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Next 3 Page(s) In Document Denied

RADIO STATION

Type KB-0.25

DESCRIPTION

(CONTINUED)

Chapter IV

MAINTENANCE AND OPERATING INSTRUCTIONS OF THE KB-0.25 TRANSMITTING RADIO STATION

A. OPERATING THE RADIO STATION

1. Preparation for Turning

The station is prepared following the procedure below:

(1) 2.5 - 3 hours prior to operation, switch on the heating of the osoillator thermostat operating the thermostat heating toggle switch located on the front panel of transmitter unit No.1; this time is sifficient for all the circuit components of the first stage, which determine the frequency of the transmitter, to attain the temperature at which the oscillator was calibrated at the factory. If the thermostat heater operates normally, the signal lamp on the front panel of unit No.1 should go on and out periodically. At the same time the characteristic noise of the thermostat fan motor should be heard. If for some reason the thermostat cannot be switched on, then the frequency setting accuracy of the operating station will be below that guaranteed by the factory.

(2) When operating on crystal-controlled frequencies, the thermostat heater of unit No.5 and the preliminary crystal heating element, should be switched on from 2 to 3 hours before operation, with the devices Б inserted beforehand into the thermostats. If the ambient temperature is not lower than +20°, a preliminary heating period of 1 to 1.5 hours is sufficient. With the thermostat heating switched off, the frequency accuracy of devices Б is reduced.

(3) When the station is supplied by a D.C. mains, the next stage in the preparation of the radio station for operation should be the starting of the converter.

For this proceed as follows:

(a) set the knob for emergency starting of the motor at the starting station to the position STOP (СТОП);

(b) set the knob of the manual excitation control РВ or РЗВ to the extreme position to ensure all-in resistance LESS (НИЖЕ);

(c) set the mains switch of the rectifier assembly to the middle position OFF (ВЫКЛЮЧЕНО);

(d) on the supply switchboard, set the ship's mains switch to one of the positions STARBOARD (ПРАВЫЙ БОРТ) or PORT (ЛЕВЫЙ БОРТ) if voltage is present,

one of the signal lamps should light up and the voltmeter should read the voltage of the D.C. mains;

(e) press the push-button START (ПУСК) on the supply switchboard and keep it pressed for 1 - 2 seconds. If for some reason automatic starting fails to be obtained, then the converter can be started by hand until the cause of the fault is discovered. To do this switch the emergency starting knob from the position STOP to the position START pausing at each contact for 2 - 3 seconds.

With the converter started, the A.C. generator should become excited. When the voltage stabilizers БРПТ-2.5 and РУН are used, the generator voltage should be automatically adjusted to read almost the nominal value, i.e. 220 volts. In case of the АПНТ-85 generators which are not provided with full automatic stabilization, the voltage is set with the manual regulator РЗВ, according to the voltmeter located in the rectifier assembly.

When employing the generator of converter ПТ-2.5 the generator voltage is regulated as follows in case the automatic voltage regulators РУН fail to operate. The rotary switch of the regulator РВ is turned to the position at which the resistance of the carbon pile is shunted.

After the switch is operated, the knob of the PB regulator is turned to set the required generator voltage, using the voltmeter located on the rectifier assembly.

Regardless of the value of the external load, when the current stabilizer is operating, no further adjustment of the generator voltage will be necessary.

The speed of the converter motor should not be adjusted during service.

During operation of the converter it is necessary to monitor the value of the current consumed from the mains by means of the ammeter mounted on the supply switchboard (the ammetor installed in unit No.1 of the rectifier assembly, monitors the current supplied by the generator).

(4) Turn the supply knife switch of the rectifier to the position PORT or STARBOARD, depending on where the A.C. voltage of the converter or the A.C. ship's mains is fed to. If there is voltage in the mains, the neon signal lamps located under the knife switch will light up.

(5) Check the value of the mains voltage with the voltmeter in rectifier unit No.1 (198 - 242 volts are normal for a 220 -V mains and 342 - 418 for a 380 V mains). Use the same voltmeter to check the +24 V auxiliary circuit (24 to 30 volts are normal); should the voltage be less check the fuses ПР-5 and ПР-4 in the first rectifier unit.

Note: The ship's mains knife switch of the rectifier may be switched off only during prolonged interruptions in the transmitter operation. This is due to the fact that with the knife switch off, the +24 V circuit supplying the automatic system is broken thus making impossible remote switching on of the station from the control unit, the remote communication post or the radio operator's post.

(6) Set the switch of the series-connected capacitors of the antenna circuit SWITCH OF ANTENNA CIRCUIT,SERIES (ПЕРЕКЛ.АНТ.КОНТ.ПОСЛ.) of transmitter unit No.3 to position 5 (earth). The antenna is now earthed thereby precluding inadvertent transmission provided the station has been first prepared for operation.

(7) From 5 to 10 minutes prior to transmission, switch on the heaters of the transmitter valves with the aid of the push-button START (ПУСК) of the control unit, the green lamp of the control unit should now light up. Preliminary switching on of the heater supply is necessary in order to increase the frequency setting accuracy.

(8) Set the high voltage toggle switch of unit 1 of the rectifier to the position TUNING (НАСТРОЙКА), the signal lamp of unit No.3 of the rectifier should light up.

(9) With the aid of the toggle switch RADIO-INTERCOM. of the control unit, switch on high voltage by setting the toggle switch in the upper position RADIO. The emergency switch of the second rectifier unit should be in the position ON (ВКЛ.). The emergency switch should be used only in case of emergency or when it is necessary to preclude switching on of high voltage by the remote posts. The emergency switch left in the OFF position unintentionally, may cause an interruption in communication.

If high voltage is switched on immediately after switching on the heater voltage, it will be automatically delayed for 20 to 40 seconds. This is the time of operation of the valve time relay.

(10) Make sure that the rectifier functions normally and then switch off high voltage by setting the toggle switch RADIO - INTERCOM. to the position INTERCOM. The red lamp of the control unit will go out. This operation completes the procedure for preparing the transmitter for tuning.

(11) To switch off the station, press the push-button STOP on the control unit. The transmitter valve heaters will now be switched off, and the green signal lamp of the control unit will go out.

(12) The converter is stopped as follows:

(a) in case of manual control, remove the generator voltage by setting the knobs of the regulators РВ or РЗВ to the position LESS (НИЖЕ);

(b) by pressing the push-button STOP on the supply switchboard (when the automatic system operates) stop the electric motor; if the electric motor was started with the manual emergency switch, then the knob of this switch should be turned rapidly from the position START to the position STOP and the push-button STOP on the supply switchboard pressed again;

(c) turn the ship's mains switch on the supply switchboard to the middle position; the signal lamp will go out.

After stopping the motor, the ship's mains switch should not be left in the ON position.

2. Tuning the Transmitter in the Continuous Range Without Tables

Preparation of Tuning Tables

The documents supplied with the station include a calibration book. This book is not filled in completely at the factory, as the transmitter is checked at the factory not with an antenna but with a dummy antenna formed by a wire-wound resistor of 70 ohms.

The tuning of the antenna circuit, the value of the coupling to the antenna, and the tuning of the output stage depends on the type and characteristics of the antenna in conjunction with which the transmitter will be installed.

This accounts for the fact that the corresponding columns of the tuning tables of the book are not filled in at the factory. These entries should be made after the power unit, the oscillator and the intermediate stages of the transmitter have been checked.

Tuning tables should be compiled beginning with the frequency 1.5 Mc/s of the first band. To do this proceed as follows:

(a) start the converter and make sure that there is mains voltage;

(b) switch on the power knife switch of the rectifier;

(c) switch on the valve heaters with the aid of the push-button of the control unit;

(d) operate the band selector switch to set the first band;

(e) set the antenna coupling knob to position 1;

(f) set the given frequency (1.5 Mc/s) according to the optical tuning dial;

(g) set the function switch of unit No.5 to the position CONTINUOUS RANGE (ПЛАВНЫЙ ДИАПАЗОН).

(h) Set the H.V. toggle switch to the position TUNING (НАСТРОЙКА); set the funotion switch of the control unit to the position CW (НЗТ), switch on high voltage and press the key;

(i) employing the tuning knob of the third and fourth stages tune the circuits to maximum current in the control grid circuit of the fourth stage; the readings of the third and fourth stage dials should correspond to those indicated in calibration book (small divergence within 1 - 2 divisions is permissible);

(j) operate the tuning knob of the fourth stage to tune the intermediate circuit to minimum anode current of the fourth stage valve;

(k) increase antenna coupling by several positions and tune the antenna circuit to maximum reading of the antenna indicator or maximum reading of the anode milliammeter of the fourth stage valve. If the antenna circuit fails to be tuned at once, set the knobs controlling the series - and parallel-connected capacitors of the antenna to the various positions;

(l) having tuned the antenna circuit, adjust the antenna coupling in such a way that the anode current of the fourth stage attains approximately 0.2 ampere and a slight detuning of the antenna circuit to the right and left of the resonance position causes the anode current of the fourth stage to decrease;

(m) switch off high voltage with the toggle switch of the control unit. Set the high voltage toggle switch of

the rectifier to the position OPERATION (РАБОТА)

Switch high voltage on again;

(n) press the key, check how accurately the antenna and intermediate circuits are tuned.

(o) by adjusting the coupling, bring the anode current of the fourth stage valves to the normal value of about 0.4 ampere (the pointer of the meter should not go beyond the limits of the coloured sector).

The grid current of the fourth stage valves should be within 12 - 30 mA. The operating conditions of the first, second and third stages should correspond to the table of operating conditions compiled by the factory. Deviations within 20 - 25 per cent are permissible.

The heating of the ГК-71 valve anodes should not exceed the permissible value (dark anodes).

If the above conditions are fulfilled, the positions of the tuning knobs and dial divisions are entered in the tables of the calibration book, and the next higher frequency can be tuned to. In this way all the tables of the calibration book are filled in.

Tuning the Antenna Circuit when Operating with Various Types of Antennas

As was already mentioned, the positions of the antenna circuit knobs when tuning to a given frequency have to be

found experimentally. It is possible that several combinations of knob positions may be found at which the antenna circuit tunes. That combination should be chosen with which:

(a) the series-connected capacity is short-circuited or of maximum value;

(b) the parallel-connected capacity is disconnected or at minimum value;

(c) tuning to resonance is sharpest;

(d) the continuous tuning knob of the antenna circuit is not at the end or beginning of the dial, i.e. it is possible to tune to left and right of resonance;

(e) the anode current load of the ГК-71 valves is greatest, while anode heating is the least (the anodes are dark).

With series feed of the antenna (series connection of the condensors) the readings of the antenna indicator are proportional to the current in the antenna proper and in this case it is necessary to tune to maximum reading of the indicator. With parallel antenna feed (parallel connection of the condensers) the reading of the antenna indicator is proportional to the current in the antenna circuit. The looser the coupling of the antenna to the antenna circuit the greater the current and the more power lost in the antenna circuit proper and less fed into the antenna. For this reason, when tuning the antenna circuit to maximum

reading of the antenna indicator with parallel antenna feed, try to reduce the value of this maximum reading by decreasing the capacitance connected in parallel with the antenna.

When tuning the antenna circuit, the following order should be observed;

(a) tune with decreased anode voltage of the fourth stage (position TUNING);

(b) tune the fourth stage with antenna coupling at the minimum value;

(c) without changing the tuning of the fourth stage increase the antenna coupling by turning the knob ANTENNA COUPLING (СВЯЗЬ С АНТЕННОЙ) one or two positions to the right;

(d) it is recommended to begin tuning the antenna circuit from the position when one inductance is connected in the antenna circuit (the left-hand switch of the antenna circuit is in position 4, the right-hand switch - in position 1). Switch on series capacitors begining with the highest (positions 3,2,1) then as the need arises connect the parallel capacitors beginning with the lowest (position 2, and then 3, 4, etc.);

(e) having tuned the antenna circuit to the maximum

readings of the indicator (or to maximum glowing of the neon lamp and to maximum reading of the anode current meter of the fourth stage), increase the antenna coupling still more till the load of the fourth stage valves reaches a current of about 0.2 ampere (with reduced anode voltage). Coupling should be increased gradually with simultaneous tuning of the antenna circuit. If the tuning is correct, detuning of the antenna circuit unloads the output stage. Decreasing coupling unloads the output stage, without greatly detuning it.

3. Tuning the Transmitter in the Continuous Range according to Tables

After preparation of the station, the transmitter is tuned according to the tables of the calibration book in the following way:

(a) Set the band selector switch to the required band;

W A R N I N G. Switch bands with the high voltage off.

(b) set the given frequency in the optical dial with the knob TUNING I-II STAGES (НАСТРОЙКА 1-II К);

(c) set the function switch of transmitter unit No.5 in the position CONTINUOUS RANGE (ПЛАВНЫЙ ДИАПАЗОН);

(d) set the high voltage switch of rectifier unit No.1 in the position TUNING (НАСТРОЙКА);

(e) according to the calibration table set the following transmitter tuning knobs TUNING OF III-IV STAGES (НАСТРОЙКА III-IV КАСК.) of unit No.2; TUNING OF IV STAGE (НАСТРОЙКА IV КАСК.) of unit No.2; ANTENNA COUPLING (СВЯЗЬ С АНТЕННОЙ) of unit No.2; ANTENNA CIRCUIT INDUCTANCE (ИНДУКТИВНОСТЬ АНТЕННОГО КОНТУРА.) of unit No.3; ANTENNA CIRCUIT SWITCH (ПЕРЕКЛ.АНТ.КОНТ.) SERIES (ПОСЛ.) and PARALLEL (ПАРАЛЛ.) of unit No.3.

(f) make sure that the appropriate antenna is connected to the transmitter via the transmitting-antennas switchboard;

(g) switch on high voltage by setting the toggle switch of the control unit in the position RADIO (РАДИО);

(h) press the key or the push-button KEY (КЛЮЧ) of unit No.5 and tune the antenna circuit (ANTENNA CIRCUIT INDUCTANCE) to maximum reading of the antenna indicator;

(i) switch off high voltage; set the high voltage switch of unit No.1 in the position OPERATION (РАБОТА) and switch high voltage on again. This concludes preparation for operation.

4. Tuning the Transmitter with the Crystal-Controlled Oscillator

With the crystal-controlled oscillator, the transmitter should be tuned as follows:

(a) select the device Б according to the given frequency and insert it in unit No.5;

(b) set the function switch of transmitter unit No.5 in the position CRYSTAL WAVES - AMPLITUDE KEYING (КВАРЦ.ВОЛНЫ - АМПЛ.МАНИП.)for amplitude keying or in the position CRYSTAL WAVES - FREQUENCY-SHIFT KEYING (КВАРЦ.ВОЛНЫ - ЧАСТ.МАН.)for printing telegraphy;

(c) set the band selector switch in accordance with the given frequency;

(d) set the toggle switch of the rectifier unit No.1 in the position TUNING (НАСТРОЙКА);

(e) switch on high voltage from the control unit by setting the toggle switch RADIO - INTERCOM. (РАДИО-ВНУТР. ПЕРЕГОВОРЫ)in the position RADIO;

(f) with the tuning knob of transmitter unit No.1 tune the second transmitter stage coarsely by setting the given frequency on the optical dial;

The second stage is tuned finely according to minimal anode current as measured by an external milliammeter connected to the jack ANODE OF II STAGE (АНОД II К) of transmitter unit No.1. Often tuning by the dial does not coincide with tuning by the milliammeter. This is due to the fact that the dial is calibrated by the frequency generated by the first stage, and absolutely exact tracking of the second and first stages is not always obtained;

(g) switch off high voltage by setting the toggle switch RADIO - INTERCOM. in the position INTERCOM;

(h) set all the tuning knobs of the third and fourth stages and the antenna circuit according to the tables of the calibration book;

(i) set the toggle switch of rectifier unit No.1 in the position OPERATION;

(j) switch on high voltage by setting the toggle switch of the control unit in the position RADIO;

(k) tune the antenna circuit to maximum reading of the indicator.

5. Switching Modes of Operation

For CW telegraphy proceed as follows:

(a) tune the transmitter to the given frequency;

(b) set the function switch of the control unit in in the position CW (HJT);

(c) depending on the communication conditions (distance, time, season, etc.) set the power regulator of the control unit in the required position;

(d) switch on high voltage with the toggle switch RADIO - INTERCOM.

The operation of the transmitter can be monitored with the aid of the receiver headphones connected to the control unit, or with the handset of the control unit. Volume is

adjusted with the monitoring volume control knob of the modulator unit of the control unit.

For tone-modulated telegraphy it is necessary to tune the transmitter in the same way as for CW telegraphy and to set the function switch of the control unit in the position TONE (TOH).

For telephone operation proceed as follows:

(a) set the function switch of the control unit in the position TELEPHONE (ТЛФ);

(b) set the power regulator in the position 5 corresponding to 100 per cent output (in telephone operation power must not be decreased as this may cause considerable distortion due to overmodulation);

(c) switch on high voltage with the toggle switch RADIO -INTERCOM by setting it in the position RADIO;

(d) lift the handset, press the handset press-to-talk lever and transmit by microphone, listen to the answer of the other station when the handset press-to-talk lever is released.

The presence of modulation can be monitored by the modulation meter of the control unit. In order to avoid distortion caused by overmodulation, care should be taken that the depth of modulation during transmission does not exceed 100 per cent, for which purpose the knob DEPTH OF MODULATION

(ГЛУБИНА МОДУЛЯЦИИ) of the control unit is set in the appropriate position.

For external modulation it is necessary to connect the source of external modulating voltage to the lines Ж and О of the transmitter.

The transmitter is tuned in the same way as for CW operation.

Set the function switch of the control unit in the position EXTERNAL MOD. (ВНШ.МОД.)

6. Operation From Remote Posts

When employing the remote communication posts proceed as follows:

(a) set the toggle switch RADIO - INTERCOM. of the remote communication post in the position INTERCOM then lift the handset and press the push-button CALL (ВЫЗОВ); the call signal lamp of the switchboard should light up;

(b) on hearing the response of the switchboard, request the party to be called, and hand up the handset;

(c) on being told by the switchboard attendant that the equipment is ready, press the push-button START (ПУСК). After this green lamp should light up signalling that the heaters of the transmitter valves are switched on;

(d) set the toggle switch RADIO - INTERCOM, in the posi-

tion RADIO. From 30 to 40 seconds after the heaters have been switched on, the red lamp will light up, signalling that high voltage has been applied to the transmitter valves;

(e) after high voltage has been applied to the transmitter, begin transmitting. Telegraph communication is conducted by means of the key. For telephone operation lift the handset, press the handset press-to-talk lever and speak into the microphone. For reception release the handset press-to-talk lever and listen to the answer of the party being called;

(f) under conditions of poor audibility, or if it is desired to conduct loudspeaker reception, switch on the amplifier by setting the toggle switch in the position ON (ВКЛ.). Volume is controlled with the knob on the front panel of the amplifier;

(g) having completed communications, hang up the handset (in telephone operation). Switch off high voltage by setting the toggle switch in the position INTERCOM. The red signal lamp should now go out. Switch off the amplifier. Press the push-button STOP (СТОП), after which the green signal lamp should go out.

<u>When operating from the radio operator's post:</u>

(a) set the toggle switch of the radio operator's

post in the position INTERCOM.; set the monitoring toggle switch in the position ON (BKJ.)

(b) lift the handset and press the CALL button. On hearing the response of the switchboard or transmitter, report that you are ready to transmit and hang up the handset;

(c) if the radio operator's post is switched to the transmitter which is ready for operation, then in order to transmit, switch on the heaters of the transmitter valves with the push-button START, the green signal lamp should light up;

(d) set the toggle switch RADIO - INTERCOM, in the position RADIO, the red signal lamp should light up signalling that the high voltage of the transmitter has been switched on;

(e) telegraph communication is conducted by means of the key. For telephone operation lift the handset, press the handset press-to-talk lever and speak into the microphone. Having spoken release the handset press-to-talk lever and wait for the answer. During lengthy reception, set the monitoring toggle switch in the position OFF (BKJ.);

(f) having completed operation, hang up the handset (in telephone operation) and switch off the high voltage of the transmitter by setting the toggle

switch RADIO - INTERCOM. in the position INTERCOM; the red signal lamp should now go out;

(g) switch off the heaters of the transmitter valves with the push-button STOP (СТОП), after which the green signal lamp should go out and the transmitter be switched off.

When employing remote posts (remote communication post and radio operator's post) for internal communication:

(a) set the toggle switch in the position INTERCOM. When operating from the radio operator's post it is also necessary to set the monitoring switch in the position ON (ВКЛ.);

(b) lift the handset and press the CALL push-button; the call signal lamp of the switchboard should now light up. The switchboard attendant should connect and call the required subscriber, after which internal communication can be conducted;

(c) if a call comes through to the radio operator's post or the remote communication post (the CALL lamp lights up or the call signal is heard in the telephone or the dynamic loudspeaker of the remote communication post amplifier, if it is switched on), then switch on the toggle switch INTERCOM, and at the radio operator's post also set the monitoring toggle switch in the position ON, lift the handset and answer the call;

(d) on completing communication hang up the handset; at the radio operator's post switch off the monitoring toggle switch.

7. Semi-Duplex Operation

Semi-Duplex Operation with Two Antennas

When two antennas (receiving and transmitting) are employed, the receiver at the control unit of the radio operator's post should be connected to the terminals Р,Я,О, according to the circuit of the receiver (depending on which circuits of the receiver should be effected by the contacts of the semi-duplex relay for cutting off the receiver).

For reception on the transmitter frequency or near to it, set the semi-duplex toggle switch of the control unit and the radio operator's post in the position ON (ВКЛ.) Reception is conducted with the key released, because with the key pressed, the receiver is cut off. In telephone operation, reception is condected with the press-to-talk lever released. With the press-to-talk lever pressed, the receiver is cut off and supply voltage is applied to the microphone of the handset.

In reception and transmission on different frequencies, or during prolonged reception, the semi-duplex toggle switch is set in the position OFF (ВЫКЛ.). Reception can be conducted simultaneously with transmission.

Semi-Duplex Operation with One Antenna

In this case the transmitter and the receiver operate into one antenna, switched by a special antenna relay, installed at the transmitter. The antenna terminal of the receiver is connected to the antenna relay by a radio-frequency cable.

In one-way communication (transmission without reception), the semi-duplex toggle switch of the control unit is set in the position OFF (ВЫКЛ.). In this case the antenna is connected to the transmitter as soon as mains voltage is applied.

In two-way telegraph communication, set the semi-duplex toggle switch of the control unit in the position ON (ВКЛ.) For reception, the toggle switch RADIO - INTERCOM. of the control unit or the radio operator's post is set in the position INTERCOM. In this case the antenna is connected to the receiver. For transmission, set the toggle switch in the position RADIO, high voltage is applied to the transmitter and the antenna is connected to the transmitter.

For two-way ytelephone communication, set the semi-duplex toggle switch of the control unit in the position ON. For transmission press the press-to-talk lever which connects the antenna to the transmitter. On concluding transmission, release the press-to-talk lever; the antenna will now be connected to the receiver, making reception possible.

8. Printing by Radio

Printing by radio is carried out with the aid of telegraph sets.

To do this proceed as follows:

(a) connect the output of the telegraph set to the radio station, as indicated below;

(b) select the device Б corresponding to the given working frequency and insert in into the recess of transmitter unit No.5;

(c) tune the transmitter following the tuning rules for operation with a crystal oscillator;

(d) set the function switch of transmitter unit No.5 in the position FREQUENCY-SHIFT KEYING OSCILLATOR (ВЧМ)

(e) set the function switch of the control unit in the position CW (НЗТ);

(f) switch on high voltage, after which the transmitter is ready for operation from the telegraph set.

9. Monitoring the Transmitter Frequency and Tuning without Radiation

The monitoring system is based on a comparison of the frequency of the oscillator with that of a heterodyne wavemeter by the zero beat method. For this purpose the function switch

is provided with the position CHECKING(КОНТРОЛЬ).In this case the oscillator is supplied with the necessary voltage, while high voltage is removed from the power stages.

The oscillator is provided with a special R.F. output from which R.F. voltage is fed by cable to a heterodyne wavemeter. The heterodyne wavemeter can be installed in another room, in which case the R.F. cable from the transmitter is led to the switchboard via which the necessary connections are made.

Zero beats can be heard in headphones plugged into the jack on the transmitter proper and connected via the switchboard to the output of the heterodyne wavemeter. This method allows the oscillator frequency to be monitored even during operation of the transmitter.

The tuned circuit of the master oscillator is provided with trimming capacitors which allow the calibration of the oscillator to be corrected using the above described system of frequency monitoring. In addition, the following operations can be carried out:

(a) setting of the working frequency of the transmitter before operation, according to the heterodyne wavemeter;

(b) checking the transmitter frequency against a standard signal. In this case an auxiliary receiver is necessary. Frequencies are compared by zero beats at the receiver output;

(c) checking frequency of receivers against the transmitter oscillator.

Setting of Knobs for Monitoring Transmitter Frequency

(a) Set the function switch of unit No.5 in the position CHECKING (КОНТРОЛЬ).

(b) The output of the heterodyne wavemeter which has previously been tuned to the frequency to be checked, is switched to the transmitter.

(c) Insert the headphones plug into the jack marked FREQUENCY MONITORING (КОНТРОЛЬ ЧАСТОТЫ) on the front panel of unit No.1.

(d) Switch on the heater voltage and the high voltage of the transmitter.

(e) The transmitter frequency is checked by listening in the headphones to the beats between the transmitter frequency and that of the heterodyne wavemeter.

10. Operation of the Radio Station Under Unfavourable Temperature Conditions

Operation of the Station at Low Temperatures

Operation of the station at low temperatures (down to -40°) is quite permissible if steps are taken to protect

the station against moist air from warm rooms. Moist air can cause condensation of moisture on the components of the transmitter and rectifier which are under voltage as, for example, mica condenser units and selenium stacks, which may lead to creeping discharge and breakdown of insulation. In addition icing of contactors and relays may occur causing an interruption in the operation of the automatic system and keying circuits. For this reason, when operating under low ambient temperatures and when components are moistened, it is necessary to observe the following rules of operation:

(a) the fan should be switched on 15 to 20 minutes prior to operation;

(b) the heaters of the transmitter valves should be switched on after switching on the fan, 10 minutes prior to operation;

(c) after switching on heater voltage, switch the transmitter on for 5 minutes as for tuning and only then switch it to normal operation.

It should be noted that until the selenium stacks have warmed up during operation, all the rectified voltages produced by the rectifiers will be below (by 5 - 6 per cent) the nominal values, but as the stacks warm up normal operating conditions of the transmitter will be established.

Operation of the Station at High Temperatures

Prolonged operation at high ambient air temperatures (up to +50°) is dangerous for the ГК-71 transmitter valves due to possible overheating of anodes and envelopes and for the rectifiers due to possible overheating of the selenium stacks.

When operating under such conditions it is necessary to pay special attention to the cooling of selenium stacks and valves and, if possible, to decrease the rectifier load by switching to tuning conditions. In order to improve the cooling of the selenium stack units of the rectifier assembly and the ГК-71 valves, the anti-dust filters should be temporarily removed from the frame of the rectifier and transmitter cabinet, in order to increase the flow of air.

At the end of operation the filters should be replaced.

During operation it is necessary to watch the overheating signal lamp of the rectifier. If the lamp lights up operation should be continued only in urgent cases, as operation with the temperature of the selenium stacks above 75° causes rapid aging of the selenium elements.

B. MAINTENANCE OF THE RADIO STATION

The transmitting radio station can be kept fully serviceable only if the equipment is cared for well and in good time.

All the equipment of the transmitting radio station should be kept clean. This also applies to the rooms where the equipment is installed. It should be borne in mind that the transmitter and rectifier employ a system of forced ventilation which gets its air for cooling the equipment from the radio room.

In order to keep the radio station in good condition routine maintenance should be organized.

Maintenance Operations Carried Out Once a Fortnight

(1) All the units of the transmitting radio station should be removed from their cabinets and blown with the aid of bellows, a vacuum cleaner, an electric fan, or a jet of compressed air. The units which have been removed may not be placed on the contact knives and guide rods.

(2) The transmitter employs ganged tuning. In order to avoid detuning and possible breakage of transmitter components when installing the units it is necessary to set the tuning knobs of the third and fourth stages to zero scale (fully counter-clockwise) and to set the band selector switch in position 1. The couplings and cams of the ganged tuning mechanism of all the transmitter units and inside the compartment of the cabinet are set according to aligned red lines.

(3) The units which are removed should be examined for the condition of the relay contacts, the male and female contacts of the switches and connectors. Traces of carbon deposit and dirt should be removed with clean waste moistened with denatured alcohol.

(4) Check the operating conditions of the transmitting radio station and the correspondance of currents and voltages to nominal values.

The actual values of current and voltage may differ by not more than 25 per cent from those indicated in the tables. However the meter pointers should not deflect beyond the limits of the coloured sectors (lines) on the scales of the transmitter and rectifier meters.

Sharp divergence of currents and voltages from the values indicated in the factory tables is an indication of incorrect tuning or faulty equipment. The faults should be eliminated immediately.

Checking of the operating conditions of the transmitting radio station with operation into the antenna may be done only with the permission of the commander.

(5) Check the calibration of the continuous range oscillator with the aid of a heterodyne wavemeter of the second class at crystal-controlled points or a heterodyne wavemeter of the first class according to instructions.

(6) Wash the anti-dust filters with gasoline to which 20 per cent of grade 8 or grade 10 motor oil has been added.

After the liquid has run off the filters, replace the filters. After drying the gasoline evaporates, and a thin layer of oil remains on the surface of the filter screens.

When washing the filters with gasoline care should be taken; do not work with an open flame to avoid fires and explosions.

If the anti-dust filters are neglected, the filter meshes may be clogged, decreasing the flow of cooling air, which will cause overheating of the selenium stacks and reduce the time of continuous operation of the station. Components of the transmitter, especially those of the fourth stage, can also overheat if the supply of air is insufficient.

Monthly Maintenance

(1) Check the operation of relays, contactors, and their contacting reliability. Special attention should be paid to the contacting of contactors 515,528, 577 and 550. The units should be removed for checking.

(2) Examine and clean the antenna insulators and the antenna cable of soot and dirt; check the reliability of connections (feeder to antenna, feeder to transmitter terminal ANTENNA).

C. FINDING AND ELIMINATING FAULTS

Serious attention should be paid to the problem of timely finding and eliminating of faults. A fault can be found

and eliminated only by the operator who knows the radio station well and clearly understands the functions of all the components and their interaction. A superficial knowledge of the control knobs is by no means sufficient for eliminating possible faults.

When locating a fault the following procedure should be observed. External symptoms serve as a basis for drawing conclusions concerning the nature and place of the fault, after which the conclusions are checked to see whether they conform to the phenomena observed in the radio station. If a check proves our suppositions to be wrong, new suppositions should be made. In some of the simpler cases it is possible to determine the place of the fault correctly at the first try.

In general, things are more complicated and the fault can be found only after a number of suppositions, which gradually approach the true cause, have been made. In this case each subsequent (correct) supposition should cover a smaller and smaller section of the circuit until the last supposition determines the place of the fault exactly.

In many cases various faults can produce one and the same symptom as for example considerable reduction or complete absence of R.F. current in the antenna.

Special attention should be paid and the radio station switched off when:

(a) breakdowns are accompanied by cracking;

(b) overheating of components occurs, there is a smell of burnt insulation or a smell of ozone;

(c) the white signal lamp lights up, indicating an overload in the 600-volt or 1500-volt circuit;

(d) neon lamps light up when one of the fuses in the control and screen grid circuits, anode and heater circuits of the master oscillator, heater circuits of other valves, burns out;

(e) a neon lamp goes out when one of the fuses has blown or one of the phases is missing in the A.C. mains supplying the rectifiers.

Thus, when a fault has occured it is first of all necessary to find out in which part of the radio station it has occured; in the power assembly, the rectifier, the transmitter, or the protection or interlocking circuits.

In order to localize the fault it is necessary to pay attention to the readings of the measuring instruments. Let as suppose that it has been ascertained that the fault is in the transmitter. Further search is limited to the transmitter. It is necessary to trace the fault to the transmitter unit and stage responsible for abnormal operation. The source of trouble is isolated by analyzing the readings of the measuring instruments, and sometimes by direct examination of the transmitter.

When the faulty stage has been located, it is necessary first to localize the circuits at fault and then to isolate the trouble within the stage or circuit. The illustrations listed below are useful to the repairman when he is trouble shooting.

F i r s t C a s e

When keying on the continuous range, the transmitter fails to be keyed, whereas the monitoring circuit functions normally.

The symptoms of the fault are as follows: when the key is pressed there is no anode current in the first and last stages, and the pointer of the antenna indicator does not deflect.

The nature of the fault clearly indicates trouble in the keying circuit.

Let us turn to Fig. 54 which shows the circuit diagram of the keying circuits. The diagram shows two circuits: the supply circuit of keying relay 307 (24 volts from rectifier B-1) and the supply circuit of the screen grid of master oscillator valve 1 (-250 volts and +220 volts from the rectifiers). Therefore to discover the trouble it is necessary to check these circuits, for continuity.

As the monitoring circuit functions normally, it may be supposed that the supply circuit of relay 307 from the key

to resistor 317, that is in the control unit and partially in unit No.5, is in order. The rest of the keying circuit, as seen from Fig.54, is arranged in unit Nos 5 and 1 and, consequently, the fault should be sought only in these units.

In order to find the fault, we supply power to the continuous range oscillator and measure the D.C. voltage at terminals 15 and 0 (at the rear of the transmitter) with switch 261 in the second position and the key operated. We ascertain that regardless of the position of the telegraph key, the voltmeter reads 0, whereas under normal conditions with the key pressed there should be 80 100 volts at these points (the plus is at terminal 15) and with the key released 20 to -25 volts(the minus at terminal 15). Removing unit 5 from the cabinet, we continue measuring the voltage at these points. The voltmeter has begun to read 20 volts (minus at terminal 15), in other words the normal reading for unit No.1. Consequently, the fault is located in unit No.5.

The absence of voltage at terminals 15 and 0 leads us to the conclusion that the circuit leading to terminal 15 in unit No.5 is open-circuited or connected to the chassis.

An open circuit is checked with an ohmmeter from terminal 19 to the relay armature and from the working contact of the relay to terminal 15. On checking we see there is no open-circuit here. Consequently, one supposition remains, that the circuit is earthed.

When the key is released the keying circuit is broken by the armature of relay 307 into two mutually isolated sections: one section leading from terminal 19 to the armature and the second section from terminal 15 to the working contact of the relay. Therefore, the absence of voltage at terminal 15 when the key is released clearly indicates that the earth is in the second part of the circuit, containing chokes 320 and 321 and switch wafer 26la. Connecting the ohmmeter to terminals 15 and 0 we make sure that this circuit is short-circuited to earth. As chokes 320 and 321 have a very low resistance, it is hard to find the earthed place with the ohmmeter, without disconnecting the chokes. After breaking the circuit between switch 26la and chokes 320 and 321, we check the two parts of the circuit with the ohmmeter for short--circuit to earth. The ohmmeter shows that the earth connection is in that part of the circuit which contains filter chokes 320 and 321, housed in a common metal box. After removal of the box the earth connection disappears. This signifies that one of the leads of the choke or capacitors 313 and 314 connected to the chokes (Fig. 43) touches the metal case of the filter, forming a short-circuit to earth.

Such faults occur due to the fact that the leads of the compactly assembled filter components pass very closely to the metal case and in time touch them as a result of shaking.

After the fault has been found it is no longer difficult to understand why the keying circuit failed. Earthing of wire 15 equals a short-circuit between the cathode and screen grid of the valve, in which case self-excitation of the oscillator cannot occur.

S e c o n d C a s e

When the push-button START (ПУСК) of the control unit of the radio operator's post or the remote communication post is pressed no heater voltage is applied and one of the 24-volt fuses of the B-1 rectifier burns out.

We replace the burnt-out fuse with a new one and try switching on the valve heaters again with the START push-button. The fuse burns out again, consequently it is impossible to switch on the transmitter supply. This indicated a short-circuit in the +24 volt circuit, which appears only when the START push-button is pressed. This means that the short-circuit is located in that part of the circuit which is associated with the aforesaid push-button.

In order to find the short-circuit we refer to the circuit diagram of the remote control equipment (See Appendix 13) and to Fig. 51 where the circuit which switches the transmitter heaters off and on is shown more clearly.

The starting circuit passes to the control unit from terminal 21 (+24 volts) via the normally closed contact of

stopping relay 76 and from there along wire 116 to the push-button START and to the contacts of relay 90. This part of the circuit has no short-circuit to earth, as it comes before the push-button. The rest of the circuit passing through terminal 115 is in the control unit and in unit No.1 of the rectifier assembly BC-2. It is in this part of the circuit that we must seek the short-circuit.

To find the place of the fault, we disconnect in the cabinet of the control unit the wire of the connecting cable from terminal 115 and measure the insulation resistance between the cabinet and the terminal 115 at the control unit and at the BC-2 rectifier, with the aid of an ohmmeter. After measuring we become convinced that at these sections, wire 115 is not short-circuited to the cabinet. Disconnecting the ohmmeter, we switch on the B-1 rectifier (24 volts) and press the push-button START of the control unit. Again the fuse of the rectifier B-1 burns out. This means that the short-circuit is in the control unit, for unit No.1 of the BC-2 is disconnected in this case.

Referring to the diagram (See Appendix 13) and to Fig.51 we see that three leads pass from terminal 115 to the control unit; one to relay 90, the second to the push-button START, and the third to signal lamp 98 with the series resistor 101. All these circuits must be checked with the ohmmeter for shorts to the cabinet.

The push-button START and signal lamp 98 are mounted on the chassis of the control unit, relay 90 on the cabinet. Therefore we remove the chassis of the control unit and measure the resistance between knife contact 115 and the cabinet, depressing the push-button START. The instrument does not show a short-circuit. We also measure the circuit resistance between terminal 115 and the cabinet of the control unit. When the armature of relay 90 is depressed, the ohmmeter shows a short-circuit, when it is released the short-circuit disappearss. This indicates that the contact springs of the relay are shorted to the cabinet via the armature.

After examination of the group of contacts of the relay we find that the relay armature is turned slightly to the side from its normal position and that the imbedded plastic insulating bush at its tail end has shifted aside from the pin of the group of contacts of the relay which bear on it. When the armature relay is pulled in, the spring pin thrusts against the metal of the armature tail, shorting the circuit to earth.

The cause of this fault may be inadvertant displacement of the armature either with the hand during repair or when inserting the chassis of the control unit into the cabinet, or when removing it from the cabinet. Small displacement of the armature can be easily remedied by setting it in the normal position by hand.

Third Case

In all operating modes and in all bands there is no anode current in the third and fourth stages of the transmitter. The operating conditions of the first and second stages are normal.

The fault is first sought in the third stage, as the fourth stage which depends on the third stage may not be at fault. For this we remove unit No.2 which houses the third stage from the cabinet and connect it with the aid of an auxiliary cable. Next, with a voltmeter we measure the D.C. voltage directly on the valveholder tags of the third stage. Measurements show there is no screen grid voltage, i.e. they are short-circuited to earth.

Examining the circuit diagram of the third stage(Fig.44), we see that the screen grid circuits contain the by-pass capacitors 100 and 105 and resistor 109. The chances are that there is a short-circuit or breakdown of one of the by-pass capacitors or a fault of one of the valves.

Leaving the voltmeter connected between the screen grid tag of the valve holder and the chassis, we remove valve 91 from the valve holder and apply voltage. Seeing that the voltmeter continues to read 0, we remove the second valve 97. Now the voltmeter reads the normal screen grid voltage (+250 volts). Consequently, the cause of the fault is

valve 97, in which a short-circuit between the cathode and the screen grid is found by checking with a continuity tester (or ohmmeter). Replacing this valve with a spare, we apply power and become convinced that the transmitter operates normally.

After eliminating the fault it is necessary to check resistor 109, because, having been subjected to the full 250 volts, it could have burned out partially or completely. If the resistor has burned out, it should be replaced with a new one.

F o u r t h C a s e

When the push-button START of the control unit, the radio operator's post or the remote communication post is depressed, heater voltage is not applied to the transmitter valve.

It is known, that all the starting and signalling circuits of the transmitter are supplied by the rectifier B-1 (+24 volts). Consequently, absence of heater voltage may be due to a fault in the circuit of this rectifier. With the aid of the push-button switch and the voltmeter of unit No.1 of the rectifier assembly BC-2, we check the 24-volt voltage. By checking we discover that this voltage is 20 volts whereas the normal value should be not less than 26 volts. At such a reduced voltage heater contactor 550 does not operate and heater voltage is not applied to the valve.

Examining the circuit diagram of the rectifier assembly

(See Appendix 14), we see that the cause of reduced voltage of rectifier B-1 may be the absence of voltage in one of the phases of the three-phase A.C. mains. Mains voltage is applied via the common fuses ПР-1, ПР-2 and ПР-3, as well as via the rectifier fuses ПР-4 and ПР-5 installed in two phases applied to the selenium stack.. The third wire is led to the stack without a fuse.

By the glowing of neon signal lamps 503, 504 and 505 we see that the mains fuses are intact. Then we check the fuses ПР-4 and ПР-5 by unscrewing them from their sockets with the A.C. voltage switched on and simultaneously measuring the 24-volt voltage. When unscrewing fuse ПР-4 we notice that the reduced voltage of rectifier B-1 drops to zero, and when we screw it in, the voltage appears again. When fuse ПР-5 is unscrewed the voltage remains unchanged. From this we conclude that fuse ПР-4 is intact and that ПР-5 has burned out.

Next we remove fuse ПР-5 and, checking it with a continuity tester, become convinced that it is intact, but that the working contact has become burned and blackened. After cleaning the contacts with sand paper or a screw-driver we replace it in the socket, continuing to measure the voltage. When the fuse is firmly screwed in, the voltage of rectifier B-1 increases to 30 volts. Consequently, the cause of the fault was that the fuse ПР-5 did not make a reliable contact in the socket and had broken the circuit of one of the

phases of the three-phase current applied to the selenium stack of the rectifier.

F i f t h C a s e

In the first four bands and in any operating mode, the anode current of the fourth stage is very high and there is no power in the antenna with any coupling of the antenna circuit. On all the other bands the transmitter operates normally.

First we examine reasons which may cause increased anode current. It is known that any increase in the positive voltage at the valve electrodes causes an increase in anode current. These voltages depend on the mains voltage and may increase by not more than 10 per cent, i.e. as much as the A.C. mains voltage can increase. Such an increase is quite permissible for normal operation of the transmitter. However, examining the circuit digram of the fourth stage (Fig. 44), we see that some of the electrode voltages can vary to a considerable degree independently of the variations of mains voltage. Thus, for example, the control grid bias voltage can vary greatly from a certain negative value to 0 in case of an open circuit of potentiometer 144 in that section where wire 8 is connected to it (Fig. 44). In the same way the screen grid voltage of the ГК-71 valve can increase greatly (from 400 to 600 volts) in case of an open circuit in potentiometer 333 or in case of a break in the wire connecting it to the chassis. In both cases

the anode current would increase considerably. However, this could not be the cause of absence of power in the antenna.

An increase in anode current may be due to a fault of the valves. In order to make sure, we replace by turn both of the fourth stage valves and check the operation of the transmitter. The readings of the fourth stage ammeter and the antenna indicator convince us that a replacement of valves has not eliminated the fault.

Now there remains only one last supposition, that the tuned circuit of the stage is detuned. The main causes of detuning of the circuit may be bad contact in band selector switch 152 or a breakdown of one of the tuned circuit capacitors.

From the circuit diagram of the transmitter we see that for the first four bands the springs Ж, И and Л of the switch are closed. From the diagram (Fig. 44) it is seen that these springs connect capacitor 127 to capacitor 128 via the stator and rotor of variometer 117, as well as via trimming coil 118. Connecting the ohmmeter or continuity tester to the corresponding terminals of these capacitors, we become convinced that the switch springs make reliable contacts.

Now, with the continuity tester, we check for breakdown those capacitors of the tuned circuit which are connected by the switch only in bands 1, 2, 3 and 4. The rest of the

capacitors of the tuned circuit should be free of suspicion as to faults, because the other bands of the fourth stage operate normally.

From the simplified circuit diagram of the fourth stage tuned circuit (Fig. 48a) switched for bands 1,2,3 and 4, it is seen that capacitors 127 and 128 are connected only in this circuit, and are missing from the circuit of the other bands shown in Figs 48б and 48в. Therefore it is sufficient to check only capacitors 127 and 128 for breakdown with a megger of 250 or 500 volts.

For checking, they are disconnected from the tuned circuit by setting the switch in any position except those of bands 1,2,3 and 4. By connecting the megger to the leads of capacitor 127 and turning the handle of the megger we are convinced (by the high value of insulation resistance) that it is intact. In the same way we check capacitor 128 and find that it is short-circuited. Consequently, this odpacitor is broken down, and it should be replaced by a spare one or a capacitor of the same value, type КВКБ (ceramic).

x x

x

Only some general information and a few cases have been dealt with here pertaining to the techniques of finding

faults in transmitters. Naturally this does not cover all the possible cases which are encountered in practice. However, the described method of fault finding may be successfully used in other similar cases of failure of the equipment.

The most common causes of transmitter failure are:

(a) faulty valves;

(b) broken interlocking circuits;

(c) bad contacts;

(d) burnt relay contacts;

(e) open circuit of cable conductors or tips;

(f) faulty fuses (no contact or burnt out);

(g) breakdown of capacitors to chassis;

(h) changed-value or burnt-out resistors;

(i) incorrect actions of the attending personnel.

The attending personnel should remember that often the transmitter does not operate not due to a fault of the transmitter, which takes a lot of time to find, but due to inattention on the part of the personnel attending the station.

For example:

(1) One of the toggle switches via which the +24-volt control circuit current passes (EMERGENCY TOGGLE SWITCH, RADIO - INTERCOM) is in the off position, or the function switch is in the position CHECKING.

(2) The currents of the first and second stages are normal, the anode currents of the third and fourth stages are low, the antenna input is very low. There is no fault, simply the power switch of the control unit is in position 3, which corresponds to 50 per cent power in the antenna.

In some cases the station can remain operative, if the faulty components are excluded from the circuit. A number of by-pass capacitors and some resistors can be disconnected in case of breakdown or open-circuits:

1. In case of damage of one of the filter condensers of the rectifiers B-6 and B-5, operation can be continued after both ends of the faulty condenser are desconnected. This will cause a certain increase in hum in telephone operation and will hardly affect telegraph operation.

2. In case of damage to one of the capacitors at the output of the filter of the rectifier supplying the anode circuit of the master oscillator (B-3), grid bias (B-4) or screen grids (B-2), operation can be continued if the faulty capacitor is disconnected. The quality of telegraph operation will hardly deteriorate in this case. However, disconnection of an input condenser of a rectifier filter will decrease considerably the working voltage and filtering. When replacing capacitors in the rectifier B-4, attention should be paid to insulating the can of the condenser from the chassis and connecting the polarity right.

3. In case of damage to the selenium stack of one of the rectifiers which supply the anode circuits of the output or intermediate stages (B-6 or B-5), it is possible to continue operation, if the faulty stack is disconnected at both ends. In this case telegraph operation will proceed without noticeable deterioration (the power will be reduced slightly) and hum will increase in telephone operation.

The above examples serve to show how the station can be made operative in a short time, if there is an urgent necessity to continue operation. If there is no urgency, the faulty component should be replaced.

D. P R I N C I P A L S A F E T Y R U L E S

1. General Information

Electric current gives man a shock when it passes through his body. D.C. or A.C. current above 100 mA is lethal for man. Currents of from 30 to 100 mA may cause serious injuries, often leading to death.

The value of the current passing through the body depends on the voltage which the body comes in contact with and the resistance of that part of the body to which voltage is applied.

The resistance of the body depends mainly on the condition of the skin at the place where the body comes in contact with live conductors.

The degree of the electric shock also depends on which organs of the body are affected. When current passes through vital organs (the region of the heart, stomach, etc.) danger increases greatly. In the case of local shocks, for example, when current passes through part of the hand or foot, serious burns may occur.

Any tension above 25 - 30 volts should be regarded dangerous to life and health. For this reason all possible measures should be taken to prevent the possibility of coming into contact with live components.

It should be remembered that in the case of very high voltages (above 2 - 3 thousand volts) it can be dangerous to touch not only conductors but even insulators. A thin film of moisture, dirt, and soot may cause a leakage along the surfaces of insulators. For this reason it is very important to pay attention to the surfaces of the insulators, keeping them clean.

High tension devices are considered those which have effective voltages with respect to earth exceeding 220 volts of alternating current and 250 volts of direct current. Devices with lower voltages are conventionally called low tension devices. In the case of storage batteries the determinating voltage is that at the beginning of charging.

High tension radio frequencies voltages (15,000 - 20,000 c.p.s. and higher) are usually not so dangerous; shocks

caused by these voltages are seldom lethal, but do cause serious burns.

2. Safety Measures for Operating With High Tension

Installation and connection of the radio station and electrical equipment should be carried out with the greatest possible observance of measures for safeguarding the personnel from electric shocks.

Repairs of the radio station, which require periodic switching on of high tension, should be carried out by two persons who are acquainted with the given installation and have obtained permission to carry out the work.

Cleaning of the room and wiping of the equipment during operation of the radio station is strictly forbidden.

It is also forbidden to work on the radio station with the signalling circuit and interlocks disconnected (short-circuited), the doors open, casings removed, as well as when there are faults in the signalling circuits, the control and interlocking circuits connected with high-tension protection, the application and removal of high tension.

The places where the equipment is earthed should be well known. The reliability of the earting of the bodies of electrical machines and equipment should be checked once a quarter, when the equipment is switched off.

It is forbidden to replace normal fuses with fuses of other ratings.

Fuses must be charged only with elements of calibrated wire of the required cross-section.

In order to replace a burnt-out fuse of the power unit, it is necessary to stop the unit and to discharge the filter condensers with a special metal rod provided with a well-insulated handle. Rectifier fuses should be replaced only after the supply mains voltage has been switched off.

Should it be necessary to repair or adjust units of the radio station under voltage, all connections (including the connection of connecting cables) should be made with the power units stopped and the rectifier switched off.

It is strictly forbidden to allow untrained personnel to repair and adjust the equipment.

When removing units from the cabinets (for example, for replacement of valves, improving contacts, etc.) the high tension should first be switched off.

When measuring high tension with portable instruments the following rules should be strictly observed:

(a) The voltmeter should be placed on a firm base and reliably insulated from the earth. It is strictly forbidden to hold the voltmeter in the hands during measurement.

(b) The insulation of the wires used for connecting the voltmeter should correspond to the voltage being measured. The wires of the voltmeter should be connected to the high tension source only after voltage has been first switched off and the terminals of the source checked to see that there is no high tension, for example, the charge of filter condensers. Checking should be carried out with the aid of an earthed short-circuiter provided with a well insulated handle.

(c) First connect the wire of the voltmeter to the earthed terminal of the high tension source, then the second wire. Having checked that all connections have been made right, step half a meter away from the voltmeter and wires, and without touching them switch on high tension. After this note the reading of the voltmeter.

At the transmitter, power unit or other equipment which has high D.C. or A.C. tension, the deck (floor) should be covered with a rubber mat or other insulating material which can withstand double the working voltage.

It is strictly forbidden to touch wires and terminals under voltage with the fingers in order to find out if voltage is present.

The power unit should operate with the current-carrying parts closed. It is impermissible for operating converters to be left with open commutators (without screens), contact rings, as well as starting-regulating equipment (without cases).

Instructions pertaining specifically to the given equipment, covering its switching on and off, repair, and first aid rules in case of electric shock, should be hung on the wall in the rooms where the radio transmitting equipment and power equipment is located.

3. Safety Measures in Working with High Frequencies

It should be borne in mind that although high frequency voltage is not lethal, the burns caused by high frequency current can lead to serious injuries. It is strictly forbidden to touch components carrying high frequency voltage.

It is forbidden to make artificial arcs or sparks in high frequency circuits.

Hight frequency circuits passing through rooms or living quarters should be shielded off.

Work on transmitting antennas and their lead - ins, as well as work in their immediate vicinity, should be carried out only with permission.

APPENDICES

Appendix 1

NOMINAL VALUES OF MAIN PARAMETERS OF THE KB-0.25 TRANSMITTING RADIO STATION

1. Power consumption:

   (a) with A.C. supply . . . . . 2.5 kW (power factor = 0.8);

   (b) with D.C. supply . . . . . 4.5 kW

2. With artificial air cooling (not less then 10 m^3 of air per minute) and the temperature of the cooling air not more than $+50^0$, the transmitting radio station maintains normal round-the-clock operation under the following conditions:

   (a) at various temperatures of the ambient air from 0 to $+50^0$;

   (b) at a relative air humidity of not more than 95 per cent (with the ambient air temperature $+20^0$).

3. Without forced ventilation, the radio station can operate continuously with any supply version for not more than 20 minutes.

4. The working temperature maintained in the thermostats is $60^{\circ} \pm 1^{\circ}$. It takes 2 - 3 hours to heat the thermostat to the working temperature.

5. The optical dial of the transmitter oscillator is calibrated in kilocycles per second, the calibration points being made in the following way:

in bands 1 to 4 every 1 Kc/s

in bands 5 to 8 every 2 Kc/s

in bands 9 to 12 every 5 Kc/s

6. The power of the transmitter in the continuous range and on crystal-controlled frequencies developed across a wire resistor of 60 - 70 ohms is not less than 250 watts in CW operation and 60 watts in modulated operation.

Note: In bands 4 and 12 a power reduction of not more than 20 per cent is permissible.

7. The transmitter modulator has a frequency response of from 100 to 5,000 c.p.s. with a non-uniformity (in voltage) of ± 2 db of the average level.

8. The value of nonlinear distortion of the transmitter at 80 per cent modulation and a modulating tone frequency of 1,000 c.p.s. does not exceed 10 per cent.

9. The frequency of the tone generator of the transmitter is 1,000 c.p.s. ±10 per cent.

10. The depth of modulation in tone-modulated telegraphy is not less than 80 per cent.

11. The level of parasitic hum (ripple voltage) at 100 per cent modulation is not more than 1.2 per cent of the signal value.

12. The maximum telegraph keying rate is 30 words per minute.

13. The keyer of the crystal-controlled oscillator is keyed by positive current signals of 15 to 50 volts at the keyer input; distortion of the signals in duration does not exceed 10 per cent; the maximum keying rate is 100 c.p.s. (50 uniform positive signals per second).

14. The insulation resistance with respect to the chassis of the high tension circuits of the transmitter is not less than 5 megohms (with the exception of insulation of by-pass and filter capacitors).

Appendix 2

NOMINAL VALUES OF MAIN PARAMETERS OF THE BC-2 RECTIFIER ASSEMBLY

Description of circuit	Voltage, V	Current, A	Ripple, per cent	Voltage stabilization with variation of mains voltage of +10 per cent
1	2	3	4	5
Rectifiers				
Auxiliary circuits, B-1	24 ± 3%	4	-	-
Anode and screen grid voltages, B-2	250±3%	0.1	0.05	-
Anode of master oscillator valve, B-3	220 ±10V	0.05	0.05	±1%
Grid bias, B-4	250 ±3%	0.1	0.05	-
Anode circuits of intermediate stages and screen grids of power output valve, B-5	600 ±3%	0.5	0.10	-
Anode circuits of output stage, B-6	1,500 ±3%	0.5	0.15	-

1	2	3	4	5
A.C. circuits				
Output stage valve heater	21 ±3%	6	-	-
Master oscillator valve heater	12.6 ±3%	0.7-0.83	-	2%
Crystal oscillator valves and electronic regulator heater	6.5 ±3%	2.8	-	-
	6.5 ±3%	1.0	-	-
Heater of intermediate stage valves and modulator valves	13 ±3%	6.8	-	-
Supply of auxiliary circuit	220±3%	1.0	-	-

Note: The values given in the table correspond to a supply mains voltage of 220 or 380 volts with phase voltage deviations of not more than 1 per cent of the nominal value.

1. The rectifier BC-2 provides trouble-free operation with fluctuations of the mains voltage within ±10 per cent and variation of the mains voltage from 45 to 65 c.p.s.

2. With a change of the load current from 0.5 ampere to zero (with the 52,000-ohm ballast resistor connected) the voltage of the B-6 rectifier increases by no more than 12 per cent while that of the B-5 rectifier increases by no more than 10 per cent when the load current changes from 0.5 ampere to zero (with the 22,000-ohm ballast resistor connected).

3. The measuring error of the voltmeter and the ammeter within the working range is within ±2.5 per cent.

4. With artificial ventilation which provides a flow of not less than 400 m^3 of air per hour through the rectifier, the BC-2 rectifier can operate continuously for a long time at ambient air temperature of from -25° to $+50^{\circ}$.

5. During prolonged and continuous operation with artificial ventilation providing a flow of not less than 400 m^3 of air per hour through the rectifier and with nominal supply voltages of 220 or 380 volts, the selenium elements of the BC-2 rectifier overheat by not more than 25°.

6. In the absence of ventilation (emergency operation) when the equipment is switched on on a cold condition, the BC-2 rectifier can operate continuously for 20 min., in which case the selenium elements will overheat by not more than 55°.

Note: The selenium stacks are said to be in a cold condition when their temperature exceeds the ambient air temperature by not more than 1°.

7. In order to compensate for aging of the selenium elements, the transformers of the B-1, B-5 and B-6 rectifiers are provided with additional windings which increase the secondary voltage by 8 ± 2 per cent.

8. The control circuits operate from the 24-volt rectifier and should operate reliably during short-time fall-offs of 20 per cent in the mains voltage.

9. The BC-2 rectifier meets all the main requirements at a relative air humidity of up to $95 \pm 3\%$ per cent and at a temperature of $20^{\circ} \pm 5^{\circ}$. All the components and attachments have extra anti-corrosion coatings, while the selenium stacks are coated with a special anti-moisture layer. The windings of non-hermetical transformers and chokes have been vacuum impregnated.

10. The insulation resistance of the BC-2 rectifier with respect to the chassis is not less than 5 megohms under both cold and hot conditions at a relative air humidity of up to 70 per cent.

11. The electrical strength of the primary circuits of the transformers of the BC-2 rectifier with respect to the chassis withstands 1,500 volts RMS during one minute. The secondary circuits are tested by increasing the nominal

voltage by 30 per cent also during one minute with rectifiers operating at no load, but with the ballast resistors connected.

12. The efficienty of the BC-2 rectifier at nominal load is not less than 65 per cent.

13. The BC-2 rectifier can operate inclined in any direction to 45°.

Appendix 3

NOMINAL VALUES OF MAIN PARAMETERS OF CONVERTERS

1. Table of Electrical Parameters

Type of converter	Description and type of machine	Power, kW	Voltage, V	Current, A	Type of current	Speed r.p.m.	A.C. Power frequency, c.p.s.	A.C. Power factor
1	2	3	4	5	6	7	8	9
П-7.2	Motor, ПН-85	9	110 or 220	-	D.C.	1,500	-	-
	Three-phase synchronous generator, АПНТ-85	7.2	220	22.4	A.C.	1,500	50	0,8

1	2	3	4	5	6	7	8	9
ПТ-2.5	Motor	3.85	110 or 220	-	D.C.	1,500	-	-
	Three-phase synchronous generator	2.5	220	7.75	A.C.	1,500	50	0.85

2. The motor of the П-7.2 converter is designed for prolonged operation with fluctuations of the supply mains voltage of ±10 per cent from nominal value.

3. The motor of the ПТ-2.5 converter is designed for operation with fluctuations of the supply mains:

(a) at rated 110 volts from 95 to 170 volts;

(b) at rated 220 volts from 175 to 320 volts.

4. With various values of mains voltage the ПТ-2.5 converter can operate continuously for the following periods:

No.	Mains voltage fluctuations		Period of operation
	for U_m = 110 V	for U_m = 220 V	
1	-	175-195 V	30 minutes
2	95-105 V	195-210 V	1 hour
3	105-130 V	210-265 V	Prolonged
4	130-155 V	265-300 V	1 hour
5	155-170 V	300-320 V	30 minutes

Note: The period of operation under conditions 1, 2, 4 and 5 are established for a cold starting condition. If the converters have to operate from a warm starting condition, the operating periods should be reduced by 20 - 50 per cent, with the exception of condition 3 which allows 24-hour operation regardless of the initial condition of the converter.

5. Converters П-7.2 and ПТ-2.5 can operate normally at ambient air temperatures not exceeding +40°.

6. The armatures of the converters rotate clockwise (as seen from the motor commutator end).

Appendix 4

TABLE OF AVERAGE VALUES OF VOLTAGES AND CURRENTS OF THE KB-0.25 TRANSMITTER VALVES IN TELEGRAPH (key pressed and released) AND TELEPHONE OPERATION

No.	Valve type	Location	Mode of operation	Current, mA				Voltage, V		
				I_{ao}	I_{g1}	I_{g2}	U_f	U_a	U_{g2}	U_{g1}
1	2	3	4	5	6	7	8	9	10	11
	П-50	1st stage	Telegraph (key pressed)	20	-	-	12.6	218	86	
			Telegraph (key released)	0	-	-	12.6	220	-20	
			Telephone	20	-	-	12.6	218	86	
1	П-50	2nd stage	Telegraph (key pressed)	55	-	-	12.6	420	225	-42
			Telegraph (key released)	25	-	-	12.6	500	260	-42
			Telephone	55	-	-	12.6	420	225	-42

1	2	3	4	5	6	7	8	9	10	11
	П-50	3rd stage	Telegraph (key pressed)	60	-	8	12.6	600	240	-230
			Telegraph (key released)	0	-	0	12.6	615	260	-230
2			Telephone	60	-	8	12.6	600	240	-230
	Г-471	4th stage	Telegraph (key pressed)	300	8	35	20	1,510	430	-100
			Telegraph (key released)	0	0	0	20	1,550	460	-85
			Telephone	170	10	60	20	1,510	450	-100
	6Ж7	Crystal oscil-lator	Crystal (key pressed)	-	-	-	6.3	150	135	-15
			Crystal (key released)	-	-	-	6.3	120	-20	0
			Frequency-shift keying oscillator	-	-	-	6.3	150	135	-15
	П-50	Buffer-amplifier of frequency-shift keying	Crystal and frequency-shift keying oscillator	50	-	-	12.6	220	130	-10

1	2	3	4	5	6	7	8	9	10	11
	6H7 (290) 1st triode	Electronic relay	Frequency-shift keying (key pressed)	-	-	-	6.3	40	-	+16
			Frequency-shift keying oscillator (key released)	-	-	-	6.3	180	-	-8
5	2nd triode		Frequency-shift keying oscillator (key pressed)	-	-	-	6.3	180	-	-8
			Frequency-shift keying oscillator (key released)	-	-	-	6.3	40	-	+16
	6H7 (287) 1st triode	Electronic relay	Frequency-shift keying oscillator (key pressed)	-	-	-	6.3	220	-	-8
			Frequency-shift keying oscillator (key released)	-	-	-	6.3	210	-	+16
	2nd triode		Frequency-shift keying oscillator (key pressed)	-	-	-	6.3	210	-	+16

1	2	3	4	5	6	7	8	9	10	11
			Frequency-shift keying oscillator (key released)	-	-	-	6.3	220	-	-8
	6SA7	1st stage	Telephone	-	-	-	6.3	160	100	-1.5
	6SJ7	2nd stage	Telephone	-	-	-	6.3	130	-	-3
Modulator	П-50	3rd stage	Telephone	-	-	-	12.6	600	250	-30
	6SJ7	Tone generator	Telegraph (key pressed)	-	-	-	6.3	250	155	-5
			Telegraph (key released)	-	-	-	6.3	265	215	-5
	6SJ7	Monitoring stage	Telegraph	-	-	-	6.3	250	-	-5

TABLE OF STANDARD OPERATING CONDITIONS OF KB — 0.25 TRANSMITTER

Band	Frequency, Kc/s	Mode of operation	Tuning: 3rd, 4th stages	Tuning: 4th stage	Position of antenna coupling switch	Position of antenna circuit switch: Series	Position of antenna circuit switch: Parallel	Tuning of antenna circuit	Mains voltage, V	Current in valve circuits, mA: I_a of 1st stage	I_a of 2nd stage	I_a of 3rd stage	4th stage: I_{g1}	4th stage: I_a	4th stage: I_{g2}	Anode voltage of 4th stage, V	Reading of antenna indicator	Current in dummy antenna, A	Power in dummy antenna, W	Modulation factor, per cent
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
I	1,500	CW	1.05	100	7	4	1	12.50	200	18	50	35	12	310	35	1,375	2	2.1	305	
									220	18	60	40	13	350	45	1,500	2.4	2.4	397	
									240	18	65	45	15	400	50	1,650	2.8	2.6	466	
		TP	1.05	100	7	4	1	12.50	220	18	60	40	17	170	70	1,500	1.6	1.2	100	80
IV	3,000	CW	7.14	90	7	3	1	9.30	200	28	40	60	10	300	30	1,375	2	1.7	200	
									220	28	50	60	12	350	40	1,500	2.4	2.1	305	
									240	28	50	65	14	410	50	1,650	2.4	2.25	350	
		TP	7.14	90	7	3	1	9.30	220	28	50	60	14	160	60	1,500	1.2	1.0	68	80
V	3,000	CW	1.3	110	9	3	1	13.50	200	18	55	40	12	320	40	1,375	2	2.3	365	
									220	18	60	50	14	360	45	1,500	2.4	2.6	466	
									240	18	65	50	15	400	50	1,650	2.8	2.8	540	
		TP	1.3	110	9	3	1	13.50	220	18	60	50	17	180	70	1,500	1.2	1.3	116	80
VIII	6,000	CW	7.30	40	10	2	1	8.00	200	28	45	30	10	300	35	1,375	2.0	2.1	305	
									220	28	45	30	11	330	45	1,500	2.0	2.4	397	
									240	28	50	40	13	390	50	1,650	2.4	2.7	502	
		TP	7.30	40	10	2	1	8.00	220	28	45	30	16	180	70	1,500	1.2	1.25	108	80
IX	6,000	CW	1.63	110	9	2	1	7.45	200	18	55	65	6	260	30	1,375	2	2	272	
									220	18	60	70	6	290	30	1,500	2	2.1	305	
									240	18	70	80	8	240	40	1,650	2.2	2.5	430	
		TP	1.63	110	9	2	1	7.45	220	18	60	70	9	160	50	1,500	1.2	1.2	100	80
XII	12,000	CW	7.20	100	7	2	1	3.28	200	28	40	75	4	240	25	1,375	2.5	1.7	200	
									220	28	50	80	4	270	30	1,500	3.0	1.9	250	
									240	28	50	90	4	310	30	1,650	3.8	2.2	334	
		TP	7.20	100	7	2	1	3.28	220	28	50	80	5	170	45	1,500	2	1.2	100	80

Note: The stabilized voltage is 220 V, the resistance of the dummy antenna is 68 ohms.

Appendix 6

TABLE OF FUSES

Description	Type	Current, A	Number per supply version		
			D.C. 110 V	D.C. 220 V	A.C. 220/380 V
Fuse	A-43	2	6	4	5
Fuse	A-43	1	-	2	-
Fuse	A-43	3	-	2	-
Fuse	A-43	5	2	-	-
Tube fuse, 250 V	-	100	4	-	-
Ditto	-	60	-	4	-
Thermal fuse	-	-	5	5	5
Fuse link	ПК-43-0.5	0.5	5	5	5
Ditto	ПК-43-5	5	1	1	1
Ditto	ПД-I	10	3	3	3
Ditto	ПД-II	6	3	3	3

Appendix 7

LIST OF COMPONENTS OF TRANSMITTER KB-0.25

(See Appendix 12)

Circuit No.	Description and type	Quantity	Electrical data
1	2	3	4
	Unit No.1		
1	Electronic valve П-50	1	
2	Variometer	1	$L_{min.}$=3.5μH $L_{max.}$=6.4μH
3	Choke	1	-
4	Band selector switch	1	-
5	Condenser of fourth band tuned circuit, consisting of:		
	КГК-С-390-1	1	Selected during alignment
	КГК-С-56-II	1	
	КГК-К-68-II	1	
6	Condenser of third band tuned circuit, consisting of:		
	КГК-С-200-I	1	Selected during alignment
	КГК-С-27-II	1	
	КГК-К-39-II	1	
7	Condenser of second band tuned circuit, consisting of:		
	КГК-С-330-I	1	Selected during alignment
	КГК-С-39-II	1	
	КГК-К-68-II	1	

1	2	3	4
8	Condenser of first band tuned circuit, consisting of:		
	КГК-С-390-I	1	Selected during alignment
	КГК-С-82-II	1	
	КГК-С-56-II	1	
	КГК-К-56-II	1	
9	Trimming capacitor	1	1-3 pF
10	Ditto	1	1-3 pF
11	Ditto	1	1-3 pF
12	Ditto	1	1-3 pF
13	Condenser КГК-М-400-I	1	400 pF;1,000 V
14	Ditto	1	400 pF;1,000 V
15	Condenser КГК-М-450-I	1	450 pF;1,000 V
16	Ditto	1	450 pF;1,000 V
17	Condenser КГК-М-1000-I	1	1,000 pF; 1,000 V
18	Condenser КГК-М-51-I	1	51 pF
19	By-pass condenser КСО-6-500-В-5100-II	1	5,100 pF; 500 V
20	By-pass condenser КСО-6-500-В-8200-II	1	8,200 pF; 500 V
21	By-pass condenser КСО-6-500-А-8200-II	1	8,200 pF; 500 V
22	Choke	1	-
23	Radio frequency relay РМУ-171-73-30 (РКН-У)	1	
24	Resistor ВС-1.0-560±10%	1	560 kilohms; 1 W

1	2	3	4
25	Resistor BC-2.0-10±5%	1	10 kilohms; 2 W
26	Anti-parasitic choke	1	-
27	Electronic valve П-50	1	-
28	Variometer	1	$L_{min.}$ = 3.5 μH $L_{max.}$ = 6.4 μH
29	Trimming choke	1	-
30	Condenser of fourth band tuned circuit, consisting of:		
	KBKT-15-330-II	1	
	KBKT-24-68-II	1	Selected
31	Condenser of third band tuned circuit, consisting of:		
	KBKT-16-18-0-II	1	Selected
	KBKT-24-56-II	1	
32	Condenser of second band tuned circuit, consisting of:		
	KBKT-15-270-II	1	
	KBKT-24-68-II	1	Selected
33	Condenser of first band tuned circuit, consisting of:		
	KBKT-15-330-II	1	
	KBKT-24-82-II	1	Selected
	KBKT-24-39-II	1	
34	Trimming capacitor	1	C=4.5 x 46 pF
35	Ditto	1	Ditto
36	Ditto	1	Ditto
37	Ditto	1	Ditto
38	Condenser KTK-4M-200-II	1	200 pF; 1,000 V

1	2	3	4
39	Condenser KCO-7-500-A-10000-II	1	10,000 pF; 500 V
40	Ditto	1	10,000 pF; 500 V
41	Ditto	1	10,000 pF; 500 V
42	Condenser KTK-2-Ж-150-II	1	150 pF; 1,000 V
43	Condenser КБГ-МП-2В-200 $\frac{1.0}{И}$ - III	1	1 μF; 200 V
44	Condenser KCO-8-1000-A-10000-III	2	10,000 pF each; 1,000 V connected in parallel
45	Condenser KCO-2-500-A-510-II	1	510 pF; 500 V
46	Condenser KCO-7-2500-Б-620-I	1	620 pF; 2,500 V
47	Band selector switch	1	
48	Resistor BC-1.0-27±10%	1	27 kilohms; 1 W
49	Resistor BC-2.0-8.2±10%	1	8.2 kilohms; 2 W, selected during alignment
50	Resistor BC-2.0-47±10%	1	47 kilohms; 2 W
51	Resistor BC-2.0-20±10%	2	20 kilohms, 2 W, connected in parallel
52	Resistor BC-0.5-100±10%	1	100 ohms; 0.5 W
54	Resistor BC-1-100+10%	1	100 kilohms; 1 W
55	Alternating current motor 110 V, type СД-262	1	-
56	Vitrified resistor, type V-400	2	Connected in series
	Ditto, type V-600	1	
57	Relay, type РМУ-171·71·32 (РКН-У)	1	-
58	Vitrified resistor, type 1-400	1	400 ohms

1	2	3	4
59	Vitrified resistor, type 1-300	1	300 ohms
60	Ditto	1	300 ohms
61	Vitrified resistor, type 1-25	1	25 ohms
62	Vitrified resistor, type 1-500	1	500 ohms
63	Heating element	1	900 ohms
64	Thermal fuse	1	Operating temperature 80°
65	Contact thermometer for 60°	1	-
66	Miniature lamp	1	6.3 V; 0.28 A
67	Relay РМУ-171·71·32 (РКН-У)	1	400 ohms; 10 V
68	Valve СМ-11	1	13 V; 5 W
69	Two-pole toggle switch	1	-
70	Blocking choke	1	3 μH
71	Blocking choke	1	115 μH
72	Condenser КСО-7-500-А-10000-II	1	10,000 pF; 500 V
73	Condenser КБГ-М2-200-0.1-III	1	0.1 μF; 200 V
74	Condenser КБГ-М2-400-0.25-III	1	0.25 μF; 400 V
75	Condenser КБГ-М1-400-0.25-III	1	0.25 μF; 400 V
76	Two-pole toggle switch	1	-
77	Shunt for 50-mA milliammeter	1	Calibrated with
78	Shunt for 250-mA milliammeter	1	instrument
79	Jack Ш-5732005	1	-
80	Jack Ш-5732005	1	-
81	Jack for telephone	1	-

1	2	3	4
82	Condenser KCO-5-500-A-10000-III	1	10000 pF; 500 V
83	Condenser KBG-M2-200-0.1-III	1	0.1 μF; 200 V
84	Vitrified resistor, type 1-300	1	300 ohms
	Unit No.2		
91	Electronic valve Π-50	1	-
92	Variometer of 3rd stage tuned circuit	1	-
95	Anode choke of 3rd stage	1	-
96	Grid choke of 4th stage	1	-
97	Electronic valve Π-50	1	-
98	Condenser KCO-5-500-A-6800-III	1	6,800 pF; 500 V
99	Condenser KCO-8-1000-A-10000-III	1	10,000 pF; 1000 V
100	Condenser KCO-6-500-A-8200-III	1	8,200 pF; 500 V
101	Mica condenser	1	275 pF
102	Mica condenser	1	600 pF
103	Mica condenser	1	90 pF
104	Condenser KCO-7-2500-A-270-I	1	270 pF; 2500 V
105	Condenser KCO-6-500-A-8200-III	1	8,200 pF; 500 V
106	Air trimming capacitor	1	$C_{max.}$=30 pF
107	Air trimming capacitor	1	$C_{max.}$=30 pF
108	Resistor BC-2-22±10%	1	22,000 ohms; 2 W
109	Resistor BC-2-560±10%	1	560 ohms; 2 W
110	Condensor KCC-5-500-A-6800-III	1	6,800 pF; 500 V

1	2	3	4
111	Shunt for 250-mA milliammeter	1	Calibrated with instrument
112	Condenser KCO-5-500-A-6800-III	1	6,800 pF; 500 V
113	Jack E-5732005	1	-
114	Electronic valve ГК-71	1	-
115	Electronic valve ГК-71	1	-
116	Trimming choke of first and second bands of 4th stage	1	-
117	Variometer of 4th stage tuned circuit	1	-
118	Trimming choke of 4th stage	1	-
120	Anode choke of 4th stage	1	-
121	Condenser KBKT-20-33-II	2	33 pF each; 1000 V, connected in series
122	Condenser KCO-7-500-A-10000-III	1	10,000 pF; 500 V
123	Condenser KCO-8-1000-A-10000-III	1	10,000 pF; 1000 V
124	Ditto	1	10,000 pF; 1000 V
125	Ditto	1	10,000 pF; 1000 V
127	Mica condenser	1	900 pF
128	Ditto	1	275 pF
129	Ditto	1	20 pF
132	Trimming condenser	1	$C_{max.}$=15 pF
133	Condenser KCO-13-2000-A-10000-III	1	10,000 pF; 2000 V
134	Ceramic trimming condenser	1	$C_{min.}$=4.5 pF $C_{max.}$=12.5 pF

1	2	3	4
137	Resistor BC-0.5-56±10%	2)	Need is determined during alignment
138	Ditto	2)	
139	Vitrified resistor, type 1-3,000	1	3,000 ohms
140	Condenser KCO-2-500-A-10-III	1	10 pF; 500 V
141	Vitrified resistor, type II-500	1	500 ohms
143	Condenser KCO-5-500-A-10000-III	1	10,000 pF; 500 V
144	Potentiometer	1	8 kilohms
145	Shunt for 5-mA milliammeter	1	Calibrated with
146	Shunt for 250-mA milliammeter	1	instruments
147	Milliammeter of 500 mA, M-52	1	-
148	Jack K-5732005	1	-
149	Jack K-5732005	1	-
150	Choke of suppressor grid	1	-
151	Band selector switch for 3rd stage	1	-
152	Band selector of 4th stage	1	-
153	Condenser KCO-5-500-A-10000-III	1	10,000 pF; 500 V
154	Ditto	1	10,000 pF; 500 V
155	Ditto	1	10,000 pF; 500 V
156	Ditto	1	10,000 pF; 500 V
157	Mica condenser	1	10,000 pF
158	Ditto	1	1,200 pF
159	Ditto	1	1,500 pF
160	Ditto	1	2,080 pF
161	Ditto	1	2,700 pF

1	2	3	4
162	Mica condenser	1	3,400 pF
163	Ditto	1	4,450 pF
164	Ditto	1	5,750 pF
165	Ditto	1	7,200 pF
166	Ditto	1	9,500 pF
167	Ditto	1	12,000 pF
168	Ditto	1	3,500 pF
169	Communication switch	1	-
	Unit No.2		
231	Inductance coil	1	-
232	Switch for series-connected condensers	1	-
233	Switch for parallel-connected condensers	1	-
234	Milliammeter M-52	1	For 1 mA
235	Condenser KCO-5-500-A-6800-III	1	6,800 pF; 500 V
236	Ditto	1	6,800 pF; 500 V
237	Condenser KBKG-19-33-II	3	Resultant capacitance 99 pF
238	Condenser KBKG-12-39-II	5	Resultant capacitance 190 pF
239	Condenser KBKG-1-68-II	7	Resultant capacitance approx. 476 pF

1	2	3	4
240	Condenser KBKB-12-89-II	2	Resultant capacitance approx. 78 pF
241	Condenser KBKB-12-89-II	2	Resultant capacitance approx. 78 pF
242	Condenser KBKB-10-56-II	2	Resultant capacitance approx. 112 pF
243	Condenser, type H	1	800 pF ±10%
245	Electronic valve 6X6M	1	-
246	High frequency transformer	1	-
248	Resistor BC-0.5-100±10%	2	Each 100 ohms connected in parallel
250	Resistor BC-1.0-10±10%	1	10 kilohms, selected during alignment
251	Neon lamp MH-3	1	
252	Resistor BC-0.5-100±20%	1	100 kilohms; 0.5 W
	Unit No.5		
261	Switch	1	-
262	Electronic valve 6K7	1	-
263	Device B(crystal)	1	-
264	Trimming condenser	1	-
265	Choke	1	-
266	Winding of thermostat	1	1,600 ohms for 220 V
267	Thermal fuse	1	Operating temperature 80°

1	2	3	4
268	Condenser KCO-5-500-10000-III	1	10,000 pF; 500 V
269	Contact thermometer for 60°	1	-
270	Relay, type PMY-171-71-32 (PKH-y)	1	400 ohms; 10 V
271	Condenser KCO-5-500-A-7,500-II	2	Connected in parallel
272	Resistor BC-0.5-2.2±20%	1	2.2 kilohms; 0.5 W
273	Miniature lamp	1	6.3 V; 0.28 A
274	Resistor BC-1.0-47±10%	1	47 kilohms; 1 W
275	Vitrified resistor, type 1-300	1	300 ohms
276	Vitrified resistor, type 1-400	1	400 ohms
277	Two-pole switch	1	-
278	Five-section choke	1	500 μH
279	Condenser KCO-4-500-B-300-I	1	300 pF; 500 V
280	Condenser KCO-6-500-A-8200-II	1	8200 pF; 500 V
281	Ditto	1	8200 pF; 500 V
282	Ditto	1	8200 pF; 500 V
283	Condenser KCO-4-500-B-51-I	1	51 pF; 500 V
284	Resistor BC-1.0-0.47-±10%	1	470 kilohms; 1 W
285	Resistor BC-1.0-30±10%	1	30 kilohms; 1 W
286	Resistor BC-1.0-62±10%	1	62 kilohms; 1 W
287	Electronic valve 6H7	1	-
288	Resistor BC-1.0-390±10%	1	390 kilohms; 1 W
289	Resistor BC-2,0-110±10%	1	110 kilohms; 2 W
290	Electronic valve 6H7	1	-

1	2	3	4
291	Resistor BC-0.5-220±10%	1	220 kilohms; 0.5 W
292	Resistor BC-2.0-110±10%	1	110 kilohms; 2 W
293	Ditto	1	110 kilohms; 2 W
294	Resistor BC-1.0-390±10%	1	390 kilohms; 1 W
295	Resistor BC-2.0-110±10%	1	110 kilohms; 2 W
296	Resistor BC-2.0-15±10%	1	15 kilohms; 2 W
297	Resistor BC-0.5-220±10%	1	220 kilohms; 0.5 W
298	Keying relay TPM-43A	1	1,200 ohms; 5 mA
299	Condenser KCO-4-1,000-150-B-I	1	150 pF; 1,000 V
300	Electronic valve П-50	1	-
301	Four-section choke	1	137 mH
302	Condenser KCO-5-500-A-5,100-1	1	5,100 pF; 500 V
303	Condenser KCO-6-500-A-8,200-III	1	8,200 pF; 500 V
304	Ditto	1	8,200 pF; 500 V
305	Resistor BC-2.0-62±10%	1	62 kilohms; 2 W
306	Resistor BC-2.0-39±10%	1	39 kilohms; 2 W
307	Keying relay TPM-43A	1	1,200 ohms; 5 mA
308	Condenser КБГ-И-200-0.02-II	1	0.02 μF; 200 V
309	Ditto	1	0.02 μF; 200 V
310	Ditto	1	0.02 μF; 200 V
311	Condenser КБГ-И-200-0,02-II	1	0.02 μF; 200 V
312	Ditto	1	0.02 μF; 200 V

1	2	3	4
313	Condenser КБГ-М-200-0.02-II	1	0.02 μF; 200 V
314	Ditto	1	0.02 μF; 200 V
315	Resistor BC-0.25-56±10%	1	56 ohms; 0.25 W
316	Resistor BC-1-1.5±10%	1	1,500 ohms; 1 W
317	Resistor BC-1-560±10%	1	500 ohms; 1 W
318	Choke	1	3 μH
319	Ditto	1	3 μH
320	Ditto	1	3 μH
321	Ditto	1	3 μH
322	Push-button switch, non-locking	1	-
323	Resistor BC-2.0-10±10%	1	10,000 ohms, 2 W
324	Ceramic trimming condenser	1	$C_{min.}$=4.5 pF
324	Ceramic trimming condenser	1	$C_{max.}$=12.5 pF
325	Resistor BC-1.0-150±10%	1	150 ohms; 1 W
326	Ditto	1	150 ohms; 1 W
327	Ditto	1	150 ohms; 1 W
328	Relay РМУ-171.71.32 (РКН-У)	1	-
329	Resistor BC-0.5-2200±20%	1	2.2 kilohms; 0.5 W
330	Condenser КСО-5-300-А-7500-II	2	7,500 pF each; 500 V, connected in parallel

1	2	3	4
329	Resistor BC-0.5-2200±20%	1	2.2 kilohms; 0.5 W
330	Condenser KCO-5-500-A-7500-II	2	7,500 pF each; 500 V, connected in parallel
	Cabinet of transmitter		
331	Wire-wound resistor	1	0.6 ohm
332	Ditto	1	100 ohms
333	Vitrified resistor, type V	1	2,000 ohms
334	Vitrified resistor, type V	1	1,000 ohms
335	Wire-wound resistor	1	1.85 ohms
336	Ditto	1	1,400 ohms
337	Condenser КБГ-МП-2в-600 $\frac{0.25}{\text{И}}$ - III	1	0.25 uF; 600 V
338	Resistor BC-2.0-100±10%	1	100 ohms; 2 W
339	High frequency relay	1	-
340	Condenser KCO-5-500-A-10,000-III	1	10,000 pF; 500 V
341	Ditto	1	10,000 pF; 500 V
342	Vitrified resistor, type IV-3,000	1	3,000 ohms
343	Milliammeter M-52 with scales 0-50 mA and 0-250 mA	1	-
344	Condenser KCO-5-500-10000-II	1	10,000 pF; 500 V
	Crystal heating element (alternating current version)		
156	Thermal fuse	3	Operating temperature 80°
157	Heating element	1	160 ohms

1	2	3	4
158	Heating element	1	160 ohms
159	Ditto	1	160 ohms
160	Relay, type PMY-171-71-32 (РКН-У)	1	-
161	Contact thermometer 60°	1	-
162	Condenser KCO-5-500-A-7500-II	2	7,500 pF; 500 V
163	Resistor BC-0.5-2.2±10%	1	2.2 kilohms; 0.5 W
164	Vitrified resistor, type 1-400	1	400 ohms
165	Ditto, type 1-300	1	300 ohms
166	Lamp	1	6.3 V; 0.28 A
167	Wire-wound resistor	1	25 ohms
168	Toggle switch	1	-
169	Fuse, type A-43-2 (ПК)	2	For 2 A
170	Condenser KCO-5-500-A-7,500-11	2	7,500 pF each; connected in parallel
171	Resistor BC-1.0-560±10%	1	560 ohms; 1 W
172	Relay, type PMY-171-71-32 (РКН-У)	1	-
173	Fuse, type A-43-2 (ПК)	1	For 2 A
174	Condenser KCO-5-500-A-7,500-II	2	7,500 pF each; connected in parallel
175	Resistor BC-0.5-2.2±10%	1	2.2 kilohms; 0.5 W

1	2	3	4
	Heater of the master oscillator tuned circuit of unit No.1		
55	110 V direct current motor, type CД-261	1	-
56	Vitrified resistor, type 1-1000	1	1000 ohms
57	Vitrified resistor, type 1-900	1	900 ohms; only for 220 V supply mains
58	Ditto, type I	1	For supply mains; 220 V - 5,000 ohms; For supply mains 110 V - 2,500 ohms
59	Ditto, type 1-300	1	300 ohms
60	Ditto, type 1-300	1	300 ohms
61	Ditto, type I	1	For supply mains 220 V - 25 ohms; for supply mains, 110 V - 15 ohms
62	Vitrified resistor, type 1-500	1	500 ohms
63	Heating element	1	225 ohms for supply mains of 110 V; 900 ohms for supply mains of 220 V

1	2	3	4
64	Thermal fuse	1	Operating temperature 80°
65	Contact thermometer 60°	1	-
66	Miniature lamp	1	6.3 V; 0.28 A
67	Relay PMU-171.71-32 (PKN-U)	1	400 ohms; 10 V
73	Condenser KBG-M2-200 - 0.1/M - III	1	0.1 μF; 200 V
74	Condenser KBG-M-2-400-0.25-III	1	0.25 μF; 400 V
75	Condenser KBG-M-1-400-0.25-III	1	0.25 μF; 400 V
76	Two-pole toggle switch	1	-
82	Condenser KSO-5-500-A-10,000-III	1	10,000 pF, 500 V
	Crystal heater of unit No.5 (direct current version)		
260	Wire-wound resistor	1	45 ohms for 110 V supply mains only
266	Winding of thermostat	1	1600 ohms for 220 V mains; 400 ohms for 110 V mains
267	Thermal fuse	1	Operating temperature 80°
268	Condenser KSO-5-500-10000-III	1	10,000 pF; 500 V
269	Contact thermometer 60°	1	-
270	Relay PMU-17.71.32 (PKN-U)	1	-

1	2	3	4
271	Condenser KCO-5-500-A-7500-II	2	7500 pF each; 500 V connected in parallel
272	Resistor BC-0.5-2.2±20%	1	2.2 kilohms, 0.5 W
273	Lamp	1	6.3 V; 0.28 A
275	Vitrified resistor, type 1-2500		2,500 ohms only for 220 V supply mains
276	Vitrified resistor, type 1-300	1	300 ohms
277	Two-pole toggle switch	1	-
328	Vitrified resistor, type 1-2500	1	2,500 ohms
329	Ditto BC-0.5-2200±20%	1	2.2 kilohms; 0.5 W
330	Condenser KCO-5-500-A-7500-II	2	7,500 pF each; 500 V, connected in parallel
	Crystal heating element (direct current version)		
156	Thermal fuse	3	Operating temperature 80°
157	Heater	1	For 220 V supply - 200 ohms; for 110 V supply - 75 ohms
158	Ditto	1	For 220 V supply - 160 ohms, for 110 V supply - 40 ohms
159	Ditto	1	For 220 V supply - 160 ohms; for 110 V supply - 40 ohms

1	2	3	4
160	Relay PMY-171.71.32 (PKH-Y)	1	-
161	Contact thermometer 60°	1	-
162	Condenser KCO-5-500-A-7500-II	2	7,500 pF each; 500 V, connected in parallel
163	Resistor BC-0.5-2.2±10%	1	2.2 kilohms; 0.5 W
164	Vitrified resistor, type I	1	For 220 V supply - 5,000 ohms; for 110 V supply - 2,500 ohms
165	Vitrified resistor, type I	1	300 ohms
166	Lamp	1	6.3 V; 0.28 A
167	Wire-wound resistor	1	25 ohms for 220 V supply; 75 ohms for 110 V supply
168	Toggle switch	1	-
169	Fuse A-43-2 (ПК)	2	2 A
170	Condenser KCO-5-500-A-7500-II	2	7,500 pF each; 500 V, connected in parallel
171	Resistor BC-1.0-560±10%	1	560 ohms; 1 W

Appendix 8

LIST OF COMPONENTS OF REMOTE CONTROL EQUIPMENT CIRCUIT

(See Appendix 13)

Circuit No.	Description and type	Quantity	Electrical data
1	2	3	4
	Modulator		
1	Microphone transformer	1	-
2	Electronic valve 6A7	1	-
3	Condenser КБГ-М1-400-0.25-III	1	0.25 μF; 400 V
4	Ditto, КСО-5-500-А-4700-III	1	4,700 pF; 500 V
5	Ditto, КБГ-М1-400-0.25-III	1	0.05 μF; 400 V
6	Ditto, КЭГ-1-В-50- 50/МК - VI	1	50 μF; 50 V
7	Ditto, КБГ-М1-200-0.1-III	1	0.1 μF; 200 V
8	Resistor ВС-0.25-1.5±10%	1	1,500 ohms; 0.25 W
9	Ditto, ВС-0.25-68±10%	1	68 kilohms; 0.25 W
10	Ditto, ВС-0.5-560±10%	1	560 kilohms; 0.5 W
11	Ditto, ВС-0.5-220±10%	1	220 kilohms; 0.5 W
12	Variable resistor, type ОМЕГА 33-В-1, unganged (СП-1-1а-33-В-13к)	1	33 kilohms; 1 W
13	Resistor ВС-0.25-1±10%	1	1 megohm; 0.25 W
14	Ditto, ВС-2-22±5%	1	22 kilohms; 2 W
15	Ditto, ВС-0.25-680±10%	1	680 ohms; 0.25 W

1	2	3	4
16	Resistor BC-0.5-2.2±20%	1	2.2 megohms; 0.5 W
17	Variable resistor, type OMETA 470-B-1 unganged (СП-II-1a-470-B-13)	1	470 kilohms; 1 W
18	Condenser КБГ-М1-200-0.25-III	1	0.25 μF; 200 V
19	Ditto, КБГ-М2-600-0.1-III	1	0.1 μF; 600 V
20	Electronic valve 6Ж8	1	-
21	Electronic valve ГУ-50	1	-
22	Resistor BC-0.25-22±10%	1	22 kilohms; 0.25 W
23	Ditto, BC-2-560±10%	1	560 ohms; 2 W
24	Condenser КЭГ-1-B-50- $\frac{50}{МК}$ - VI	1	50 uF; 50 V
25	Modulation transformer	1	-
26	Condenser КСО-4-1,000-A-1,000-III	1	1,000 pF; 1,000 V
27	Ditto, КБГ-М2-600-0.1-III	1	0.1 μF; 600 V
28	Resistor BC-0.5-51±20%	1	51 kilohms; 0.5 W, selected during alignment
29	Ditto, BC-1-22±5%	1	22 kilohms; 1 W
30	Ditto, BC-1-22±5%	1	22 kilohms; 1 W
31	Ditto, BC-0.5-1±5%	1	1 kilohm; 0.5 W
32	Ditto, BC-0.5-1±5%	1	1 kilohm; 0.5 W
33	Variable resistor, type OMETA 470-A-2, unganged (СП-II-2a-470-A-13)	1	470 kilohms; 2 W

1	2	3	4
34	Milliammeter M-52 (for measuring modulation depth)	1	For 1 mA; graduated M-60, 70, 80%
35	Electronic valve 6X6M	1	-
36	Electronic valve 6Ж8	1	-
37	Tone-generator transformer	1	-
38	Resistor BC-0.25-22±10%	1	22 kilohms; 0.25 W
39	Ditto, BC-0.5-100±10%	1	100 kilohms; 0.5 W
40	Ditto, BC-0.25-5100±5%	1	5,100 ohms; 0.25 W
41	Ditto, BC-0.25-560±10%	1	560 kilohms; 0.25 W
42	Variable resistor, type OMETA 470-B-1, unganged (СП-II-1а--470-B-13)	1	470 kilohms; 0.5 W
43	Condenser КСО-5-500-В-1800-I	1	1,800 pF; 500 V
44	Condonser КБГ-М1-400-0,05-III	1	0.05 μF; 400 V
45	Ditto, КБГ-М1-200-0.1-III	1	0.1 μF; 200 V
46	Ditto, КСО-5-500-А-4700-III	1	4,700 pF; 500 V
47	Ditto, КСО-5-500-В-4700-III	1	4,700 pF; 500 V
48	Electronic valve 6Ж8	1	-
49	Control transformer	1	-
50	Resistor BC-0.25-1±20%	1	1 megohm; 0.25 W

1	2	3	4
51	Resistor BC-0.5-1.0±20%	1	1 megohm; 0.5 W
52	Resistor BC-0.25-1.2±10%	1	1,200 ohms; 0.25 W
53	Ditto, BC-0.25-100±20%	1	100 kilohms; 0.25 W
54	Condenser KCO-8-1000-A-10000-III	1	10,000 pF; 1,000 V
55	Ditto, KBT-M1-400-0.1-III	1	0.1 μF; 400 V
56	Electronic valve 6X6M	1	-
57	Resistor BC-0.25-220±20%	1	220 kilohms; 0.25 W
58	Variable resistor, type OMETA 470-A-2, unganged (CП-II-2a-470-A-13)	1	470 kilohms; 2 W
59	Ditto, BC-0.25-560±10%	1	560 kilohms; 0.25 W
60	Ditto, BC-0.25-68±10%	1	68 kilohms; 0.25 W
61	Ditto, BC-0.25-560±10%	1	560 kilohms; 0.25 W
62	Ditto, BC-0.5-1.5±10%	1	1.5 kilohms; 0.5 W
63	Ditto, BC-1-560±10%	1	560 ohms; 1 W
64	Relay TPM-43A	1	1,200 ohms; 5 mA
65	Resistor BC-1-560±10%	1	560 ohms, 1 W
66	Condenser KBT-M1-400-0.25-III	1	0.25 μF; 400 V
67	Condenser K3T-1-B-20- 50/MK - У1	1	50 μF; 20 V
	Control unit		
75	Heater push-buttons START (ПУСК) and STOP (СТОП)	1	-
76	Relay, type PMУ-171.73.32 (РКН-У)	1	-

1	2	3	4
77	Function switch	1	-
78	Filter choke	1	-
79	Filter choke	1	-
80	Condenser КЭГ-1-В-50 -$\frac{50}{МК}$ - У1	1	50 μF; 50 V
81	Ditto	1	50 μF; 50 V
82	Potentiometer	1	4x2,500 ohms
83	Power control switch	1	-
84	Call push-button	1	-
85	Switchboard lamp	1	24 V
86	Resistor ВС-1-560±10%	1	560 ohms; 1 W
87	Condenser КЭГ-1-В-50- $\frac{50}{МК}$ -VI	1	50 μF; 50 V
88	Transformer	1	-
89	Handset МТК-2	1	-
90	Relay, type РМУ-171.73.32 (РКН-У)	1	-
92	Semi-duplex toggle switch	1	-
93	Relay ТРМ-43А	1	1,200 ohms; 5 mA
94	Resistor ВС-1.0-1.5±10%	1	1,500 ohms; 1 W
95	Ditto, ВС-1.0-560±10%	1	560 ohms; 1 W
96	Toggle switch	2	Ganged
97	Red signal lamp	1	26 V; 5 W
98	Green signal lamp	1	26 V; 5 W
99	Telegraph signal lamp	1	-
100	Relay РМУ-171.91.87 (РКН-У)	1	-
101	Series resistor	1	30 ohms

1	2	3	4
102	Series resistor	1	30 ohms
103	Potentiometer	1	2,500 ohms
104	Vitrified resistor, type IV	1	2,000 ohms
105	Variable wire-wound resistor	1	-
	Radio Operator's Post		
111	Heater push-buttons START (ПУСК) and STOP (СТОП)	1	-
112	Red signal lamp	1	26 V; 5 W
113	Green signal lamp	1	26 V; 5 W
114	Toggle switch	1	Ganged
115	Monitoring toggle switch	1	-
116	Handset МТК-2	1	-
118	Relay ТРМ-43 А	1	1,200 ohms; 5mA
119	Transformer	1	-
120	Call push-button	1	-
121	Switchboard lamp	1	24 V
122	Condenser КЭГ-1-В-50 - $\frac{50}{МК}$ - У1	1	50 μF; 50 V
123	Resistor ВС-1-560±10%	1	560 ohms; 1 W
124	Ditto, ВС-1-1.5-±10%	1	1,500 ohms ±10%; 1 W
125	Resistor ВС-1-560±10%	1	560 ohms ±10%; 1 W
127	Semi-duplex toggle switch	1	-

1	2	3	4
128	Telegraph key	1	-
129	Series resistor	1	30 ohms
130	Ditto	1	30 ohms
	Remote Communication Post		
135	Push-buttons START (ПУСК) and STOP (СТОП)	1	-
136	Red signal lamp	1	26 V; 5 W
137	Green signal lamp	1	26 V; 5 W
138	Toggle switch	2	Ganged
139	Handset МТК-2	1	-
140	Additional telephone БЭМ2	1	-
141	Relay РМУ-171.73.32 (РКН-У)	1	-
142	Transformer	1	-
143	Call push-button	1	-
144	Switchboard lamp	1	24 V
145	Condenser КЭГ-1-В-50 - $\frac{50}{МК}$ -VI	1	50 μF; 50 V
146	Resistor ВС-1-560±10%	1	560 ohms; 1 W
147	Jacks of telegraph key	1	-
151	Series resistor	1	30 ohms
152	Ditto	1	30 ohms
	Amplifier with dynamic loudspeaker		
219	Condenser КБГ-МП-2В-600 - $\frac{0.25}{И}$ -111	1	0.25 μF; 600 V

1	2	3	4
221	Variable resistor, type OMEГА 33-B-1, unganged (СП-1-1а-33-В-13п)	1	33 kilohms, 1 W
222	Electronic valve 6SJ7	1	-
223	Resistor BC-0.25-15±10%	1	1,500 ohms; 0.25 W
224	Condenser КЭГ-1-2Н-12 - $\frac{100}{МИ}$ -VI	1	100 μF; 12 V
225	Ditto, КБГ-М1-200-0.05-III	1	0.05 μF; 200 V
226	Resistor BC-0.25-1000±10%	1	1,000 kilohms, 0.25 W
227	Condenser КЭГ-1-2В-150 - $\frac{50}{МИ}$ -VI	1	50 μF; 150 V
228	Resistor BC-0.25-270±10%	1	270 kilohms; 0.25 W
229	Ditto, BC-0.25-560±10%	1	560 kilohms; 0.25 W
230	Condenser КСО-5-500-А-10000-III	1	10,000 pF; 500 V
231	Electronic valve 30П1М	1	-
232	Condenser КЭГ-1-2В-12 - $\frac{100}{МИ}$ -VI	1	100 μF; 12 V
233	Resistor BC-1-150±10%	1	150 ohms; 1 W
234	Ditto, BC-2-1.2±10%	1	1,200 ohms; 2 W
235	Output transformer	1	-
236	Input transformer	1	-
237	Fuse A-43-2 (ПК)	2	For 2 A
238	Condenser КЭГ-1-2В-150- $\frac{50}{МИ}$ -VI	1	50 μF; 150 V

1	2	3	4
239	Switch	1	-
240	Selenium stack	2	-
241	Switch	1	-
242	Vitrified resistor, type IV-300	1	300 ohms
243	Signal lamp	1	6.3 V; 0.28 A
244	Resistor BC-1.0-68±10%	2	68 ohms; connected in parallel
245	Condenser KCO-2-500-A-200-III	1	200 pF; 500 V
246	Toggle switch	1	-
248	Vitrified resistor, type IV-300	1	300 ohms
249	Dynamic loudspeaker ЗГД-2М	1	-

Appendix 9

LIST OF COMPONENTS FOR THE RECTIFIER ASSEMBLY CIRCUIT

(See Appendix 14)

Circuit No.	Description and type	Quantity	Electrical data
1	2	3	4
501	Ship's mains switch	1	-
502	Fuse panel	1	-
503	Signal lamp MH-5	1	-
504	Ditto	1	-
506	Signal lamp OVERHEATING (ПЕРЕГРЕВ)	1	26 V; 0.15 A
507	Signal lamp OVERLOAD (ПЕРЕГРУЗКА)	1	26 V; 0.15 A
508	Emergency switch	1	220 V; 1 A
509	Switch panel of rectifier B-5	1	-
510	Current transformer for amperemeter 544	1	-
511	Overload relay of rectifier B-5 РМУ-171.70.01 (РКН-У)	1	-
512	Grid bias relay РМУ-171.70.76 (РКН-У)	1	-

1	2	3	4
513	Resistor	1	33 kilohms; 2 W
514	Selenium stack of rectifier B-4, BC-35-35	1	250 V; 0.1 A
515	Three-pole electromagnetic contactor KM-1	1	-
516	Electrolytic condenser K9T-2	3	20 μF each; 450 V
517	Filter choke	1	12 H
518	Transformer	1	220/250/280 V
519	Filter choke	1	2.5 H
520	Filter condenser KBG-MN	3	Paper-oil, 600 V; 6 μF
521	Heater transformer	1	220/6.5/6.5 V
522	Transformer of rectifier B-5	1	220/600 V
524	Bimetal overheating relay	1	-
527	Switch panel of transformer 572	1	-
528	Three-pole electromagnetic contactor KM-1	1	-
536	Time delay relay PMU-171.71.32 (PKH-U)	1	-
537	Overload relay of rectifier B-6 PMU-171.70.01(PKH-U)	1	-
539	Overload signal lamp B-6	1	26 V; 0.15 A
541	Fuse unit with signal lamps	1	-
542	Push-button switch of voltmeter 543	1	-

1	2	3	4
543	Voltmetor M-41	1	50 V
544	Ammeter M-41	1	20 A
545	Selenium rectifier of ammeter	1	-
546	Electrolytic condenser КЭГ-2	3	20 μF; 450 V
547	Fuse panel	1	-
548	Transformer switch panel of rectifier B-1	1	-
549	Stabilizer and barretter valve panel	1	-
550	Three-pole electromagnetic contactor КМ-1	1	-
551	Electrolytic condenser КЭГ-2 of rectifier B-2	3	20 μF; 450 V
552	Selenium stack ВС-100-34 of rectifier B-1	1	24 V; 4 A
553	Selenium stack ВС-35-35 of rectifier B-3	2	280 V; 0.1 A
554	Selenium stack ВС-35-35 of rectifier B-2	2	250 V; 0.1 A
555	Filter choke of rectifier	1	4,000 turns
556	Transformer of rectifier B-3	1	220/250/280
557	Choke of rectifier B-2	1	4,000 turns
558	Transformer of rectifier B-2	1	220/250/280 V
559	Heater transformer	1	220/26/6.5 V

1	2	3	4
560	Resistor (vitrified) of barretter ballast load	1	100 ohms
561	Three-phase transformer of rectifier B-1	1	220/24 V
562	Copper-oxide rectifier BKИ-1	1	-
563	Selenium stacks BC-45-49 of rectifier B-5	2	6 discs each 600 V; 0.5 A
566	Vitrified ballast resistor, type V	2	20 kilohms; connected in parallel
567	Vitrified ballast resistor, type V	1	10 kilohms
568	Vitrified ballast resistor, type IV	1	10 kilohms
569	Ditto	1	10 kilohms
570	Signal lamp TUNING (НАСТРОЙКА)	1	26 V; 0.15 A
571	Switch TUNING (НАСТРОЙКА)	1	220 V; 1 A
572	Transformer	1	1.1 kW
573	Filter condenser КБГ-МН	4	1,500 V each; 2 μF
574	Selenium stacks BC-45-49 of rectifier B-6	2	9 discs each
575	Heater transformer	1	-
576	Filter choke	1	2.5 H
577	High voltage switch	1	-

1	2	3	4
580	Semi-variable vitrified resistor, type III	1	50 ohms
581	Receptacle	1	220 V
$Л_2$	Signal lamp MH-5	6	-
$Л_3$	Barretter 1-Б-10-17	1	-
$Л_4$	Valve 6B4	1	-
$Л_9$	Stabilovolt 150-C5-30	1	-
$Л_{10}$	Dual triode 6H7C	1	-
$Л_{11}$	Valve 6Ж8	1	-
$Л_{12}$	Stabilovolt СГ-2С	1	1
R_1	Resistor ВС-0.5-100	3	100 kilohms; 0.5 W
R_2	Resistor ВС-0.5-100	6	100 kilohms; 0.5 W
R_3	Resistor ВС-1-270	1	270 kilohms; 1 W
R_5	Wire-wound resistor	1	0.6 ohm
R_7	Semi-variable vitrified resistor, type III-50	1	50 ohms
R_{13}	Wire-wound resistor	1	58.8 kilohms
R_{14}	Ditto	1	Ditto
R_{15}	Ditto	1	Ditto
R_{16}	Ditto	1	Ditto
R_{17}	Ditto	1	Ditto
R_{18}	Wire-wound resistor	1	5,870 ohms

1	2	3	4
R_{19}	Wire-wound resistor	1	26,400 ohms
R_{20}	Ditto	1	26,400 ohms
R_{21}	Ditto	1	1.1 ohms
R_{22}	Ditto	1	1.1 ohms
R_{23}	Resistors 610, 915 or 1,830 ohms	1	-
R_{24}	Resistor BC-05-510	1	510 kilohms; 0.5 W
R_{25}	Resistor BC-0.5-100	1	100 kilohms; 0.5 W
R_{26}	Resistor BC-0.5-100	1	100 kilohms; 0.5 W
R_{27}	Resistor BC-1-270	1	270 kilohms; 1 W
R_{28}	Resistor BC-0.5-48	1	48 kilohms; 0.5 W
R_{29}	Dropping resistor	1	50 ohms
C_1	Condenser КБГ-И	1	400 V; 0.025 μF
C_2	Ditto	1	400 V; 0.025 μF
C_3	Ditto	1	400 V; 0.025 μF
ПР-1	Fuse ПД-1	1	For 10 A
ПР-2	Ditto	1	For 10 A
ПР-3	Ditto	1	For 10 A
ПР-4	Fuse ПД-II	1	For 6 A
ПР-5	Fuse ПД-II	1	For 6 A
ПР-6	Fuse ПД-II	1	For 6 A

1	2	3	4
ПР-7	Fuse ПК-43	1	For 0.5 A
ПР-8	Ditto	1	For 0.5 A
ПР-9	Ditto	1	For 5 A
ПР-10	Ditto	1	For 0.5 A
ПР-11	Ditto	1	For 0.5 A
ПР-12	Ditto	1	For 0.5 A
582	Semi-variable wire-wound resistor	1	1,400 ohms ±10%
583	Ditto	1	1,400 ohms ±10%
R_4	Resistor BC-2-20-5%	2	20 kilohms each, connected in series
R_6	Resistor BC-2-10-5%	3	10 kilohms each, connected in series

Appendix 10

LIST OF COMPONENTS OF THE ПТ-2.5 CONVERTER CIRCUIT WITH CONTROL EQUIPMENT

(See Appendix 15)

Circuit No.	Description and type	Quantity	Electrical data
1	2	3	4
184	Power supply switchboard	1	-
177	Voltmeter ПМ-70-0-300 with external series resistor	1	-
178	Ammeter ПМ-70 with external shunt	1	100 A for 220 V 200 A for 110 V
179	Fuse A-43 (ПК)	2	3 A for 220 V 5 A for 110 V
180	Fuse	2	60 A for 220 V; 100 A for 110 V
181	Fuse A-43 (ПК)	2	1 A for 220 V; 2 A for 110 V
182	Signal lamp	1	26 V; 5 W
183	Ditto	1	26 V; 5 W
185	Supply switch	1	-
186	Push-buttons START (ПУСК) and STOP (СТОП)	1	-
187	Condenser БЭК-153	4	0.5 μF; 220 V
202	Vitrified resistor, type IV	1	1,000 ohms for 220 V; 500 ohms for 110 V

1	2	3	4
188	Starting station КРП-2.5	1	For 220 or 110 V mains
189	Convorter ПТ-2.5	1	-
190	Voltago regulating unit of generator БРПТ-2.5	1	-
192	Carbon-pilo voltage regulator РУН-121	1	-
193	Solenium rectifier ВС-255	1	-
194	Setting rheostat ВС-240	1	-
195	Manual excitation control РВ-5212	1	-

Appendix 11

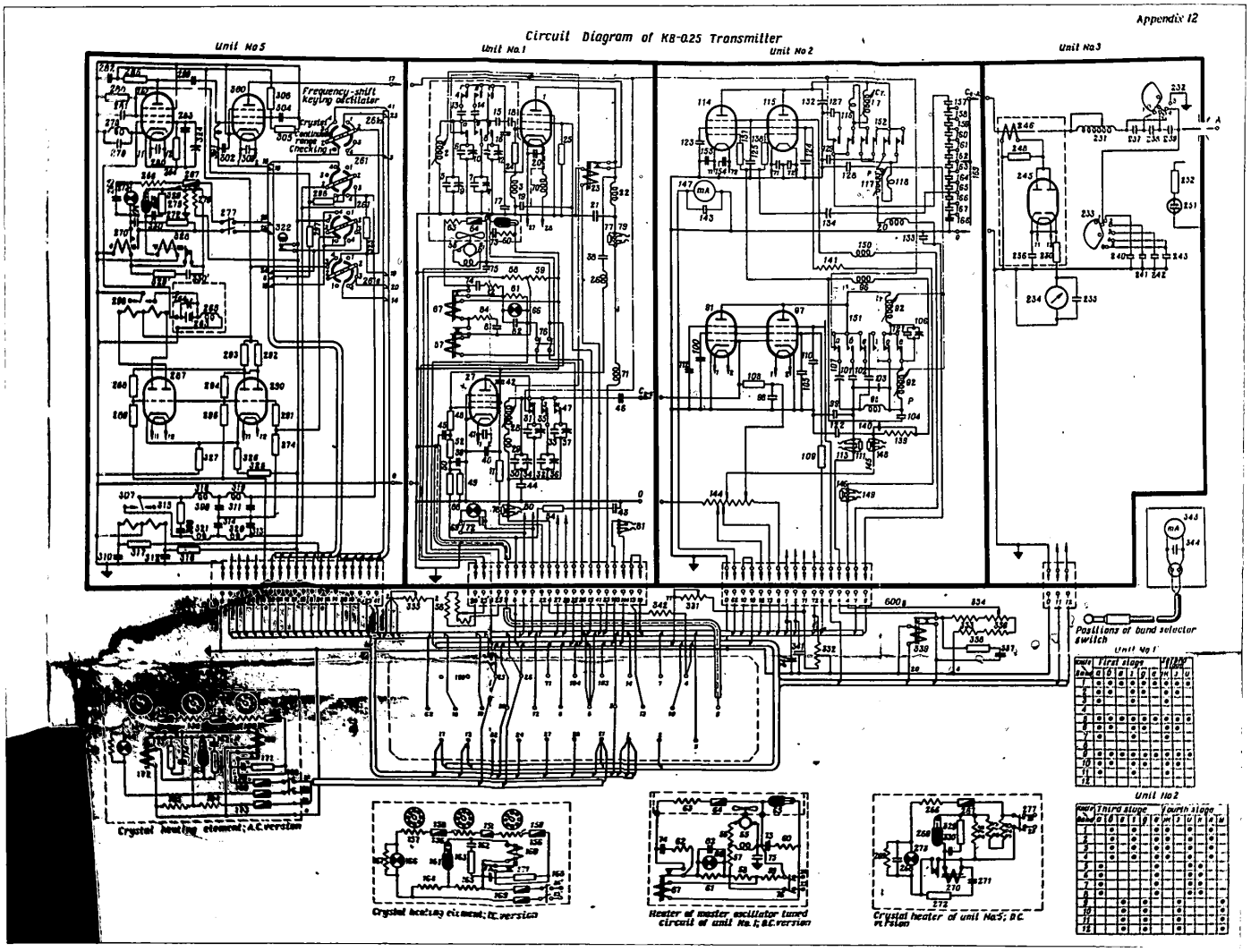
LIST OF COMPONENTS OF THE П-7.2 CONVERTER CIRCUIT WITH CONTROL EQUIPMENT

(See Appendix 16)

Circuit No.	Description and type	Quantity	Electrical data
1	2	3	4
184	Power switchboard	1	-
177	Voltmeter ПМ-70 with external scrics resistor	1	For 300 V
178	Ammeter ПМ-70 with external shunt	1	100 A for 220 V; 200 A for 110 V;
179	Fuse A-43 (ПК)	2	3 A for 220 V; 6 A for 110 V;
180	Fuse	2	60 A for 220 V;
181	Fuse A-43 (ПК)	2	1 A for 220 V; 2 A for 110 V;
182	Signal lamp	1	26 V; 5 W
183	Signal lamp	1	26 V; 5 W
185	Supply switch	1	-
186	Push-button START (ПУСК) and STOP (СТОП)	1	-
187	Condenser БЗК-153	4	0.5 μF; 220 V
202	Vitrified resistor, type IV	1	1,000 ohms for 220 V; 500 ohms for 110 V

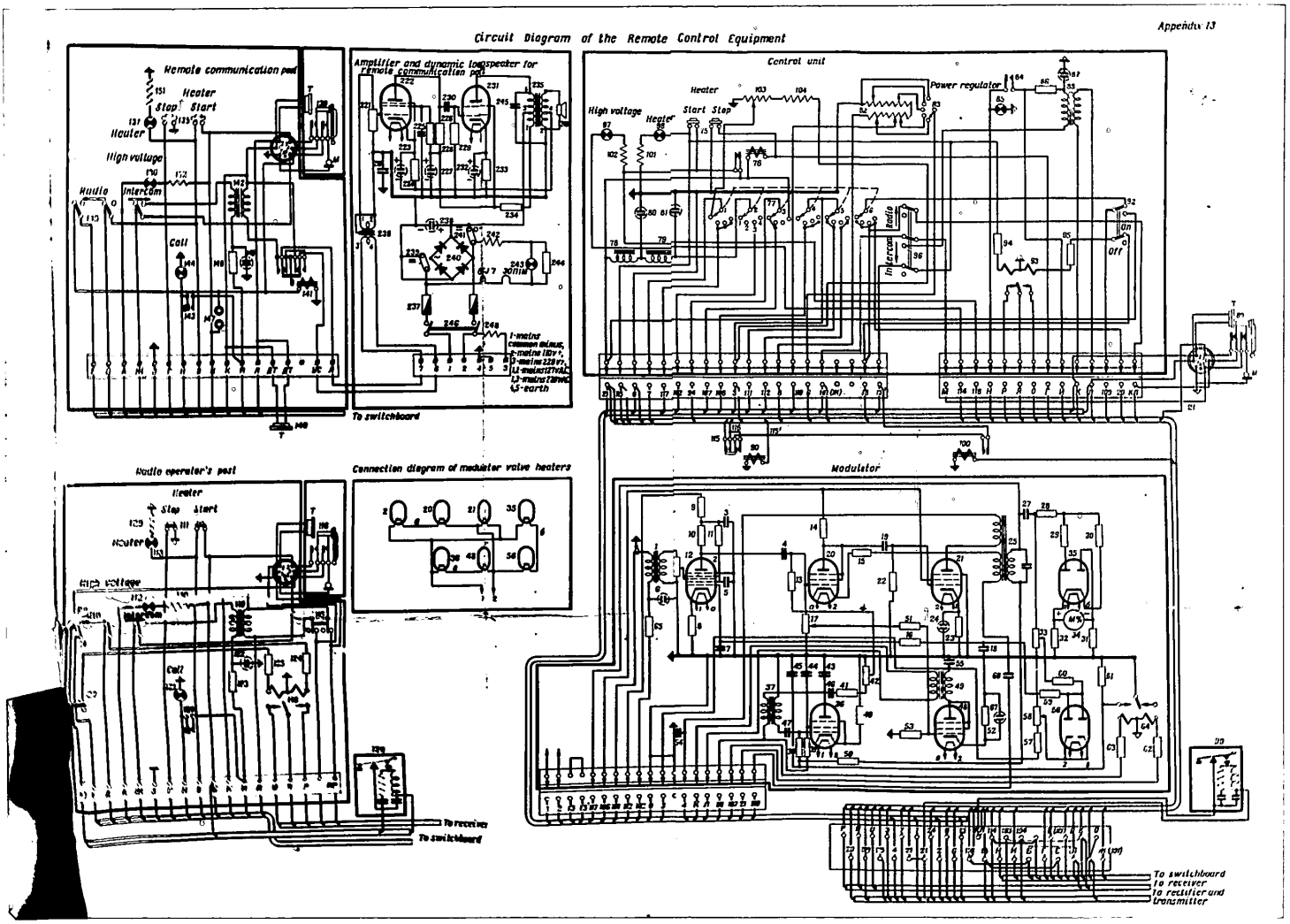
1	2	3	4
195	Converter П-7.2	1	-
190	Condenser B3K-153	1	0.5 μF; 220 V
191	Ditto	1	0.5 μF; 220 V
192	Ditto	3	0.5 μF; 220 V
193	Condenser B3K-253	1	0.5 μF; 220 V
194	Ditto	1	0.5 μF; 220 V
196	Three-phase current transformer	1	-
198	Selenium rectifier	1	-
199	Filter choke	1	-
200	Excitation regulator P3B-21A	1	-
201	Automatic control station		
	(starter)	1	-
	CMK-2001-21A1/22A2	1	-
208	Condenser B3K-253	1	In one casing
209	Ditto	1	

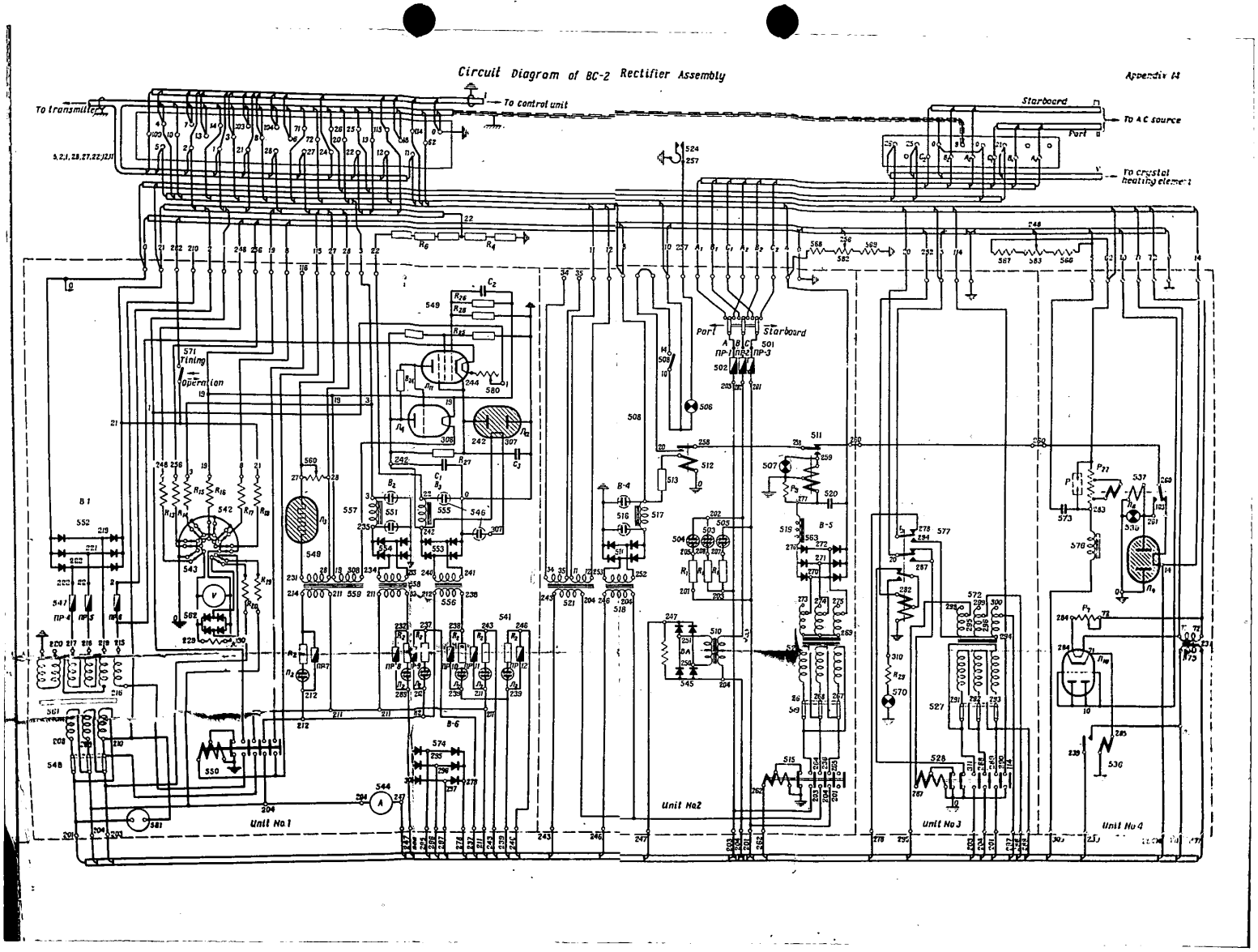
Appendix 12

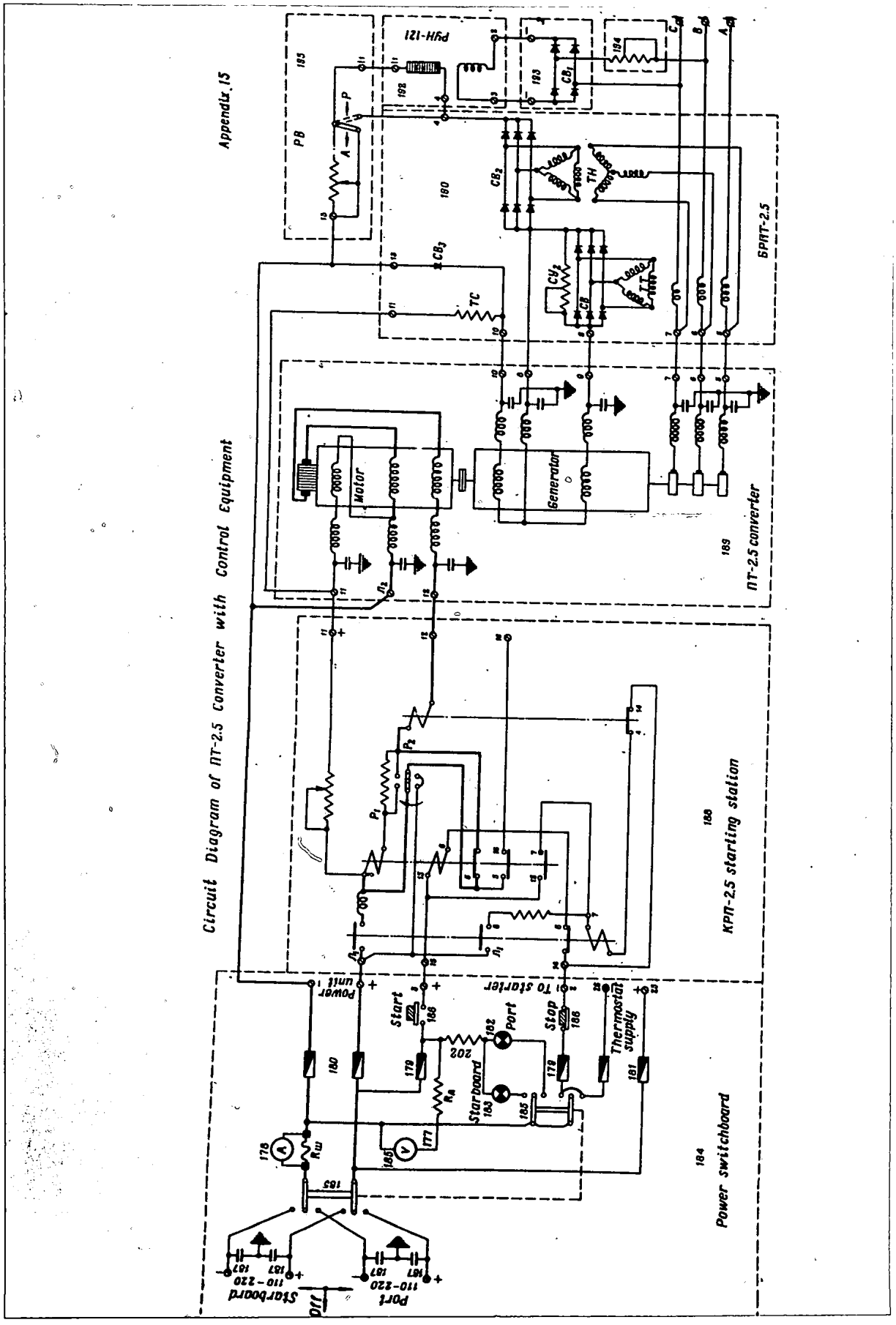


Appendix 13

Circuit Diagram of the Remote Control Equipment

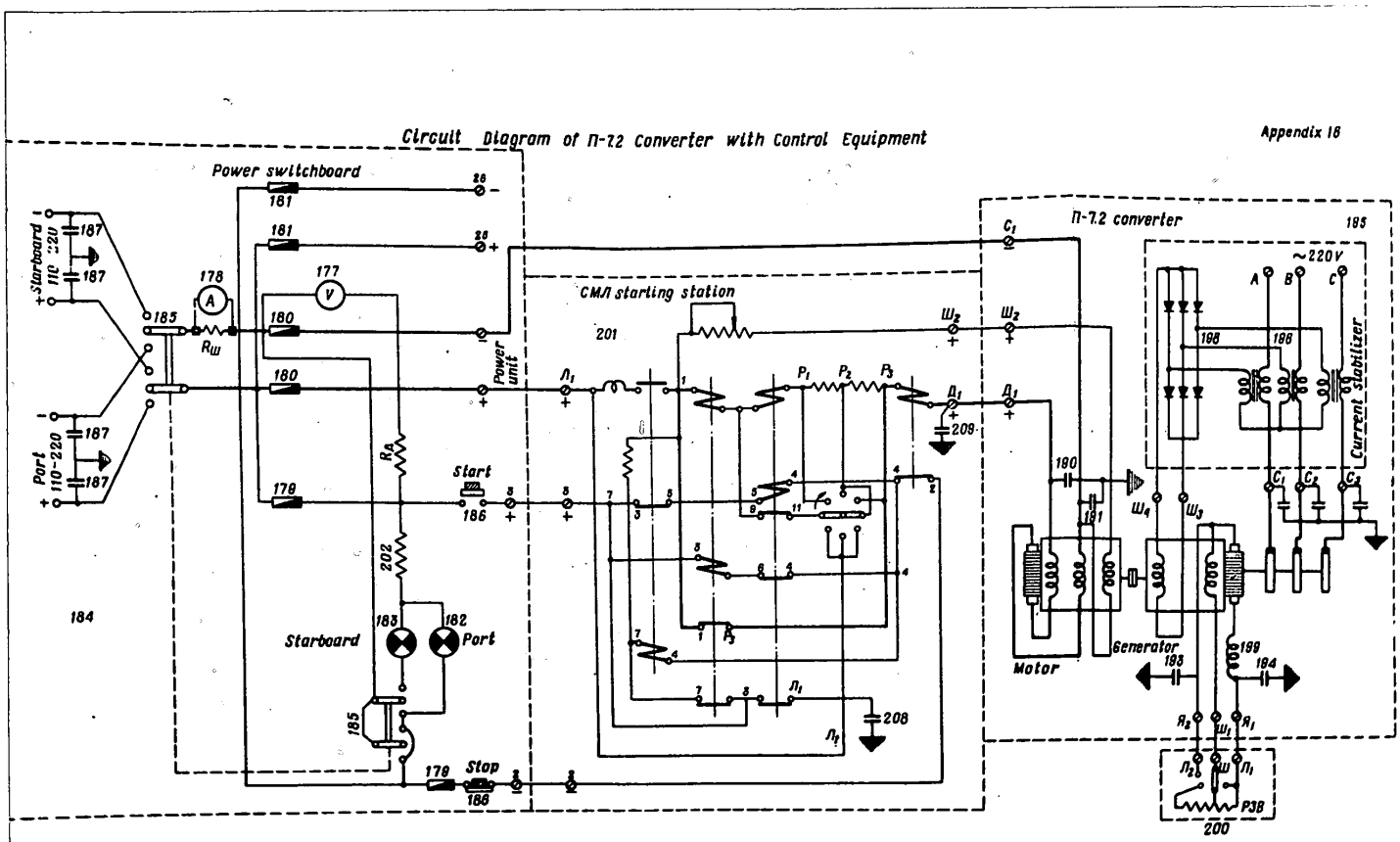






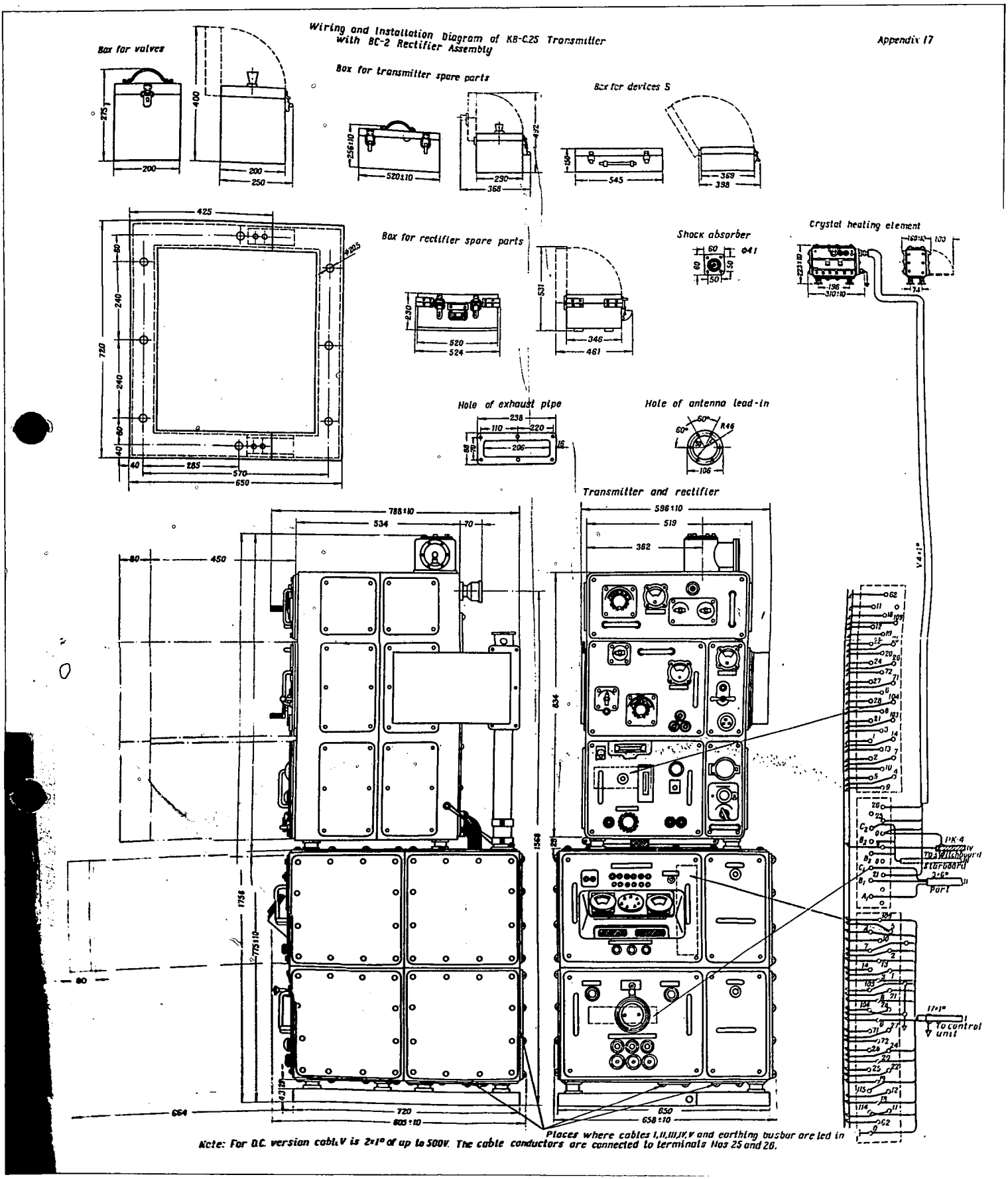
Circuit Diagram of П-7.2 Converter with Control Equipment

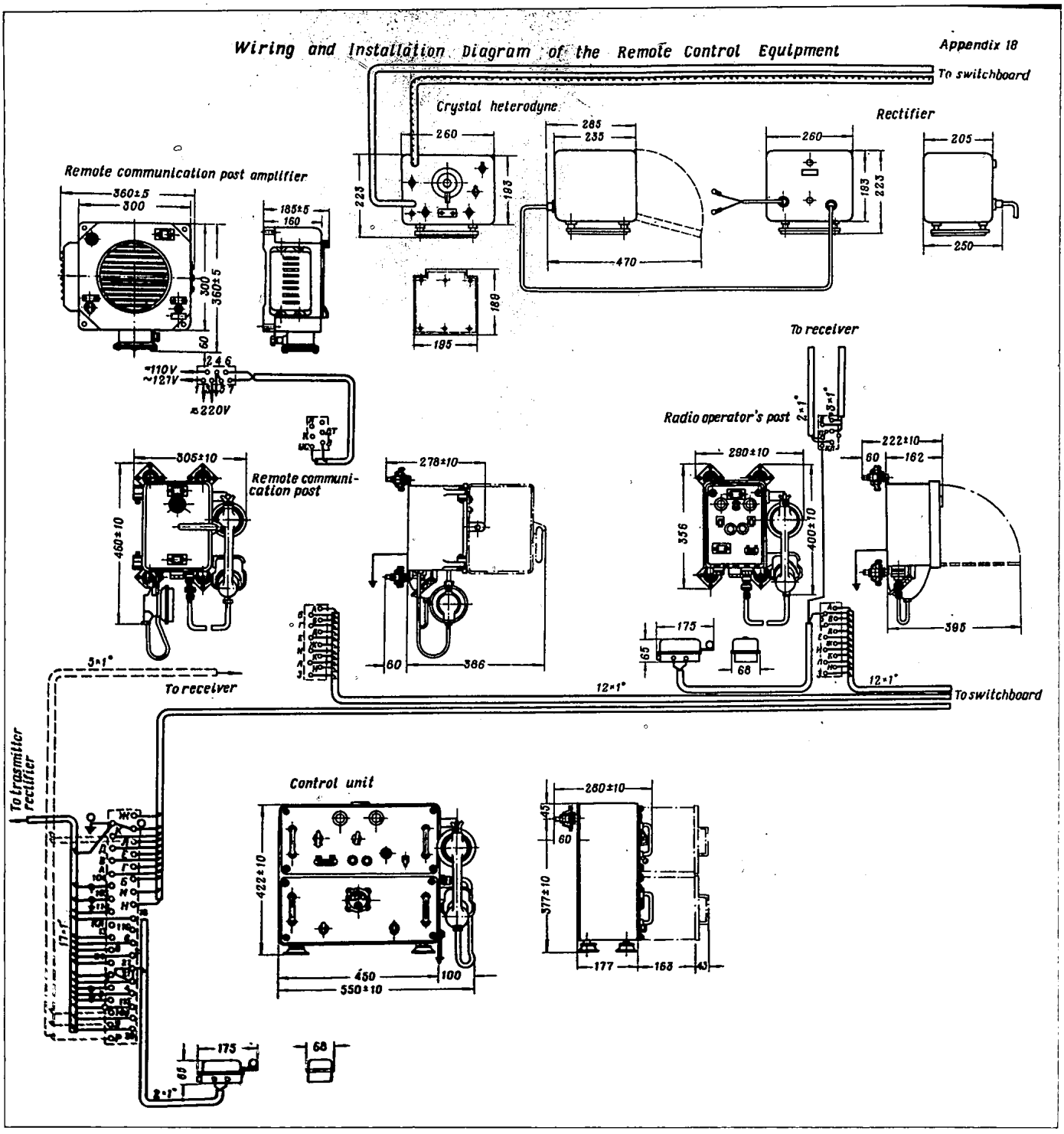
Appendix 16



Wiring and Installation Diagram of KB-C.25 Transmitter with BC-2 Rectifier Assembly

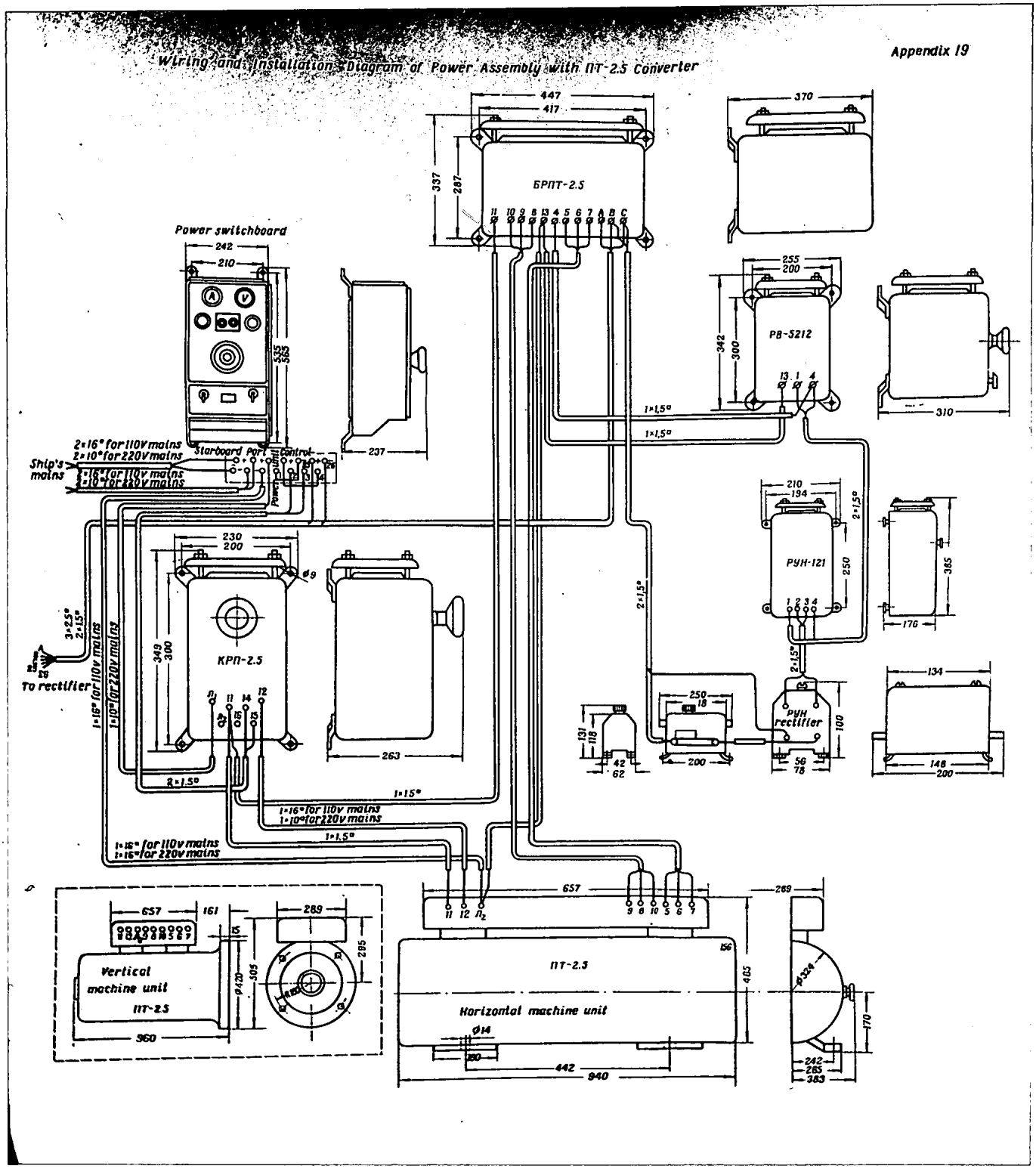
Appendix 17





Appendix 19

Wiring and Installation Diagram of Power Assembly with ПТ-2.5 Converter



Appendix 20

Wiring and Installation Diagram of Power Assembly with II 12 Converter