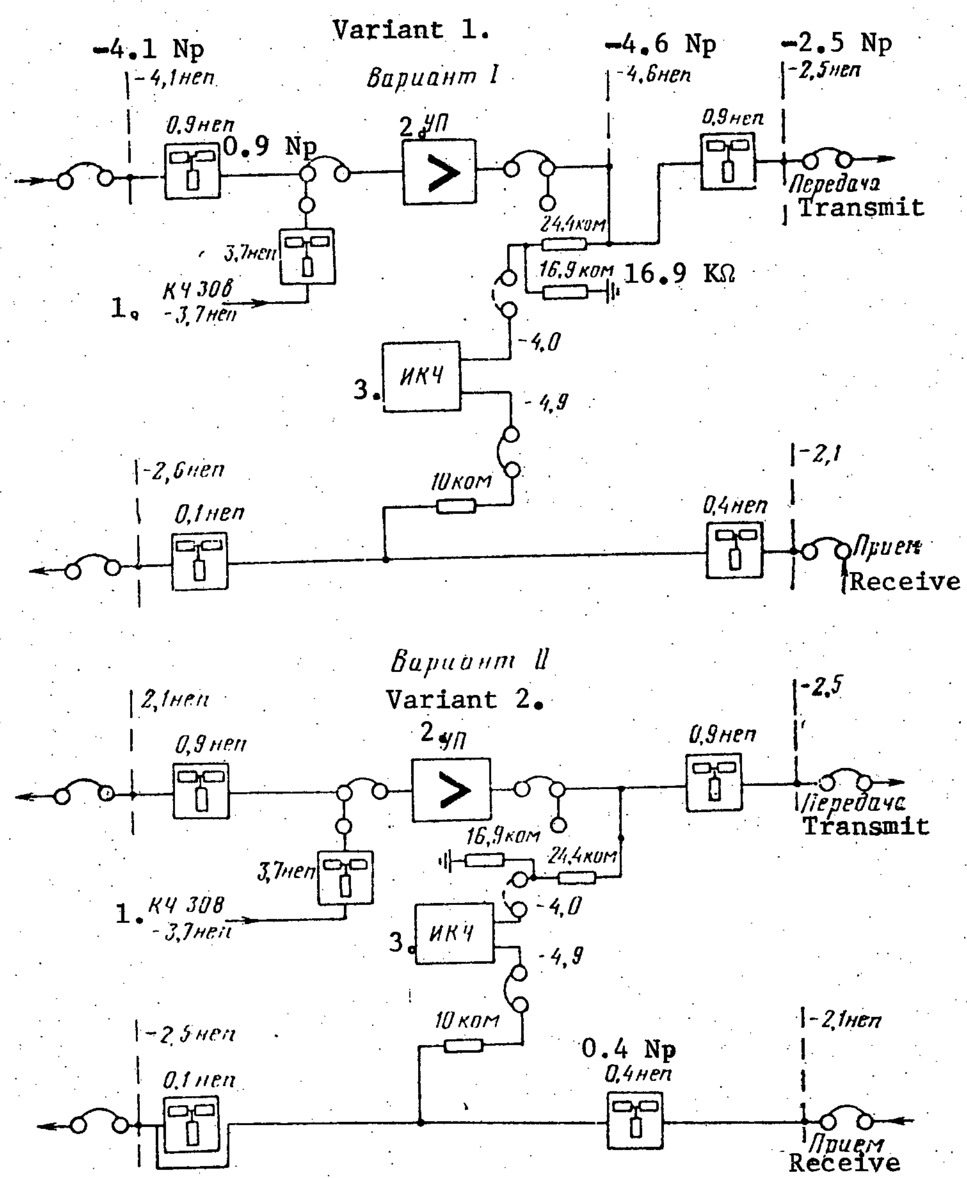


Figure 11.13.2. Block diagram of the two variants for the connection of the SLUR-2 racks of line amplifiers for radio relay links.

Key: 1. -3.7 Np, 308 KHz control frequency;
2. UP [?transmit amplifier?];
3. IKCh [control frequency meter].

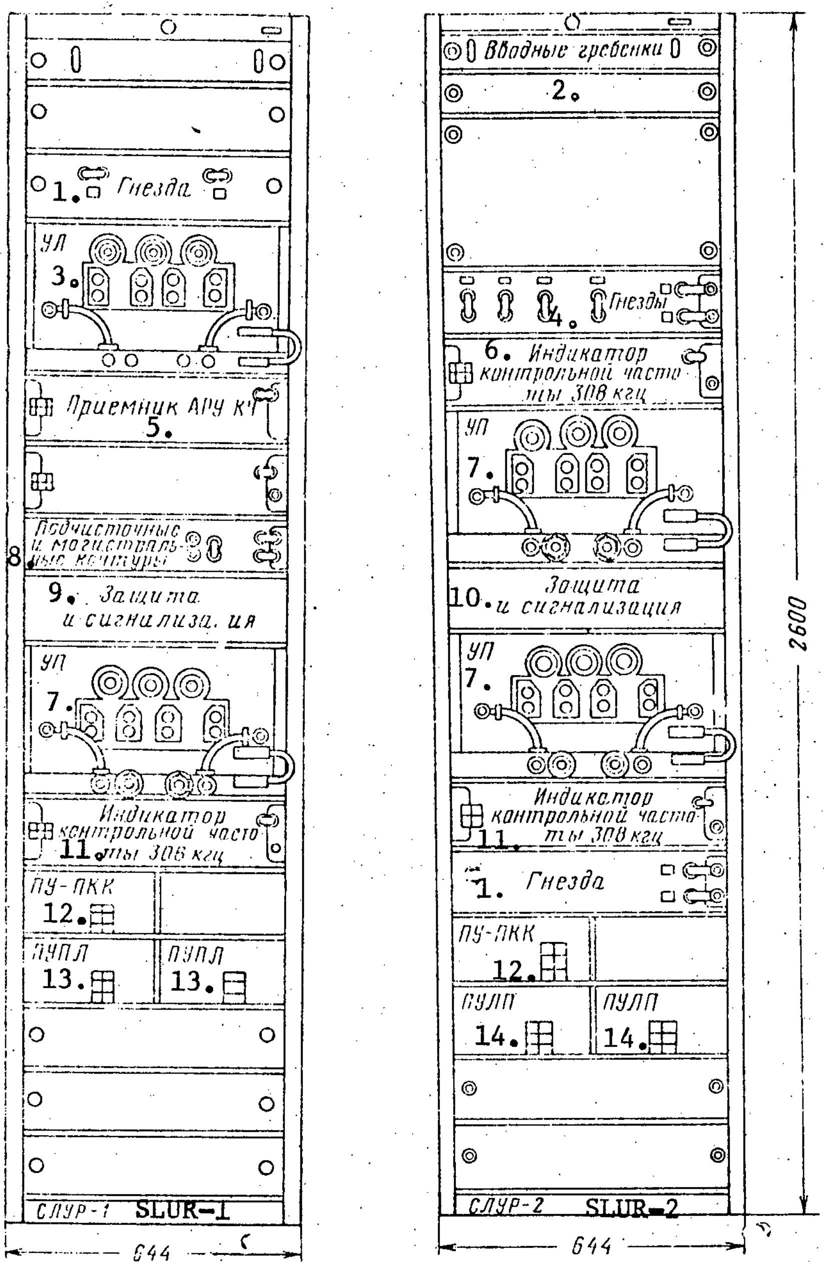


Figure 11.13.3. The placement of the equipment in the SLUR-1 and SLUR-2 rack of line amplifiers for radio relay links.

Key:
1. Jacks;
2. Input terminal blocks;
3. UL [?line amplifier?];
4. Jacks;
5. Control frequency AGC receiver;
6. 308 KHz control frequency indicator;
7. UP [?transmit amplifier?];
8. Trimmer and trunk equalization networks;
9, 10. Protection and signaling;
11. 308 KHz control frequency indicator;
12. PU PKK [control channel receiver switcher?];

[Key to Figure 11.13.3, continued];

13. PUPL [expansion unknown];
14. PULP [expansion unknown].

11.14. The UTK-60-1 Remote Monitor Unit

Figure 11.14.1.

Purpose

Intended for remote monitoring from a terminal or attended intermediate amplifier station in K-60 multiplex equipment of a balanced cable.

Equipment Complement

The unit consists of the UTK-60-1-OUP set, which can be set up at an OUP [attended repeater] or OP [terminal station], and the UTK-60-1-NUP set, which can be set up at an NUP [unattended repeater]. One UTK-60-1 set permits the monitoring of up to eight K-60 systems simultaneously. Included in the complement of the remote monitor unit are the monitor generators with stabilizing amplifiers, which are installed at the NUP of the K-60 systems being monitored, and the terminal receiver, which takes the form of a selective level meter for three fixed frequencies (set up only at OP's and OUP's).

Included in the set of the UTK-60-1-NUP remote monitor devices are the following:
A panel with plug-in blocks (two generators and four monitor frequency amplifiers, as well as a slide-out tray).
A set of decoupling devices for frequencies of 252.1 and 507.1 KHz, and included in the set are 16 angle iron bases with one RU 252.1 KHz and RU 507.1 KHz each [level controls] mounted on each base.
A set of components used when installing the panel in the VKS-NUP rack (screws, washers, getinax [paper/bakelite plastic] strips and insulation bushing inserts).
Spare parts (PM [expansion unknown] fuses for a current of 0.25 amps, two units).

Note: The components needed for normal operation of the UTK-60-1-NUP devices, installed at NUP's, are included with the UTK-60-1-OUP equipment set.

Included in the set of devices of the UTK-60-1-OUP remote monitor are the following:
Receive unit, PU (plug-in);
Panel of the block of monitor generators, BKG-1 (not plug-in);
Mobile console cart with a slide-out box for cords and the spare parst set (included in the set of cords are working and repair cords for NUP's and OUP's).
Standby blocks of amplifiers and generators for the panels of the UTK-60-1-NUP for two routes (A-B and B-A).

Note: At the present time, standardized remote monitor units have been designed for the K-60 and K-60p systems, which are incorporated as follows: A remote monitor console of the K-60 and K-60p systems for OUP's, the UTK-60-2-OUP; the remote monitor panel of the K-60 systems for the NUP's, the UTK-60-2-NUP. For K-60p NUP's, the monitor generator is mounted in the SPUN K-60p rack.

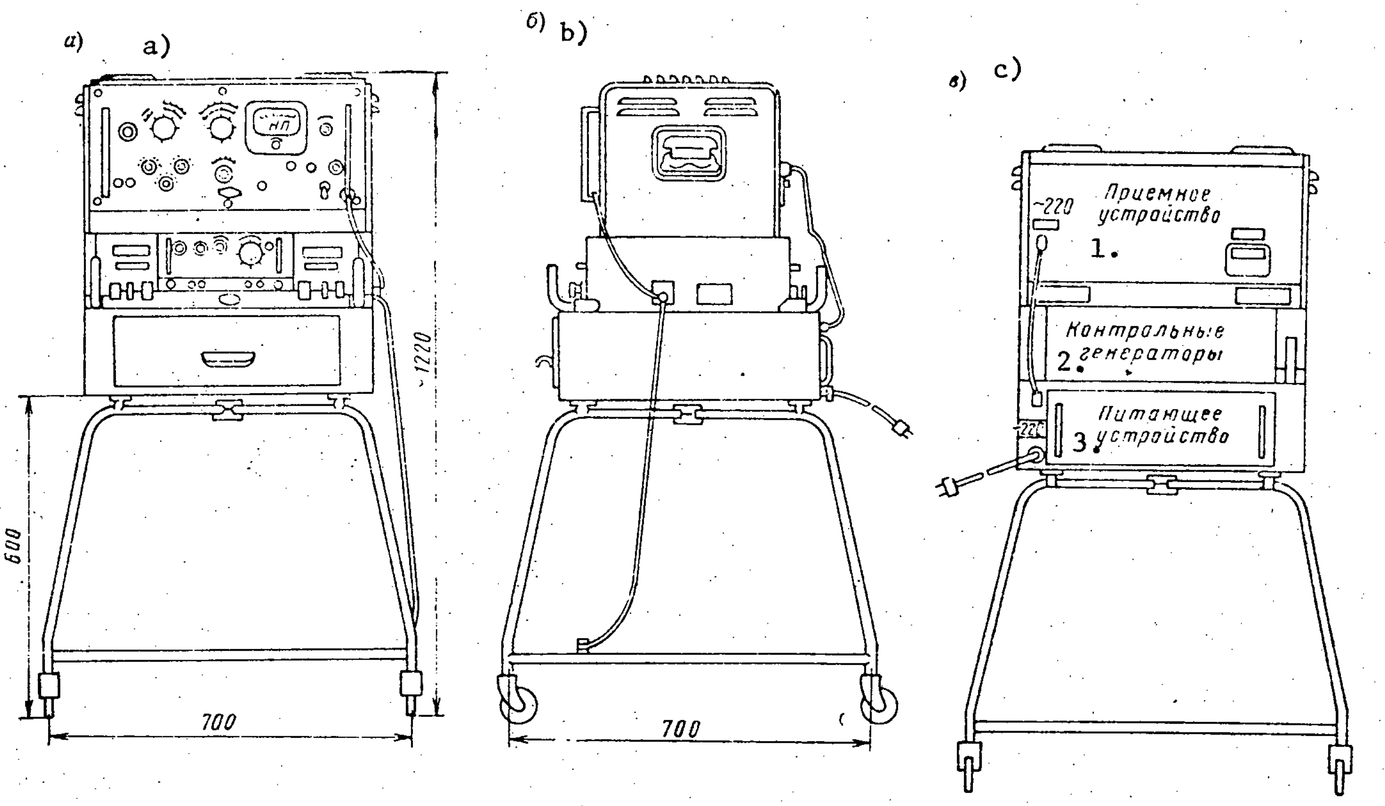


Figure 11.14.1. The UTK-60-1-OUP remote monitor set:
a) View from the front; b) View from the side; c) View from the rear.

Key: 1. Receiver;
2. Monitor generators;
3. Power supply.

SECTION 12. MEASUREMENT EQUIPMENT FOR COMMUNICATIONS CHANNELS AND SYSTEMS

12.1. The KS Set of Measurement Instruments

Figures 12.1.1 - 12.1.6.

Purpose

Intended for carrying out the main alignment and operational measurements of the group and line channels of communications systems, operating on coaxial cables, in a frequency range of from 60 KHz up to 10 MHz.

All of the instruments of the set are made in the form of portable instruments, intended for operation at terminal stations, attended repeater stations and in laboratories at temperatures of from +5 to +35° C, and a relative humidity of up to 80% at a temperature of 20 ± 5°C.

The Main Technical Data of the Set

The GI-KS Measurement Generator

The working frequency range: from 60 KHz to 10 MHz
The maximum output level into a load impedance of 75 ohms: 3.3 Np
The generator is designed for power supply from the AC mains at 127/220 volts ± 10%.
The power consumed from the mains is no more than 150 VA.
The dimensions of the instrument are 550 x 419 x 363 mm.
The weight is 37 kg.

The UU-KS Wideband Level Meter

The working frequency range: from 60 KHz to 10 MHz.
The measurement limits run from -6 Np up to +4 Np.
The input impedances of the instrument: 75 ohms ± 1%; 135 ohms ± 1%, and high impedance;
The input to the instrument is unbalanced with respect to ground.
The instrument is designed for a power supply from the AC mains at a voltage of 127/220 volts ± 10%.
The power consumed from the mains is no more than 70 VA.
The dimensions of the instrument are 442 x 330 x 272 mm.
The weight is 16 kg.

The IUU-KS Selective Level Meter

The working frequency range is from 0.3 to 10 MHz.
The measurement limits are from -9 to +2 Np.
The input impedances are 75 ohms ± 10%, 135 ohms ± 1%, and high impedance (10 Kohms, 20 pf).
The instrument is designed for a power supply from the AC mains at a voltage of 127/220 volts ± 10%.
The power consumption is no more than 170 VA.
The dimensions of the instrument are 598 x 459 x 300 mm.
The weight is 40 kg.

The KP-KS Connection Panel

In conjunction with the GI-KS and UU-KS, the KP-KS is intended for working attenuation and gain measurements.

The working frequency range is from 0 to 10 MHz.
The measurement limits for the working attenuation and gain are from 0 to 8.21 Np.
The characteristic impedance of the attenuator decade is 75 ohms.
The dimensions of the instrument are 600 x 359 x 262 mm.
The weight is 19 kg.

The FINCh Measurement Low Pass Filter

The FINCh is intended for suppressing the harmonic components of the measurement generator signal when making measurements, where the presence of these components causes an additional measurement error, or completely prevents carrying out the measurements.

The working range of the filter frequencies runs from 0.05 up to 20 MHz, and is broken down into 18 bands. The attenuation of each band in the passband is 0.2 Np. The attenuation of second harmonics in the frequency passband for each band is 3.5 Np for bands 1 - 13, and 3.0 Np for bands 14 - 16.

The filter is designed for operation between load impedances of 75 ohms. The dimensions are 536 x 301 x 192 mm. The weight is 14 kg.

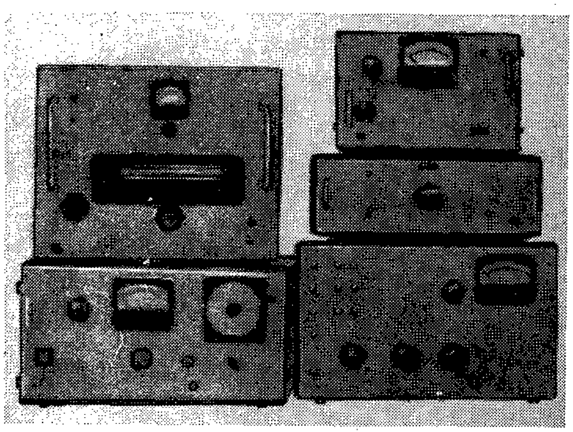


Figure 12.1.1. Exterior view of the KS set of measurement instruments.

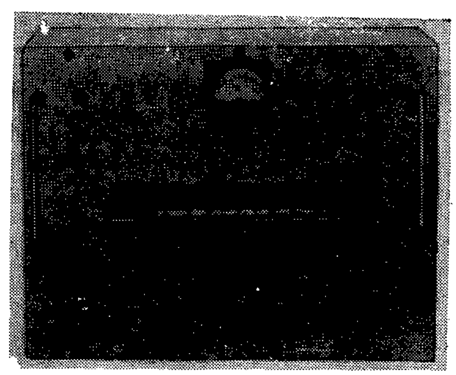


Figure 12.1.2. Exterior view of the GI-KS generator.

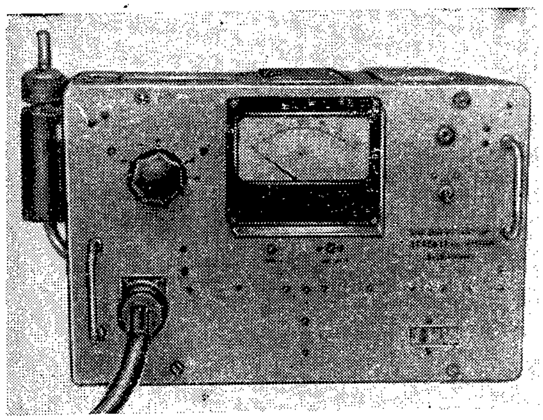


Figure 12.1.3. Exterior view of the UU-KS level meter.

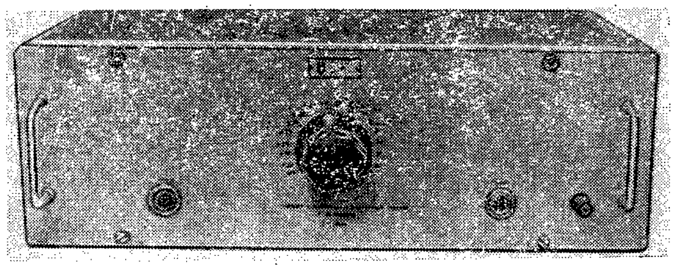


Figure 12.1.4. Exterior view of the FINCh low pass measurement filter.

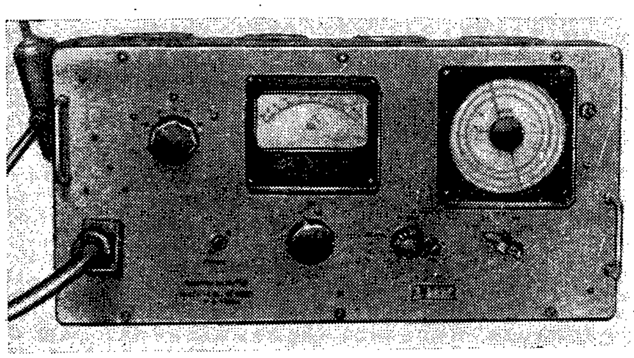


Figure 12.1.5. Exterior view of the IUU-KS selective level meter.

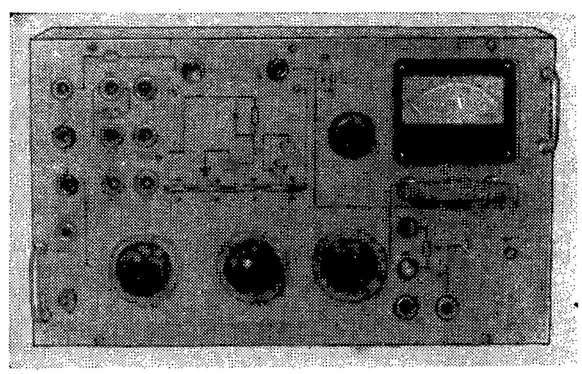


Figure 12.1.6. Exterior view of the KP-KS switching panel.

12.2. The IP-FCh Measurement Console Using Fixed Frequencies

Figure 12.2.1.

Purpose

Intended for utilization at attended stations of cable communications lines using the K-1920 transmission system. The measurements of the line channel can be carried out both with and without interrupting traffic in the system. The control console permits making tests and aligning the line channel without the terminal equipment, as well as the individual line amplifiers.

The Main Technical Data

The IG-FCh measurement generator:

The working frequencies, in KHz, are: 308, 434.7, 65.06, 1,056, 1,304.12, 1,552, 4,656, 8,544 and 5,974. The generator output is unbalanced with an output impedance of 75 ohms ± 15%, and in this case, the maximum output power is + 1 Np.

The UU-FCh selective level meter:

The working frequencies, in KHz, are: 308, 1,056, 1,552, 2,491, 3,372, 4,656, 8,544 and 5,974.
The level measurement range is from -6 to 0 Np.
The input to the instrument is unbalanced, both high and low impedance.

The INI-FCh nonlinear distortion meter:

Permits measuring levels from -11 to -5 Np at a fixed frequency of 1,304.12 KHz.
The input to the instrument is unbalanced, the input resistance is no less than 4.5 Kohm and the input capacitance is no more than 15 pf.
The instrument additionally provides for the measurement of levels from 0 to 1.0 Np at frequencies of 652.06 and 434.7 KHz with an input impedance of 75 ohms.

The FD-1304,12 Low Pass Filter:

Serves to suppress the harmonics of the IG-FCh generator when measuring the attenuation of the nonlinearity in four-pole networks. The characteristic impedance of the filter is Z = 75 ohms.

The filter suppresses the 1,304.12 KHz frequency, and passes frequencies of 434.7 and 652.06 KHz. The attenuation introduced by the filter at 1,304.12 KHz is no less than 7 Np, while the attenuation introduced by the filter at frequencies of 434.7 and 652.06 KHz is no more than 0.1 Np.

Connection Panel:

Serves for making the requisite connection of the instruments and the objects being measured.
The panel incorporates two paralleled coaxial jacks with a load of 75 ohms and three high impedance, paralleled coaxial jacks.

The power supply:

Provides power for the IP-FCh console from the AC mains at 220 volts ± 10%. The power consumption is 330 VA.

All the instruments of the control console are designed for operation where the ambient air temperature is from +10 to +40° C, with a relative humidity of up 85%.

The dimensions of the IP-FCh are 1,743, x 670 x 590 mm.

The weight is 123 kg.

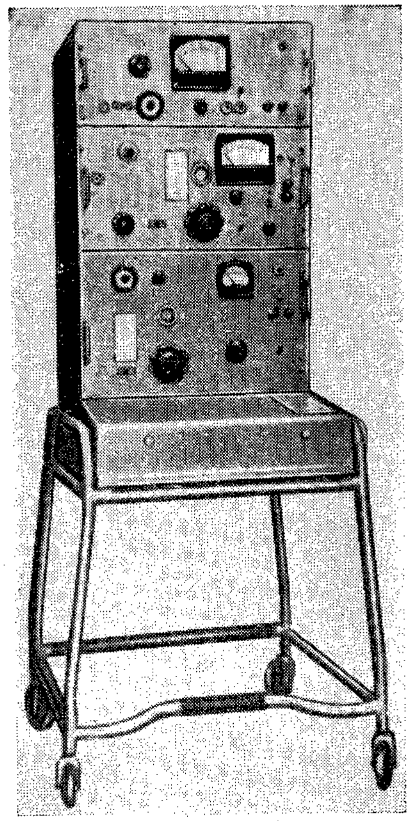


Figure 12.2.1. →
Exterior view of the IP-FCh measurement console.

12.3. The IP-300 Measurement Console

Figure 12.3.1.

Purpose

Intended for making operational and alignment measurements of channels, group and line channels, and long distance equipment assemblies in a frequency range of from 0.2 up to 300 KHz.

The IP-300 is designed for operation in an ambient air temperature of from +10 to +40° C, and a relative humidity of up to 85%.

The Main Technical Data

The IG-300 measurement generator:

The working frequency range is from 0.2 to 300 KHz.
The maximum output power throughout the entire working frequency range into a load of 600 ohms or 135 ohms is no less than one watt (+3.5 Np).

The generator output is balanced with respect to ground.
The scalar output impedance of the generator throughout the entire frequency range is 600 ohms + 15% and 135 ohms ± 15%.
The generator is designed for power supply from the AC mains at 110, 120 and 220 volts, ± 10%, with a power consumption of about 100 VA, or from DC sources at a voltage of 220 volts ± 10% and 24 volts ± 10%, with a filament current consumption of no more than 1.8 amps and a plate current consumption of no more than 0.2 amps.
The dimensions are 506 x 531 x 388 mm.
The weight is 31 kg.
The IG-300 can be used as a separate instrument.

The IU-600 Wideband Level Meter:

The working frequency range is from 200 to 600 KHz.
The measurement limits run from -6.0 to +3.0 Np.
The input impedance is 135 ohms, 600 ohms, and more than 6 Kohms.
The input is balanced with respect to ground.
The dimensions are 506 x 200 x 388 mm.
The weight is 13 kg.
The IU-600 can be used as a separate instrument.

The IRZU Working Attenuation and Gain Meter

The IRZU meter, in conjunction with the IG-300 and IU-600, makes it possible to measure the working attenuation and gain of balanced, equalized four-pole networks, which have nominal input and output impedance values of 600 or 135 ohms.
The frequency range is from 0.2 to 300 KHz.
The measurement limits for the working attenuation and gain run from 0.05 to 9.0 Np. The attenuator decades, which are included in the instrument circuitry, are designed with a characteristic impedance of 600 and 135 ohms, having a circuit configuration balanced with respect to ground.
The working frequency range of the attenuator decades runs from 0 to 300 KHz.
The maximum permissible power level to the input to the decades amounts to +3.5 Np.

The IUU-300 Selective Level Meter:

It is used in making a number of operational and alignment measurements in long distance service where noise and other signals are present, which should not influence the measurement results. The meter makes it possible to segregate the requisite frequency component from a multifrequency signal, and to measure its amplitude.
The working frequency range is from 5 to 300 KHz.
The measurement limits run from -7 to +3 Np.
The input to the instrument is balanced with respect to ground.
The input impedance: 600 ohms, 135 ohms and a high impedance input of no less than 10 Kohm.
The instrument is designed for a power supply from the AC mains at a voltage of 220, 127 and 170 [sic] volts with a power consumption of 25 VA, or from DC sources at 220 and 24 volts, with a plate current consumption of 0.02 amps

and a filament current consumption of 0.3 amps. The instrument is powered from the AC mains at 110, 127 and 220 volts with a power consumption of 35 VA, or from a DC source at 220 volts with a current consumption of 0.055 amps and a current consumption of 0.8 amps at 24 volts.

The dimensions are 506 x 300 x 388 mm.

The weight is 20 kg.

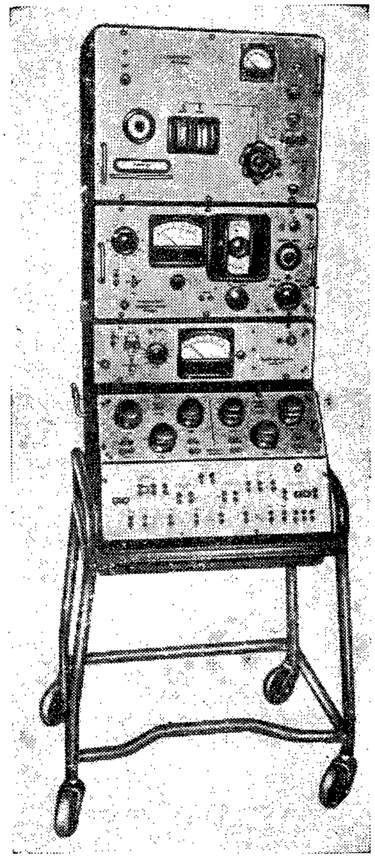


Figure 12.3.1. →

Exterior view of the IP-300 measurement console.

12.4. The LIG-DP-300 Remotely Powered Generator

Figure 12.4.1.

Purpose

Intended as a sinusoidal voltage source of 12 fixed frequencies for monitor and operational measurements at the attended and unattended repeater stations of cable and open wire communications lines.

The instrument is designed for operation in an ambient air temperature of from -10 to +45° C, and a relative humidity of up to 85%.

The Main Technical Data

The output of the instrument is balanced with respect to ground.
The output impedance is 135, 600 and more than 6,000 ohms.
The instrument generates the following frequencies: 17, 40, 53, 67, 80, 92, 103, 115, 143, 163, 199 and 247 KHz.

The maximum power level at the generator output is -1.5 Np.
The instrument is powered from remote sources at a voltage of 140 - 220 volts (through the IU-DP-300 level meter).
The dimensions are 313 x 215 x 232 mm.
The weight is 8.5 kg.

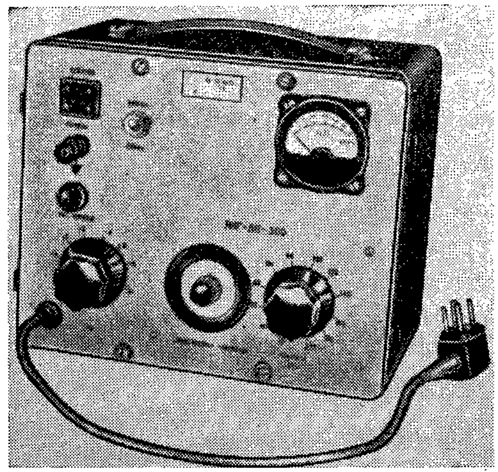


Figure 12.4.1. Exterior view of the LIG-DP-300 remotely powered generator.

12.5. The IU-DP-300 Remotely Powered Level Meter

Figure 12.5.1.

Purpose:

Intended for measuring voltage and power levels during operational and monitor measurements at attended and unattended repeater statations of cable communications lines (using vacuum tube type transmission systems). The instrument is designed for operation at an ambient air temperature of from -10 up to +45° C, and a relative humidity of up to 85%.

The Main Technical Data

The input to the level meter is balanced with respect to ground.
The input impedance is equal to 135 ohms + 15%, 600 ohms ± 5%, and more than 3 Kohms.
The measurement range of the meter runs from -6 to +3 Np.
The instrument is powered from remote DC sources at a voltage of 140 - 220 volts with a current consumption of 260 ma.
The IU-DP-300 also has the capability of providing the LIG-DP-300 generator with electrical power.
The dimensions are 214 x 150 x 296 mm
The weight is 7 kg.

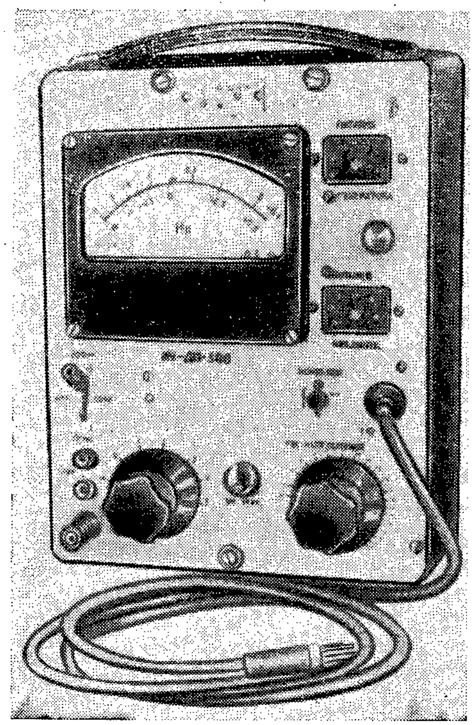


Figure 12.5.1. Exterior view of the IU-DP-300 remotely powered level meter.

12.6. The IP-KV Measurement Console

Figure 12.6.1.

Purpose

Intended for measurements in broadcast and telephone channels. Included in the equipment complement of the console are: a generator, the IU-KV level meter, a control panel with a low-pass filter and an attenuator decade; and the S6-1 (INI-12) nonlinear distortion meter.

The Main Technical Data

The measurement console provides for the measurement of voltage and power levels within limits of from -4 to +3 Np; for measurements of attenuation and gain within limits of from 0.05 to 8 Np; and for measurements of the nonlinear distortion in broadcast and telephone channels at frequencies of from 30 Hz to 16 KHz.

The console is powered from the AC mains at 110, 127 and 220 volts.

The power consumption is no more than 310 watts.

The measurement console is designed for operation in an ambient air temperature of from +10 to +40° C, and a relative air humidity of no more than 85%.

The dimensions are 1,594 x 695 x 645 mm.

The weight is 100 kg.

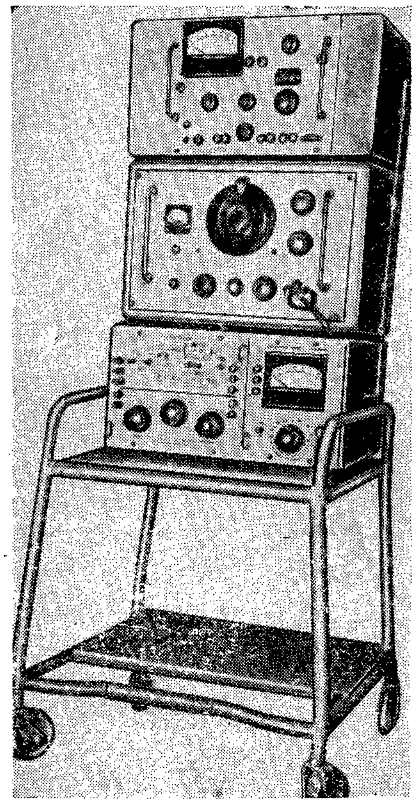


Figure 12.6.1. Exterior view of the IP-KV measurement console.

12.7. The P-320M Measurement Equipment Set

Purpose

Intended for making operational and alignment measurements of the channels of a line route and equipment in a range of from 0.2 up to 60 KHz.

The Main Technical Data

The LIG-60 Generator:

The working frequency range runs from 0.2 to 60 KHz.
The output power level is no less than +2 Np.
The output impedance of the generator is 600 ohms ± 5% for the output with fixed power levels of +2, +1 and 0 Np, and no more than 40 ohms for the low impedance outputs with fixed voltage levels of +1 and -1 Np. The generator can operate from the AC mains at 127 and 220 volts, or from DC at a voltage of 24 and 220 volts. The weight is 25 kg.

The UU-110 Level Meter

Intended for measuring levels at frequencies of from 0.05 to 110 KHz, and can also be used for measuring the working attenuation, crosstalk attenuation, and in conjunction with a high frequency attenuator decade, the scalar value of a characteristic impedance.
The measurement limits run from +3 to -6.0 Np.
The input impedances are: high impedance, more than 15,000 ohms, and low impedance, 600 ohms ± 30 ohms.
The instrument input is balanced.
The instrument can be powered from DC sources at 24 volts ± 10% and 220 volts ± 10%, as well as from the AC mains at 127 or 220 volts.
The weight is 25 kg.

The IGU-60 Selective Heterodyne Amplifier

Intended for measurements of power or voltage levels to determine the individual components with respect to the absolute magnitude and frequency. The range of frequencies runs from 0.5 to 60 KHz. The bandwidth is 35 ± 15 KHz. It is powered from DC sources at 24 and 220 volts, or from the AC mains at 127 or 220 volts. The weight is 30 kg.

12.8. The P-321 Instrument Case

Purpose

Intended for measuring the levels and working attenuation on cable and open wire communications lines.

The Main Technical Data

A generator for 24 fixed frequencies in a range of from 0.3 to 30 KHz.
A level meter with measurement limits from -6 to +3 Np.
The generator and level meter can not only be used together, but also independently of each other. The level meter has two values of input impedance: a high impedance of more than 10 Kohms, and a low impedance input of 600 ohms. The P-321 instrument can operate from the AC mains at 127 or 220 volts, or from DC at 24 volts.

The dimensions are 315 by 200 x 205 mm. The weight is 8 kg.

12.9. The SI-5 (SI-1) Pulse Oscilloscope

Purpose

Intended for the observation and study of pulse and periodic electrical processes. The instrument makes it possible to study pulses with widths of from 0.1 to 3,000 msec, to measure their duration and amplitude and to observe the traces for periodic processes and Lissajous figures.

The Main Technical Data

The range of frequencies runs from 20 Hz to 4,000 KHz.
The input impedance is 80 Kohms.

The sweep is continuous in nine bands, and provides for continuous control of the frequency within limits of from 20 Hz to 200 KHz.
The power is from the AC mains at 50 Hz at 127 or 220 volts, +5, -10%; from the AC mains at 400 Hz, at 115 volts, +5, -10%. The power consumption is 180 VA.
The dimensions are 430 x 360 x 220 mm. The weight is 18 kg.

12.10. The UNP-60 Noise Voltage Meter (Psophometric Noise Meter)

Figure 12.10.1.

Purpose:

Intended for the quantitative evaluation of noise in telephone and radio broadcast channels.

The noise meter can be used to measure the psophometric noise voltage in power supply circuits when DC voltage sources are present in them, and can also operate as a vacuum tube voltmeter for AC, measuring the effective value of a voltage.

The Main Technical Data

The measurement limits run from 0.1 mv to 10 v in ten ranges.
The frequency coverage of the vacuum tube voltmeter is from 50 Hz to 20 KHz.
The input to the meter is balanced.
The input impedance is 600 ohms ± 5%, or more than 8 Kohms.
The meter is powered: from the AC mains at 127 or 220 volts, or from a DC source at a voltage of 24 volts ± 10%, or 21.2 volts ± 3%.
The power consumption is no more than 50 watts with any power supply.
The instrument is designed for operation at an ambient air temperature of from +10 to +40° C, and a relative humidity of up to 80%.
The dimensions of the instrument with the protective cover are 486 x 270 x x 260 mm. The weight is 18 kg.

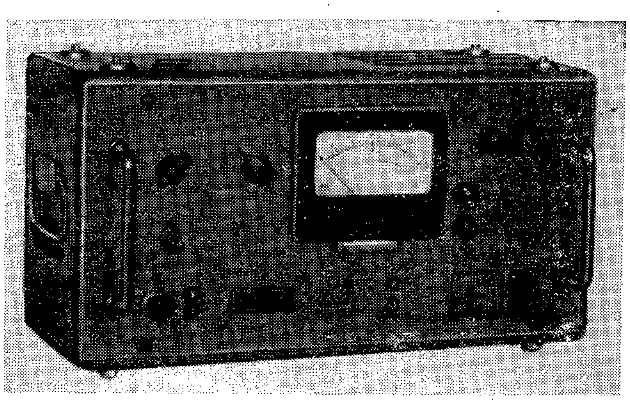


Figure 12.10.1. Exterior view of the UNP-60 psophometric noise meter.

12.11. The UU-NUP Level Meter

Purpose

Intended for measurements of the levels of monitor and measurement frequencies at 308, 1,552, 8,544 and 5,974 KHz at unattended repeater stations of the K-1920 system.

The Main Technical Data

The measurement limits are from -5 to 0 Np.
The instrument has a high impedance input with an input capacitance which does not exceed 20 pf.
The instrument can be powered from: The AC mains at 220 volts ± 10%; from a DC source at a voltage of 24 volts ± 10%; or from a DC source at 12.8 volts using a vibrator inverter.

The instrument power consumption does not exceed 40 watts.

The dimensions are 370 x 245 x 270 mm. The weight is 12.5 kg.

12.12. The UUD-10 Detector Type Level Meter

Purpose

Intended for measuring the levels of high frequency signals in transmission system equipment using coaxial cables.

The Main Technical Data

The working frequency range runs from 60 KHz to 10 MHz.
The measurement limits of the instrument are from 0 to 2 Np.
The input to the level meter is unbalanced with two values of the scalar input impedance: more than 1,000 ohms, and 75 ohms ± 5%.
The dimensions are 266 x 93 x 155 mm.
The weight is 2 kg.

12.13. The UUP-600 Semiconductor Level Meter

Figure 12.13.1.

Purpose

Intended for the operational measurements of signal levels in long distance communications equipment.

The Main Technical Data

The working frequency range runs from 250 Hz to 600 KHz.
The measurement limits are from -7 to +3.1 Np.
The input is balanced.
The input impedance is 135 ohms, 600 ohms, and high impedance at more than 6 Kohms.

The instrument is powered: from the AC mains at a voltage of 24 volts [sic]; from a DC source at a voltage of 24 volts; or from three internal batteries of the KBS-L-0.5 type.
The current consumption is no more than 6 ma (one set of batteries is good for 80 hours of instrument operation).
The level meter is designed for operation in an ambinet air temperature of from +10 to +35° C, and a relative humidity of up to 80%.
The dimensions are 260 x 180 x 135 mm. The weight is 4 kg.

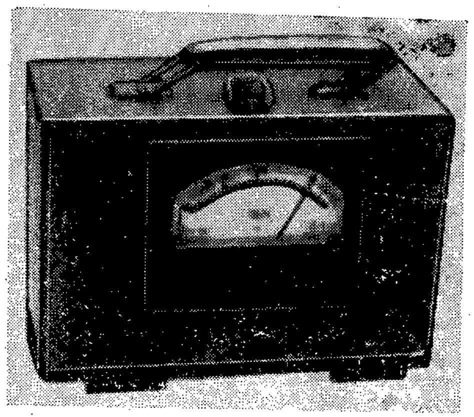


Figure 12.13.1. Exterior view of the UUP-600 transistorized level meter.

12.14. The KhI-10 ("Polosa") Amplitude-Frequency Response Meter

Figure 12.14.1.

Purpose

Intended for visual measurements of the amplitude-frequency response of both communications channels (when using two instruments) and four-pole networks (when using one instrument).
A provision is made in the instrument for the capability of operating in either the receive or transmit mode.

The Main Technical Data

The range of measurable frequencies runs from 0.2 to 30 MHz.
The maximum output voltage of the generator is one volt, and the minimum is 0.001 volt (changed in steps).
The output impedance of the generator is 75 ohms $\pm$ 5%.
The input capacitance of the meter is no more than 10 pf, and there is the capability of obtaining an input with an impedance of 75 ohms.

The instrument is powered from the AC mains at 50 Hz, and a voltage of 220 volts ± 10%.

The power consumption is 300 VA.

The dimensions are 550 x 320 x 410 mm. The weight is 28 kg.

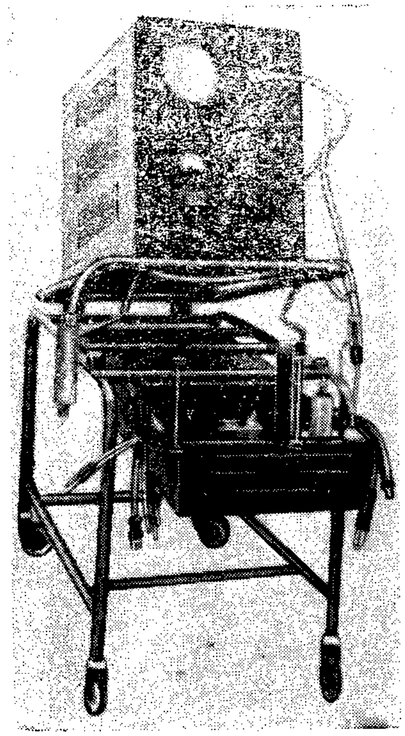


Figure 12.14.1.

Exterior view of the KhI-10 ("Polosa") amplitude-frequency response meter.

12.15. The KhI-17 ("Prognoz") Amplitude-Frequency Response Meter

Figure 12.15.1.

Purpose

Intended for measuring the amplitude-frequency response on the screen of a cathode ray tube for four-pole networks, both balanced and unbalanced with respect to ground, have concentrated and distributed parameters.

The Main Technical Data

The working frequency range is from 10 to 600 KHz.
The instrument measures an attenuation of up to 7 Np and a gain of up to 8.5 Np.
The maximum output level of the generator into a load of 135 ohms is no less than 2.5 Np.
The output impedance of the generator; 75 ohms ± 10%, 135 ohms ± 10%, 170 ohms ± 10%; and 600 ohms ± 10%. The 75 ohm output is unbalanced with respect to ground.
The imbalance attenuation of the generator for the output impedances of 135, 170 and 600 ohms is no less than 4 Np.
The oscilloscope of the instrument has three linear scales on the working section of the screen: 0.2 Np, 0.5 Np, 1.5 Np and a logarithmic 4.5 Np scale.

The input impedance of the indicators is 75 ohms ± 10%, 135 ohms ± 10%, 170 ohms ± 10%, 600 ohms ± 10%, and a high impedance input of no less than 2,000 ohms.

The instrument is powered from the AC mains at 50 Hz ± 2%, and a voltage of 220 volts ± 10%.

The power consumption of the instrument does not exceed 400 VA.

The dimensions are 340 x 440 x 625 mm.

The weight is 46 kg.

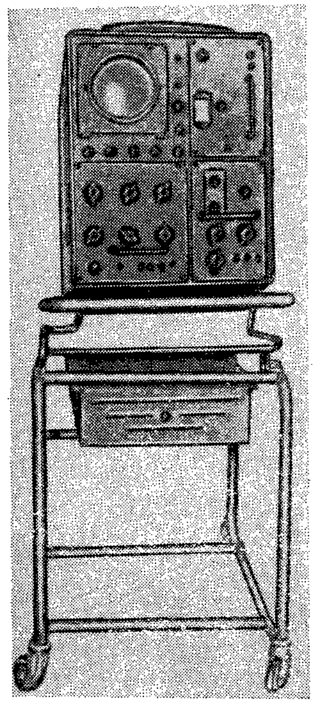


Figure 12.15.1.

Exterior view of the Kh1-17 ("Prognoz") amplitude-frequency response meter.

12.16. The 1-13A (IO-60) Pulse Oscilloscope

Figure 12.16.1.

Purpose:

Intended for the visual observation of pulses and periodic electrical signals, the measurement of amplitudes and widths of the signals being studied, the detailed study of a television signal with display of the part of the raster under consideration on a remote monitor unit, the study and alignment of video amplifiers and passive four-pole networks from the frequency response observed on the screen of the cathode ray tube.

The Main Technical Data

The vertical amplifier operates in two modes, depending on the passband. When the passband is from 2 Hz to 20 MHz: The nonuniformity in the frequency response is no more than 3 dB; the settling time is 0.02 microseconds; the nonlinearity in the amplitude characteristic for an oscilloscope trace height of 40 mm is no more than 5%.

When the passband is from 2 Hz to 6 MHz: the nonuniformity in the frequency response is no more than 3 dB; the settling time is 0.07 microseconds.

The output impedances of the vertical deflection channel are: 1 MOhm ± 10% with a parallel capacitance of 30 pf ± 5% (without the remote dividers), 75 ohms ± 10% with the special cable.

The measurement of the amplitude of the signals being studied covers a range of from 250 mv to 25 volts with a precision of 10%.

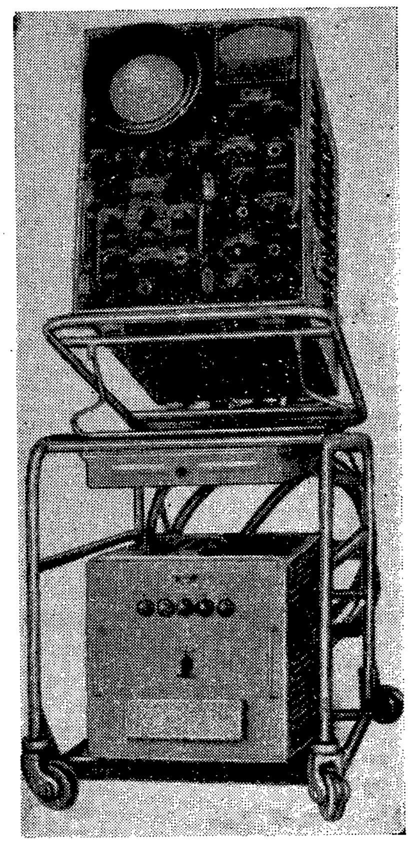


Figure 12.16.1. Exterior view of the S1-13A (IO-60) pulse oscilloscope.

The horizontal sweep amplifier, where the passband runs from 1 Hz up to 1.5 MHz, has a nonuniformity in the frequency response of no more than 3 dB.

The sweep generator can operate in the following modes: periodic, with a frequency of from 20 Hz up to 10 MHz; triggered by pulses of any polarity and with an amplitude of no less than 0.3 v effective.

For the case of TV measurements: the sweep generator, in the TV horizontal line separation mode, is triggered by a standard TV signal with a peak-to-peak value of no less than 0.5 v. For the display on a remote monitor of the section of a frame field being observed, a provision is made for the output of a blanking pulse of positive polarity with a peak-to-peak value of no less than 10 volts; the range of sweep pulse widths of the block for separating a horizontal TV trace runs from 5 to 20 microseconds.

When measuring frequency responses: the working frequency range is from 0.3 to 25 MHz. The maximum bandwidth which can be observed on the screen is 10 MHz, and the minimum is 1 MHz; the maximum output voltage is 1 volt; the output impedance is 75 and 50 ohms, ± 20%.

Power: from the mains at 50 Hz, 220 volts; or from a 400 Hz main at 115 volts.

The power consumption is 300 VA.

The oscilloscope is designed for operation where the ambient air temperature is from +10 to +35° C, and a relative humidity of up to 80%

The dimensions of the instrument in the set (on a cart) are 1,165 x 686 x 486 mm. The weight is 95 kg.

12.17. The S1-19 ("Primeta") Oscilloscope

Purpose

Intended for phase measurements using the Lissajous figure method, since the phase-frequency characteristics of the amplifiers are identical. The instrument is supplied in two variants: The S1-19 for laboratories and working on a line; The S1-19A for severe climatic conditions.

The Main Technical Data

The frequency range runs from 0 to 200 MHz. [sic]
The settling time is 2 microseconds.
The sensitivity is 50 mv/cm.
The input impedance is 75 ohms.
The maximum sync frequency is 20 KHz
The weight is 21 kg.
The dimensions are 257 x 500 x 362 mm.

12.18. The S5-3 ("Fil'tr") Low Frequency Harmonic Analyzer

Figure 12.18.1.

Purpose

Intended for measuring the frequency and the voltage of the individual frequencies of harmonic components of a complex signal, as well as for studying periodic processes in steady-state noise.

The Main Technical Data

The range of frequencies from 10 Hz to 20 KHz is convered with one linear scale having scale divisions of 10 Hz.

The voltage measurement limits are: 0.03 v; 0.1 v; 0.3 v; 1 v; 3 v; 10 v; 30 v; 100 v.

The input impedance is 100 KΩ ± 10%.

Powered from the AC mains at 220 volts ± 10%. The power consumption is 15 VA.

The dimensions are 508 x 340 x 348 mm.

The weight is 30 kg.

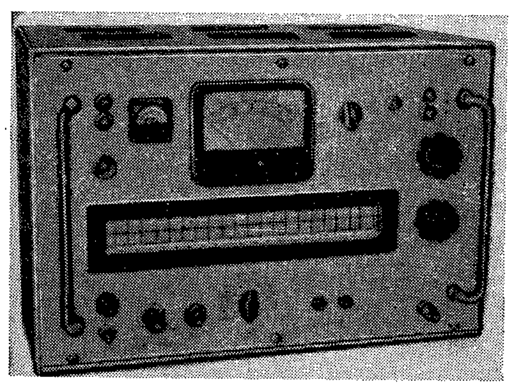


Figure 12.18.1. Exterior view of the S5-3 ("Fil'tr") low frequency harmonic analyzer.

12.19. The S6-1 (INI-12) or S6-1A ("Indiy-A") Nonlinear Distortion Meter
Figure 12.19.1.

Purpose

Intended for measurements of the nonlinear distortion factor of an audio frequency voltage in a range of from 20 Hz to 20 KHz. It is used only for low noise levels in voice frequency channels.

The Main Technical Data

Noise levels and voltages of from 0.003 to 300 volts are measured.
Power is from the AC mains at 220 volts +5%, -15%, and the power consumption is 100 VA.
The meter is designed for operation in an ambient air temperature of from +10 to +40° C, and a relative air humidity of no more than 85%.
The dimensions are 380 x 310 x 280 mm.
The weight is 18 kg.

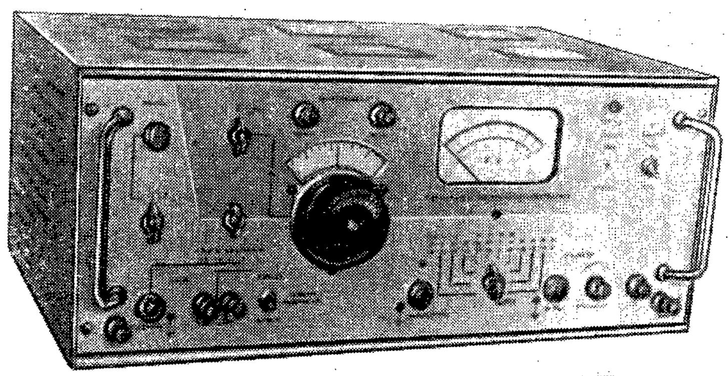


Figure 12.19.1. Exterior view of the S6-1 (INI-12) nonlinear distortion meter.

12.20. The VZ-13 Vacuum Tube Millivoltmeter ("Bokal-A")
Figure 12.20.1.

Purpose

Intended for measurements of the effective values of AC voltages with a sinusoidal waveform of from 0.3 mv up to 300 v in a frequency range of from 20 Hz to 1 MHz.

The instrument is also produced in the VZ-13T variant, suitable for use under tropical conditions, with measurement limits of from 1 mv to 300 v. The VZ-13 instrument replaces the VZ-2A.

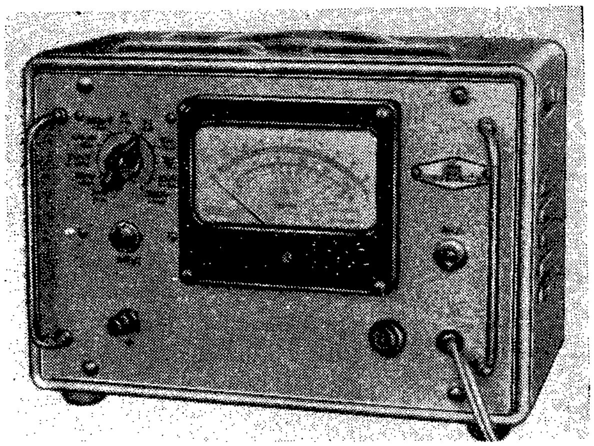


Figure 12.20.1. Exterior view of the VZ-13 ("Bokal-A") vacuum tube millivoltmeter.

The input impedance is no less than: 1 MOhm at 1,000 Hz; and 400 KOhms at 1 MHz.

It is powered from the AC mains at 220 volts, a frequency of 50 Hz, and the power consumption is 50 VA.

The instrument is designed for operation in an ambient air temperature of from -10 to +40° C, and a relative humidity of up to 85%.

The dimensions of the VZ-13 are 300 x x 220 x 185 mm; the VZ-13T: 325 x 270 x x 185 mm.

The weight of the VZ-13 is 6 kg, and that of the VZ-13-T is 8.5 kg.

12.21. The VK7-9 Voltohmmeter ("Inkrustatsiya")

Figure 12.21.1

Purpose

Intended for the measurement of DC voltages from 30 mv to 500 v, AC voltages from 100 mv to 1,000 volts, and resistances of from 10 to 1,000 Mohms. The VK7-9 voltohmmeter is also produced in the VK7-9T variant, suitable for use under tropical conditions. The VK7-9 instrument replaces the VK7-4 (VOLU-1).

The Main Technical Data

The range of measurable DC voltages runs from 30 mv up to 1,000 volts (scales of 0.3, 1, 3, 10, 30, 100, 300 and 1,000 volts); for AC voltages, from 100 mv to 1,000 volts (scales of 1, 3, 10, 30, 100, 300 and 1,000 volts).

The range of measurable frequencies runs from 20 Hz to 700 MHz.

The input impedance is no less than: 15 MOhms when measuring DC voltages; 3 MOhms when measuring AC voltages at 1,000 Hz.

It is powered from the AC mains at 220 volts, a frequency of 50 Hz; and at a voltage of 115 and 220 volts at a frequency of 400 Hz. The power consumption is no more than 26 VA.

The instrument is designed for operation in an ambient air temperature of from -30 to +50° C, and a relative humidity of up to 85%.

The dimensions: The VK7-9, 313 x 226 x 135 mm; VK7-9T, 295 x 235 x 190 mm.

The weight: The VK7-9, 6 kg; VK7-9T, 9 kg.

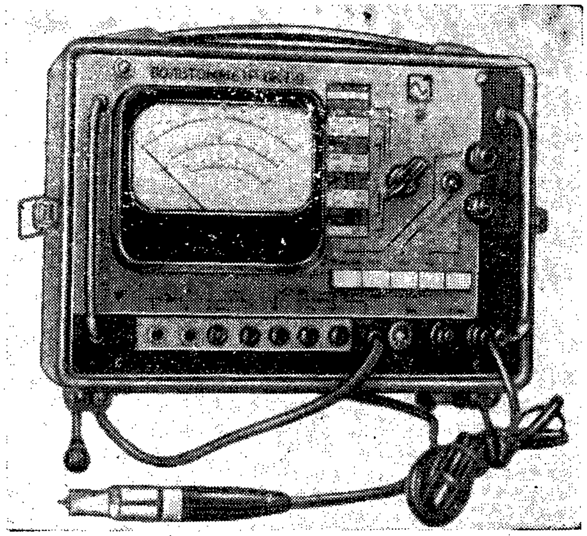


Figure 12.21.1. Exterior view of the VK7-9 voltohmmeter ("Inkrustatsiya").

12.22. The GZ-34 (ZG-16A) Audio Frequency Generator

Figure 12.22.1.

Purpose

Intended for the alignment and ajustment of communications equipment. It is a source of sinusoidal audio frequency signals.

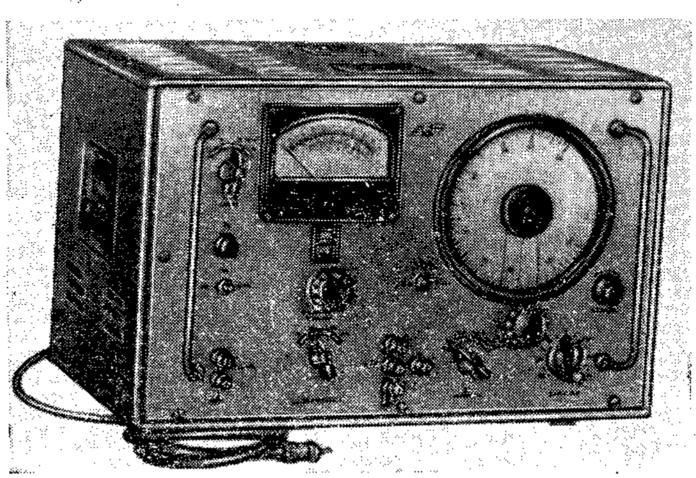


Figure 12.22.1.

Exterior view of the GZ-34 (ZG-16A) audio frequency generator.

The Main Technical Data

The range of frequencies is from 20 Hz to 20 KHz (three bands).
The nominal output power is 0.5 watts, and the maximum is 5 watts.
It is powered from the AC mains at 50 Hz, a voltage of 220 volts ± 10%.
The power consumption is 150 VA.
The instrument is designed for operation in an ambient air temperature of from +10 to +35° C, and a relative humidity of up to 60%.
The dimensions are 510 x 340 x 350 mm.
The weight is 30 kg.

12.23. The G6-2 ("Standart") Television Test Signal Generator

Figure 12.23.1.

Purpose

Intended for monitoring and measuring the parameters of television channels and equipment of radio relay and cable communications links by means of special signals.

The Main Technical Data

The test signals put out by the generator make it possible to measure the transient and frequency response characteristics; echo signals and streaking; the ratio of the peak value of a signal to the effective noise value; the ratio of the peak value of a signal to the quasi-peak noise value; to check the operability of the black level clamping devices and other parameters of the television equipment and communications gear.

Equipment Complement

The generator takes the form of a set of the following instruments:

Sync generator. Generates blanking and sync pulses. The dimensions are 480 x 445 x 300 mm. The weight is 25 kg.

Output unit with a trapezoidal and sinusoidal signal generator at a frequency of 15,625 KHz [sic]. The dimensions are 480 x 265 x 450 mm. The weight is 22 kg.

Sawtooth and staircase generator. Generates a test signal. The dimensions are 410 x 265 x 420 mm. The weight is 16 kg.

A sine-squared pulse generator. Generates a test signal. The dimensions are 410 x 265 x 420 mm. The weight is 16 kg.

The signal generator for checking the transient and frequency response characteristics. The dimensions are 410 x 265 x 270 mm. The weight is 14 kg.

The "Okoshko" ["Window"] signal generator. Generates pulses corresponding to a black window against a white background, or vice-versa. The dimensions are 410 x 265 x 270 mm. The weight is 14 kg.

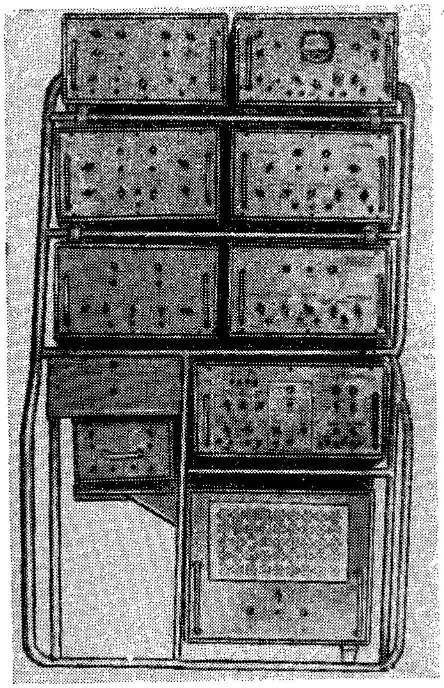


Figure 12.23.1. Exterior view of the G6-2 ("Standart") television test signal generator.

Measurement filter. Takes the form of an amplifier with a bandwidth of 1.2 - 6 MHz having a gain of 10 and a nonuniformity in the frequency response of 10%. The dimensions are 260 x 180 x 160 mm. The weight is 6 kg.

The G6-2 instrument. Put together as a set of two signal/noise ratio meters and the S1-13 oscilloscope.

All of the blocks are placed together on a rack on a mobile cart. The instruments included in the equipment complement have independent power supplies. The instruments are powered from the AC mains at 50 Hz with a voltage of 220 v ± 10%.

The power consumed by all of the instruments of the unit amounts to 1.1 KVA. The dimensions of the unit with the cart are 1,740 x x 960 x 740 mm. The weight is 170 kg.

Note: At the present time, the G6-2 has been taken out of production and replaced by the G6-8. The G6-8 is completely transistorized. It is made in the form of a portable, single block desk-top instrument. The dimensions are 490 x 215 x 475 mm, and the weight is 20 kg.

12.24. The Li-3 (MILU-1) All-Purpose Tube Tester

Figure 12.24.1.

Purpose

Intended for measuring the parameters and registering the static characteristics of vacuum tubes.

The Main Technical Data

The measurement limits are: Up to 300 volts for the plate and screen grid voltage; up to 70 volts for the control grid voltage; up to 15 volts for the filament voltage; plate current up to 150 ma; screen grid current up to 15 ma; up to 300 ma for the rectified current of vacuum tube rectifiers; leakage current and reverse current of from 0.75 to 150 microamps.

Power supply: From the AC mains at 50 Hz and 110, 127 or 220 volts; from a 400 Hz AC main at a voltage of 115 volts.

The power consumption is 300 VA.

The dimensions are 510 x 312 x 235 mm. The weight is 22 kg.

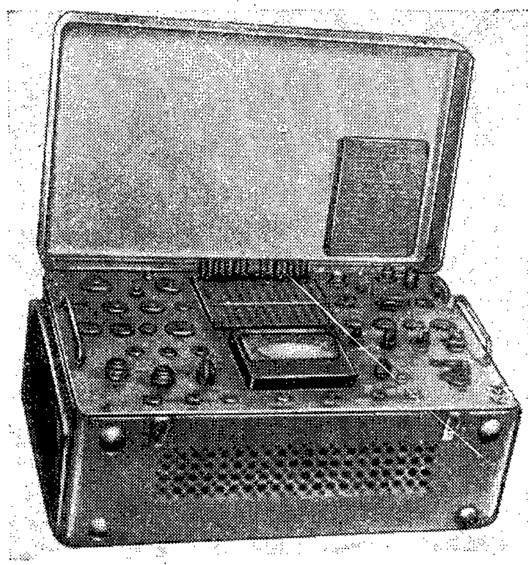


Figure 12.24.1. Exterior view of the L1-3 (MILU-1) all-purpose tube tester.

12.25. The ChZ-3A ("Kayma") Frequency Counter

Purpose

Intended for measuring the frequency and period of sinusoidal signals, the time interval and width of pulses, and counting electrical oscillations.

The Main Technical Data

The frequency range runs from 10 Hz to 1 MHz for the case of frequency measurement, and when measuring periods, from 1 to 10,000 Hz.

The input signal level: when measuring frequency, from 0.05 to 100 volts; when measuring the duration of periods, from 1 to 100 volts; and when measuring pulse widths and time intervals, from 1 to 100 volts.

The dimensions are 500 x 360 x 340 mm. The weight is 27 kg.

12.26. The L2-1 (IPT-1) Junction Transistor Tester

Purpose

Intended for the rapid determination of the suitability of low power junction transistors, and measuring some of their parameters. A provision is made in the instrument for the capability of checking the breakdown between the emitter and collector.

The Main Technical Data

The following parameters are measured in a common base configuration at a frequency of 700 Hz: the gain from 0.9 to 1, with an error of no more than ± 5%; the maximum output conductance of from $0.4 \cdot 10^{-6}$ to $4 \cdot 10^{-6}$ mhos, with an error of no more than ± 10%; the reverse collector current, from 2 to 50 ma, with an error of no more than ± 2.5%.

The parameters of junction transistors are measured in one DC mode with a collector voltage of 4.5 volts and an emitter current of 1 ma. The power comes from two KBS-05 batteries.

The dimensions are 210 x 150 x 90 mm. The weight is 2 kg.

Note: At the present time, the L2-1 has been taken out of production, and the L2-23 is being manufactured to replace it.

12.27. The MZ-600 and MZ-135 Attenuator Decades for up to 300 KHz.

Figure 12.27.1.

Purpose

Intended for determining the attenuation and gain of four-pole networks by the comparison method.

Figure 12.27.1. The exterior view of the MZ-600 and MZ-135 attenuator decade for up to 300 KHz.

The Main Technical Data

The working attenuation range is from 0 to 15.21 Np in steps of 0.01 Np. The working frequency range is from 0 to 300 KHz.

The characteristic impedance of the MZ-600 attenuator decade is 600 ohms, and 135 ohms for the MZ-135. The maximum permissible level is +3 Np.

The instrument panel is designed for operation in an ambient air temperature of from +10 to +40° C, and a relative air humidity of no more than 85%. The dimensions are 506 x 200 x 260 mm. The weight is 9.5 kg.

12.28. The KIP-2 Monitor-Measurement Instrument

Figure 12.28.1.

Purpose

Intended for monitor and preventive measurements of the currents of vacuum tubes (cathode activity), as well as voltages and resistances in the equipment of terminal stations, attended repeaters and unattended repeaters in the K-1920 system, and can also be used for these measurements (with the exception of cathod activity) in the KV-12, K-24-2 and K-60 systems.

The Main Technical Data

The measurement limits for DC voltages are from 0 to 300 volts with scales of 0.3, 3, 10, 30 and 300 volts.
The measurement limits for AC voltages are from 0 to 300 volts with scales of 10, 30 and 300 volts.
The instrument measures direct current from 0 to 1 ampere with scales of: 10, 30, 300 ma, and 1 amp.
The instrument measures the emission current and cathode activity of vacuum tubes, as well as the current in the circuits of transistors.
The instrument makes DC resistance measurements of from 0 to 2 MOhms. The dimensions are 252 x 200 x 146 mm. The weight is 1.5 kg.

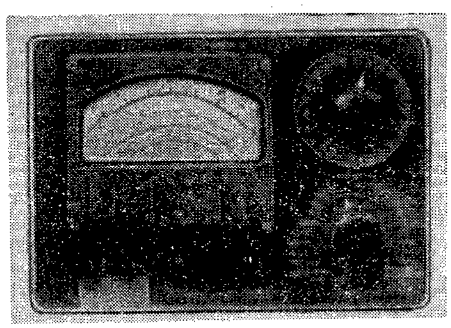


Figure 12.28.1. Exterior view of the KIP-2 monitor-measurement instrument.

12.29. The MZ-10-2 Attenuator Decade for up to 10 MHz

Purpose

Intended for measuring attenuation in a frequency range of from 0 to 10 MHz.

The Main Technical Data

The working frequency range is from 0 to 10 MHz. The characteristic DC resistance of the instrument is 75 ohms $\pm$ 1%. The overall attenuation of the instrument is 8.21 Np with the capability of changing it in steps of 0.01 Np.

The weight is 12.5 kg.

12.30. The E-59 Voltmeter

Purpose

Intended for measuring AC voltages.

The Main Technical Data

The measurement ranges are: 7.5, 15, 30 and 60 volts or 75, 150, 300 and 600 volts.
It has an extended frequency range of from 90 to 200 KHz. The dimensions are 145 x 200 x 86 mm.
The weight is 2 kg.

12.31. The AVO-5M Voltammeter

Purpose

Intended for measuring DC and AC currents and voltages, as well as DC resistances.

The Main Technical Data

The measurement limits: for DC and AC voltage, from 0.6 to 6,000 volts; direct and alternating currents, from 60 microamps to 12 amps; DC resistance from 3 ohms to 3 MOhms; and the frequency range is from 50 to 1,000 Hz.
The dimensions are 230 x 265 x 180 mm.
The weight is 8 kg.

12.32. The Ts-435 Voltammeter

Figure 12.32.1.

Purpose

Intended for measuring the current and voltage in AC and DC circuits at frequencies of from 45 to 10,000 Hz, as well as DC resistance and capacitance.

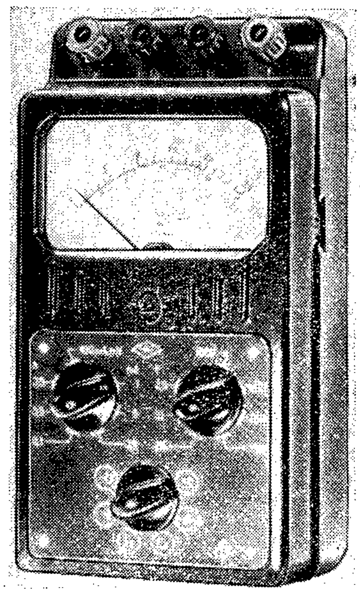


Figure 12.32.1. Exterior view of the Ts-435 voltammeter.

The Main Technical Data

The measurement limits: DC voltage, 75 mv, and 2.5 - 1,000 v; direct current, 50 microamps, and 1 - 100 ma, 0.5 - 2.5 amps; AC voltage, from 2.5 to 1,000 volts; DC resistance, from 3 KOhms to 3 MOhms; capacitance, 0.5 microfarads.

The instrument is designed for operation at an ambient air temperature of from -15 to +40° C, and a relative humidity of up to 80%.

The dimensions of the instrument without the case are 110 x 205 x 84 mm.

The weight of the instrument without the case is 1.3 kg.

The dimensions of the instrument with the case are 258 x 200 x 100 mm.

The weight of the instrument with the case is 2.7 kg.

12.33. The VIZ-2B Instrument for the Visual Measurement of Crosstalk Attenuation

Figure 12.33.1.

Purpose

Intended for measuring the frequency characteristics of the crosstalk attenuation in the process of balancing a symmetrical high frequency cable with respect to either near-end or far-end crosstalk attenuation.

The Main Technical Data

Frequency range: I. From 12 to 150 KHz; II. From 15 to 300 KHz.

The maximum output level of the generator into a load of 170 ohms is + 3 Np.
The maximum measurable crosstalk attenuation is 16 Np.
The input to the indicators is a balanced, transformer coupled 800 ± 100 ohm input.
Plug-in load resistances of 135 and 170 ohms make it possible to obtain an input impedance of the indicator of 600 ohms ± 10%.
The duration of a single phase trace of the characteristic on the screen of the cathode ray tube is 1.25 seconds.
The diameter of the CRT is 120 mm.

The power is from storage batteries at 220 volts and 6.5 volts; from the AC mains at 110, 127, 220 volts ± 10%; and from a DC supply at 12 volts through a semiconductor voltage converter.

Direct current consumption: Total plate current, no more than 220 ma; total filament current, no more than 6.5 a. When powered from the 12 volt source, the generator uses no more than 4.5 a, and the indicator no more than 6.5 a. The power consumption from the mains: generator, no more than 50 VA; indicator, no more than 75 VA.

The dimensions of the generator are 350 x 265 x 197 mm, and those of the indicator are 280 x 405 x 450 mm.

The weight of the generator is 14 kg, and that of the indicator 29 kg.

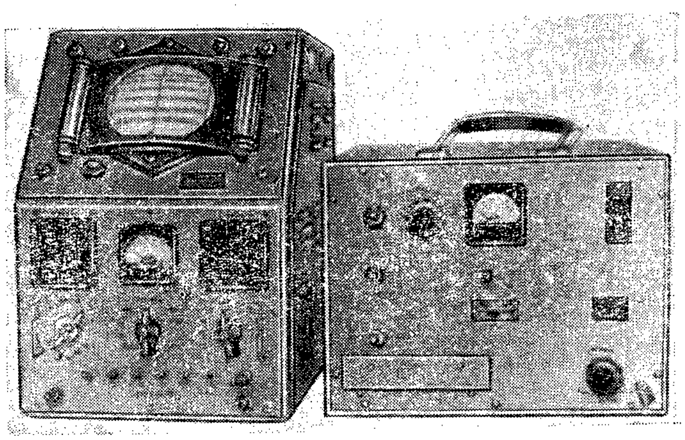


Figure 12.33.1. Exterior view of the instrument for the visual measurement of crosstalk attenuation, the VIZ-2B.

12.34. The UIP-5k Pulse Tester

Figure 12.34.1.

Purpose

Intended for determining the inhomogeneities in a coaxial cable.

The Main Technical Data

The length of a cable section which can be inspected is 9 km, with the capability of simultaneously looking at individual sections of it with lengths of from 200 to 1,000 m (over the entire screen).

The output impedance of the instrument is 75 ohms ± 10%.

The instrument has calibration markers in the form of a sinusoidal curve with a period corresponding to 20 m of cable length.

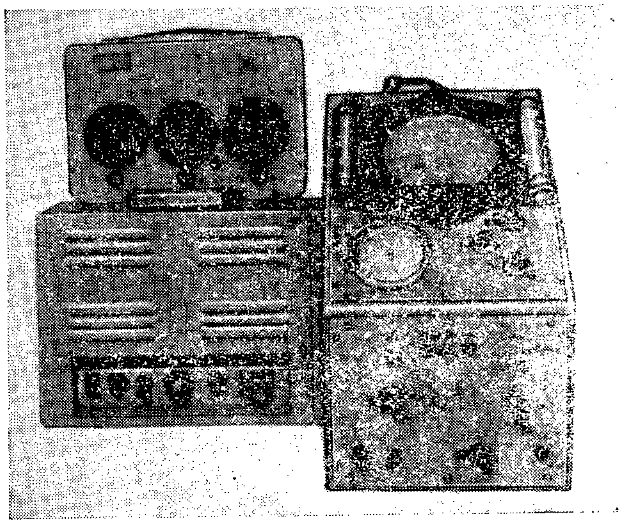


Figure 12.34.1. Exterior view of the UIP-5k pulse tester for determining the inhomogeneities in a coaxial cable.

The instrument is powered completely from the AC mains at voltages of 110, 127 or 220 volts.

The power consumption is about 370 VA.

Attached to the instrument are a loading network, which has a characteristic impedance of 75 ohms, with the capability of varying this nominal value by ± 0.7 ohms, and supplemental instrument cords.

The instrument is structurally packaged in the form of two portable units (the instrument and the power supply block for it). Included in the set are cords with a length of 30 - 40 m, something which permits locating the instrument at a distance from the excavation, or conducting the measurements from a motor vehicle.

The dimensions of the instrument are 460 x 390 x 230 mm. The weight is 14 kg.

The dimensions of the power supply block are 330 x 250 x 190 mm. The weight is 18 kg.

12.35. The KM-61s Cable Instrument

Figure 12.35.1.

Purpose:

Intended for measuring the parameters of a communications line, and it permits the measurement of the DC resistance, the ohmic imbalance of a circuit, the insulation resistance, capacitance, and distance to various types of faults.

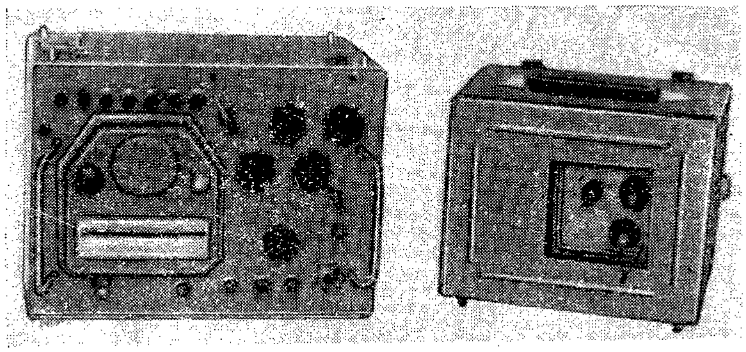


Figure 12.35.1. Exterior view of the MK-61s cable tester.

The Main Technical Data

The KM-61s instrument permits the measurement of the following: loop resistance within limits of from 0.1 to 10^5 ohms; ohmic imbalance within limits of from 0.1 to 100 ohms; insulation resistance within limits of from 10^4 to 10^{10} ohms; capacitance within limits of from 0.001 to 5 microfarads.

The instrument is powered: from the AC mains at voltages of 24 volts $\pm$ 10%, 36 volts $\pm$ 10% or 220 volts $\pm$ 10%; from batteries with voltages of 11.5 - - 14 volts.
The power consumption: from the AC mains, no more than 5 VA; from dry or storage batteries, no more than 3 watts.

The instrument is designed for operation at an ambient air temperature of from -30 to +50° C, and a relative humidity of up to 98%.

The dimensions of the instrument are 397 x 320 x 232 mm. The weight is 18 kg.

12.36. The Sent of Instruments for Testing the Electrical Strength of Cable Insulation and Determining the Location of Points of Reduced Strength (IPI-1, VKM-1 and IMP-1)

Figures 12.36.1 - 12.36.3.

Purpose

Intended for testing the electrical strength of cable insulation and determining the location of points of reduced strength.

The insulation strength of a cable is test with the IPI-1 instrument.

If the electrical strength of cable insulation proves to be below a set norm, then within the limits of the amplifier section, the location of the breakdown is determined by the VKM-1 instrument, which is powered from the IPI-1. The

The point of lowered electrical strength of the cable insulation is determined within a precision of 100 - 150 m, i.e. within the limits of a structural reel length. After uncovering the coupling closest to the point found with the first measurement, the fault location is determined with the VKM-1 instrument with an accuracy of a few meters. It can then subsequently be found with a precision of a few centimeters by means of the IMP-1 instrument.

The Main Technical Data

The IPI-1 Insulation Strength Tester

The output voltage is from 0 to 3,000 volts. (It is possible to obtain a voltage of up to 3,500 v from the instrument).
The tester permits the measurement of leakage in the cable insulation of down to 50 microamperes. The time for charging a capacitor of 4 microfarads up to 90% of the set voltage of 3,000 volts is no more than 20 seconds.
The IPI-1 derives its power from the AC mains at voltages of 220 volts ± 10%, and 24 volts ± 10%; and from a DC circuit with a voltage of 12 volts ± 10%.

The AC power consumption is 2 VA, and the DC power consumption is 3 watts.

The instrument is designed for operation at an ambient air temperature of from -30 to +50° C, and a relative humidity of up to 98%.

The dimensions are 325 x 190 x 265 mm. The weight is 9 kg.

The VKM-1 High Voltage Cable Bridge

The instrument permits the measurement of cables with a loop resistance of up to 2 x 1,000 ohms. The power for the bridge comes from the power source of the IPI-1 at a voltage of up 3 - 3.5 KV.

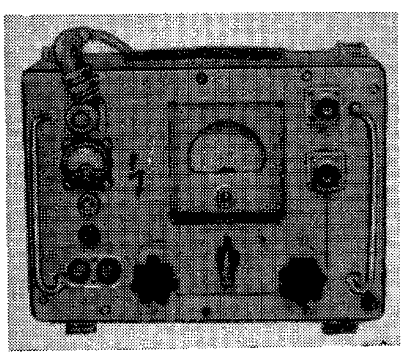


Figure 12.36.1. Exterior view of the IPI-1 electrical insulation strength tester.

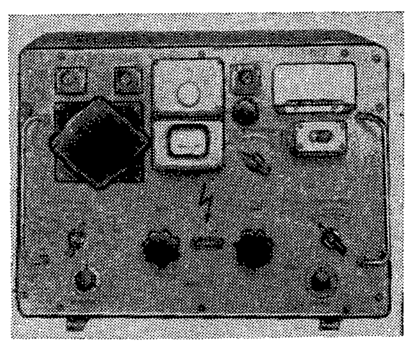


Figure 12.36.2. Exterior view of the VKM-1 high voltage cable bridge.

The instrument has switchable storage capacitors of one microfarad, two mfd, and four mfd.

The instrument is designed for operation at an ambient air temperature of from -30 to +50° C, and a relative humidity of up to 98%.

The dimensions are 260 x 403 x 325 mm. The weight of the instrument without the packing box is 16 kg, and with the packing box, 50 kg.

The IMP-1 Fault Point Finder

The error in determining the location of a fault with double-ended measurement is ± 50 mm.

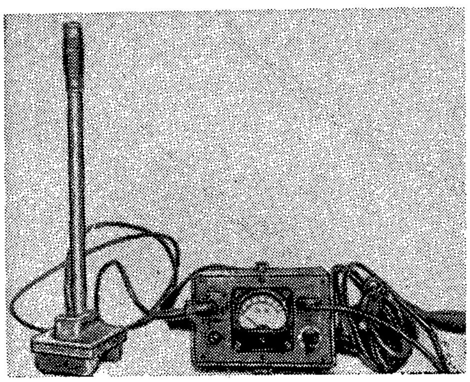


Figure 12.36.3. Exterior view of the IMP-1 finder for the location of a breakdown in cable insulation.

The indication is either aural or on a meter.
The amplifier sensitivity using the meter in the passband is no less than 8 μa/μv.
The amplifier is powered by six batteries.

The instrument is designed for operation at an ambient air temperature of from -30 to +50° C, and a relative humidity of up to 98%.

The dimensions of the amplifier are 203 x 147 x 143 mm; the length of the coupling rod of the transducer is 1,195 mm. The dimensions of the packing box are 415 x x 270 x 230 mm.

The weight of the amplifier is no more than 3 kg, the weight of the transducer is no more than than 1.5 kg, and the weight of the set in the packing box is no more than 12.5 kg.

12.37. The R5-1A (IKL-6) Cable Line Tester

Figure 12.37.1.

Purpose

Intended for determining the distance to a fault on open wire and cable, electrical power transmission and communications lines.

The Main Technical Data

The instrument permits measurements of the following: High voltage open-wire electrical power transmission lines with lengths up to 300 km;, open-wire communications lines with lengths up to 300 km; high-power, high voltage cable lines with lengths up to 10 km; KMB coaxial communications cables with lengths up to km.

The instrument is powered from the AC mains at 220 volts, or from DC at 24 volts using the PPT-2 DC converter.

The power consumption is 200 watts.
The dimensions are 557 x 271 x 395 mm.
The weight is 23 kg.

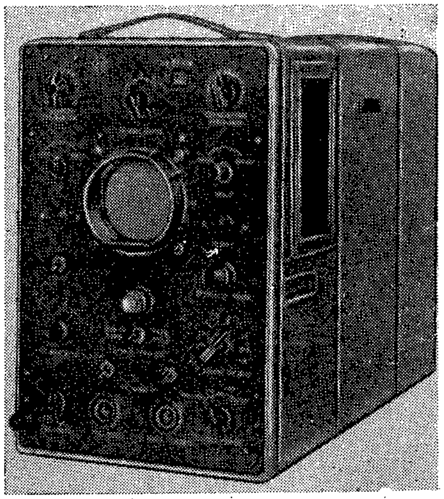


Figure 12.37.1.

Exterior view of the R5-1A (IKL-6) cable line tester.

12.38. The KI-3 Cable Finder

Purpose

Intended for determining the route of an underground cable, the depth at which it is buried, as well as for determining the location of a fault in the cable cores when they are completely grounded.

The Main Technical Data

In the normal power supply mode, and at temperatures of from +10 to 40° C, the generator should develop a power of no less than 1.3 watts at the corresponding outputs into loads of 600 ohms ± 30%, or 10 ohms ± 3%, and no less than 1 watt into a load of 1 ohm ± 3%.

The generator is powered from the 220 volt AC mains or from a 12 DC source. (The generator and finder can also be powered from "Saturn" type dry batteries.)

The maximum current consumption of the generator is 300 ma.
The maximum current consumption of the cable finder is 5 ma.

The instrument is designed for operation at an ambient air temperature of from +10 to +40° C, and a relative humidity of up to 80%.

The dimensions of the generator are 260 x 160 x 150 mm; the length of the finder is 1,030 mm, and its diameter is 34 mm.

The weight is 12 kg.

The Cost of the Measurement Equipment:

KS	2,576	rubles
IP-FCh	2,280	"
IP-300	1,952	"
LIG-DP-300	194	"
IU-DP-300	180	"
IP-KV	1,570	"
P-320M	576	"
P-321	248	"
UNP-60	450	"
UU-NUP	490	"
UUD-10	70	"
UUP-600	90	"
KhI-10 ("Polosa")	800	"
KhI-17 ("Prognoz")	1,630	"
S1-5 (SI-1)	180	"
S1-13A (IO-60)	856	"
S1-19 ("Primeta")	392	"
S5-3 ("Fil'tr")	923	"
S6-1 (INI-12)	171	"
VZ-13 ("Bokal-A")	70	"
VK7-9 ("Inkrustatsiya")	243	"
G6-2 ("Standart")	3,280	"
ChZ-3A ("Kayma")	740	"
L1-3 (MILU-1)	399	"
L2-1 (IPT-1)	50	"
MZ-10-2	219	"
MZ-600; MZ-135	179	"
KIP-2	167	"
E-59	25	"
Ts-435	40	"
AVO-5m	33	"
VIZ-2B	1,144	"
UIP-5k	2,269	"
KM-61k	1,275	"
IPI-1	545	"
VKM-1	734	"
IPM-1	276	"
R5-1A (IKL-6)	495	"
KI-3	83	"

SECTION 13. SUPPLEMENTAL COMPONENTS FOR THE EQUIPMENT

13.1. The Blocks of Temperature Sensors (BTD) and Blocks of Thermistors (BTS) for the Unattended Repeater Station Equipment of Balanced and Coaxial Cables.

Figures 13.1.1 - 13.1.3.

Purpose

Intended for controlling the gain NUP [unattended repeater] equipment on communications trunks using balanced or coaxial cables as a function of the ground temperature. The blocks of temperature sensors and the blocks of thermistors are connected into the negative feedback circuit of the amplifiers of the NUP equipment.

Type BTS blocks of thermistors are used on balanced cable lines for the K-24-2 and K-60 (using vacuum tubes) transmission systems. In each BTS block there are eight type KMT-8 thermistors. The DC resistance of the KMT-8 thermistors fluctuates from 143 to 53 ohms within the limits of the temperature range from +16 to +30° C.

Used for the K-60p transmission systems are blocks of type BTD temperature transducers, for which thermistors of the ST 1-2 type are used as the control elements. Housed in one BTD block are eight ST 1-2 thermistors, which are connected in parallel in pairs (based on the design for four K-60p systems). The DC resistance of the ST 1-2 thermistors fluctuates from 106 to 49 ohms within the limits of the range of temperatures from +16 to +30° C.

The ST 1-2 thermistors are tied into the connecting circuits through autotransformers, located in the BTD block.

Notes: 1. At the present time, industry is producing a universal BTD block for the K-60p and K-60 systems.
2. The ground temperature referenced AGC cables are tied into the SPUN through the ground temperature referenced type AGC coupling.

Used on coaxial cable lines for the K-1920 transmission systems are blocks of temperature transducers, which contain six type MMT-4 thermistors. In this case, used for the K-24k transmission system, which works via service pairs, are blocks of temperature transducers which contain two type KMT-8 thermistors. The blocks of thermistors are installed in the ground close to the NUP chamber at the depth at which the trunk cable is layed.

Construction

The blocks of temperature transducers and the blocks of thermistors are structured as steel cylinders, inside which the following are placed: in the BTS blocks, the thermistors; in the BTD blocks, the termistors and autotransformers. The BTS block has a cylinder length of 215 mm, a diameter of 84 mm; the BTD block has a cylinder length of 286 mm and a diameter of 115 mm.

The metal cylinders of the BTS and BTD blocks are additonally housed in cast iron sleeves, and in this case, the MCh-75 cast iron coupling sleeve is used for the BTS blocks, and the MCh-85 is used for the BTD blocks.

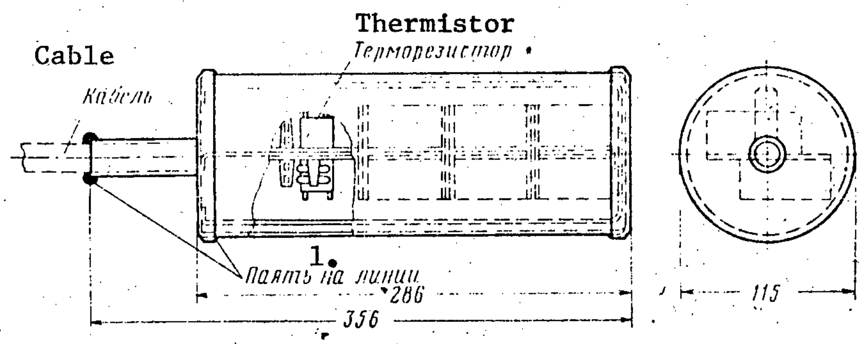


Figure 13.1.1. The construction of the temperature transducer block for the SPUN K-60p.

Key: 1. Solder to the line.

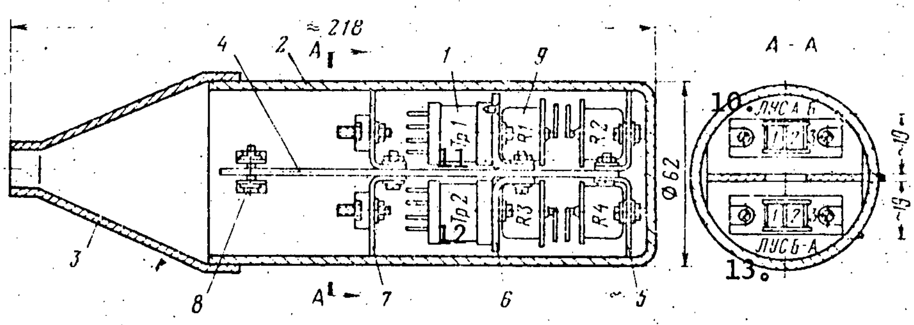


Figure 13.1.2. The construction of the K-24k block of temperature transducers.

Key: 1. Autotransformer;
2. Housing;
3. Cap;
4. Plate;
5, 6, 7 and 8. Clamps;
9. Thermistor;
10. A-B line amplifier;
11. Transformer 1;
12. Transformer 2;
13. B-A line amplifier.

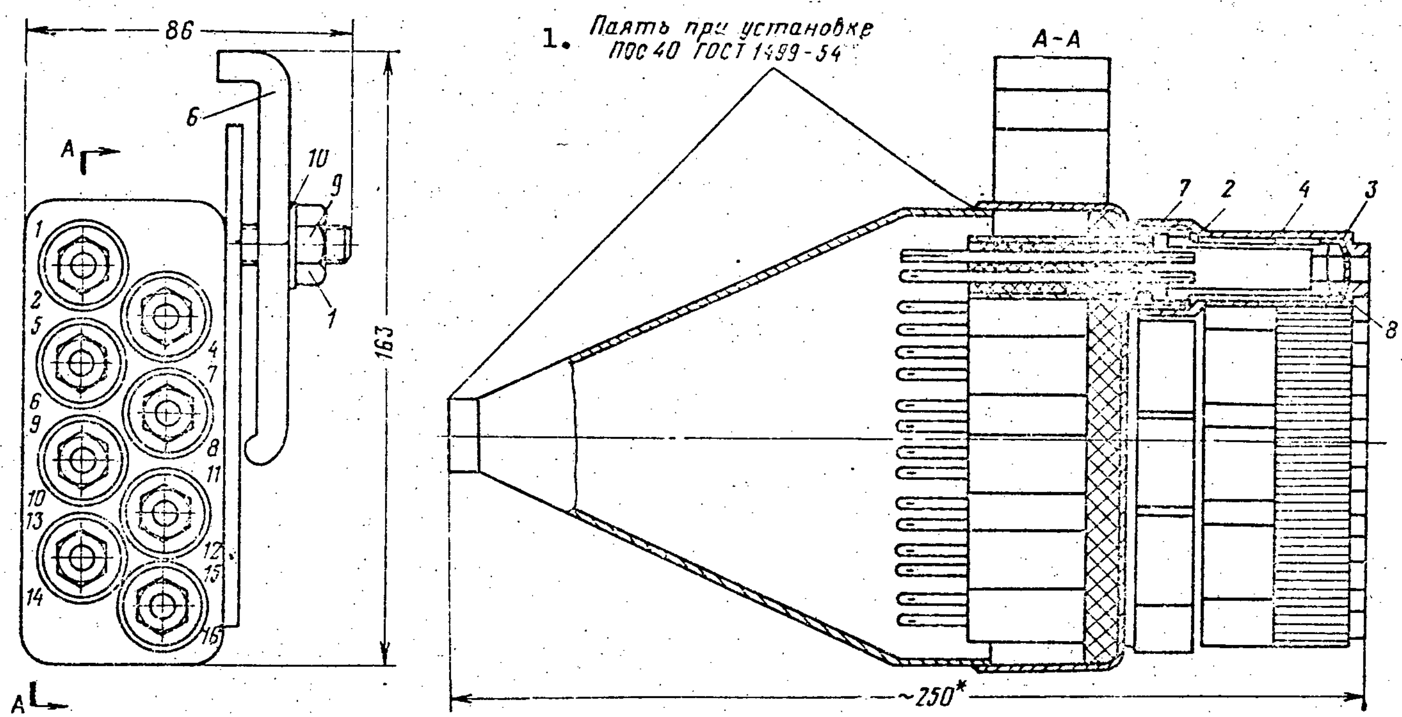


Figure 13.1.3. The construction of the coupling sleeve for the ground referenced AGC of the K-60p.

Key: 1. Solder when installing, POS 40, GOST [State Standard] 1499-54.

13.2. The RMINCh Power Distributor for Individual Carrier Frequencies

Figure 13.2.1.

Purpose

Intended for the transmission of the individual carrier frequencies from the generator equipment (SZGIO-III, SUGO-I) to the individual equipment racks (SIO-24, SIP-60). Two types are manufactured:

- RMINCh-I. . . . . For the transmission of the individual carrier frequencies from the SZGIO-III to the SIO-24 or SIP-60 racks.
- RMINCh-II . . . . The same, going from the SUGO-I racks to the SIO-24 or SIP-60 racks.

When the racks are located in different rows, the RMINCh-I and RMINCh-II provide for the capability of simultaneously connecting no more than 25 modems for each individual carrier frequency (i.e., no more than 5 SIP racks). Where the SIP-60 racks are located in one row, where the RMINCh-I is installed, it is permissible to connect no more than eight SIP-60 racks (or 40 modems).

The carrier frequency level at the output of the SIP racks should be set at -0.2 ± 0.05 Np (0.64 volts $\pm$ 5%), something which is achieved by resoldering the taps in the RMINCh transformers. When more than 13 modems for each carrier frequency are connected to the RMINCh, the 27 ohm resistor should be unsoldered in the RMINCh.

Construction

The RMINCh-I and RMINCh-II are made as an individual panel with dimensions of 333 x 212 x 80.5 mm, on which the transformers and the shielded terminal block for 36 pairs of contacts are mounted. The panel is secured to the side wall of the rack, which is of the standard structural design, in the immediate vicinity of the SIP racks. The RMINCh panel is connected by means of RVChS-160 cable. (The level of the carrier frequencies at the input to the SIP racks is established by resoldering the wire at the transformers of the RMINCh.)

Note: At the present time, the RMINCh-II panels are supplied along with the SUGO racks.

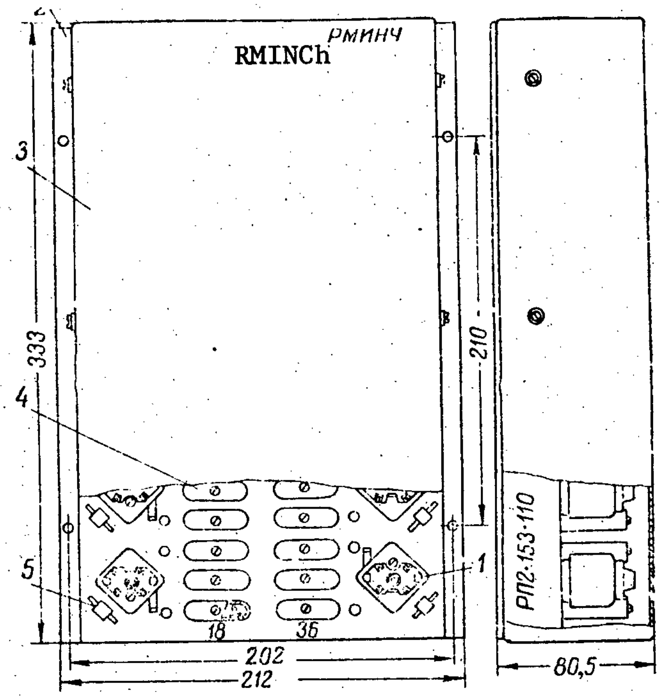


Figure 13.2.1. The construction of the RMINCh power distributor for individual carrier frequencies.

Key: 1. Transformer, SB-30; 4. Shielded terminal strips;
2. Base; 5. Connecting block.
3. Housing

13.3. The Low Frequency and High Frequency Transformers for Physical and Phantom Circuits

Figures 13.3.1 - 13.3.7.

Purpose

Intended for matching the characteristic impedances of a line and station, and eliminating galvanic coupling between a line and the station equipment. In terms of function, transformers are subdivided into high frequency and low frequency types.

Transformers can be connected into physical or phantom circuits in electrical circuitry.

See the drawings for the dimensions.

Type, Function and Technical Data on the Transformers

Transformer Type	Xfmr matching ratio, ohms	Range of frequencies KHz	Working Attenuation nepers	Resistance of the windings Ω
Differential, low frequency line, 5-terminal transformer for steel circuits, type DTN (YaE4.732.020)	600:1400	0.3 - 2.4	0.15	I. 7 - 9.5 II. (18-22)x2 III. 10 - 13
The same, for nonferrous circuits, type DTN-1 (YaE4.732.019)	600:600	0.3 - 10.0 0.016 - 0.025	0.15 0.4	I. 7 - 9.5 II.(8-11.5)x2 III. 10-12.5
Differential, low frequency, line, 6-terminal transformer for steel circuits, type DTN (YaE4.732.022)	600:1400	0.3 - 2.4	0.15	I. (7-8.9)x2 II. (30-40)x2 III.(7.9-9.1) x2
The same, for nonferrous circuits, type DTN-1 (YaE4.732.021)	600:600	0.3 - 10.0 0.016 - 0.025	0.15 0.4	I.(7.0-8.9)x2 II.(14-18)x2 III.(7.0-9.0)x2
Line, low frequency transformer for the physical circuits of a coil-loaded cable, type Tr.VKS (YaE4.732.013)	600:1500	0.3 - 3.4 0.016 - 0.050	0.08 -	- -
High frequency line transformer, type Tr.VKS (YaE4.732.014)	135:180	12 - 60	0.05	-
Low frequency phantom transformer for the circuits of a coil-loaded cable, type Tr.VKS (YaE4.732.012)	600:800	0.3 - 3.4 0.016 - 0.050	0.08 -	- -
Low frequency phantom transformer, type Tr.VKS (YaE4.731.006)	200:600	0.3 - 0.8	0.05	No more than 10 for the station winding No more than 4 for line winding.
High frequency line transformer for the KRR equipment, type Tp. RT4.732.007	75:160	12 - 552	0.08 at 550 KHz	No more than 10 for the station winding, no more than 2.8 for line winding.

Type, Function and Technical Data on the Transformers [continued]:

Equipment	Xfmr matching ratio, ohms	Range of Frequencies KHz	Working Attenuation nepers	Resistance of the windings, Ω
Wideband, low frequency line transformer, type ShTL (YaE4.732.001)	800:800	0.3 - 15.0	0.1	-
The same, station transformer, ShTS type (YaE4.732.000)	800:800	0.3 - 15.0	0.1	-

Weight and Cost

Transformer Type	Weight, kg	Price, rubles
DTN (YaE4.732.020)	1.0	2.15
DTN-1 (YaE4.732.019)	1.0	2.15
DTN (YaE..732.022)	1.0	2.15
DTN-1 (YaE4.732.021)	1.0	2.15
VKS transformer (YaE4.732.014)	0.8	4.65
VKS transformer (YaE4.732.013)	1.0	3.90
VKS transformer (YaE4.732.012)	1.0	3.85
ShTL (YaE4.732.001)	1.7	5.80
ShTS (YaE4.732.000)	1.1	3.40

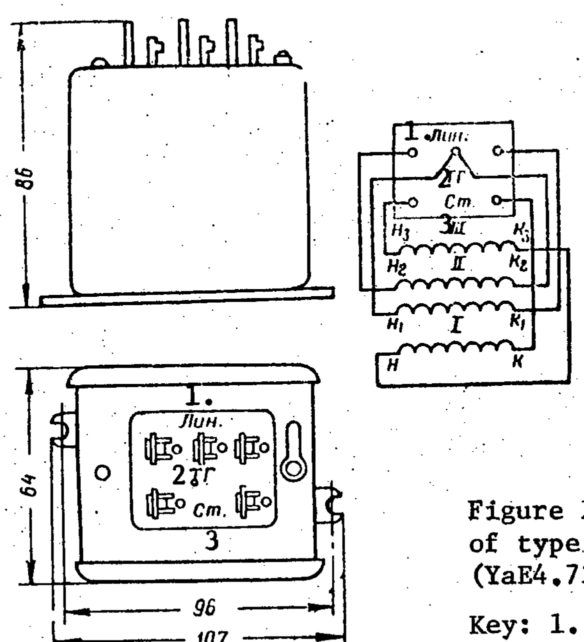


Figure 13.3.1. Schematic and construction of type DTN differential line transformers (YaE4.732.020); and DTN-1 (YaEr.732.019).

Key: 1. Line;
2. TG [?transformer terminal board?];
3. Station.

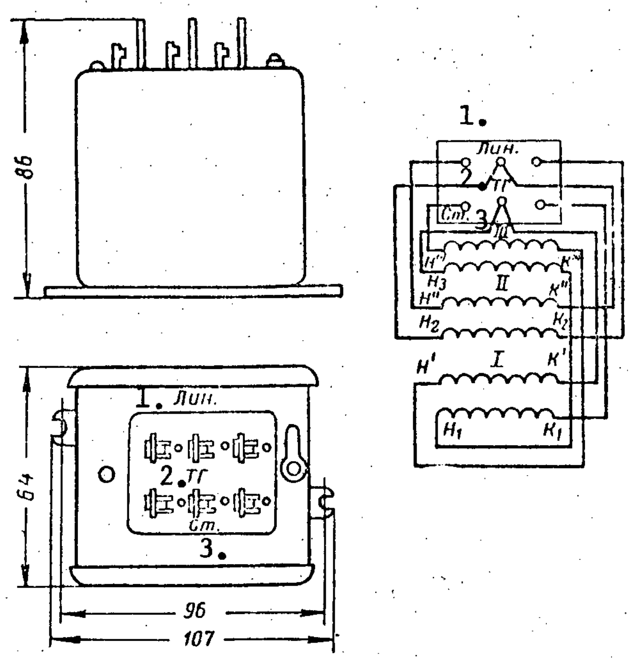
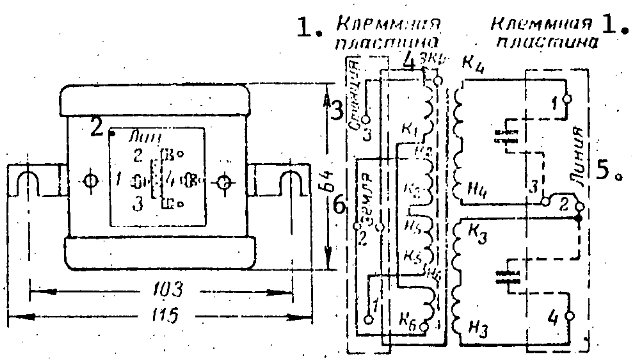


Figure 13.3.2. Schematic and construction of type DTN differential line transformers (YaE4.732.022); also, DTN-1 (YaE4.732.021).

Key: 1. Line;
2. TG [?transformer terminal board?];
3. Station.

a)



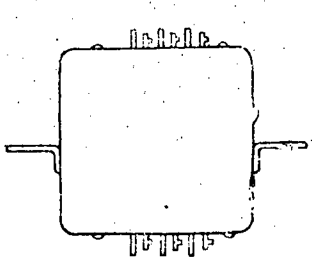


Figure 13.3.3a.

[Caption and key on next page, 739]

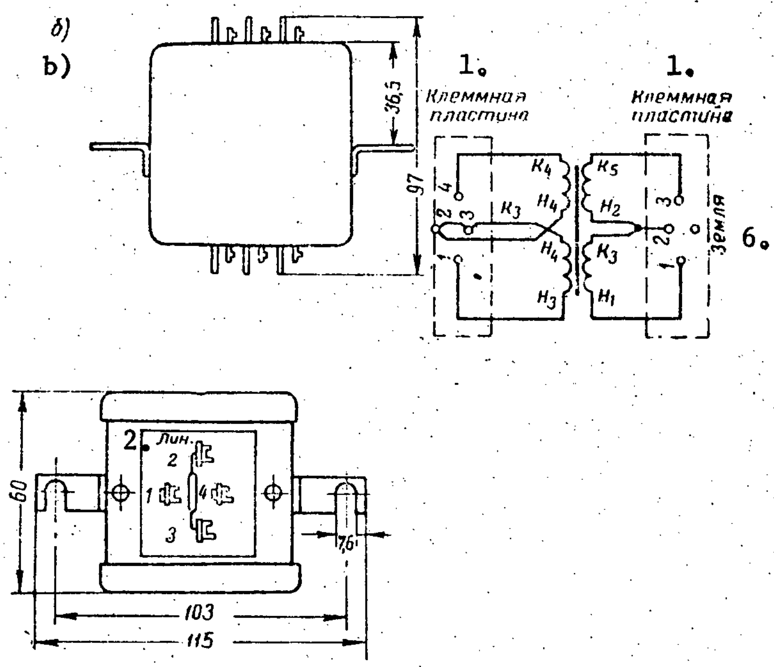


Figure 13.3.3b. Schematic and construction of the line transformers of the VKS rack.
a) [page 738] High frequency type YaE4.732.014;
b) Low frequency type YaE4.732.013.

Key: 1. Terminal plate; 4. Shield;
2. Line; 5. Line;
3. Station; 6. Ground.

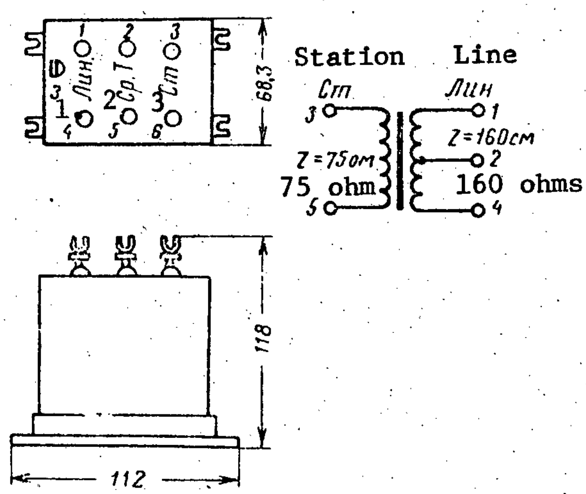


Figure 13.3.4. The schematic and construction of the line transformer for KRR equipment, type RT4.732.007.
Key: 1. Line; 2. Center tap; 3. Station.

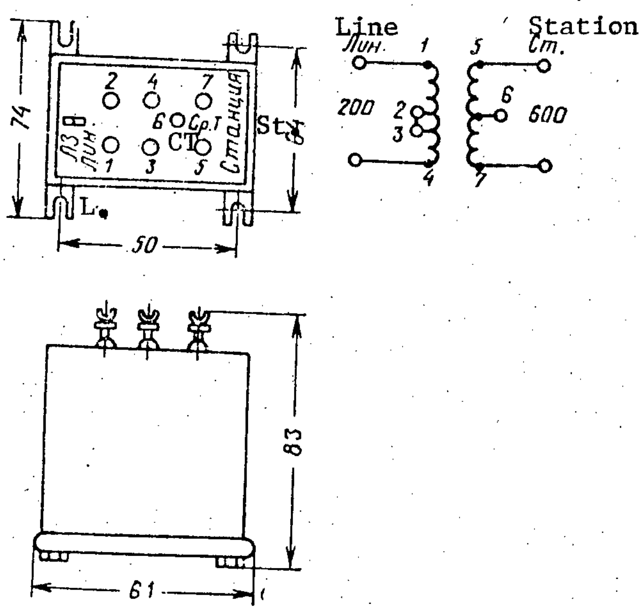


Figure 13.3.5. The schematic and construction of the VKS rack phantom transformer, type RT4.731.006 [sic].

Key: L = line;
CT = center tap.

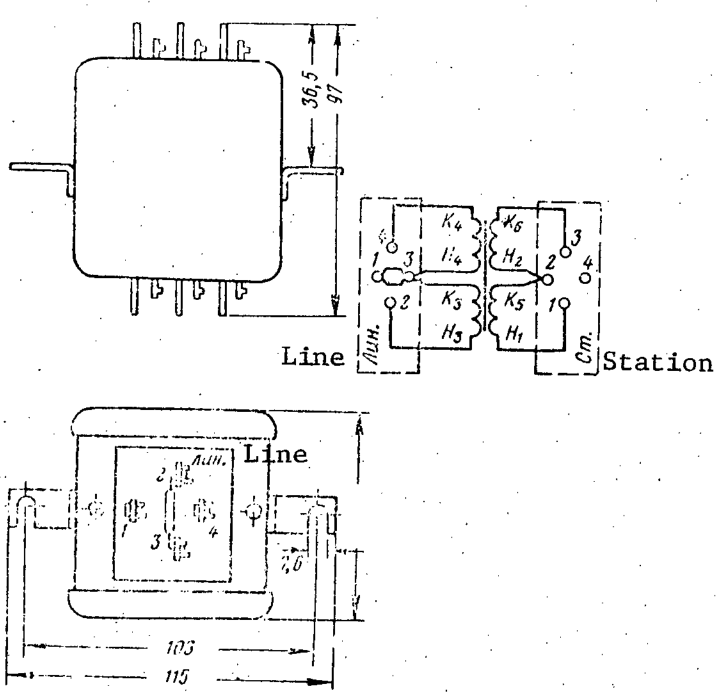


Figure 13.3.6. The schematic and construction of the phantom transformer of the VKS rack, type YaE4.732.012.

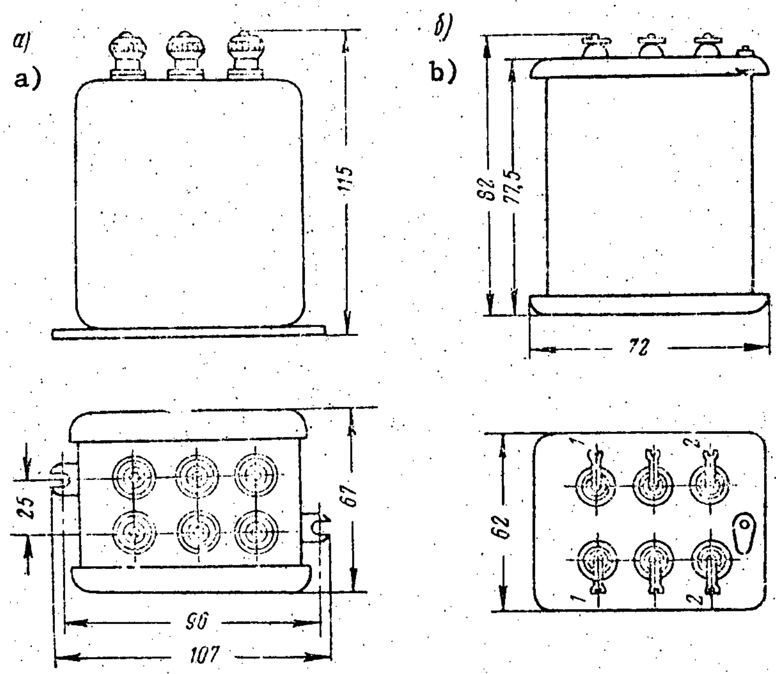


Figure 13.3.7. The schematic and construction of wideband transformers:
a) Line type, YaE4.732.001;
b) Station type, YaE4.732.000.

13.4. The IL-5 Phantom Line

Figures 13.4.1, 13.4.2.

Purpose

The phantom line is intended for insertion in shortened amplifier sections of cable trunks, which are multiplexed with K-24-2 or K-60 systems.

The phantom line has a frequency characteristic equivalent to the attenuation of an MKSB-60 cable with a length of 5 km at a temperature of +2° C.

The phantom lines are installed at the input of the line amplifier of intermediate and terminal stations of multiplex systems, i.e., on the panel of line amplifiers following the K-12 filter.

Construction

The IL-5 is made in the form of a block with dimensions of 95 x 34 x 125 mm.

Weight: 0.5 kg. Cost: 14 rubles.

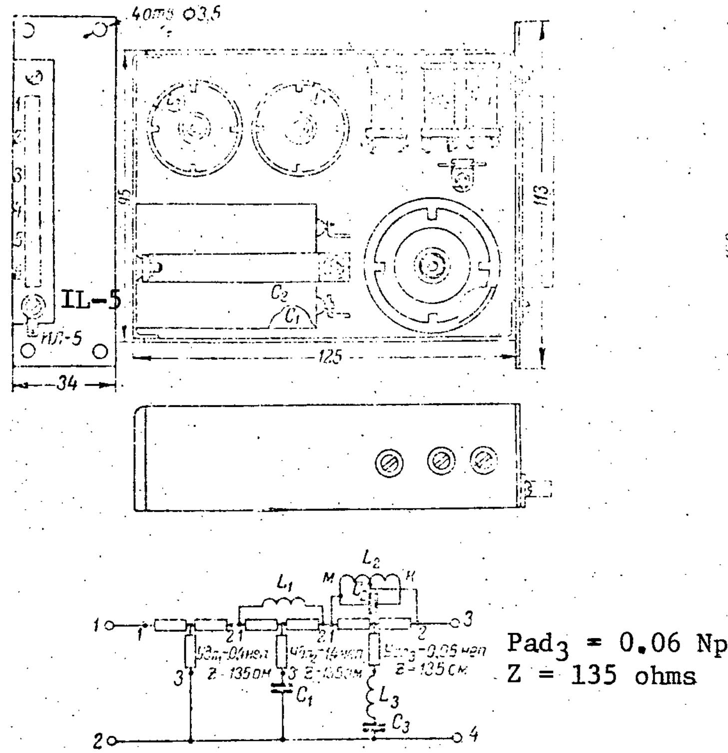


Figure 13.4.1. The schematic and construction of the 5 km phantom line block.

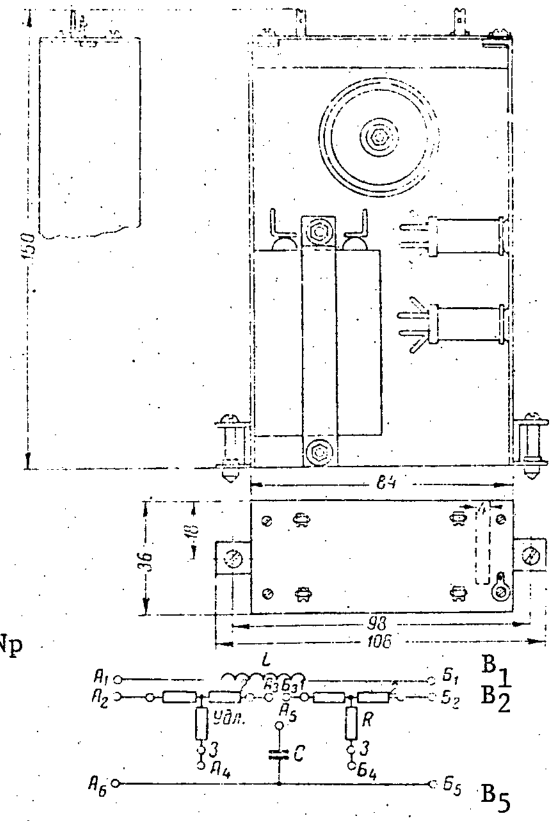


Figure 13.4.2. The schematic and construction of the 3 - 5 km phantom line block.

13.5. The Trunk Equalizer (MV) for K-60 and K-60p Transmission Systems

Purpose

Intended for correcting amplitude-frequency distortions which accumulate on a trunk due to the imprecision in the matching of the frequency characteristics of the gain of the line amplifiers and the attenuation of the cable sections.

It is used on trunks of MKSB, MKSAB and MKB balanced cables multiplexed with K-60 or K-60p equipment, and is inserted at the input to the line amplifiers of unattended repeaters, attended repeater stations and terminal stations between the line transformer and the line equalizer. The attenuation of the MV [trunk equalizer] should not exceed 0.5 Np when the equalizer is installed in an unattended repeater, and 0.3 Np when installed in an attended repeater and terminal station.

The trunk equalizer contains four sections of an amplitude equalizer, which are connected in series in any combination.

Construction

Designed in two variants: a fixed MV, which is installed in the equipment; and a variable MV, which is made in the form of a portable instrument (there are supplemental switches in the variable MV for switching from one characteristic to another). The fixed MV is mounted on a chassis with dimensions of 80 x 100 x 135 mm, while the variable MV has dimensions of 155 x 254 x x 410 mm.

Trunk equalizers make it possible to correct distortions with a nonuniformity of ± 0.3 Np to ± 0.05 Np.

Weight: 1 kg (fixed MV) and 10 kg (variable MV).

Cost: 39 rubles (fixed MV), and 174 rubles (variable MV).

13.6. The D-14 Filter

Figures 13.6.1 - 13.6.3.

Purpose

Intended for protecting the channels of KV-12 equipment against line crosstalk through the bundles of three forward two-wire circuits of a cable. The filters are inserted in the section of unmultiplexed pairs, which are located next to multiplexed parallel circuits.

Equipment Complement

Depending on the magnitude of the input impedance, three types of D-14 filters are manufactured:

- D-14-400 for cables without coil loading (Z = 1,400 ohms);
- D-14-1300, the same, with light coil loading (Z = 1,300 ohms);
- D-14-2200, the same, with moderate coil loading (Z = 2,200 ohms).

Construction

The D-14-400 filter is made as a block with dimensions of 88 x 80 x 65 mm. Eight filters can be mounted on one panel with dimensions of 644 x 118 x x 162 mm.

The D-14-1300 and D-14-2200 filters are mounted on a panel with dimensions of 520 x 160 x 180 mm, with 14 units per panel.

Weight: D-14-400 1 kg

Cost:	D-14-400	136 rubles
	D-14-1300	187 rubles
	D-14-2200	167 rubles

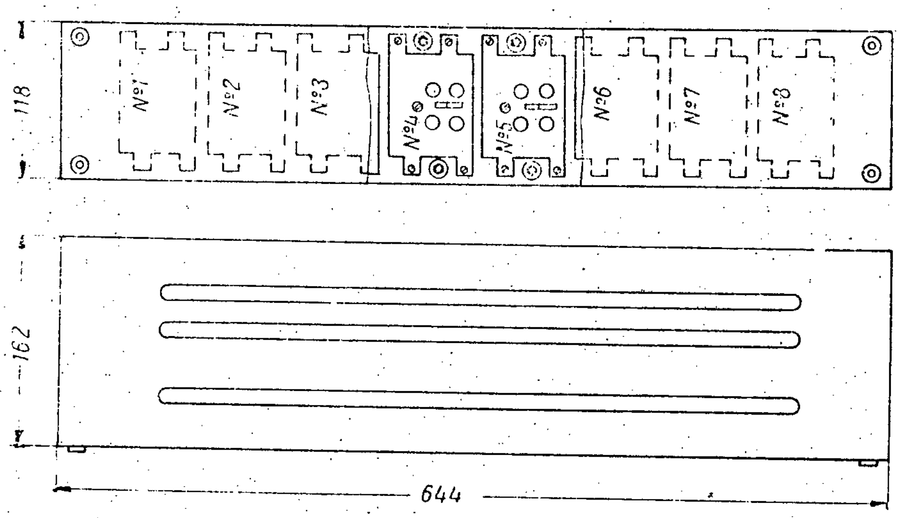


Figure 13.6.1. The construction of a panel of D-14 suppression filters, Z = 400 [ohms].

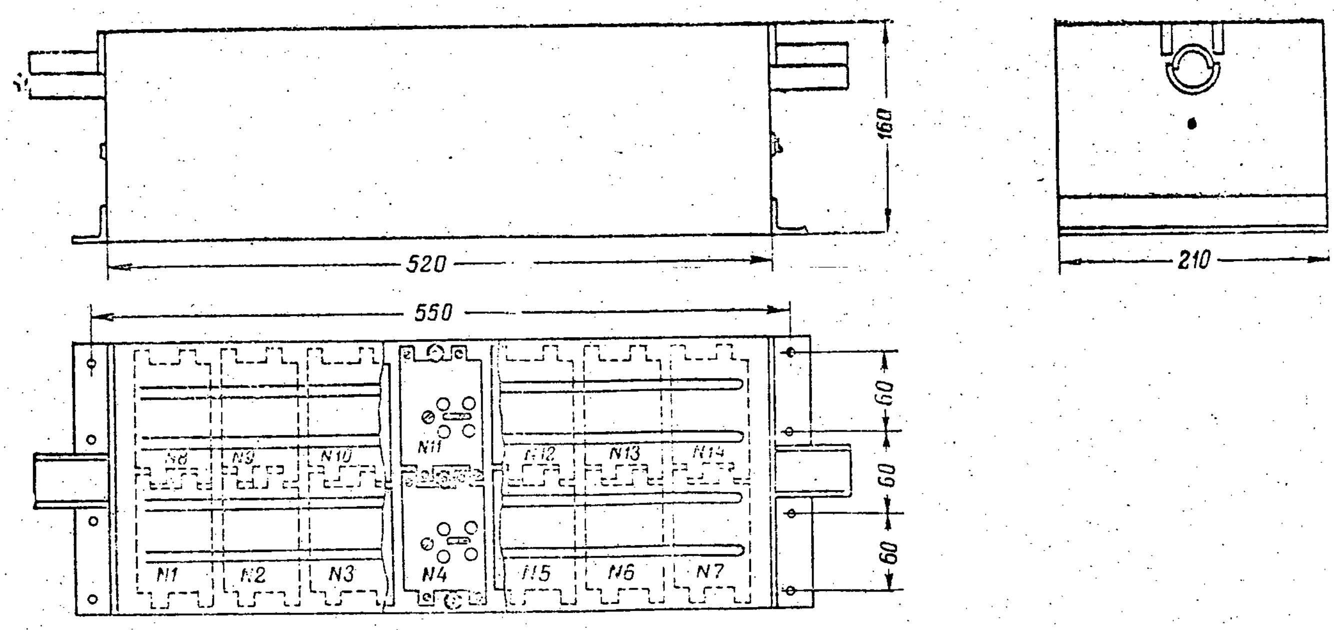


Figure 13.6.2. The construction of a panel of D-14 suppression filters, Z = 1,300 ohms and Z = 2,200 ohms.

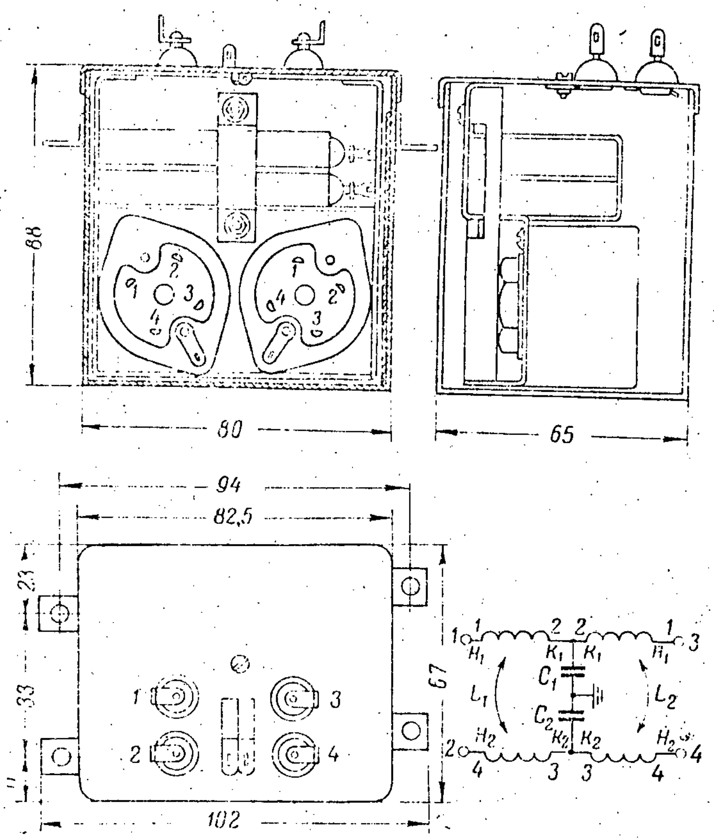


Figure 13.6.3. The schematic and construction of the D-14 suppression filter, Z = 400 ohms.

13.7. The Rack Frames of a Line Equipment Shop

Figures 13.7.1 - 13.7.3.

Purpose

Intended for the mounting of the blocks and panels of LATs [line equipment shop equipment.

Construction

The LATs equipment is housed in racks of differing structural designs:

-- In racks made of channel steel;
-- In racks of the base structure.

Moreover, individual LATs equipment has a special structural design (PSP, SKP-1, SKVT-1 and cabinet equipment of the VUS-12-2 type), which maximally corresponds to the function of this equipment.

Rack Frames Made of Steel Channels

Intended for mounting panels and blocks of equipment on one or both sides. The frames are manufactured in two sizes:

-- 2,500 x 526 x 380 mm, for entrance-connection equipment, the SARN racks, etc.
-- 2,500 x 648 x 360 mm, for multiplex equipment for open-wire and cable circuits, etc.

Steel channel frames are installed in the equipment rows of a LATs and installing them with their front or wiring side against the wall is not permitted.

The wiring for the blocks and equipment panels is run along the inside walls of the channels, and is soldered to the input terminal blocks of the rack.

The rack weight is 55 kg.

Base Structure Rack Frames

Intended for mounting the panels and equipment blocks on one side. They are made of sheet steel with a blank rear wall and with internal wiring done by the plant. The main dimensions of the frame are 2,600 x 650 x 250 mm.

It is permissible to employ frames of the same structural design with a size of 1/2, 1/3 or 1/4 of the main height of 2,600 mm.

There are tray bases in the rack for the mounting of the equipment blocks.

The dimensions of the blocks correspond to 1/6, 1/3 or 1/2 of the width of a rack frame window, or to the width of this window. The blocks are connected into the rack circuitry by means of a plug-in system, which provides for standard 16 and 20 contact connection plugs. The base structure racks can be installed with their backs together, or with the back side to the wall.

Note: At the present time, a new type of base structure rack has been designed, which is favorably distinguished from the old type of racks: the dimensions are in accordance with the recommendations of the CEMA and the CCITT; the weight of the support structure has been reduced by decreasing the overall dimensions of the tray bases and the absence in the majority of blocks of metal frames and chassis; volumetric intrablock wiring is absent (because of the use of printed circuit hookups); easy access is provided to the components of the blocks, as well as simplicity of disassembly; new plastic materials and coatings are employed, something which imparts an exterior appearance to the racks which meets the modern requirement of engineering esthetics.

Standardized cabinet dimensions are 2,600 x 600 x 255, and 450 mm (the depth is indicated without doors and protruding parts). The upper and lower parts of the cabinets are enclosed from the front by two removable double-hinged doors. Where necessary, a slide-out desk is installed in the rack at a height of 1,155 mm from the floor. Base trays are provided which are not insulated from the frame, for the installation of blocks in the cabinet. Located in the upper part of a cabinet is the panel of input terminals (shielded or unshielded), and in the upper frame, a signal light, power supply terminal blocks and grounding bolts for grounding.

The depth of the blocks is 180 mm; the height is a multiple of 30 mm (recommended sizes are 120 mm and 150 mm), and the width is a multiple of 9 mm (recommended sizes are 27 mm, 36 mm, 45 mm, 90 mm, 108 mm, 135 mm, 180 mm and 540 mm). The blocks are secured to the rack by means of catches or a lock with a key. Where necessary, a connection panel or several panels can be installed in the center of the rack above the desk. The common power supply block, where necessary, is installed in the lower part of the rack, and does not have to be covered by a door. The electrical connection of the blocks is made by means of plug connectors. Knife terminal plugs are installed in the blocks, while the terminal sockets are installed in the frame.

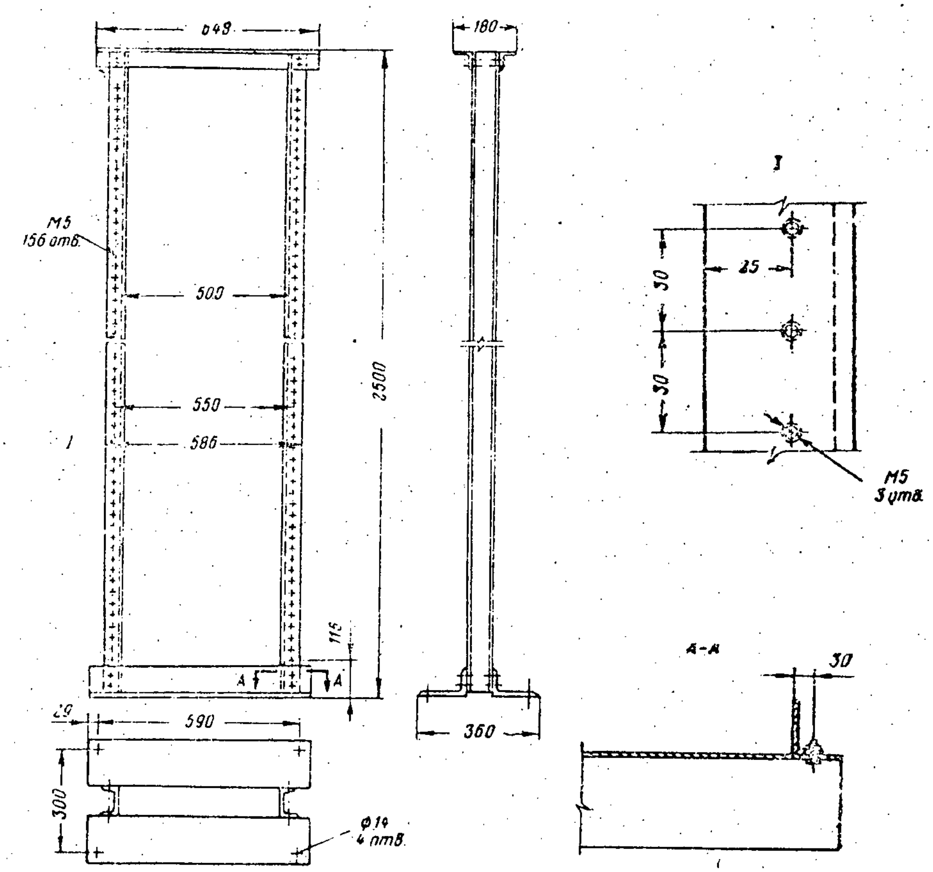


Figure 13.7.1. The construction of the LATs equipment rack (new type)

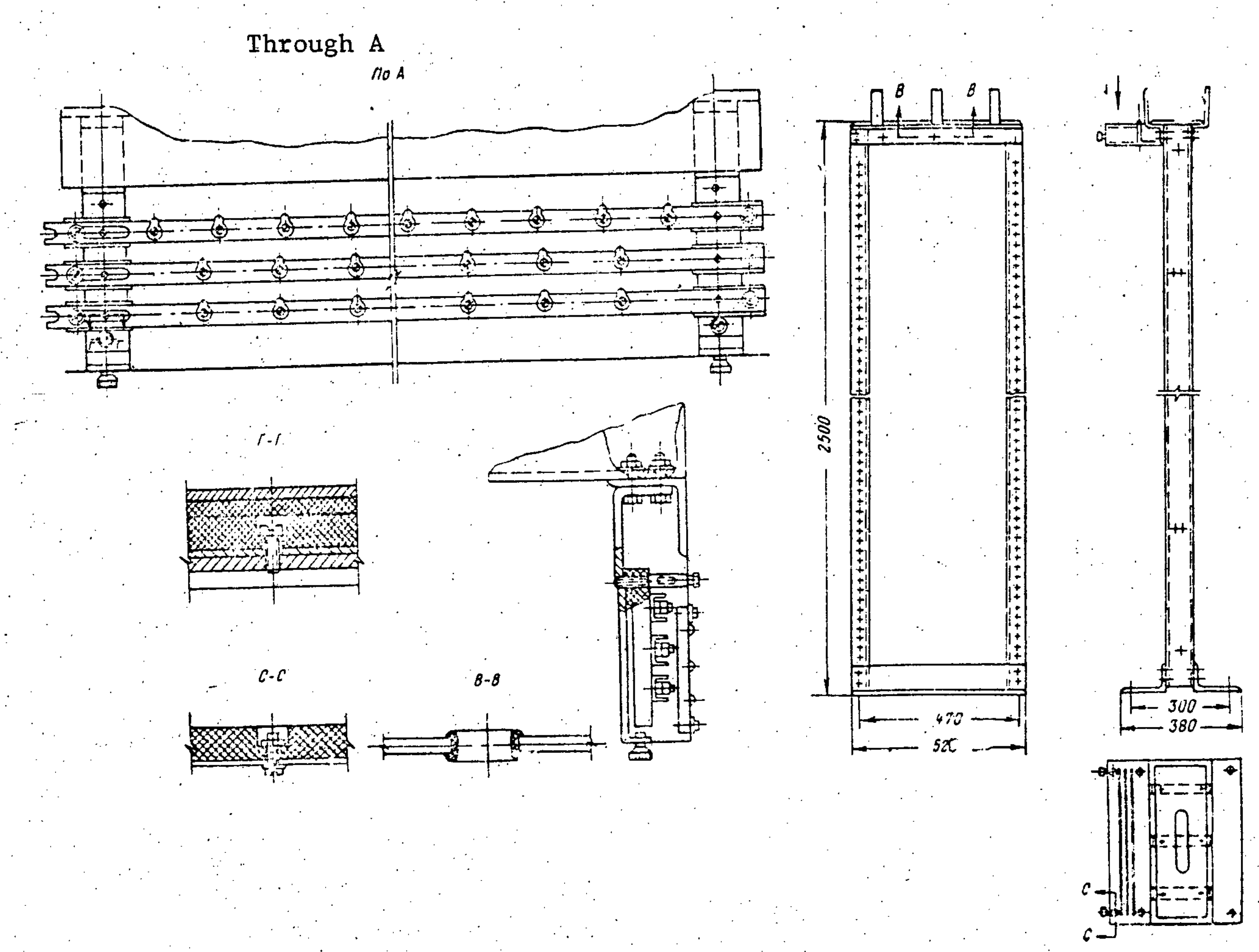


Figure 13.7.2. The construction of the rack frame for LATs equipment (old type).

a)

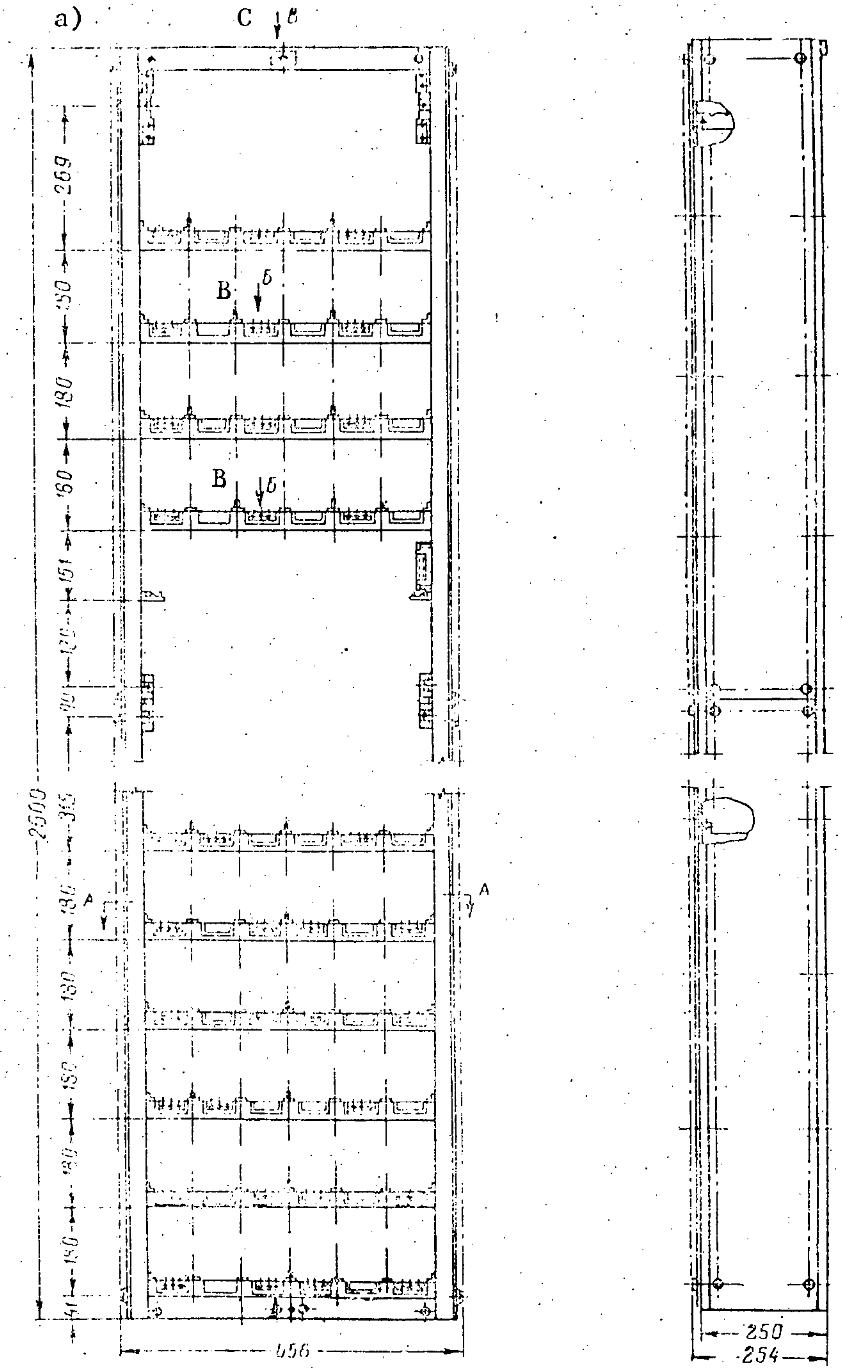
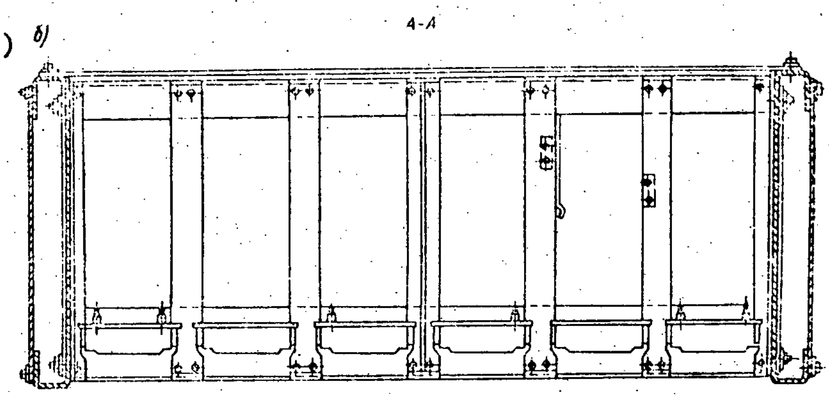
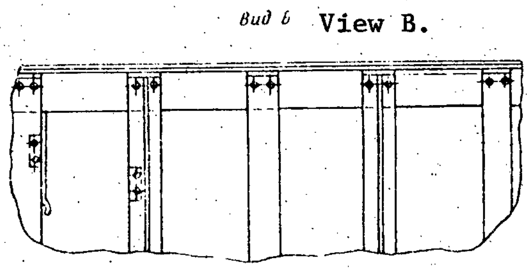
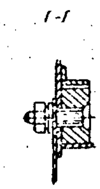


Figure 13.7.3. a. The construction of the base structure rack frame for LATs equipment.
a) Rack.

b) 

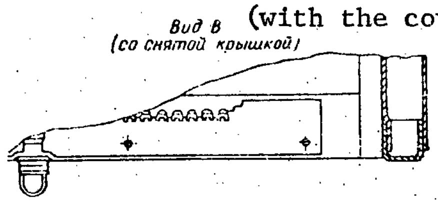
View B.





View C.

(with the cover removed)



Outline for fastening the rack to the floor.

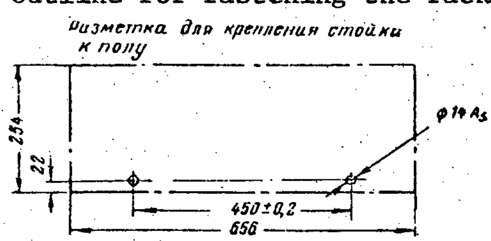


Figure 13.7.3. b. The construction of the base structure rack frame for LATs equipment.
b) Support tray for the blocks.

13.8. The Row Transparency

Figure 13.8.1.

Purpose

Intended for aural and visual signaling of faults in the LATs racks, and signaling the arrival of a call for terminal and intermediate stations.

Construction

The transparency is made in the form of a panel, which is secured to the side wall, the end wall of the main passageway for the LATs rack. Mounted on the panel are six (or four) lamp receptacles of the "Min'on" type with aircraft type signal lights (type SM-14) and a DC bell.

Approximate weight: 1 kg

Cost: 15 rubles, 50 kopecks.

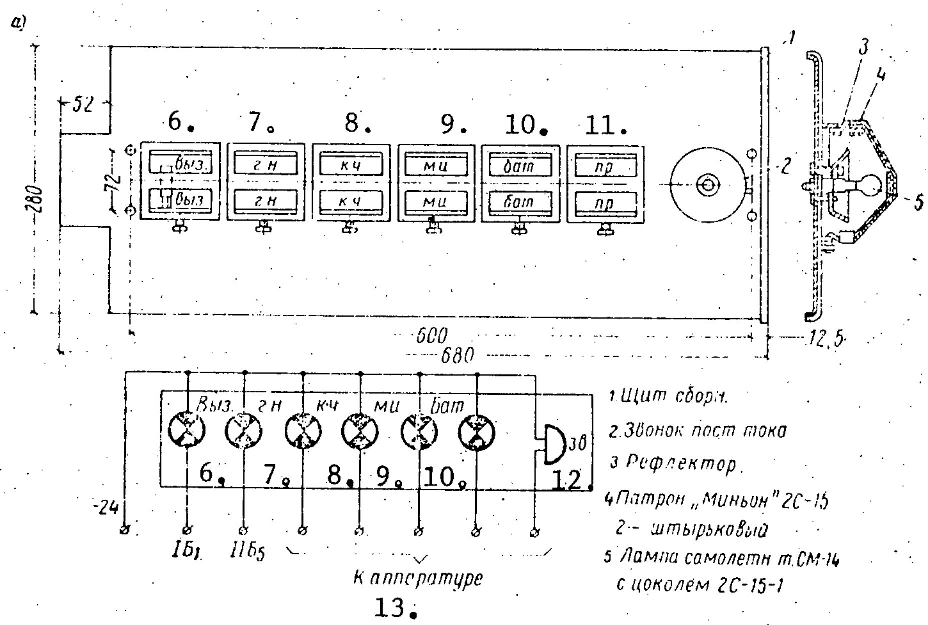


Figure 13.8.1a.

b) б)

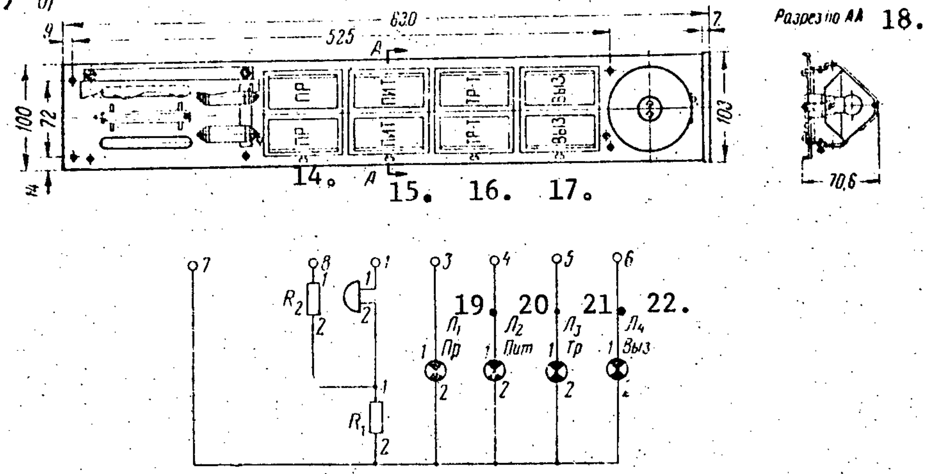


Figure 13.8.1. The construction of row signaling transparencies.
a) For the V-12-2 equipment;
b) For the K-1920 equipment.

Key: 1. Panel assembly;
2. DC bell;
3. Reflector;
4. Two-pin "Min'on" 2S-15 light socket;
5. Type SM-14 aircraft light with 2S-15-1 base;
6. Call;
7. GN [expansion unknown];
8. KCh [control frequency];
9. MTs [expansion unknown];
10. Battery;
11. pr [?fuse?];
12. Bell;
13. To the equipment;
14. PR [?fuse?];
15. PIT [?power supply?];
16. TR-T [expansion unknown];
17. Call;
18. Section through A-A;
19. Light 1, pr [?fuse?];
20. Light 2, power;
21. Light 3, [?transformer?];
22. Light 4, call.

13.9. The VU Callup Unit

Figures 13.9.1, 13.9.2.

Purpose

Intended for installation at telephone exchanges as a ringing current source at a frequency of from 15 to 50 Hz.

Electrical Characteristics

The callup unit circuits are designed for operation from DC sources at 24 or 6 volts. A provision is made for the operation of the callup unit from the AC mains at 127/220 volts. In this case, the callup unit works as a step-down transformer.

The current consumption of the VU [callup unit] at 24 volts is no more than 0.3 a.
The current consumption of the VU at 6 volts is no more than 1.3 a.

In all cases, the alternating current voltage in the secondary winding of the VU transformer is no less than 65 volts. The load resistance is 100 - - 2,000 ohms. The power consumed from the AC mains is no less than [sic] 2 watts.

Composition

The callup unit consists of:

- -- Transformer with a tapped primary winding;
- -- Relay vibrator, consisting of a dual winding coil, two contact groups and a weighted armature;
- -- Two networks, consisting of capacitors C_1 and C_2 and resistors OK_1 and OK_2, which serve for spark suppression at the contacts;
- -- Capacitor C_3, inserted at the output of the VU;
- -- A "mains--TV [expansion unknown]" key which serves for connecting the VU to the storage battery at 24 volts (or 6 volts), or to the AC mains at 127/220 volts.

Construction

The callup unit is mounted in a housing consisting of a metal base and a cover. The cover is secured to the base on hinges, with the capability of opening and providing access to inspect the circuit. The dimensions are 240 x 134 x 172 mm.

Weight: 3 kg.

Cost: 11 rubles, 60 kopecks.

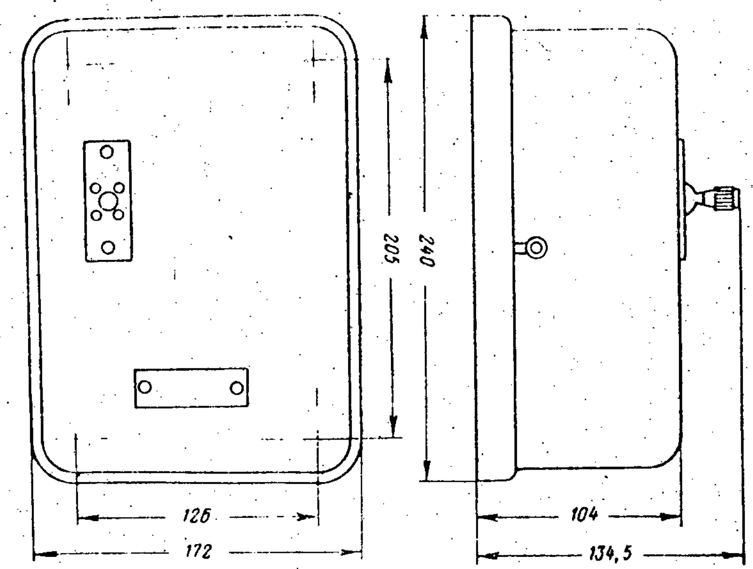


Figure 13.9.1. The construction of the VU ringing devices.

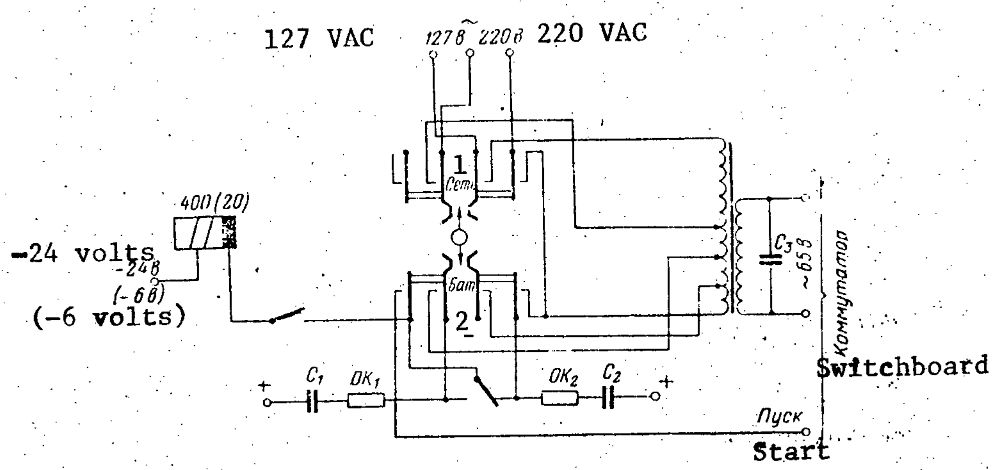


Figure 13.9.2. The schematic of the ringing device.

13.10. The D-280 and D-268 Filters

Figures 13.10.1, 13.10.2.

Purpose

The D-280 filter is intended for protecting the SPUN K-60p equipment against radio interference. The D-280 filter is installed in the SPUN K-60p racks, and is inserted at the input to the line amplifier. The input and output impedance of the filter is 150 ohms. The filter operates at temperatures of from -40 to +50° C, and a relative humidity of 98% at a temperature of +30° C.

The D-268 filter is intended for the suppression of control frequencies in the 270 - 280 KHz spectrum at attended repeater and terminal stations. The D-268 filter is installed at the output of the line channels of SPU-2 and SPU-3 racks, as well as the output of a SGU receive channel of the K-60 system using vacuum tubes. Inserting the filters makes it possible to remotely monitor the proper operating condition of the line channel on an OUP-OUP [attended repeater] section during the operation of vacuum tube type attended repeater and terminal stations with unattended amplifier stations which are transistorized (SPUN K-60p). The input and output impedance of the filter is 135 ohms. The filter operates at a temperature of from +5 to +40° C, and a relative humidity of 85% at a temperature of +30° C.

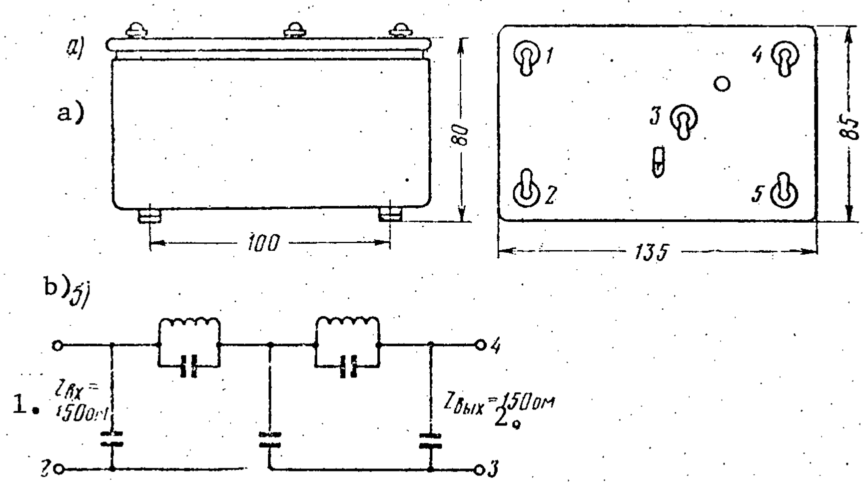


Figure 13.10.1. The construction and circuit of the D-280 filter for the SLUK K-60p equipment:
a) Exterior view; b) Basic schematic.

Key: 1. Z_{in} = 150 ohms; 2. Z_{out} = 150 ohms.

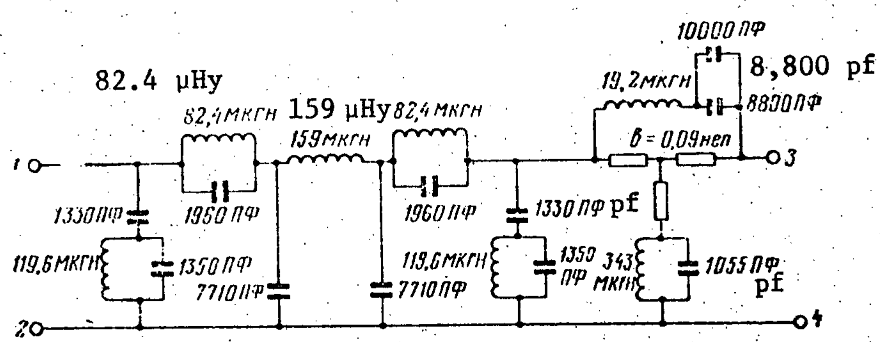


Figure 13.10.2. Schematic of the D-268 filter for SPU and SGU racks of the K-60 system.

13.11. The Cosine Corrector Panel with the PKKU Amplifier for the K-60 Equipment

Purpose

Intended for the seasonal correction of the overall timewise changing amplitude-frequency distortions of the HF group channel of the K-60 system.

Electrical Characteristics

The corrector generates 12 echo signals (12 harmonics), which are adjustable in amplitude and polarity by means of the phase controller.

The control ranges for the harmonics are given in Table 13.11.1.

The reflection factor of the cosine corrector with respect to the 135 ohm impedance:	
At the input to the panel	No more than 10%
At the output	No more than 15%
The attenuation of the cosine corrector with the amplifier, at any frequency (for the cutout harmonics)	0.07 Np
The internal noise level of the amplifier within the spectrum of one telephone channel, referenced to the amplifier input in the 12 - 16 KHz range	No more than 14.8 Np [sic]

The Equipment Complement of the PKKU Panel

The PKKU panel consists of the cosine corrector and amplifier, which serves for compensating for the attenuation introduced by the corrector. There is a set of pads between the amplifier and the corrector to establish the normal level pattern following correction of the HF channel by the corrector.

Table 13.11.1.

No. of the Harmonic (№ гармоник)	1	2	3	4	5	6
Control Range, Np (Пределы регулирования, неп)	—0,26 +0,20	—0,24 +0,18	—0,23 +0,18	—0,20 +0,17	—0,18 +0,15	—0,15 +0,13

Продолжение

No of the Harmonic (№ гармоник)	7	8	9	10	11	12
Control Range, Np (Пределы регулирования, неп)	—0,13 +0,12	—0,12 +0,11	—0,11 +0,10	—0,9 +0,09	—0,8 +0,09	—0,7 +0,07

Electrical Power Supply

Voltage	21.2 volts ± 3%
Current consumption for the PKKU amplifier	0.031 a (the amplifier is transistorized).

Construction

The cosine corrector is made in the form of a separate panel, on the front of which are 12 potentiometer controls, as well as 12 terminal blocks with U-links for switching the polarity of the harmonics. Also mounted on the panel is the amplifier, packaged as a separate block. The panel is made as the same type as that of the K-60 equipment, in the racks of which it is mounted.

The panel is placed in a housing which should be secured to the SGU or SPU racks. There is a 16-contact plug block for bringing in the power, as well as shielded "input" and "output" sockets for tying in the rack wiring. The panel is plugged in by means of a mating knife terminal block, and is connected into the channel with shielded U-links.

The dimensions of the panel are 148 x 644 x 207 mm.

APPENDICES

Appendix 1. The Main Technical Data of the Most Frequently Used Long Distance Cables

Figures A.1.1. - A.1.8.

I. Symmetrical Cables

1. Type MKS cable with a spiral quad, cord-polystyrene (styroflex) insulation in a lead jacket, having a capacity of 4 x 4 and 7 x 4 with copper cores 1.2 mm in diameter. Depending on the manner and location for laying the cable, these cables are produced in the following types: MKSG, without armor, for running in telephone ducting; MKSBG, armored with two steel tapes, without a jute sheath, for running in subway tunnels and other similar installations; MKSB, the same, with a jute sheath, for laying directly in the ground; MKSBv, the same, with a polyvinylchloride cushion above the lead jacket, for laying directly in the ground with a corrosive medium; MKSK, with armor of circular wires, for running through water obstacles; MKSKv, the same, with a plastic tape on top of the lead, for running through water obstacles in corrosive media.

A section through the cable is shown in Figures A.1.1 and A.1.2.

2. Type MKSA cable with a spiral quad, cord-styroflex insulation, in an aluminum jacket, with a capacity of 4 x 4 having copper cores 1.2 mm in diameter. The following types of cables are produced depending on the manner and location for laying the cable: MKSAP, with polyethylene tubing, for running in ducting and in the ground, where it is not necessary to protect the circuits against the influence of AC high voltage lines and electrified railroad lines; MKSAPB, the same, armored with two steel tapes with an exterior jute sheath, for running along AC electrified railroad lines, high voltage lines, and in regions with increased thunderstorm activity in those cases where it is not necessary to protect the armor tapes against corrosion because of the ground conditions; MKSAPBV, the same, in an exterior polyvinyl chloride jacket. The conditions for laying the cable are the same, but for the presence of a corrosive medium in the ground; MKSAPEV, with polyethylene tubing with a shield of steel tapes having increased magnetic permeability, in an external polyvinylchloride jacket. It is layed under the same conditions, in especially severe cases of external electromagnetic influences, as well as in regions with high thunderstorm activity; MKSAPK, with a polyethylene jacket, armored with circular steel, galvanized wires, with an exterior jute sheath, for running through water barriers.

A section through the cable is shown in Figure A.1.3.

3. Type MKPV cable, with continuous polyethylene insulation, a copper or aluminum shield in a plastic jacket, having copper cores 1.2 mm in diameter, and a capacity of 1 x 4;
MKPV: in a polyethylene and polyvinylchloride jacket, for laying in the ground and in telephone conduit;

MKPBV, the same, armored with two steel tapes with a protective exterior sheath, for laying directly in the ground;
MKPVK, the same, armored with circular steel, galvanized wires, with a protective exterior sheath, for running through water barriers.

A section through the cable is shown in Figure A.1.4.

4. Cables of the VTSP and VTSPA types. With polyethylene insulation, an aluminum shield, and a plastic jacket with copper cores 1.2 mm in diameter (VTSP) or aluminum cores 1.6 mm in diameter (VTSPA), having a capacity of 1 x 4. It is used on rural communications networks.

VTSP, VTSPA: In a polyvinylchloride jacket, for running in telephone conduit, or directly in the ground;

VTSPB: With armor tape, for running directly in the ground.

A section through the cable is shown in Figure A.1.5.

II. Coaxial Cables

1. Type KM cable: Coaxial trunk cable, containing four coaxial pairs with a ratio of the diameters of the conductors of 2.6/9.4 mm, and five balanced quads for service functions having copper cores 0.9 mm in diameter. These cables are manufactured in the following types, depending on the manner and location for laying them:

KMG-4: Coaxial trunk cable in a lead jacket, for running in telephone conduit;
KMB-4: The same, armored with two steel tapes with a protective outer layer, for laying directly in the ground;
KMBG-4: The same, armored with two steel tapes with anticorrosion protection, for laying in subway tunnels and other similar installations;
KMBV-4: The same, with a layer of polyvinylchloride plastic, armored with two steel tapes, with a protective outer layer, for laying directly in the ground in corrosive media;
KMK-4: The same, armored with circular steel, galvanized wires, with a protective outer layer, for running through water barriers.

The numeration and function of the coaxial pairs in the cable are: coaxial pair 1, between the red and blue symmetrical quads; coaxial pair 2, between the white and brown symmetrical quads; coaxial pair 3, between the blue and white symmetrical quads; coaxial pair 4, between the red and brown symmetrical quads.

The first and second coaxial pairs are used for one system, while the second and third are used for a second system.

The numeration and function of the service quads in the cable are: Quad 1, yellow (central quad): the first pair is coil loaded for USS [sectional service communications]; the second pair is for contactless remote control control, and where contact type remote control is used, the pair is free;
Quad 2, red (or red-white); the third pair is for multiplexing with the K-24k system, the fourth pair for PSS-2 [station-to-station service communications] links; quad 3, blue (or green) for PSS-1 service communications links;

quad 4, white, for contact type remote control, and where noncontact type remote control is employed, the quad is free; quad 5, brown (or white-green), the ninth pair is for multiplexing with the K-24k system, while the 10th pair is for PSS-2 service communications.

The average values of the attenuation factor of the cable coaxial pairs at a temperature of +7.5° C are:

f, MHz	f, Мгц	0,3	0,5	1,0	2,0	3,0	4,0	5,0	6,0	7,0	8,0	9,0	10,0
α, $\frac{mNp}{km}$	α, $\frac{мнеп}{км}$	152	196	277	392	482	557	623	683	733	789	837	882

Note: If the near-end crosstalk attenuation between pairs is less than 9 Np, then chosen in place of the ninth pair is a pair from the third or fifth quads, and the utilization of the pairs for service communications is changed correspondingly.

A section through the cable is shown in Figure A.1.6.

2. Type MKTP-4, MKTSP-4 and MKYASh-4 cables: coaxial cables with tubular polyethylene insulation, containing four coaxial pairs with a ratio of the conductor diameters of 1.2/4.6, five service communications pairs with copper cores 0.7 mm in diameter, and one control core, 0.7 mm in diameter.

These cables are produced in the following types, depending on the manner and location for laying them:

MKTP-4: In a polyethylene jacket, for running in telephone conduit, and directly in the ground;
MKTPB-4: The same, armored with two steel tapes, for laying in regions infested with rodents;
MKTS-4: In a lead jacket, without armore, for running in telephone conduit;
MKTSB-4: The same, armored with two steel tapes, with a jute sheath, for laying directly in the ground;
MKTSK-4: The same, armored with steel, galvanized circular wires with a jute sheath, for running through water barriers;
MKTASh-4: In an aluminum jacket with a plastic sheath, for running in the region of influence of an AC electrified railroad.

The numeration and function of the coaxial pairs in the cable are: The first coaxial pair is between the red-white and green-white pairs; the second coaxial pair is between the green-white and blue-white pairs; the third coaxial pair is between identical blue-white pairs. The fourth coaxial pair is between the blue-white and red-white pairs.

The pairs are counted at end "A" going in a clockwise direction. The first and second coaxial pairs are used for the first system; while the third and fourth pairs are used for the second system. The numeration of service pairs in the cable is: The first pair, red-white; the second pair, green-white;

the third pair, blue-white; the fourth pair, blue-white; the fifth pair (center pair), blue-white.

The distribution of the service pairs and the control core in the cable is: Two pairs for PSS-1 service communications; two pairs for PSS-2 service communications; one pair (in the center of the cable) for the remote control unit; the cores of this pair are conventionally designated "A" and "B"; the control core (in the center of the cable) is used for the remote control as a signaling transducer for a reduction in the cable insulation, and is conventionally designated "C".

The average value of the attenuation factor for the coaxial pairs of the cable:

f, KHz	60	100	150	200	250	300	400	500	700	900	1000	1100	1200	1300
1.	183	219	256	288	314	343	390	432	512	582	615	645	677	706

A section through the cables is shown in Figures A.1.7 and A.1.8.

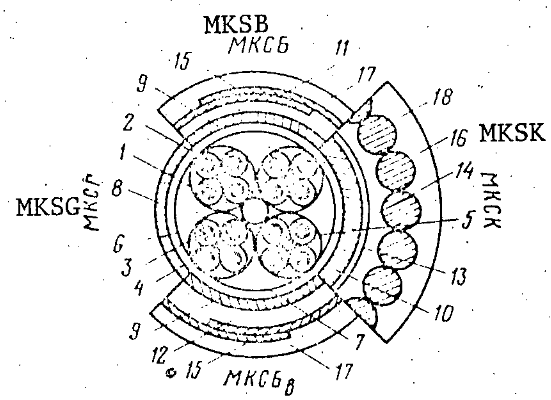


Figure A.1.1. Section through type MKS cable, 4 x 4 x 1.2.

Key: 1. 1.2 mm copper core;
2. Polystyrene cord;
3. Polystyrene tape, 0.045 mm;
4. Centering cord;
5. Quad diameter, 7.06 mm;
6. Core diameter, 15 mm;
7. Strip insulation of the third tape of 0.15 mm (MKSK, fourth tape);
8. 1.4 mm lead jacket;
9. 1.25 mm lead jacket;
10. 2 mm lead jacket;
11. 0.5 mm cable paper cushion;
12. 2 mm cushion (cable paper, polyvinyl chloride);
13, 14. Cushion (cable paper, 0.25 mm, jute, 1.75 mm);
15. Armor, 2 x 0.5 mm;
16. 4 mm armor;
17. Outer sheath (jute, bituminous compound, chalk), 1.9 mm;
18. Outer sheath (jute, bituminous compound, chalk), 2.05 mm.

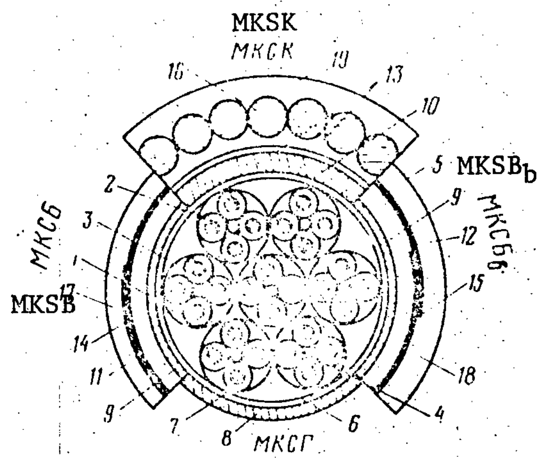


Figure A.1.2. Section through type MKS cable, 7 x 4 x 1.2.

Key: 1. 1.2 mm copper core;
2. Polystyrene cord;
3. 0.045 mm polystyrene tape;
4. Centering cord;
5. Quad diameter 7.06 mm;
6. Core diameter 19.8 mm;
7. Strip insulation of the fourth tape, 0.5 mm;
8. Lead jacket, 1.6 mm;
9. Lead jacket, 1.3 mm;
10. Lead jacket, 2.0 mm;
11. 1.5 mm cable paper cusion;
12. 2.05 mm cable paper and polyvinylchloride cushion;
13. 0.25 mm cable paper and 1.75 mm jute cusion;
14. Armor, 2 x 0.5 mm;
15. Armor, 2 x 0.5 mm;
16. Armor, 4.0 mm;
17, 18, 19. Outer sheath (jute, bituminous compound, chalk), 2.0 mm.

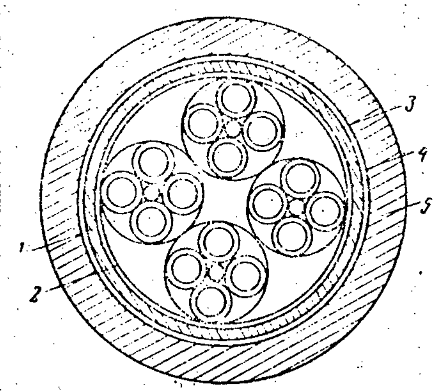


Figure A.1.3. Section through type MKSAP cable, 4 x 4 x 1.2.

Key: 1. Symmetrical quads;
2. Cable paper;
3. Aluminum jacket;
4. Bituminous compound;
5. Polyethylene jacket.

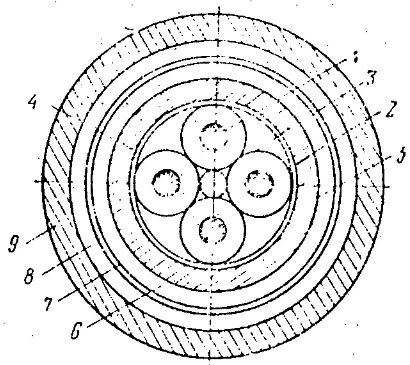


Figure A.1.4. Section through type MKPV cable, 1 x 4 x 1.2.

Key: 1. 1.2 mm copper wire;
2. 1.1 mm polyethylene;
3. Polyethylene cord core;
4. Spiral winding of nylon, lavsan or other synthetic fiber;
5. Polyethylene tubing, 1.5 mm;
6. Electromagnetic shield (of two strips of aluminum foil, and a 0.3 - 0.5 mm soft copper wire between them, or made of two copper strips);
7. 0.25 mm layer of bituminous compound;
8. 0.19 - 0.27 mm polyvinyl chloride plastic tape;
9. 2.2 mm polyvinylchloride jacket.

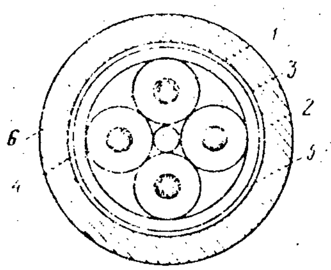


Figure A.1.5. Section through type VTSP cable, 1 x 4 x 1.2.

Key: 1. 1.2 mm copper wire;
2. 0.6 - 0.7 mm polyethylene;
3. Cord core of polyethylene;
4. Polyethylene tubing, 0.6 - 0.7 mm thick;
5. 0.1 mm aluminum tape;
6. Polyvinyl chloride jacket.

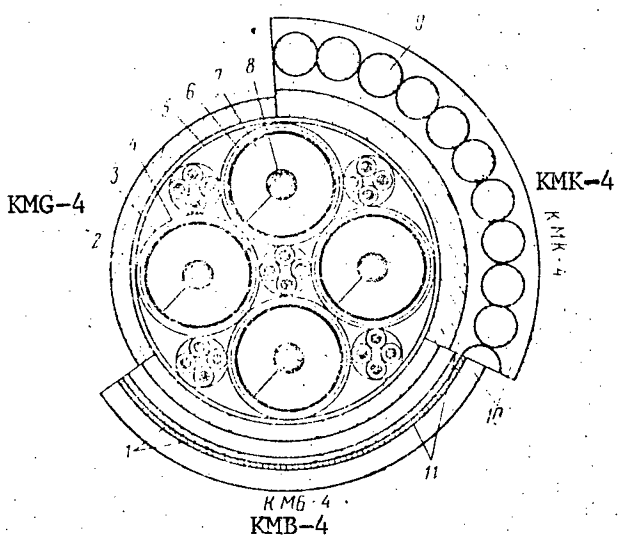


Figure A.1.6. Section through type KM cable, 4 x 2.6/9.4.

Key: 1. Two armor tapes;
2. Lead jacket;
3. Two steel tapes;
4. Winding of paper tapes;
5. Strip insulation;
6. External copper strip conductor;
7. Polyethylene washer, 2.2 mm thick;
8. Inner conductor, 2.6 mm;
9. Armore wire;
10. Outer sheath (jute);
11. Cushion.

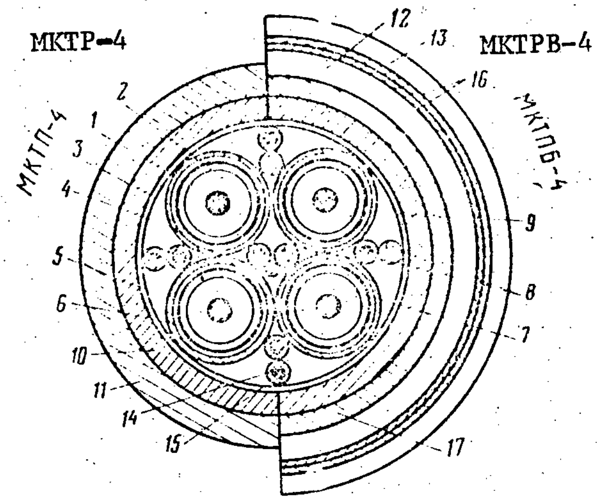


Figure A.1.7. Section through type MKTP-4 cable.

Key:
1. 1.2 mm copper core;
2. 1.2/4.6 coaxial pair;
3. Tubular polyethylene insulation;
4. External conductor of copper tape;
5. Two bimetal tapes of 0.12 mm each;
6. 0.2 mm polyvinylchloride tape;
7. Uninsulated 0.7 mm control core;
8. Symmetrical cores;
9. Strip insulation (two polyvinylchloride tapes);
10. 1.8 mm polyethylene jacket;
11. 2.2 mm polyvinylchloride jacket;
12. 1.5 mm cushion;
13. 2.0 mm outer sheath;
14. 0.7 mm copper wire;
15. 1.6 mm continuous polyethylene insulation;
16. Two armored tapes, 2 x 0.5 mm;
17. 1.0 mm polyvinylchloride jacket.

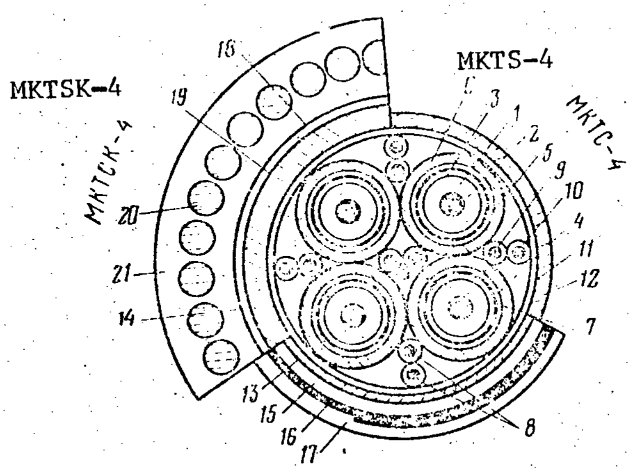


Figure A.1.8. Section through type MKTS 4 x 1.2/4.6 cable.

Key:
1. 1.2/4.6 coaxial pair;
2. Copper core;
3. Tubular polyethylene insulation;
4. Outer conductor of copper tape;
5. Two bimetal tapes;
6. Polyvinylchloride tape;
7. Unisulated control core;
8. Balanced cores;
9. 0.7 mm copper wire;
10. Continuous polyethylene insulation;
11. Strip insulation (two polyvinylchloride tapes);
12. 1.6 mm lead jacket;
13. [not given in text];
14. 2.0 mm lead jacket;
15. Cable paper cushion;
16. 2 x 0.5 mm armor;
17. 2.0 mm outer sheath;
18. 0.25 mm cable paper and 1.75 mm jute cushion
19. Two tapes of 0.25 mm cable paper;
20. 4.0 mm armor
21. 2.0 mm outer sheath.

Appendix 2.

List of Cables and Wires Used For LATs [Line Equipment Shop] Equipment Installation

Function of the Wiring	Designation of the Cables and Wires	Brands of Cables and Wires	No. of Pairs No. of Quads Cross-section	GOST or TU*
	** Line Wiring **			
Wiring of the HF circuits of the K-1920, K-300, K-120 and KRR multiplex systems	Distribution coaxial cable	KRK-75	One coaxial pair	TU Len. SNKh 60230-61
	Coaxial, station, flexible shielded cable	KGK	The same	TU 16-06-348 -69
	Coaxial, station, junction cable	KGKS, KGKSE	The same	TUKP-26-58, with change No. 1.
Wiring of the HF circuits of multiplex systems for coaxial cable; wiring of circuits from the generator equipment (SUGO-I SUGO-II, STGO)	Radio-frequency coaxial cable	RK-75-4-16 or RK-75-4-12	The same	GOST 113260--67; GOST 11326-23-67
Cross-connection in the SKP rack	Shielded hookup wire	PMEO	Single-pair	TU 16-06-344--69
Wiring of the HF circuits of the KV-12, K-24 and K-60 multiplex systems in a spectrum to 252 KHz	High frequency station wire	PVChS	The same	TU-017-162--65
The same	The same	RVChS-160	The same	TUKOMM-50513855
Wiring of circuits multiplexed up to 60 KHz	The same	RVChS-60	The same	"
Wiring of multiplexed and unmultiplexed circuits up to 10 KHz when bringing a cable in from the box to the input equipment, and from the input equipment to the main equipment	Distribution cable for radio broadcasting	RVShE-1 RVShE-5 RVPShE-1 RVPShE-5	One or five pairs with a common shield, core diameter of 0.5 mm.	TU-017-126--65.

* GOST = State Standard; TU = Technical Specification.

List of Cables and Wires Used For LATs Equipment Installation [continued]:

Function of the Wiring	Designation of the Cables and Wires	Brands of Cables and Wires	No. of Pairs No. of Quads Cross-section	GOST or TU
Wiring of multiplexed circuits when bringing in an open-wire circuit from the entrance bracket to the input equipment	Flexible hookup wire	MGVLE	Single-core cross-section 2 mm	VTU MEP 68-47 with change No. 3
	The same, shielded	MRTE	"	VTU NKEP 138-45
Wiring of an unmultiplexed circuit, telegraph wires, when bringing in an open-wire circuit from the entrance bracket to the input equipment, and for the case of telegraph wires when gringing in a cable from the box to the output equipment and from the input equipment to the telegraph set	Installation wire with an aluminum core having polyvinylchloride insulation	APV	Single-core cross-section 2.5 mm	GOST 6323-62
	Installation wire with an aluminum core having rubber insulation in a PVC jacket	APRV	Single-core cross-section 2.5 mm	TUKP 072-66
Wiring of the center taps of physical circuits from the line transformers to the input or switching equipment	Monitor cable with aluminum cores having rubber insulation in a PVC or rubber jacket.	AKVRG AKNRG	4 x 2.5 5 x 2.5 6 x 2.5 7 x 2.5 8 x 2.5 10 x 2.5 14 x 2.5 19 x 2.5 24 x 2.5	GOST 1508-63
	The same, with copper cores in a rubber jacket	KNRG	4 x 1.5 4 x 2.5 5 x 1.5 5 x 2.5	GOST 1508-63
Wiring of low frequency circuits and channels via two-wire and four-wire circuits	Telephone, station cable with insulation and jacketing of PVC plastic	TSB	5 x 3 x 0.5 10 x 3 x 0.5 20 x 3 x 0.5 5 x 2 x 0.5 10 x 2 x 0.5 20 x 2 x 0.5 30 x 2 x 0.5 41 x 2 x 0.5 103 x 2 x 0.5	GOST 14354-69

List of Cables and Wires Used For LATs Equipment Installation [continued]:

Function of the Wiring	Designation of the Cables and Wires	Brands of Cables and Wires	No. of Pairs No. of Quads Cross-section	GOST or TU
Cross-connections in the PSP rack	Station type cross-connection wire	PKSV-2 PKSV-3 PKSV-4	1 x 2 x 0.5 1 x 3 x 0.5 1 x 4 x 0.5	TUKK-OMM 505 200-56
Intrarack wiring of the equipment	Installation wire	MGVLE MEBDL PMVG MGP	1 x 0.2 1 x 0.35 1 x 0.5 1 x 0.75	TU 16-06--463-70
** Power Supply, Ringing and Signaling Wiring **				
Trunk and row power supply wiring	Power cable with rubber insulation & aluminum cores in a PVC jacket	AVRG-500 (for corrosive media).	1 x 4 2 x 4 1 x 6 3 x 4 1 x 10 1 x 16 1 x 25 1 x 35 1 x 50 1 x 70 1 x 95	GOST 433-58
	Power cable with rubber insulation & aluminum cores in a rubber, noncombustible jacket	ANRG-500	"	"
Ringing and buzzer circuits from the AC source to the equipment	Shielded hookup wire Distribution cable for radio broadcasting	PMEO RVShE-1	One pair	TU 16-06 344-69
Signal circuits	Telephone station cable with PVC insulation and in the same jacket	TSV	See above	GOST 14354--69
Remote power supply circuits from the remote power supply racks to the VKS	Flexible hookup wire with PVC insulation	TMVG	1 x 0.5 1 x 0.75	TU 017-153---65

Appendix 3.

The Main Structural Design Data for Underground Chambers for Unattended Repeater Stations

At the present time, three types of underground chambers are used for unattended repeater stations on cable trunks: vertical, thermally insulated chambers for multipair symmetrical cables, multiplexed with K-24-2 or K-60 equipment using vacuum tubes; horizontal chambers for coaxial cables of the KMB-4 type, multiplexed with K-1920 equipment; and horizontal, shortened chambers, for symmetrical multipair cables, multiplexed with the type K-60p semiconductor equipment.

The Vertical Type Underground Thermally Insulated Unattended Repeater Station Chamber

Figures A.3.1. - A.3.4.

Purpose

The vertical type underground, thermally insulated chamber is intended for housing the equipment of an unattended repeater station on balanced communications cable trunks having a capacity of 4 x 4 and 7 x 4, multiplexed with K-24-2 or K-60 equipment.

Technical Characteristics

The thermally insulated chamber is made in the form of a double-walled, steel cylinder with a vertically positioned manhole and entrance hatch in it. Some eight standard, one-sided racks with overall dimensions of 2,500 x 650 x 250 mm can be installed about the perimeter of the interior cylinder of the chamber. The interior of the thermally insulated chamber is electrically insulated from the exterior, and contains the structures to which the equipment of the repeater station is secured. The thickness of the outer and inner walls of the chamber is 4 mm. The space between the walls is filled with a heat insulating material: microporous rubber. The outer surface of the chamber is coated with a special toughened anticorrosion protective layer, designed for long term protection of the chamber in the ground.

The upper part of the thermally insulated chamber has nine branch pipes, of which six have a diameter of 30 mm, and three have a diameter of 25 mm. These branch pipes are intended for bringing four trunk cables into the NUP chamber (two each from each direction), and two ground cables, two cables for connecting the thermistors for ground temperature referenced AGC, and one connecting cable. The branch pipes are made in the form of feed through bushings, to which the cable jackets are sealed on the outside.

The hatch cover is secured with special wing nuts, and equipped with a rubber seal, something which makes it moisture proof. There are two ventilating pipes in the upper part of the chamber. The construction of the chamber permits maintaining the requisite temperature and humidity in it by virtue of the heat dissipated by the equipment, or by heating lamps which can be turned on remotely. The power dissipated by the equipment, and the temperature mode in the NUP chamber, are given in Table A.3.1, as a function of the multiplex system, for the central zone of the USSR.

In case something less than the complete number of intermediate stations (less than eight) is installed initially, supplemental heating is accomplished with the installation of heating lamps, powered remotely via the working cores of the cable from the OUP or OP [attended repeater or terminal station].

Table A.3.1.

Equipment	Power Dissipated by the Equipment watts	Range of Temperature Variation in the Chamber	Relative Humidity %
SPUN-U for 8 systems, K-24 or K-60 (4 x 4 cable)	160	+3 - 35° C	75 - 80
SPUN-U for 4 systems, and SPUN K-60p for 4 systems (4 x 4 cable)	80	0 - 35° C	75 - 80
SPUN-U for 14 systems, K-24 or K-60 (7 x 4 cable)	260	+5 - 40° C	75 - 80

Equipment Complement:

Thermally insulated chamber;
Long ladder;
Short ladder;
Special wrench for the cover;
Wrench, S = 65 mm;
Socket wrench, S = 17 mm;
Eight insulating mats, with dimensions of 785 x 750 x 6 mm.

The dimensions of the thermally insulated chamber are:

Overall height with the manhole	3,872 mm
Diameter of the outer shell (with the protruding parts)	2,760 mm
Height of the inner room	2,546 mm
Inside diameter of the chamber	2,400 mm
Inside diameter of the hatch	750 mm
Weight of the thermally insulated chamber	4,000 kg

Cost: 2,500 rubles

The thermally insulated chamber is installed in an excavation, and to avoid surfacing, it is secured to a steel reinforced foundation slab. Installed above the thermally insulated chamber is a steel-reinforced composite box, intended for housing the equipment for maintaining the cable under a constant excess gas pressure (AKOU) and the service communications sockets. Depending on the climatic conditions, the surface area of the NUP is made either with or without an embankment.

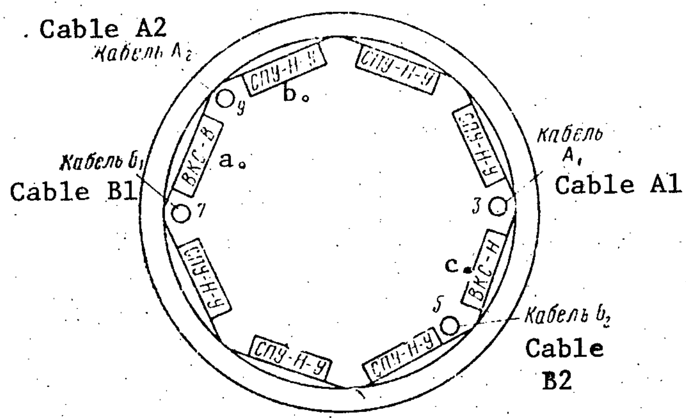


Figure A.3.1. Sample plan view of the placement of the equipment in a vertical NUP (3, 5, 7 and 9 are the numbers of the openings for bringing in the cables).

Key: a. VKS-V;
b. SPU-N-U;
c. VKS-N.

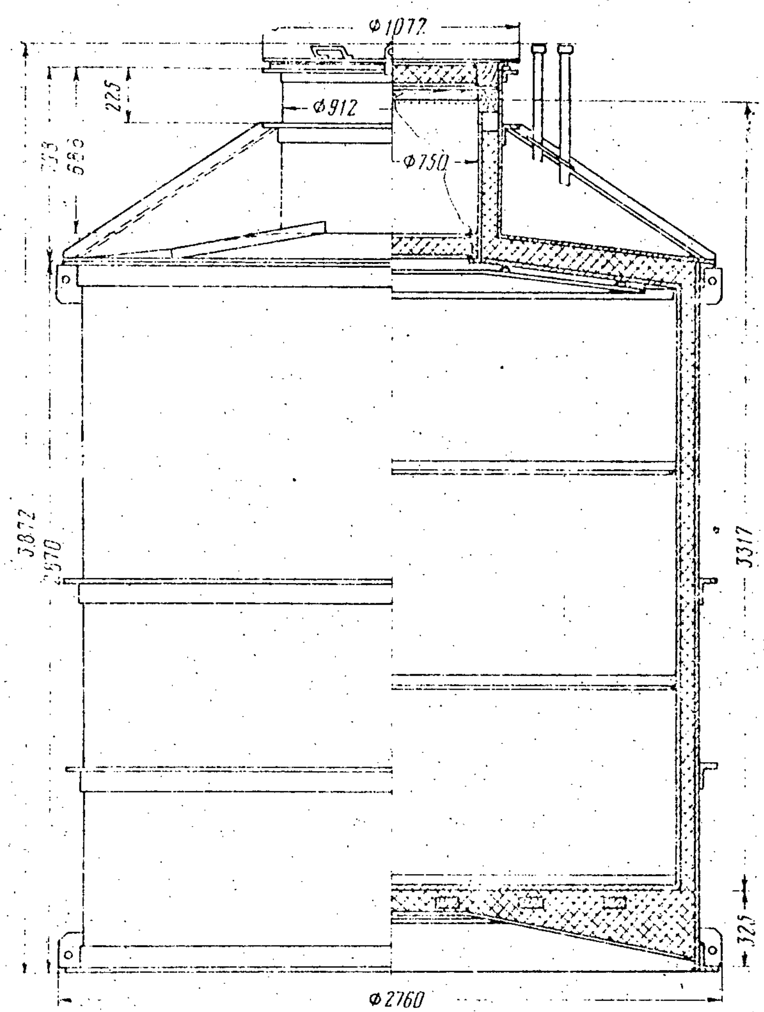


Figure A.3.2. The construction of a vertical, thermally insulated chamber for unattended stations of balanced cable trunks (view from the side).

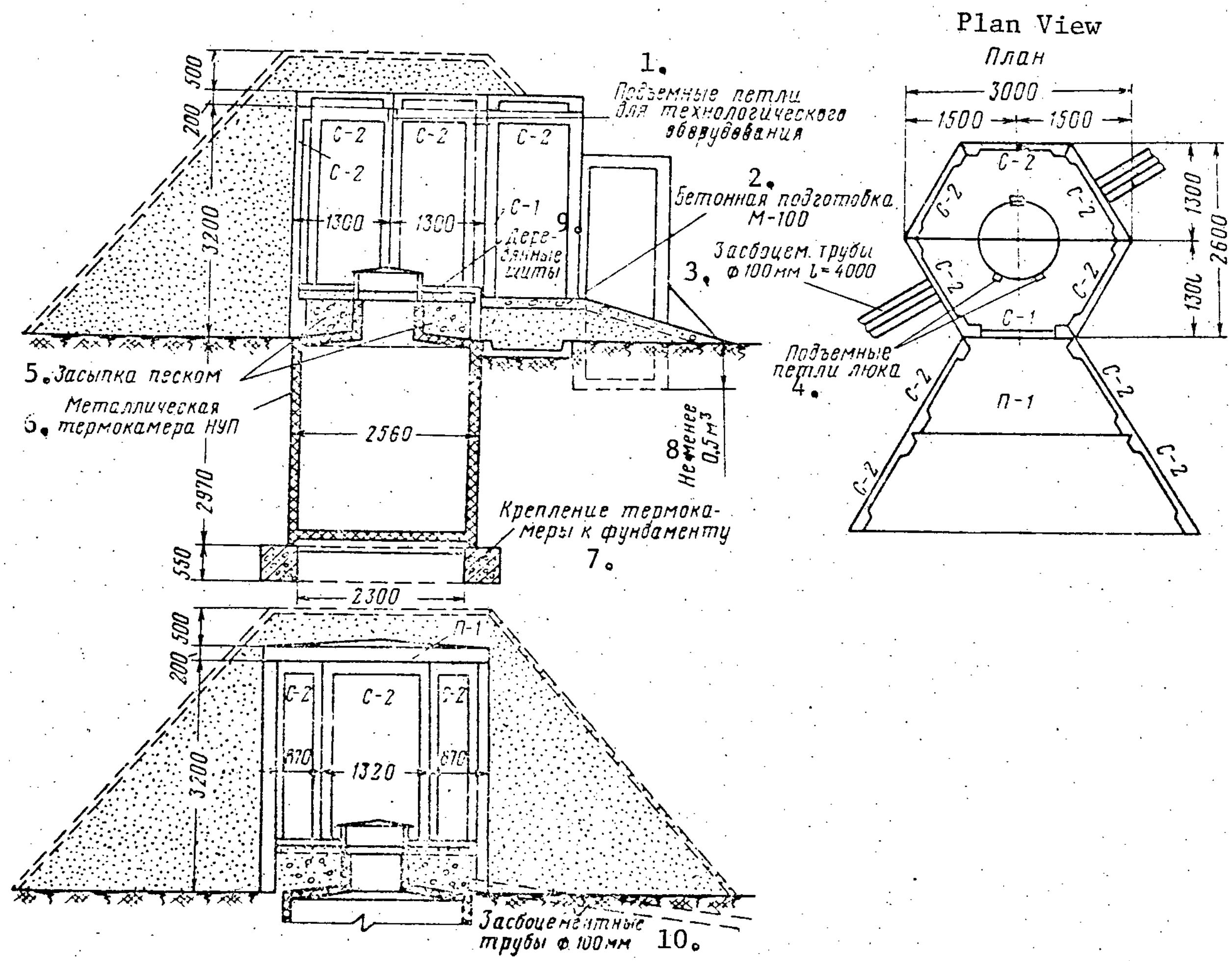


Figure A.3.3. Plan view and sections showing the vertical, thermally insulated chamber installation (variant with embankment).

Key: 1. Lifting loops for production equipment;
2. Concrete base, M-100;

[Key to Figure A.3.3, continued]:

3. Three asbestos cement pipes, 100 mm diameter, 1 = 4,000;
4. Hoist loops for the hatch;
5. Sand fill;
6. Metal, thermally insulated NUP chamber;
7. Securing of the thermally insulated chamber to the foundation;
8. No less than 0.5 m^3;
9. Wooden panels
10. Three asbestos cement pipes, 100 mm diameter.

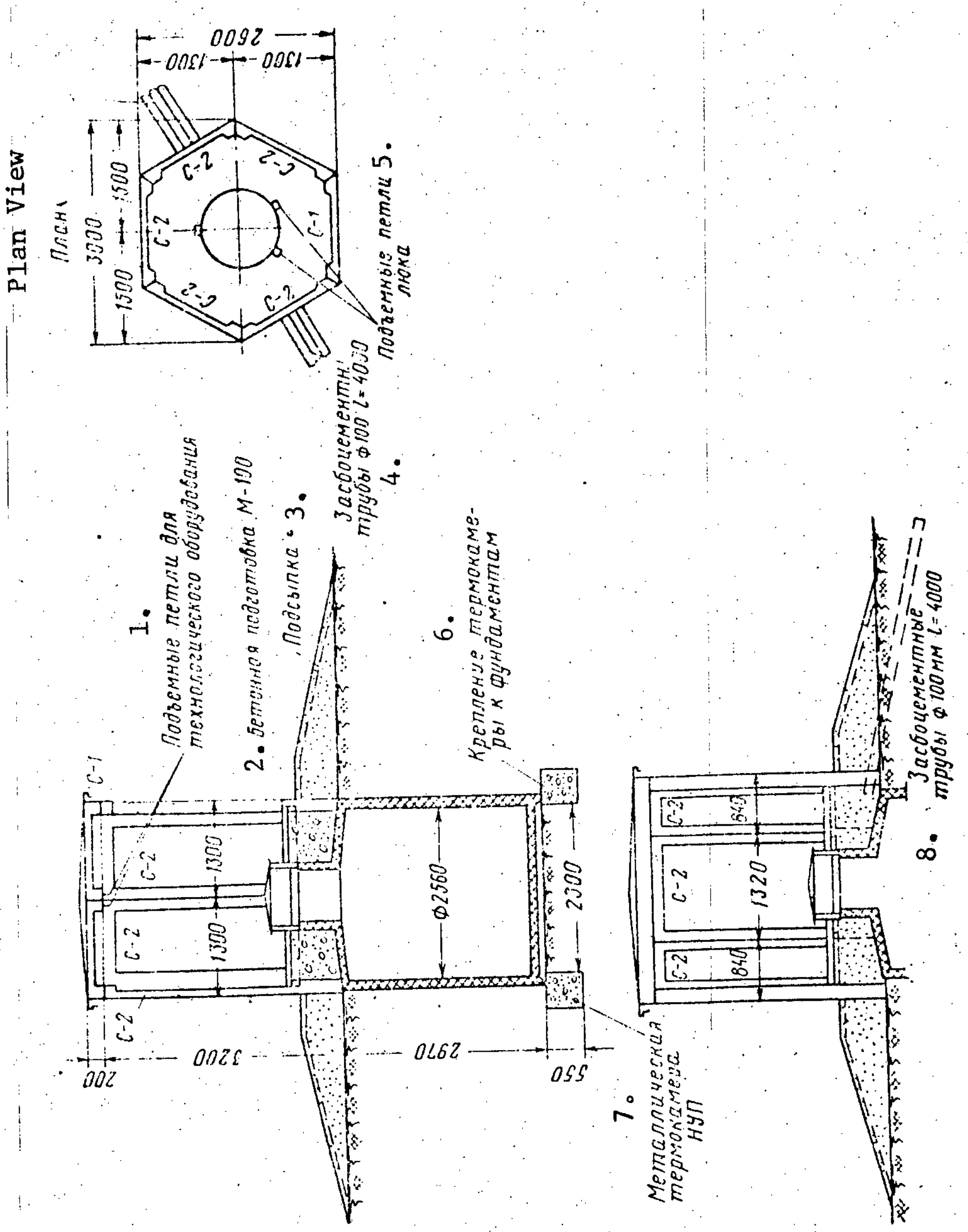


Figure A.3.4. Plan view and sections showing the installation of the vertical thermally insulated chamber (variant without embankment).

Key: 1. Hoist loops for production equipment;
2. M-100 concrete base;
3. Filler;

[Key to Figure A.3.4, continued]:

4. Three asbestos cement pipes, diameter = 100, 1 = 4,000;
5. Hoist loops for the hatch;
6. Securing of the thermally insulated chamber to the foundations;
7. Metal thermally insulated chamber of the unattended repeater station;
8. Three asbestos cement pipes, diameter = 100 mm, 1 = 4,000 mm.

The Horizontal Type Underground Metal Unattended Repeater Station Chamber for the K-1920 System

Figures A.3.5. - A.3.7.

Purpose

The underground, metal NUP chamber of the horizontal type is intended for housing the equipment of unattended repeater stations on KMB-4 coaxial cable trunks, multiplexed with K-1920 equipment.

Technical Characteristics

The underground chamber for housing the K-1920 unattended repeater station equipment takes the form of a single walled, steel cistern with spherical ends, having a diameter of 2.6 m and a length of 4.55 m. Inside the chamber, the NUP has a wooden liner, and on the outside, the chamber is coated with anti-corrosion protection consisting of two layers of glass fabric and bitumen. For entry into the NUP, the chamber has a manhole with a diameter of 0.83 m and a height of 0.96 m offset from the horizontal and vertical axes. The manhole entrance and its steel cover are thermally insulated. The interior room of the chamber has two compartments: a room in which the equipment is placed to maintain the cables under a constant gas pressure (AKOU or similar equipment). Installed in the second compartment is the unattended repeater station equipment of the K-1920 system. In all, up to six racks with dimensions of 2,000 x 650 x 310 can be installed in this compartment (SU-NUP and SV-NUP).

The overall power dissipated by the NUP equipment (for the case of two K-1920 systems, runs on the order of 600 watts, a figure which assures temperature conditions inside the compartment with the equipment within limits of +5 to +40° C, at a relative humidity of up to 75%.

In the end face wall of the chamber (at the entranceway end), there are four branch pipes for bringing in cables (two trunks of the KMB-4 type, one cable from the thermistors for ground temperature referenced AGC, and one grounding cable). Ventilation is provided in the room by means of special ventilating pipes. The metal NUP chamber is placed in an excavation, and secured to a steel-reinforced concrete foundation slab. Installed above the manhole entrance to the chamber is a box made of steel reinforced concrete slabs. Brought out in this box is a socket for connection to the service communications channel.

Equipment Complement

NUP housing;
Ladder;
Four holders for cable coupling sleeves;
Two clamps for securing KMB-4 cable;
Two clamps for SBG and TZB cable;
Switch;
Cover;
NUP liner;
Four cable stubs;
Lock switch;
Mat, 2,370 x 1,110 x 3 mm (insulating rubber);
Mat, 2,370 x 1,400 x 4 mm (linoleum);
Mat, 1,400 x 1,400 x 4 mm (linoleum).

Cost: 2,500 rubles

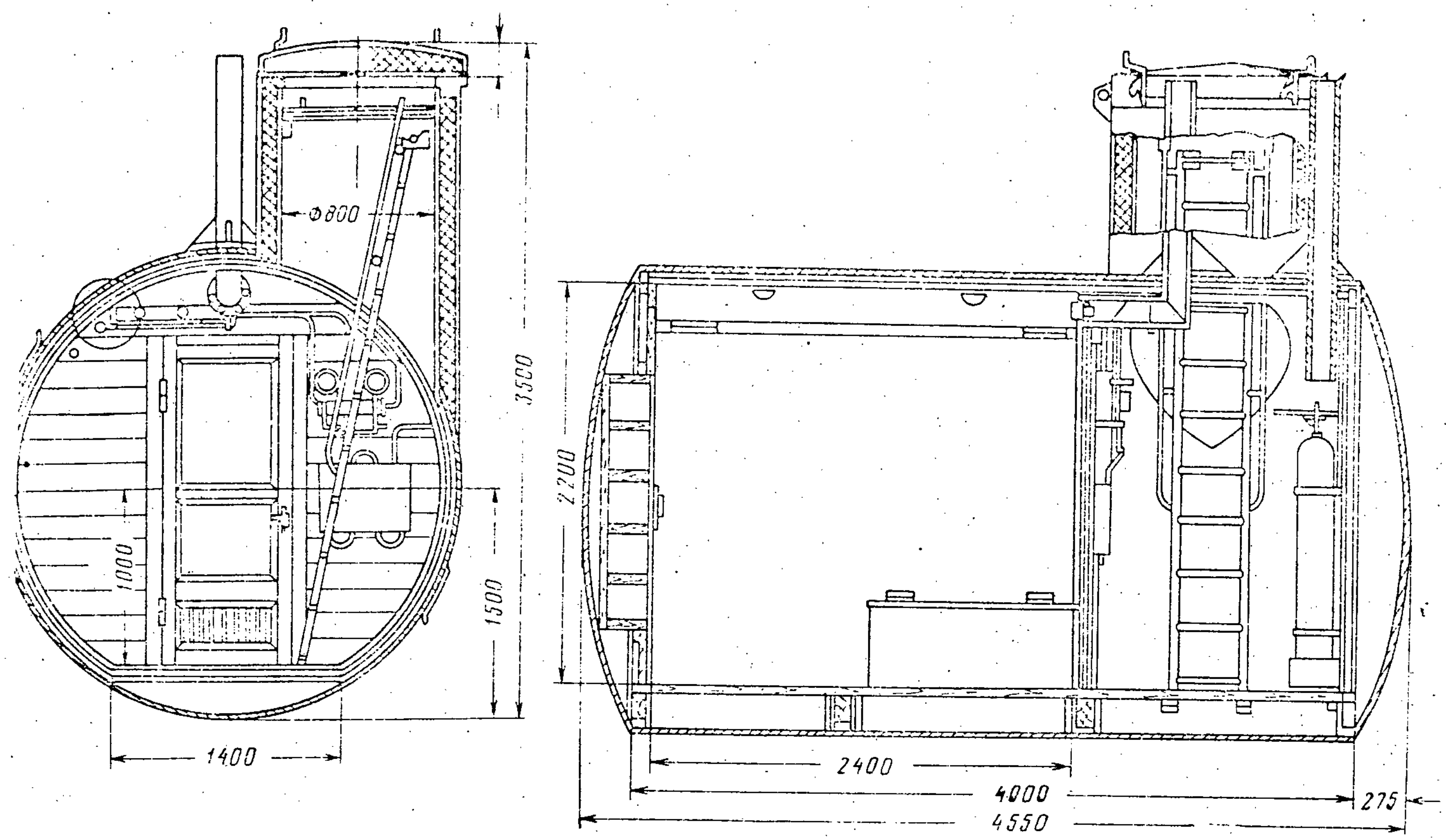


Figure A.3.5. The construction of the thermally insulated chamber for unattended repeater stations of coaxial cable trunks.

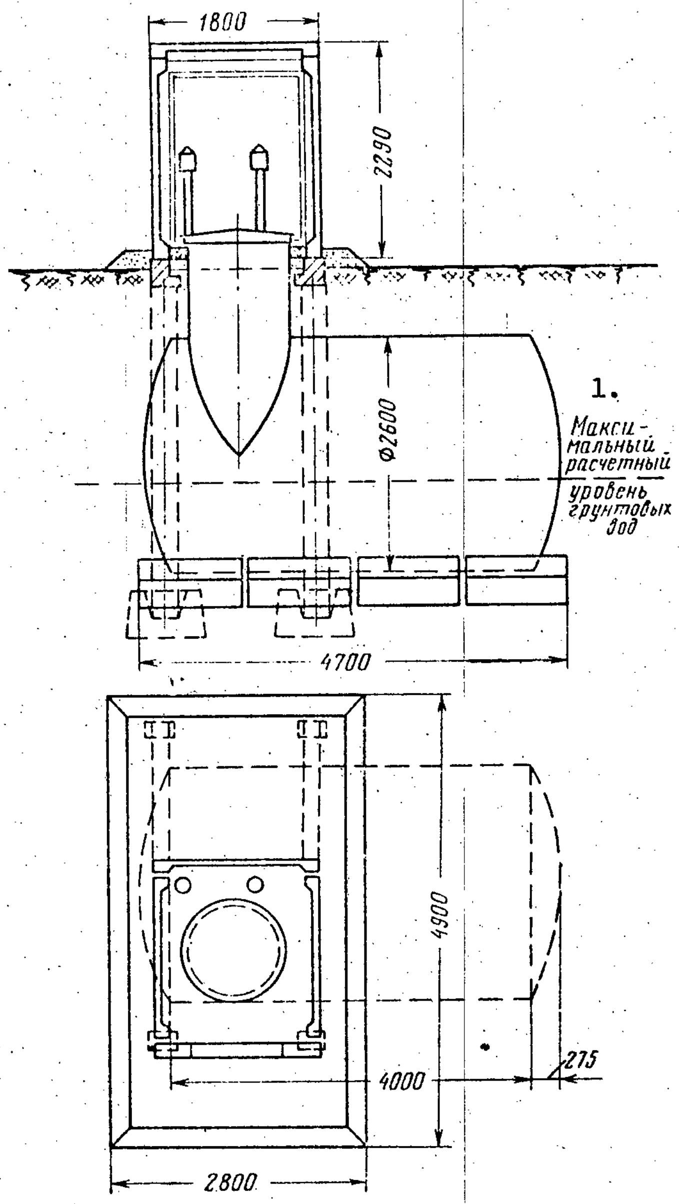


Figure A.3.6. The installation of the underground, unattended repeater station (NUP) for KMB-4 coaxial cable multiplexed with K-1920 equipment.

Key: 1. Maximum design ground water level.

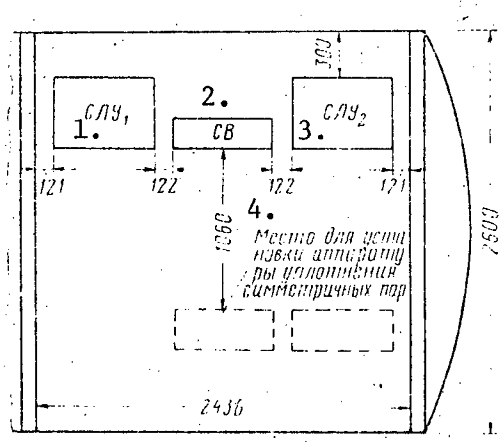


Figure A.3.7. Plan view of the placement of the K-1920 equipment in an unattended repeater station.

Key: 1. Line amplifier rack;
2. SV [expansion unknown];
3. Line amplifier rack 2;
4. Location for the installation of equipment for multiplexing balanced pairs.

The Horizontal Type Underground, Shortened Metal Chamber for Unattended Repeater Stations for the K-60p System

Figure A.3.8.

Purpose

The horizontal type, shortened NUP chamber is intended for housing the equipment of unattended repeater stations on balanced cable trunks with a capacity of 4 x 4, multiplexed with the K-60p transistorized equipment.

Technical Characteristics

The shortened NUP chamber for the K-60p system is structurally similar to the analogous chamber for the K-1920 system, and differs from the latter in its length, as well as in the absence of an entranceway room. The length of the shortened cahmber, with the spherical ends, amounts to 2,950 mm. There are 10 branch pipes in the end wall of the chamber for bringing in cables: four trunks of the MKSB 4 x 4 type, two of the same type from the temperature transducers for ground temperature referenced AGC, two ground cables and two junction cables. The inner room of the chamber is designed for the installation of two SPUN K-60p cabinets, one VKSh cabinet, as well as equipment for keeping the trunk cables under a constant gas pressure (AKOU).

The power dissipated in the NUP amounts to 80 watts in all, something which does not influence the temperature conditions in the NUP room. The air temperature in the NUP is practically determined by the ground temperature, something which assures normal operational conditions for the SPUN K-60p equipment in the majority of regions of the USSR (the minimum temperature in northern regions is -9.4° C, while the maximum in southern regions is +27°C. In the central zone, the minimum and maximum temperatures will fall within limits of from -2 to +12.1° C).

Equipment Complement

NUP housing; ladder; dome light; electric lamp, 10 w, 28 volts; liner and plastic foam for the NUP.

Weight: 2,200 kg.   Cost: 1,600 kg.

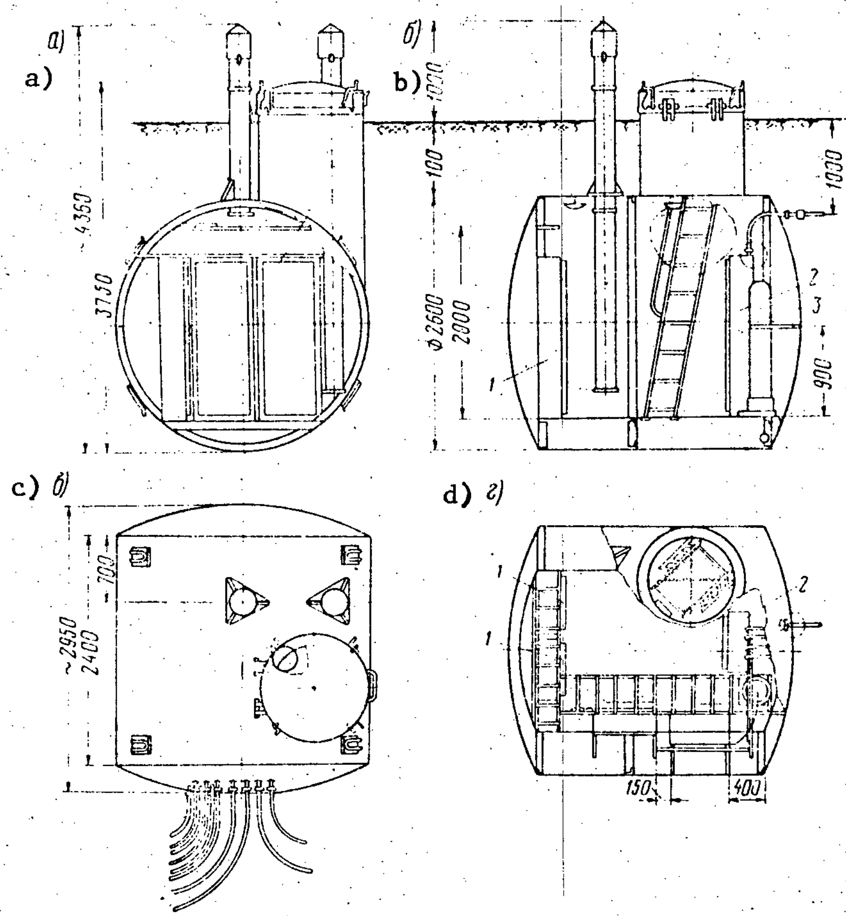


Figure A.3.8. The construction of the chamber for unattended repeater stations of the K-60p 4 x 4 equipment.
a) View from the end;
b) View from the side;
c & d) View from above;

Key: 1. SPUN;
2. VKSh;
3. Tank for AKOU [cable pressurizing equipment].

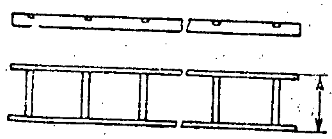
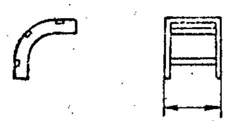
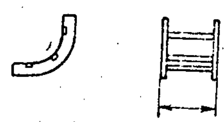
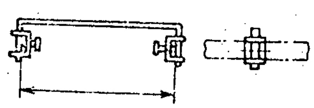
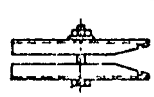
Appendix 4

The Main Standard Dimensions of Open Type Troughs

For running cables and wires in the open between the equipment in equipment shops, between equipment shops, and for cable entrances to communications enterprises, the following types and main dimensions have been established for the structural components of cable troughs.

The designations and general view of the components of open cable troughs are given in Table A.4.1.

Table A.4.1. Designations and general view of the components of open cable troughs

Designation of the Element / Наименование элемента	Symbol / Обозначение	General View / Общий вид	Width, B, mm / Ширина, B мм
Straight Welded Section / Сварной прямой участок	ЖСП ZhSP		
Сварной поворотный участок „Спуск" 1.	ЖСПС ZhSPS		150, 300
Сварной поворотный участок „Подъем" 2.	ЖСПП ZhSPP		400, 500, 600
Sliding Pin / Скалка передвижная	СП SP		
Clamping Tie-piece / Перемычка зажимная	ЗП ZP		

Key: 1. Welded elbow section, "Drop";
2. Welded elbow section, "Rise".

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