

INFORMATION REPORT INFORMATION REPORT

CENTRAL INTELLIGENCE AGENCY

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COUNTRY USSR

REPORT

SUBJECT English-Language Manual on the Soviet
Marine Radio-Relay Installation, Type
MKTU-15s

DATE DISTR. 7 January 1964

NO. PAGES 1

REFERENCES

50X1-HUM

DATE OF INFO.

PLACE & DATE ACQ

50X1-HUM

THIS IS UNEVALUATED INFORMATION. SOURCE GRADINGS ARE DEFINITIVE. APPRAISAL OF CONTENT IS TENTATIVE.

1. [redacted] 90-page, English-language manual on the Soviet MKTU-15s naval radio-relay installation [redacted] 50X1-HUM
[redacted] No publishing data were given. 50X1-HUM

2. The MKTU-15s is an updated version of the MKTU-15;¹ it is used to transmit commands and relays broadcast programs on shipboard. Main components of the MKTU-15s include the MK-17A microphone posts; MK-10A receiver-amplifier; MK-21A power-supply switchboard; electric record player; MN-B extension microphones; ZGD-ZMA and MARG-1 loudspeakers; RG-2 gain controls; 5-NKN-10M storage batteries; and AMG-Z converters.

3. Part I contains a general section and sections on: installation components; operation of the MKTU-15s installation; operating instructions and maintenance; and trouble-shooting procedures. Part II consists of key diagrams and general views of the installation, plus a list of components. The table of contents lists an insert entitled "transformers and chokes winding data," however, it was not received. The title page of the manual was also missing.

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INFORMATION REPORT INFORMATION REPORT

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MARINE RADIO RELAY INSTALLATION
Type MKTU-15s

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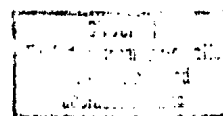
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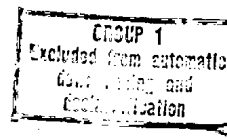
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DESCRIPTION AND OPERATING INSTRUCTIONS

1. GENERAL

1 - 1. Purpose

The MKTY-15c marine radio relay installation is actually a rediffusion station intended for transmitting commands and broadcast programs on shipboard^{x)}.

1 - 2. Components

The main components of the installation are as follows:

1. Microphone posts (M.P.) MK-17A.
2. Receiver-amplifier unit (R.A.U.) MK-10A.
3. Power-supply switchboard (P.S.S.) MK-21A.
4. Electric record player.
5. Extension microphones of the MH-B type.
6. Loudspeakers of the 31A-3MA and MAPF-1 types.
7. Gain controls of the PT-2 type.
8. Storage batteries of the 5-HKH-10i type.
9. Converters AMP-3.
10. Spare parts and tools.
11. Technical papers.

The purpose and diagram of each component are dealt with in Section II of the present Album.

^{x)} In earlier publications this equipment was referred to as "intercommunication set".

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Note: When a 110 - 127 or 220 V A.C. feeder is available aboard ship, the MKTY-15C installation is not equipped with converters, a power-supply switchboard or storage batteries.

1 - 3. General Characteristics

The installation provides for the following kinds of transmission to be effected through three loudspeaker lines (both separately and together in any combination):

(a) transmission of commands and orders from any of the two microphone posts (M.P.) over the main M.P. microphones or extension microphones;

(b) transmission of announcements and local programs over an extension microphone located in the radio relay room;

(c) transmission of broadcast programs (reception from the ether or sound reproduction) from the receiver-amplifier unit;

(d) transmission of broadcast programs over the crew quarters loudspeaker line from a 30 V external rediffusion net.

The installation ensures continuous trouble-free operations:

(a) in conditions of high ambient temperature of up to $+50^{\circ}\text{C}$;

(b) in conditions of high relative humidity of up to 95 per cent;

(c) after staying in conditions of low temperatures (down to -40°C) for a long time;

(d) in conditions of vibration and jolts.

The components intended for operation on the upper decks are of a waterproof design.

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1 - 4. Operating Possibilities

Commands and orders can be transmitted from any of the two microphone posts.

Broadcast programs are put through directly from the radio relay room.

The amplifier supply sources, the microphone circuits and the loudspeaker lines are turned on and off with the aid of the appropriate remote switches at the microphone posts or on the receiver-amplifier unit.

The broadcast programs are changed over from radio reception to record playing and vice versa manually.

The installation ensures the primacy of command transmissions over broadcasting by automatically switching off the broadcast program as soon as the command transmission begins.

The microphone posts have no primacy over each other.

To avoid simultaneous transmissions from a microphone post, the signal ENGAGED (ЗАНЯТО) is automatically applied to the non-operating microphone post as soon as one of the posts is switched on for work.

The readiness of the installation for transmission from the microphone posts is indicated by the signal READY (ГОТОВО) at the appropriate post and by the signals ON (ВКЛЮЧЕНО) and ENGAGED on the receiver-amplifier unit.

The installation remote control, the primacy of command transmissions over broadcast programs and the signal system operation are ensured by a switching device consisting of relays.

The volume of command transmissions is not controlled, while a volume control is provided for broadcast programs.

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To convey an urgent message, one of the lines (the crew quarters line) is made up as a three-wire net. Urgent messages are conveyed from the microphone posts only.

Such a system makes it possible to control the volume of broadcast transmissions or to switch them off altogether, but during command transmissions all the loudspeakers of the crew quarters line operate at full capacity.

To convey urgent messages, special loudspeakers of the ЗГД-3МА type and volume controls of the ПГ-2 type are used which allow operation through a three-wire line.

As the installation is equipped with extension microphones, it is possible to convey messages at a distance of up to 6 metres from the microphones post.

To provide transmissions for the sick - bay, use is made of headphones ТА-4.

To facilitate the work of the operating personnel and to speed up fault finding and removal of troubles, the installation provides for:

- (a) subjective monitoring of the transmission with the aid of headphones across the output circuits of the receiver, amplifier and outside rediffusion line;
- (b) objective monitoring of the transmission with the aid of a level indicator at the amplifier output;
- (c) check of the plate currents passing through the output valves.

The current being of an admissible value, the instrument pointer should be within the appropriate coloured sector;

- (d) check of the mains voltage and the voltage across the power source feeding the signal and automatic system circuits.

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The voltage across these circuits is normal if the instrument pointer is within the appropriate coloured sector;

(e) receiving the light and audio signal FAILURE (АВАРИЯ) when the amplifier is faulty (output valves are out of order, the rectifier is defective) and when the signal fuses in the supply circuits blow;

(f) receiving the light signal AMPLIFIER FAILURE (АВАРИЯ УСИЛИТЕЛЯ) when the amplifier output valves are out of order or in case of any other faults which cause de-energizing of relay P1-3 (CPR);

(g) tuning the receiver by means of phones and visual indicator.

When operated from a D.C. feeder, the installation provides for manual switching on and change over of the converters so as to ensure continual operation or an additional charge of storage batteries.

1 - 5. Power Supply for the Installation

To feed the installation, a source of 110, 127 or 220 V, 50 c.p.s., one-phase alternating current is required. A tumbler switch mounted on the power transformer is used to switch the installation to such a source.

As indicated in their respective logs, all installations are factory-switched on to work from 127 or 220 V.

If an A.C. source is available aboard ship, the installation is supplied from the ship's feeder or, when the ship is at shore, from a shore-end A.C. feeder.

The installation can be switched over for work from the ship's supply source or from the shore-end feeder by means of switch B3-8 on the front panel of the receiver-amplifier unit.

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In both cases the feeder is to be electrically coupled to the power transformer mounted on the amplifier chassis. The transformer maintains the rated voltage across the apparatus, with the feeder voltage altering within +10 to -20 per cent of the rated value.

The installation can be supplied from a 110 or 220 V D.C. source through power-supply set AMP-3.

The arrangement is equipped with two such sets operating alternately.

The power consumed from the mains:

1. Alternating current-250 VA with $\cos \phi \geq 0.75$.
2. Direct current-300 W.

The circuits of the automatic and signal systems are supplied with 24 V direct current derived from selenium rectifier BC-47 (A4-1).

When the installation is supplied from the ship's D.C. feeder, a storage battery of four accumulator cells 5-HKH-10M is cut in which is needed to start the arrangement and which works in buffer with the selenium rectifier.

When the installation is supplied from an A.C. feeder, the selenium rectifier is loaded with a ballast resistor of 100 ohms (R4-1) to reduce the voltage variation.

1- 6. Electric and Electroacoustic Characteristics

The rated output power of the installation is 15 VA.

The output voltage is 30 V.

The rated load resistance is 60 ohms.

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The coefficient of nonlinear distortions at a frequency of 1000 c.p.s. and at the rated power is not more than 6 per cent. The installation electric circuits insulation resistance with respect to chassis is not lower than 20 megohms for the sound circuits and not lower than 10 megohms for the other circuits, with the ambient temperature being $+20^{\circ}\text{C} \pm 3^{\circ}\text{C}$ and the relative humidity 65 ± 15 per cent.

2. BRIEF DESCRIPTION OF THE INSTALLATION COMPONENTS

2 - 1. Microphone Posts MK-17A (Figs 4, 5 and 6)

The MKTY-15c installation set includes two microphone posts MK-17A. They are assembled according to one and the same diagram shown in Fig.27.

The posts are of a waterproof design and are made in a silumin-cast housing with covers. There are rubber gaskets between the cover and the housing. The cover is secured to the housing with four screws.

The cable is passed into the housing through a gland and fanned out on 16-pin terminal block П5-1 fitted inside the housing. Mounted on the microphone post cover are: a magnetic microphone М5-1 of the ДЭМ-4 type, cam switches ВП of the K-22 type to switch the installation on and off, and lamps READY and ENGAGED. Plug connector П5-1 serves to insert an extension microphone.

The overall dimensions of the post:

Width - 150 mm.

Height - 224 mm.

Depth - 125 mm.

Weight - 3.5 kg.

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2 - 2. Receiver-Amplifier Unit MK-10A

(Figs 1, 2 and 3)

This installation consists of the following components:

- (a) Amplifier (MK-11A).
- (b) Receiver (MK-12A).
- (c) Control panel (MK-13A).

The body of the unit is made of angle steel in the form of a rigid welded frame with a sheet steel skin which is louvered for cooling.

Access to the parts and the wiring is ensured by pulling the front panel of the unit back and downwards.

All controls and signal lights are mounted on the front panel which is the control panel of the receiver-amplifier unit.

Selenium rectifier BC-47 and the bell are mounted on the inner side of the body back. Under the front panel, inside the body, on the left and right sides, there are four interlocking contacts (two on either side) which instantaneously de-energize the installation when the control panel is thrown back for inspection and repair.

The terminal blocks for fanning out the cables are mounted on the bottom of the body.

The cables are passed into the body from below through the two oval holes in the skin.

Anti-radar filter MJC-3 is fitted in the right-hand front corner of the lower wall.

The receiver and amplifier chassis are moved into the grooves of the bracket, which is rigidly linked with the control panel, and secured with screws.

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The unit overall dimensions without shock absorbers are:

Width - 580 mm.

Height - 414 mm.

Depth - 347,5 mm.

Weight - 55 kg.

The body of the unit is secured to the bulkhead on six shock absorbers of the 271C-3-25 type.

(a) Amplifier

Amplifier MK-11A is mounted on a chassis whose top carries valves, transformers, choke and relays. All the other parts and the wiring are inside the chassis.

For the key diagram of the amplifier see Fig.27.

Also mounted on the same chassis is the rectifier which feeds the plate and screen circuits of the amplifier and receiver.

The amplifier has three stages designed to amplify low-frequency voltage. The first stage employs resistors in a push-pull circuit. Each arm uses halves of valves $\Pi 1-1$ and $\Pi 1-3$ of the 6H2П type, respectively.

The second stage employs a push-pull circuit of resistors based on the other two halves of valves $\Pi 1-1$ and $\Pi 1-3$, with a negative feedback. From a special winding of the output transformer the feedback voltage is symmetrically, through dividers, applied to the cathodes of the corresponding valves. To balance the circuit according to the amplification and the background noise compensation, a potentiometer R1-26 is inserted between plate loads R1-19 and R1-2, with the given stage plate voltage applied to the mid-point of the potentiometer.

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Resistor R1-26 is adjusted when the amplifier is tuned or its valves replaced. In case the background noise increases, it can be reduced to a minimum with the aid of headphones connected to the amplifier output.

The third (final) stage is a push-pull circuit employing two valves $\Pi 1-2$ and $\Pi 1-4$ of the 6H3C type, with an automatic bias (at the expense of the resistance of relay P1-3 winding) and a transformer output.

In the process of operation the secondary of the transformer is loaded on the loudspeaker lines.

The cathode circuits of the final valves have by-pass resistors R1-14 and R1-15 connected to instrument M13-1.

The rectifier employs a full-wave circuit based on valves $\Pi 1-5$ and $\Pi 1-6$ of the 5H4C type. The like electrodes of the kenotrons are connected in parallel.

The cathodes of the valves in the amplifier are preheated, which ensures instantaneous readiness of the installation for work.

The amplifier is equipped with a fault-signalling circuit to indicate failures in the amplifier or the rectifier which de-energize relay P1-3 (CPR):

When one of the amplifier valves is out of order, the installation will go on operating but with lower electro-acoustic characteristics.

The amplifier MK-11A has the following electrical parameters:

Sensitivity - 12 ± 2 mV.

Output power rating - 15 VA.

Output voltage rating - 30 V.

Coefficient of nonlinear distortions at a frequency of 1000 c.p.s. and at the rated power is not more than 6%.

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Pass-band at an irregularity of $\pm 40\%$ with respect to 1000 c.p.s. is not narrower than 200 - 4000 c.p.s.

Increase in the output voltage, with the load resistance ten times as much as the rated value, is not more than 40%.

The operating voltages of the amplifier valves at the rated supply voltage should correspond to the following Table:

Voltage, current or power	Unit of measurement	Stage and type of valve		
		I(6H2П)	II(6H2П)	III(6П4C)
Plate voltage E_p	V	110-150	150-230	380-430
Screen grid voltage E_{g2}	V	-	-	250-290
Bias voltage E_{b1}	V	-1-2	-1-2	-21-25
Plate current I_p (through one arm)	mA	0.25-0.4	0.5-1	40-57
Plate dissipated power	W	≤ 1	≤ 1	≤ 20.5

The plate currents are checked by means of the coloured sector on the instrument of the receiver-amplifier unit.

(b) Receiver

Receiver MK-12A is a five-valve superheterodyne (Fig.27). Antenna filter П4-1 of the ППФ-3 type is connected to the receiver input to suppress radio interference from radar installations. The antenna circuit has neon lamp HT2-1 of the MH-3 type to protect the receiver against any considerable high-frequency voltages, and a

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rejector tuned to 435 Kc/s to suppress interference at frequencies close to the intermediate frequency.

The first valve, a pentagrid of the 6A7 type, is at the same time a heterodyne and a mixer.

The tuning to the received signal and heterodyne frequency tuning are effected by means of a variable gang capacitor. The first intermediate-frequency filter is in the plate circuit of valve 6A7. In all there are three such filters which are tuned to the intermediate frequency of 435 Kc/s.

The I.F. amplifier has two stages and operates on valves 6K3.

The multiple valve 6F2 functions as:

- (a) second detector,
- (b) automatic volume control detector,
- (c) receiver low-frequency amplifier,
- (d) cathode follower for connecting the high-resistance pickup to the amplifier input,

In the grid circuit of this valve there is a potentiometer R2-16 to control the volume of transmissions. The detector load circuit has a step band (tone) control B2-2. When interference increases, turn the control knob to NARROW BAND (УЗКАЯ ПОЛОСА). The receiver is equipped with visual tuning indicator 6E5C. Power supply for the receiver is derived from the common rectifier of the receiver-amplifier unit.

The receiver is designed to receive local and distant radio stations on the following wavebands:

- (a) long waveband 130 - 380 Kc/s (2300 - 790 m.);
- (b) medium waveband 490 - 1450 Kc/s (615 - 208 m.);

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(c) short waveband I 2.7 - 8 Mc/s (112 - 37.5 m);

(d) short waveband II 8 - 13 Mc/s (37.5 - 23 m).

The receiver design ensures reliable operation in heavy weather and mechanical conditions (humidity, temperature, vibration, jolts, etc.).

The basic electrical characteristics of the receiver are as follows:

(a) plate voltage \approx 250 V;

(b) filament voltage - 6.3 V;

(c) plate current - 30 mA;

(d) filament current - 1.5 A;

(e) sensitivity at the adapter input at a frequency of 1000 c.p.s. is 0.35 V;

(f) receiver sensitivity on all wavebands is not lower than 40 μ V (with the ratio of the signal voltage to the noise voltage being 5);

(g) graduation accuracy - 4%;

(h) image attenuation is not lower than:

30 times for long and medium waves;

5 times for short waveband I;

3 times for short waveband II;

(i) selectivity of the receiver at \pm 10 Kc/s separation is not less than 60 times at frequencies of 200 and 1000 Kc/s;

(j) intermediate-frequency band of the receiver at two times attenuation is not narrower than 7 Kc/s, and at 100 times attenuation-not wider than 22 Kc/s.

The operating voltages of the receiver valves should be as follows:

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Type of valve and its designation in diagram	Voltage, V				Current, mA		
	Ef	Ep	Eg1	Eg2	If	Ip	Ig2
6A7-M2-1	6.3	221		93	0.3	3.9	8.35
6K3-M3-2	6.3	230	1	30	0.3	3	0.77
6K3-M2-3	6.3	172	3	99	0.3	8.8	2.35
6P2-M2-4	6.3	190	1.5	-	0.3	1.03	-
6N5-M2-5	6.3	57	2.5		0.3	1.6	-

(c) Control Panel (MK-13A)

This is designed as a face panel of the receiver-amplifier unit.

It has three fixed positions:

- (a) working (or closed) position;
- (b) first unfolded position - 70° from the working position.

In this position the receiver-amplifier unit is de-energized which makes it possible to replace valves, to make an external inspection and adjustment of relays. This position is fixed with two side rods.

(c) Second unfolded position - 180° from the working position.

In this position, safe access is made to the wiring and parts of the amplifier and receiver.

For the key diagram of the control panel see Fig.27.

The panel comprises the following elements:

1. Three 6 spring roller switches 33-4 (combat loudspeaker

Type of valve and its designation in diagram	Voltage, V				Current, mA		
	Ef	Ep	Eg1	Eg2	If	Ip	Ig2
6A7-12-1	6.3	221		93	0.3	3.9	8.35
6K3-12-2	6.3	230	1	30	0.3	3	0.77
6K3-12-3	6.3	172	3	99	0.3	8.8	2.35
6P2-12-4	6.3	190	1.5	-	0.3	1.03	-
6K5-12-5	6.3	157	2.5		0.3	1.6	-

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For the key diagram of the control panel see Fig.27.

The panel comprises the following elements:

1. Three 6 spring roller switches B3-4 (combat loudspeaker

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line), B3-5 (crew quarters loudspeaker line) and B3-6 (upper deck loudspeaker line) to operate directly from the receiver-amplifier unit.

2. Cam switch K-3³ (B3-8) serves to change over from the ship's to the shore-end feeders and has a neutral position.

3. Automatic system elements: relay P3-1 (MPR) to work from the microphone posts: P3-2 (BTR) to operate directly from the receiver-amplifier unit; loudspeaker system relays: P3-3 (LLR-1) - combat line, P3-4 (LLR-2) - crew quarters line, P3-5 (LLR-3) - upper deck line.

4. Elements for monitoring the sound channel by means of headphones:

socket P3-2 in the receiver output circuit;
socket P3-5 in the amplifier output circuit;
socket P3-4 in the outside rediffusion line.

5. Socket P3-1 for broadcast transmissions over an extension microphone of the receiver-amplifier unit, and socket P3-3 in the amplifier input circuit to check the work of the input switching system.

6. Tumbler switches: B3-2 switch to cut in the power supply for the receiver; B3-7 switch to turn on the outside rediffusion.

7. MICROPHONE - RECEIVER (МИКРОФОН-ПРЕЕМНИК)
function switch B3-1 for broadcast transmissions.

8. Signal system elements: pilot lamp ЛН3-5 - ON; pilot lamp ЛН3-6 - READY; pilot lamp ЛН3-2 - ENGAGED; pilot lamps ЛН3-6 - С МВАТ (БОЕВАЯ); ЛН3-7 - CREW QUARTERS (МАТРОССКАЯ); ЛН3-8 - UPPER DECK (ВЕРХНЯЯ ПАЛУБА). These operate when transmissions are put through from the receiver-amplifier unit.

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9. Elements of the failure-signalling system: pilot lamp ЛНЗ-4-AMPLIFIER FAILURE (АВАРИЯ УСИЛИТЕЛЯ) ; pilot lamp ЛНЗ-1-FAILURE (АВАРИЯ) indicates that the installation is faulty;

tumbler switch ВЗ-3 serves to cut off the bell for the time the fault is being sought for and cured.

10. Check meter МНЗ-1 of the М4-2 type serves to check: plate currents in the amplifier output valves, mains voltage, audio-frequency output voltage, voltage in the signal and automatic system circuits according to the appropriate coloured sectors on the meter scale.

To prolong the life of copper-oxide cell Д1-1, the switch should be set to the mid-position after each measurement of alternating voltages.

11. Elements of the electric protection system are as follows: signal fuse ПпЗ-1 in the receiver filament circuit; signal fuse ПпЗ-2 in the selenium rectifier circuit (-) for 24 V; signal fuse ПпЗ-3 in the +24 V circuit of МР-1; signal fuse ПпЗ-4 in the +24 V circuit of МР-2; signal fuse ПпЗ-5 in the rectifier circuit of the amplifier and receiver; signal fuse ПпЗ-6 in the +24 V circuit of the storage battery; signal fuse ПпЗ-11 in the \sim 127 V circuit of the phonograph motor; fuses ПпЗ-8 and ПпЗ-10 of the ПК-43 type in the ship's A.C. feeder circuit; fuses ПпЗ-7 and ПпЗ-9 of the ПК-43 type in the shore-end A.C. feeder circuit.

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12. Connection plugs III3-1 and III3-2 for inserting the sound pickup or phonograph motor.

2 - 3. Power-Supply Switchboard MK-21A
(Fig.22)

This is designed to ensure:

(a) automatic connection of the converters to the ship's D.C. feeder circuit when operating from the microphone posts or the receiver-amplifier unit;

connection is accomplished by means of the groups of relays P7-1, P7-2, P7-3, P7-4 or P7-5, P7-6, P7-7, P7-8;

(b) starting of the converters for additional charging of storage batteries which is accomplished by switches B7-1 or B7-2 on the board;

(c) changing-over of the converters for alternate operation by means of switch B7-3;

(d) electric protection of the ship's D.C. feeder with the aid of fuses:

Ип7-1, Ип7-2, Ип7-3 and Ип7-4 of the ИБ type.

For the key diagram of the switchboard see Fig.27.

The overall dimensions of the switchboard without shock absorbers:

Width - 220 mm.

Height - 335 mm.

Depth - 152 mm.

Weight - 9 kg.°

2 - 4. Electric Record Player
(Fig.20)

The universal electric record player allows playing of ordinary and long-playing records. The pickup of the record

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player has a detachable head with two permanent needles: one for conventional and the other for long-playing records.

The life of each needle is 150 hours if properly used. The pickup has the following parameters:

1. Sensitivity at 1000 c.p.s. and at a load of one megohm is not lower than 70 mV (for an oscillatory speed of 1 cm/sec.),
 2. Band of reproduced frequencies is 50 to 10000 c.p.s.
- The record player is supplied from 127 or 220 V mains. It is changed over to the required voltage by means of the block under the disc.

2 - 5. Headphones

The installation is equipped with electromagnetic headphones of the TA-4 type.

One pair of headphones is used in tuning the receiver and in checking the sound channel and the outside rediffusion net.

The cord of this pair of headphones is fitted into a two-conductor plug.

The cords of the other headphones are fitted into two-pin plugs.

The weight of a pair of headphones is 0.4 kg.

2 - 6. Storage Battery

This is intended for remote switching of the installation and for feeding the signal and automatic system circuits when operating the installation from the ship's D.C. feeder. The battery works in buffer with the selenium rectifier.

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The installation is equipped with four alkaline storage batteries of the 5-HKH-10M type connected in parallel. The battery weighs 15.6 kg (without electrolyte).

2 - 7. Loudspeakers

(a) Cone Moving-Coil Loudspeaker of the 3PT-3MA Type

This is designed to serve the cabins, crew's quarters and other enclosed space.

The loudspeaker can be used with a separate volume control of the PT-2 type or without it, depending on where it is supposed to operate and the need to control the volume of messages put over it.

For the general view of the loudspeaker and its components see Figs 7, 8 and 9.

Electrical Parameters

1. Rated power - 3 VA.
2. Band of reproduced frequencies - 150 to 6000 c.p.s.
3. Irregularity of the frequency characteristic over the band of reproduced frequencies is not more than 8 times.
4. Mean sound pressure developed by the loudspeaker within the frequency range of 150 to 6000 c.p.s. at a distance of one metre and at an input power of 0.1 VA is not less than 2.6 bars.
5. Coefficient of nonlinear distortions at a frequency of 1000 c.p.s. is not more than 7%.
6. Rated voltage - 30 or 60 V.

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7. When operated from a 30 or 60 V line, the loudspeaker can be adjusted to consume one of the following power values: 0.1 VA, 0.5 VA and 1 VA.

8. The induction in the magnetic system air gap is 9000 gauss. The loudspeaker is enclosed in a metal housing which, however, does not protect it against the effect of sharply changing air pressure or the penetration of water in case of rain or stormy sea.

The basic components of the loudspeaker are:

1. Loudspeaker head.
2. Tapped transformer.
3. Metal housing.

The loudspeaker head comprises a magnetic circuit with a permanent magnet made of aluminium-nickel alloy, a diffuser holder and a moving system.

The moving system consists of a waterproof cast diffuser, a speech coil and a centring device. The latter is designed to centre the coil in the magnetic circuit gap and consists of a corrugated paper centring washer and a metal bridge bracket.

In the centre of the diffuser is glued a cap to prevent moisture and dust from getting on the voice coil and the magnetic circuit gap. Tapped transformer TB-130 has a plate to adjust the loudspeaker to the required voltage and power.

For the transformer winding data see Album No.2.

The transformer is enclosed in a metal screen filled with heat-resistant compound. The loudspeaker can be adjusted for the required voltage and appropriate power according to the circuit diagram on the inner side of the housing cover.

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The loudspeaker housing has a detachable cover. By means of a baffle the body is divided into two sections to house the loudspeaker head and the transformer with a contact plate.

The loudspeaker head is secured to the inner side of the detachable cover which has holes covered with wire gauze.

The loudspeaker frame has three attachment lugs. The cable from the loudspeaker line is passed through a special hole in the transformer section of the housing.

The design data of the loudspeaker are as follows:

Width of the air gap in the magnetic circuit - 1 mm.

Number of turns on the voice coil - 60.

Type and diameter of conductor - 0.16 mm wire of the ПЭИ type.

The voice coil direct current resistance - 3.25 ohms.

Weight of the diffuser - 2.5 gr

Diameter of the diffuser - 147 mm.

Weight of the permanent magnet - 580 gr

Overall dimensions of the loudspeaker:

Height - 289 mm.

Width - 174 mm.

Depth - 122 mm.

Weight - 4.2 kg.

(b) Gain Control of the PT-2 Type
(Figs 13 and 14)

Loudspeaker 3ПН-3МА can be used with gain control PT-2 or without it.

The basic components of the gain control are as follows:

1. Tapped transformer.
2. Switch.
3. Metal housing.

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The winding data of the gain control transformer are similar to those of the transformer employed in loudspeaker 3ГМ-3МА, with the only difference that its secondary winding is tapped.

The gain control is designed to be connected to the loudspeaker at normal voltages of 30 or 60 V, the power consumed being 0.1 VA, 0.5 VA, 1 VA or 3 VA.

The gain control switch is a nine-step arrangement with a position in which it fully disconnects the loudspeaker from the line.

The basic parameters of the gain control are as follows:

Number of control positions - 9

Max/min. control ratio - 22

Overall dimensions:

Height - 175 mm.

Width - 110 mm.

Depth - 116 mm.

Weight - 1.8 kg.

(c) Horn Moving-Coil Loudspeaker of the MAFI-1
Type

(Figs 15, 16, 17 and 18)

This is intended to serve open decks and noisy premises aboard ship.

Electrical Parameters

1. Rated power - 10 VA.
2. Band of reproduced frequencies is 500 to 50,000 c.p.s.
3. Irregularity of the frequency characteristic over the given band of frequencies is not more than 18 decibels.

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4. Mean air pressure at a distance of 1 metre from the loudspeaker and at an input power of 0.1 VA is not less than 10 bars.

5. Coefficient of nonlinear distortions at 1000 c.p.s. is not more than 10%.

6. Rated input voltage - 30 or 60 V.

7. Number of turns on the voice coil - 53.

8. Voice coil conductor - 0.15 mm wire of the ПЭЛ type.

9. Voice coil resistance - 6.6 ohms.

The loudspeaker consists of three main components:

1. Loudspeaker head.

2. Impedance-matching transformer.

3. Curved silumin horn.

The loudspeaker head comprises a magnetic circuit with a permanent magnet made of the "Magniko" alloy, a moving system and a pre-horn chamber with a cap.

The moving system comprises a compacted textolite diaphragm with lead buses pressed between its layers, and a voice coil wound on a percale former impregnated with B-2 glue.

To reduce its dimensions, an exponential curved horn is used in the loudspeaker.

To protect the moving system against the effect of sharply changing air pressure, there is a "labyrinth" in the cylindrical hole of the pre-horn chamber, while on the end horizontal plane of the magnetic circuit base, under the central surface of the diaphragm, is mounted the damper of the moving system.

The loudspeaker curved horn has an outer and an inner section. On the truncated side surface of the horn is installed a case to accommodate the transformer in a screen with

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a contact plate. To the base of the horn outer section is fitted a stand which has three lugs with holes to attach the loudspeaker to the required place.

The head of the loudspeaker is fitted in the inner section of the horn by means of a threaded boss at its input hole.

Impedance-matching transformer TB-87 has a tapped primary winding and is designed to connect the loudspeaker to an audio-frequency voltage line of 30 or 60 V to consume 1, 3, 5 or 10 VA.

The loudspeaker can be made to operate on one of the said voltage and power values with the aid of the engraved contact plate on the transformer.

The primary winding sections of the transformer relating to the input voltage of 30 V and the power of 3, 5 and 10 VA are tapped in their mid-points.

A special table is secured to the inner side of the transformer case cover as a guide in cutting-in the loudspeaker.

When in operation, the loudspeaker should be mounted on shock absorbers.

The loudspeaker can work:

- (a) at an ambient temperature of -40 to $+80^{\circ}\text{C}$;
- (b) at a relative humidity of $95\% \pm 3\%$;
- (c) in conditions of stormy weather and rain;
- (d) in conditions of mechanical knocks and vibration.

The cable lead is passed through glands.

Overall dimensions:

Height - 308 mm.

Width - 264 mm.

Depth - 212 mm.

Weight - 6 kg.

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2 - 8. Spare Equipment

The spare equipment supplied with the MKTY-15c installation is kept in the following boxes:

1. Box MK-24 for the combat set.
2. First priority box MK-25 for spare valves, parts and moving systems.
3. First priority box MK-26 for tools.
4. First priority box for instrument TT-1.

3. OPERATION OF THE MKTY-15C INSTALLATION

Fig.26 represents the key wiring diagram of the installation. The specifications to this diagram are given at the end of this book.

To study the diagram, consider specific examples illustrating the work of the installation.

3 - 1. General Instructions

A. In the diagrams and descriptions of the installation its elements are indicated by letters.

The position of any element is indicated by its letter symbol (for instance, resistor - R, capacitor - C, relay - P, etc.), the serial number of the unit in which the given element is located and the serial number of the element in the given unit.

For instance, P7-3 means the third relay in the seventh unit; R3-1 means the first resistor in the third unit!

B. Relay symbols:

- MPR - microphone post relay.
- BTR - broadcast transmission relay.
- LLR - loudspeaker line relay.
- FSR - failure-signalling relay.

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CPR - common plate relay.
SSR - supply switching relay.
TR - thermorelay.

C. Abbreviations used in the description:

RAU - receiver-amplifier unit.
MP - microphone post.
PSS - power-supply switchboard.

3 - 2. Operation of the Installation when
Supplied from the Ship's A.C.
Feeder

Consider the three states of the installation:

- A. Readiness for work.
- B. Transmitting commands from MP.
- C. Relaying broadcast programs from RAU.

A. Readiness for Work

In this state the voltage of the ship's A.C. feeder is applied to the primary of power transformer Tpl-3 through the closed contacts of interlocks B4-2 and B4-4, fuses Hp3-10 and Hp3-9 and closed contacts 8, 7, 6 and 4, 3, 2 of switch B3-8 (shore-end feeder - ship's feeder). At this time tumbler switch Bl-2 (110 - 220 V) and change-over switch Bl-3 (voltage regulator) should be set in positions corresponding to the ship's feeder voltage. From the secondary of transformer Tpl-3 the voltages are applied to the following circuits:

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(a) from leads 25 - 26 the voltage of 5 V is applied to the filament of kenotrons $\Pi 1-5$ and $\Pi 1-6$ of the 5H4C type;

(b) from leads 13 - 14, via contacts 11-12 of relay P1-4 (SSR), 3.5 V is fed to the filament of amplifier valves $\Pi 1-1$ and $\Pi 1-4$.

No plate voltage is applied to the amplifier, for the high-voltage circuit is broken between contacts 22-23 of relay P1-4 (SSR);

(c) from leads 16 - 18 of transformer Tpl-3 30 V is applied to feed selenium rectifier $\Pi 4-1$ of the BC-47 type. From the rectifier the rectified voltage of 24 V is fed to ballast resistor R4-1 and via circuit No.1 to relay P3-2 (BTR) which operates and makes the circuits ready to switch on the installation from the receiver-amplifier unit.

Circuit No.1:

-24 V of the selenium rectifier, fuse $\Pi p 3-2$, lead 1 in the winding of relay P3-2 (BTR), lead 2 in the winding of relay P3-2, closed contacts 13-14 of relay P3-1 (MPR), +24 V.

B. Transmitting Commands from MP

Consider two cases of transmitting commands from MP: through the combat line and through the crew's quarters line.

To transmit commands through the combat line, turn switch B5-1 (COMBAT) to the right. At this moment relay P3-1 (MPR) in circuit No.2 (See below) will operate, whose contacts will do the following: contacts 22 and 32 will cut in the microphone circuit of the post; contacts 13 - 14 will disconnect circuit No.1 (See above) and the RAU READY signal circuit and cut in the ENGAGED signal circuit of the receiver-amplifier unit.

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Contact 12 cuts out relay P3-3 (LLR-1) by means of the receiver-amplifier unit switch. Since circuit No.1 is broken after relay P3-1 is cut in, relay P3-2 (BTR) opens and its contacts 14 and 34 cut out relays P3-4 (LLR-2) and P3-5 (LLR-3) by means of the RAU switches. Connections established by other contacts of relay P3-2 are of no importance in this case.

Circuit No.2:

-24 V of the selenium rectifier, fuse Hp3-2, lead 1 in the winding of relay P3-1 (MPR), lead 2 in the winding of relay R3-1, closed contacts 4-3 of switch B5-1, fuse Hp3-8, (MP-1), +24 V.

After switch B5-1 is turned on, +24 V from the selenium rectifier will be applied to the lamp READY of the operating post and the lamp ENGAGED of the parallel post via contacts 6-5. +24 V will also be applied to lead 2 in the winding of relay P3-3 (LLR-1) via contacts 2-1 of switch B5-1 (-24 V will constantly be applied to lead 1 of the winding). At this time relay P3-3 operates and pilot lamp MH3-C (COMBAT) connected in parallel with its winding lights up.

When relay P3-3 operates, its contacts make the following switchings:

Contacts 21 and 31 connect the combat loudspeaker line to the amplifier output (contacts 7 and 8) of output transformer Tpl-2, while contact 11, after closing contact 12, supplies -24 V to:

- (a) the ENGAGED signal circuit;
- (b) lead 1 in the winding of relay P1-4 (SSR);
- (c) contacts 12-22 of relay P1-3 (CPR).

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Relay P1-4 (SSR) operates and its contacts 22 and 23 complete the high-voltage circuit, while contact 12 changes over the amplifier valve filament circuit from the lower voltage (3.5 V) to the rated voltage. So after relay P1-4 (SSR) operates, the rated operating voltages are applied to the electrodes of the amplifier valves. The amplifier is ready to work approximately one second after any of the line switches is turned on.

When plate voltage is applied to the valves of the amplifier, current begins to flow through valves J1-2 and J1-4 of the 6H3C type, so causing relay P1-3 (CPR), included in the cathode circuit of these valves, to operate. Contacts 13 and 23 of relay P1-3 are used to apply signals READY and ENGAGED.

From contact 13 the voltage of -24 V is applied to the lamps READY and ENGAGED at the microphone posts, while from contact 23 it is fed to lamps JH3-2 and JH3-3 (READY and ENGAGED on the receiver-amplifier unit).

Consequently, the signals indicating that the installation is ready or engaged are applied only when the final stages and supply circuits of the amplifier are operative, for otherwise (for instance, when both final valves or both kenotrons are out of order) the winding of relay P1-1 will be de-energized. In this case the circuits of the failure-signalling system will be cut in. The work of these circuits is dealt with under Failure-Signalling System.

After the lamp EADY lights up at the microphone post, press foot switch B5-4 or switch B5-5 of the extension microphone and begin transmitting.

The forwarding of command transmissions through the crew's quarters loudspeaker line differs from the above case in the following:

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As was stated above, loudspeakers ЗГД-3МА with gain control ПГ-2 are connected to the crew's quarters line as a three-wire system.

When commands are being put over, the primary winding of gain control ПГ-2 is short-circuited through closed contacts 21-22 of relay P3-2 (BTR) and 15-14 of relay P3-4 (LLR-2).

Since the primary of gain control ПГ-2 is shorted, its secondary offers a very low resistance to audio-frequency currents, owing to which the gain control for broadcast transmissions is inoperative; the transmission voltage is fed from the amplifier output to wire "K" of the line through contacts 31-32 of relay P3-2 (BTR) contacts 22-23 of relay P3-4 (LLR-2) and to wire "O" of the line through contacts 32-33 of relay P3-4 (LLR-2). Gain in this case is at a maximum and is not controlled.

Transmission of commands over the upper deck line in no way differs from that over the combat line.

C. Relaying Broadcast Programs from RAU

Consider relaying of broadcast programs over the combat and crew quarters lines.

After the installation is prepared for operation as stated under paragraph A above, one can start relaying broadcast programs.

To forward such programs through the combat line by means of an extension microphone of the receiver-amplifier unit:

Insert the plug of the extension microphone in MICROPHONE (ММКР090Н) socket P3-1;

turn MICROPHONE - RECEIVER function switch B3-1 on the RAU panel to MICROPHONE;

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turn switch B3-4 to COMBAT.

As a result, the microphone circuit will be connected to the amplifier input via contacts 1-2 and 7-8 of switch B3-1, 21-22 and 31-32 of relay P3-1 (MPR) and contacts 1-2 and 3-4 of socket ПЗ-3.

In the circuit: +24 V, closed contacts 5-6 of switch B3-4, closed contacts 12-11 of relay P3-1 (released), lead 2 of relay P3-3 (LLR-1), -24 V, relay P3-3 operates and pilot lamp ЛНЗ-6 connected in parallel with its winding lights up.

As contacts 11-12 of relay P3-3 close, pilot lamp ЛНЗ-5 ON (ВКЛЮЧЕНО) lights up and relay П1-4 (SSR) cuts in, which by closing its contacts feeds the rated supply voltage to the installation.

The plate current, passing through relay П1-3 (CPR), cuts it in. Closing of contacts 22-23 in relay П1-3 connects pilot lamp ЛНЗ-3 READY in parallel with the winding of relay P3-2 (BTR).

The amplifier output is connected to the line via closed contacts 22-21 and 32-31 of relay P3-3 (LLR-1).

When rediffusing programs picked up by the receiver, turn MICROPHONE - RECEIVER function switch B3-1 to RECEIVER, i.e. connect the receiver output to the amplifier input via the closed contacts of RECEIVER OUTPUT (ВЫХОД ПРИЕМНИКА) socket ПЗ-2, contacts 5-6 and 11-12 of switch B3-1, 21-22 and 31-32 of relay R3-1 (MPR) and contacts 1-2 and 3-4 of socket ПЗ-3.

To play phonograph records, insert the pickup plugs in the PICKUP (ЗВУКОСЧИМАТЕЛЬ) socket on the receiver-amplifier unit, and the motor supply cord in the MOTOR ~ 127 V socket.

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Turn tone control B2-2 to PICKUP, thereby connecting the pickup via contacts 1-5 to the grid of valve 6T2 in the receiver output stage. The audio-frequency voltage developed by the pickup is fed from the receiver output (cathode load resistor R2-14) to the amplifier input via contacts 1-2 and 3-4 of socket P3-2, 5-6 and 11-12 of switch B3-1, 21-22 and 31-32 of relay P3-1 (MPR) and 1-2 and 3-4 of socket P3-3.

The amplifier output, as in the case of operating from the RAU microphone, is connected to the line via closed contacts 22-21 and 32-31 of relay P3-3.

When broadcast programs are relayed over the crew quarters line through the extension microphone of the receiver-amplifier unit, from the receiver or the phonograph pickup, the amplifier input circuits are switched in the same way as in the case of broadcast relaying through the combat line.

When switch B3-5 is pressed, relay P3-4 (LLR-2) included in the circuit: -24 V, the winding of relay P3-4, closed contacts 15-14 of relay P3-2 (BTR), closed contacts 6-5 of switch B3-5, +24 V, will operate and pilot lamp JH3-7 connected in parallel with relay will light up.

Closing of contacts 35-34 in relay P3-4 (LLR-2) will cause lamp JH3-5 ON to light up. Relay P1-4 (SSR) and relay P1-3 (CPR) operate the latter connecting lamp JH3-3 in parallel with the winding of relay P3-2 (BTR).

In broadcast relaying over the three-wire line, the amplifier output circuits are switched as follows: the primary of the transformer in loudspeaker 3T3-3MA is short-circuited via closed contacts 23-22 of relay P3-4 (LLR-2) and contacts 32-33 of relay P3-2; the audio-frequency voltage is fed from the amplifier output via contacts 33-32 of relay P3-4 to wire

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"O" of the line and via contacts 23-22 of relay P3-2 and contacts 14-15 of relay P3-4 to wire "III" of the line.

To distribute broadcast programs through the crew quarters loudspeaker line from a 30 V outside rediffusion net, it is necessary to release relay P3-4,

When tumbler switch B3-7 is turned on, the voltage from the outside rediffusion net is applied to wires "O" and "III" of the crew quarters line via contacts 13-14 and 31-32 of relay P3-4 (LLR-2).

Wires "O" and "K" of the line are short-circuited through contacts 31-32 and 21-22 of relay P3-4.

3 - 3, Failure-Signalling System

This system operates in the following cases of abnormal work of the installation:

- (a) when there is no plate current through relay P1-3 (SSR);
- (b) when any of the signal fuses blows;
- (c) when relay P1-3 (CPR) is de-energized, thermorelay P1-1 (TR) cuts in via the following circuit: -24 V, contacts 12-11 of relay P3-3 (LLR-1), if transmissions are put through the combat line, contacts 12-11 of relay P1-3, contacts 12-11 of relay P1-2 (FSR), lead 3 of relay P1-1 (TR), lead 4 of relay P1-1 (TR), +24 V.

When the thermorelay operates, its contacts 1 and 2 will close and cause the AMPLIFIER FAILURE lamp to light up and relay P1-2 (FSR) to operate.

When relay P1-2 (FSR) operates, its contacts 11-12 will open and thermorelay P1-1 (TR) will be de-energized; -24 V will, through contacts 12-13 of relay P1-2, be applied to

When the loudspeaker MAPI-1 to the line according to the connection diagram, it can be adjusted to consume 1, 3, 5 or 10 VA, the voltage across the loudspeaker lines being 30 or 60 V.

(b) Loudspeaker 3T1-3MA can be used with the gain control of the PI-2 type or without it.

When the loudspeaker is used without the gain control (Fig.10), the taps of the loudspeaker transformer primary are coupled to contacts 1-13 of the contact plate. The taps of the transformer secondary are coupled to contacts 14 and

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15, while the leads of the voice coil are connected to contacts 14 and 16.

There are circuit diagrams for loudspeaker 3T-3MA with gain control PT-2 employing a two-wire and three-wire system (Figs 11 and 12).

(c) Headphones TA-4 are inserted in the line via intermediate transformer IT-96 (Fig.23) which is supplied with the installation.

4. OPERATING MAINTENANCE

4 - 1. General

The serviceability of the installation is dependent on the way it is operated.

The operating personnel should be guided in its work by the instructions set out in the present Description on how to put transmissions through and to maintain the installation.

Location and elimination of serious faults which require unsoldering or replacing parts can be done only by persons who know how to use key and wiring diagrams.

4 - 2. Preventive Inspection and Measurements

(a) Attendance of the Automatic and Signal Systems

The serviceability of the installation largely depends on the regular attendance of the circuits of the automatic and signal systems.

Before checking these circuits, make sure that the controls on the installation are in proper positions and that there are no emergency signals.

When the installation is ready for work, its controls should be in the following positions: the feeder switch in the operating feeder position; all the other switches on RAU and MP (except the BELL OFF (БЫЛОЧЕВНИКЪ СЪОНКА) tumbler switch) - in the neutral or OFF position.

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All relays, except P3-2 (BTR), are de-energized.

The following signals indicate normal operation of the automatic and signal systems.

1. When the installation is switched on from MP:

(a) READY at one MP;

(b) ENGAGED at the other MP;

(c) signals ON, ENGAGED, COMBAT, CREW QUARTERS or UPPER DECK on the control panel of the receiver-amplifier unit, depending on which line is in operation.

2. When the installation is switched on from the receiver-amplifier unit:

(a) READY, ON, COMBAT, CREW QUARTERS, UPPER DECK, all at a time or separately;

(b) ENGAGED on the control panel of RAU when the broadcast program is cut off by a command transmission from MP. In this case the signal READY on the control panel should go out.

3. The following table explains the signals as regards various faults.

Fault	Signal on control panel of RAU					
	READY	ON	FAILURE	AMPLIFIER FAILURE	BELL	MAINS
1	2	3	4	5	6	7
1. Two valves 6H3C out of order	-	+	+	+	+	+

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1	2	3	4	5	6	7
2. Two valves 5U4C out of order	-	+	+	+	+	+
3. One of the signal fuses Пp3-1, Пp3-3 and Пp3-4 burnt out	+	+	+	-	+	+
4. Fuse Пp3-2 burnt out	-	-	+	-	+	+
5. Fuse Пp3-5 burnt out	-	+	+	+	+	+
6. One of the fuses Пp3-7 + Пp3-10 burnt out, or the feeder is de-energized (with the installation supplied from A.C. mains)	-	-	-	-	-	-
7. One of the fuses - Пp3-7 + Пp3-10; Пp7-1+Пp7-4 is burnt out, or the feeder is de-energized (with the installation supplied from D.C. mains)	-	+	+	+	+	+

+ indicates presence of the signal

- indicates absence of the signal

(b) Attendance of the Amplifier and Receiver

The serviceability of the installation depends to a large extent on the condition of amplifier MK-11A; therefore, it is necessary to check periodically its mode of operation.

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If the installation is not switched on from MP, switch it on from RAU. On obtaining the light signals READY and ON, check the plate current of each valve by means of the RAU change-over switch and meter. This should be done when no transmissions are being put through. With the proper selection of valves, normal condition of the amplifier and normal supply voltage the plate currents of the output valves should be such that the pointer of the RAU meter is within the blue sector.

In case the pointer deflects from the blue sector, the valves should be replaced.

After replacing the valves, check the amplifier mode of operation once again. The replacement of valves should be registered under "Replacement of Receiver-Amplifier Valves" of the log.

Attendance of the receiver implies periodic monitoring of its operation by means of headphones on all wavebands.

4 - 3. Attendance of Power Sources (converters, power transformer, storage batteries, selenium rectifier)

(a) Installation of Fuses

The ratings of all fuses should strictly correspond to the values indicated on the labels near the fuses and on the fuses proper. When replacing a fuse see that its contact with the holder is absolutely reliable.

(b) Switching-on Supply Sources

The power sets (converters) are cut in automatically:

1. When turning on the switches of the lines: COMBAT, CREW QUARTERS and UPPER DECK at the microphone post.

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2. When turning on the switches of the lines: COMBAT, CREW QUARTERS and UPPER DECK on the receiver-amplifier unit.

The power sets can be cut in manually by means of POWER SET 1 (АРРЕТАТ 1) tumbler switch B7-2 and POWER SET 2 (АРРЕТАТ 2) tumbler switch B7-1 on the power-supply switchboard.

The sets are changed over to work alternately by means of the change-over switch labelled POWER SET CHANGE-OVER (ПЕРЕКЛЮЧЕНИЕ АРРЕТАТОВ) on the power-supply switchboard.

(c) Attendance and Care of Power Supply Sets

While operating the installation see that the power supply sets are attended as required in the description and instructions compiled by the Manufacturer.

When one of the power supply sets is under repair or test, the installation should be changed over for work from another power supply set.

(d) D.C. Voltage Regulation

To ensure that the installation operates normally, it is necessary to maintain the power transformer voltage at the rated value, i.e. the pointer of the meter on the receiver-amplifier unit should be within the red sector. The voltage is to be regulated by turning the VOLTAGE REGULATOR (РЕГУЛЯТОР НАПРЯЖЕНИЯ) knob to the right or to the left.

(e) Attendance and Care of Storage Batteries

See that the storage batteries are always charged. For this purpose, check periodically their voltage as follows.

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Disconnect the installation feeder. The voltage should be checked by means of the meter on the receiver-amplifier unit. After disconnecting the feeder, observe the meter reading during 5 to 10 minutes.

A drop in voltage, i.e. when the meter pointer moves to the left beyond the black sector, shows that the storage battery is discharged. To charge the battery, turn on the POWER SET 1 or POWER SET 2 switches in the intervals between the transmissions.

The storage batteries should be carefully attended in keeping with the general rules for maintenance of alkaline batteries.

(f) Attendance of the Selenium Rectifier

The selenium rectifier requires no special attention.

It is only recommended to make sure that the rectifier is in good order, for otherwise the installation, when supplied from an A.C. feeder, will not operate, and when supplied from a D.C. feeder it will work from the storage battery only, which will cause a complete discharge of the latter.

To check the selenium rectifier, remove fuse Пр3-6 (+ storage battery) with the installation in operation. If the pointer of the meter on the receiver-amplifier unit is within the black sector, the rectifier is in good order.

4 - 4, Attendance of Microphone Posts

These, like all the other apparatuses, should given a periodic check.

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Check should be made by switching on the installation from any of the two microphone posts and by bringing trial transmissions through the microphone as required by the instructions for MP.

The presence of the signal READY at the operating MP and the signal ENGAGED at the other MP and also normal transmission through the microphone show that the microphone posts are in good order.

4 - 5. Attendance of Loudspeakers and Their Lines

This should be done:

1. By regularly measuring the resistance between the wires of each loudspeaker line and the insulation resistance of the line;
2. by monitoring transmissions from the loudspeakers inserted in the line.

The resistance of the lines as well as their insulation resistance should be measured with instrument TT-1 in intervals between transmissions.

It is recommended that the resistance of the lines be measured as follows:

1. Set the tester switch to OHMS (OHM) position, insert the testing prod in jack "x1", close the prods and set the pointer at zero.
2. By touching with the tester prods the line contacts: П4-5/1-П4-5/2 COMBAT; П4-5/5-П4-5/4; П4-5/4-П4-5/3 with relay P3-4 (LLR-2) CREW QUARTERS pressed down; П4-5/6-П4-5/7 UPPER DECK, check the loudspeaker lines for breaks.

If there is no break, the tester should read low resistances of the order of several ohms. If during mea-

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surements a break is found in the line, switch the installation for one of the transmissions (the receiver or record player) and check the transmission throughout the line by connecting the headphones to the terminals of the junction boxes or loudspeakers.

Thus, a section of the loudspeaker line can be located in which there is a break.

The insulation resistance of the line should be measured as follows:

1. Set the tester switch to OHMS position, insert the testing prod into jack "x1000" and on closing the prods of the instrument set its pointer at zero.

2. Measure the resistance between the screening sheath and terminals H4-5/1-H4-5/9.

When the insulation of the loudspeaker lines is normal, the tester should read 100,000 ohms and more.

If in measuring the line insulation resistance the tester shows a lower reading (less than 100,000 ohms), alternately disconnect individual sections of the line in the junction boxes and measure the insulation resistance of each section.

The loudspeakers should be checked by monitoring the transmissions. In doing so, attention should be paid to the sound volume, jarring and distortions in sound reproduction. These troubles should be located and cured as laid down in the instructions on how to eliminate faults in loudspeakers.

5. OPERATING INSTRUCTIONS

5 - 1. Instructions for Working from Microphone Posts

To switch on the installation for operation from the microphone posts, proceed as follows:

(a) if there is no light signal ENGAGED, turn on the switch of the line required: COMBAT, CREW QUARTERS or UPPER DECK;

(b) when the light signal READY appears, press the PRESS-TO-TALK (НАЖАТЬ ПЕД ПАЗТОВОПЕ) foot switch and begin transmitting;

(c) keep at a distance of 15 cm. from the microphone during transmission;

(d) when the transmission is over, set the line switches to their initial positions.

5 - 2. Instructions for Relaying Broadcast Programs from Receiver-Amplifier Unit

To switch on the installation for operation from the receiver-amplifier unit, proceed as follows:

(a) if there is no light signal ENGAGED on the control panel of the receiver-amplifier unit, turn the line switches to COMBAT, CREW QUARTERS or UPPER DECK, depending on which line is needed;

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(b) when the light signals READY and ON appear, start preparing and carrying out transmissions from the RAU extension microphone, the receiver or the record player.

1. When preparing and carrying out transmissions from the microphone:

(a) insert the extension microphone plug into the MICROPHONE socket on the control panel of the receiver-amplifier unit;

(b) turn the MICROPHONE - RECEIVER switch to MICROPHONE;

(c) put the program through with the microphone switch pressed down.

2. When preparing and relaying broadcast programs picked up by the receiver:

(a) turn the MICROPHONE - RECEIVER switch to RECEIVER;

(b) set the RECEIVER tumbler switch to ON position;

(c) insert the headphones plug into the RECEIVER OUTPUT (ВЫХОД ПРИЕМНИКА) socket on the control panel of the receiver-amplifier unit;

(d) cut in the loudspeaker line required;

(e) make sure that the receiver knob (extreme right) is set to WIDE BAND (ШИРОКАЯ ПОЛОСА) position;

(f) turn the knob (extreme left) fully clockwise;

(g) turn the receiver BANDS (ДИАПАЗОНЫ) knob to select the waveband required;

(h) tune the receiver in to the required radio station by turning the receiver TUNING (НАСТРОЙКА) knob and by monitoring the transmission with the aid of headphones. The receiver tuning in to the appropriate radio station is to be checked with the aid of the "magic eye" (valve 6E5C). The minimum-shaded sector of the "eye" indicates that the tuning is good;

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(i) on finishing the tuning, turn the LOUDER (ГРОМЧЕ) knob slightly to the right, take the headphones plug out of the RECEIVER output socket and set the loudness level of the relayed program as required.

The loudness level of transmissions can be made normal with the aid of the LOUDER knob according to the level indicator on the RAU panel. The level of a transmission is normal when the instrument pointer on the transmission peaks deflects to the right edge of the red sector, which corresponds to 30 V;

(j) relaying of programs picked up by the receiver is checked by means of headphones plugged in the AMPLIFIER OUTPUT (ВЫХОД УСИЛИТЕЛЯ) socket;

(k) when the relaying of programs is over, turn the RECEIVER tumbler to OFF (ВЫКЛЮЧЕНО) position.

3. When preparing and carrying out sound reproduction:

(a) insert the two single-pin plugs of the pickup in the PICKUP (ЗВУКОЧИМКА) socket. Do not insert the pickup plug in the socket MOTOR - 127 V (МОТОР-127 В) intended for the double-pin plug of the record-player motor. (The instructions on use of electric record player VII-1 are supplied separately);

(b) turn the receiver knob (upper one at extreme right) to PICKUP (ЗВУКОЧИМКА);

(c) turn the MICROPHONE - RECEIVER switch to RECEIVER;

(d) turn the RECEIVER tumbler switch to ON position.

At this moment the luminous inscription PICKUP will appear in the upper right corner of the receiver scale;

(e) cut in the loudspeaker line required;

(f) start sound reproduction with the aid of the pickup.

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The level of loudness in sound reproduction is regulated by means of the LOUDER (ГРОМЧЕ) knob.

The loudness level is set in the same way as in the case of transmissions from the receiver.

To obviate crackles and clicks invited each time the pickup needle is set on the record, turn the LOUDER knob fully counter-clockwise when changing records.

When the transmission from the microphone post, receiver or record player is finished, turn off the installation, i.e. set the COMBAT, CREW QUARTERS or UPPER DECK switches on the receiver-amplifier unit to OFF position.

5-3. Instructions for Checking the Readiness of the Installation

The readiness of the installation should be checked regularly when testing the engines of the ship.

Subjected to the check are:

1. Amplifier.
2. Selenium rectifier.
3. Voltage of storage batteries (if any).
4. Converters (if any).
5. Operation from the microphone posts.
6. Operation from the receiver-amplifier unit.
7. Insulation resistance of the loudspeaker lines.

1. When checking the amplifier:

(a) turn on the installation by means of the COMBAT, CREW QUARTERS or UPPER DECK switch on the receiver-amplifier unit;

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(b) when the signals READY and ON appear, measure the plate currents of each valve with the aid of the instrument on the panel of the receiver-amplifier unit.

If the signal READY appears approximately one second after the installation is turned on and if the pointer deflects within the blue sector of the instrument, the amplifier is electrically sound.

2. When checking the selenium rectifier:

(a) switch on the installation from the receiver-amplifier unit;

(b) check the voltage developed by the selenium rectifier (according to the blue sector on the instrument).

If the voltage supplied by the selenium rectifier is too low and the pointer moves beyond the black sector, resolder the ends of power transformer Tpl-3 as stated under 6 - 4,1.

3. When checking the voltage of the storage battery:

(a) turn the SHIP'S FEEDER - SHORE-END FEEDER switch to SHIP'S FEEDER;

(b) set the change-over switch of the instrument at 24 V;

(c) measure the storage battery voltage with the arrangement turned off.

If the pointer is within the black sector, the battery is in good order. A quick drop in voltage shows that the storage battery is discharged.

In this case the battery should be charged additionally as stated under 5 - 3, e.

4. When checking the converters (with the installation supplied from the D.C. feeder), manually turn them on to operate alternately, and then follow the special instructions for the given type of converter.

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The alternate switching-on of the power sets for manual operation is effected with the aid of the POWER SET 1 or POWER SET 2 tumbler switches and the POWER SETS CHANGE-OVER (ПЕРЕКЛЮЧЕНИЕ АППЕРАТОВ) switch on the power-supply switchboard.

5. When checking operation from the microphone posts, follow the instructions on how to operate from MP.

The installation can be tested by counting ONE, TWO, THREE, etc. or pronouncing the word TEST into the microphone.

The presence of signal READY at the operating MP and signal ENGAGED at the other MP and also normal transmission through the microphone show that the microphone posts are in good order.

6. When checking the installation from the receiver-amplifier unit, follow the instructions for relaying broadcast programs.

To check transmissions from the extension microphone, from the receiver or the record player, insert the headphones plug into the AMPLIFIER OUTPUT socket on the panel of the receiver-amplifier unit.

7. In checking the insulation resistance of the loud speaker lines, follow the instructions set out under "Attendance of the Loudspeakers and Their Lines".

Insulation resistance is checked by touching the earth terminal with one prod and the line contacts on the receiver-amplifier unit with the other. If the resistance is normal, the tester should read not less than 100,000 ohms.

6. TROUBLE-SHOOTING PROCEDURES

6 - 1. General

Fault finding should be preceded by a thorough study of the installation so as to know the operating principle of the arrangement as a whole and of its components in particular, to be able to correctly read diagrams and to know the purpose and performance of all electric components . It is also necessary to know well improper indications for all units and assemblies. Fair knowledge of the fault-signalling system enables the operator to quickly locate and correct the trouble. In case of any trouble in the installation, first determine in which unit the trouble has occurred and then trace the trouble to the defective component of this unit.

Following this, locate the faulty circuit of the unit.

It should be borne in mind that the fault which causes a fuse to blow does not lie in the fuse itself.

That is why before inserting a new fuse, thoroughly examine and test the circuit of the blown fuse.

Only skilled personnel should be allowed to correct troubles which involve replacement of parts or repair of the equipment.

Listed below are some hints on how to locate and remedy the simplest troubles in the installation.

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6 - 2. Troubles in Microphone Posts

1. When the microphone post is switched on with loud-speaker line switches B5-1, B5-2, B5-3 (Fig. 26), signal READY does not appear, but the installation is cut in, transmission is normal and signal ENGAGED lights up at the other post.

Possible causes:

The pilot lamp burnt out. Use a special screw-driver from the tools kit to unscrew the cap and then remove the bulb with a bulb extractor and insert a new one.

2. The same as in Point 1, but there is no signal ENGAGED at the other post.

In addition to the cause referred to in Point 1, there may be the following causes:

(a) contact fault between contacts 6 and 5 of switches B5-1, B5-2 and B5-3;

(b) contact fault between springs 12-13 in relay P1-3 (CPR) mounted on the amplifier chassis; re-establish contact.

3. When the post is switched on, signal READY appears, but no transmission through the microphone is heard. There is no audio voltage across the amplifier input.

Possible causes:

No contact between springs 22 and 23, 32 and 33 in relay P3-1 (MPR) or between contacts 1 and 2, 3 and 4 in the amplifier input socket,

Re-establish contact by cleaning or adjusting the relay and the socket.

6 - 3. Troubles in Receiver-Amplifier Unit

These may occur:

(a) in the amplifier;

(b) in the receiver;

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(c) in the switching circuits of the receiver-amplifier unit.

(a) Troubles in Amplifier

Troubles in the amplifier may be caused by faulty valves, punctured capacitors or damaged wiring.

Faults caused by defective output valves are indicated by the AMPLIFIER FAILURE lamp or the fault-signalling system as a whole. Determine the condition of valves by checking their plate currents.

If these currents differ considerably from the admissible values, the valves are out of order (poor emission, breakdown, low vacuum, etc.). In case the plate currents are not within the limits allowed, replace the faulty valve. However, the cause of the current being different from the rating does not always lie in the valve.

If after replacing the valves the instrument reading did not change, or changed inconsiderably, the cause of the trouble does not lie in the valve.

A sharp increase in the plate current of valves 6H3C may occur due to the breakdown of one of the coupling capacitors C1-4, C1-7 (See the diagram of the amplifier in Fig.27).

On the contrary, the breakdown of one of the amplifier filter capacitors C1-9, C1-10 or C1-8 may cause a sharp drop in plate current or its complete cessation. A short circuit in the winding of relay P1-3 (CPR) leads to a sharp increase in plate currents accompanied by signals AMPLIFIER FAILURE and FAILURE.

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In each case of abnormal operation of the amplifier it is necessary to determine the nature, cause and place of the fault by using the diagram and a tester.

(b) Troubles in Receiver, Their Causes and Remedy

Given below are the most probable troubles caused by the quality of valves and their prolonged service life. These troubles can be located without testers and eliminated in the process of operating the receiver.

More serious faults are not given here, for special instruments and skilled personnel are needed to locate and remedy them.

1. The receiver is silent; the scale is illuminated. When the tuning knob is turned, the visual indicator is operative. The receiver audio-frequency stage is inoperative. Replace valve 6F2.

2. The receiver is silent. When the tuning knob is turned, the visual indicator is inoperative. The valve of the conversion stage or the valves of the I-F amplifier stages are also inoperative.

Replace valves 6A7 and 6K3 one by one.

3. Reception is normal; visual indicator is inoperative. Valve 6E5C is faulty, replace the valve.

4. Poor reception, visual indicator operates poorly. Valves 6A7 and 6K3 are of poor quality; replace them one by one.

5. Poor reception; visual indicator operates normally. Valve 6F2 is of poor quality, replace it.

6. When the receiver is turned on, the scale is not illuminated. The function switch is in RECEIVER position. The lamps illuminating the scale burnt out; replace them.

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7. When the function switch is in PICKUP position, the PICKUP window on the scale is not illuminated. No contact between the lamp and its holder or the lamp burnt out; screw in the lamp fully or replace it.

(c) Troubles in Switching Circuits of Receiver-Amplifier Unit

As is known from the description of the installation, the switching arrangement of the receiver-amplifier unit comprises relays, switches, change-over switches and tumbler switches.

Since all these elements are scattered all over the unit (the amplifier, control panel, frame), fault finding in the switching circuits should be preceded by a thorough study of the diagram of the receiver-amplifier unit and the installation as a whole.

Consider some possible cases.

1. Faults in the sound channel circuits.

When the installation is switched on from the receiver-amplifier unit, signals ON and READY appear and the pilot lamp of the line concerned lights up.

No failure signals. The receiver operates normally. After the headphone plugs are taken out of the RECEIVER OUTPUT (ВЫХОД НАУШНИКОВ) socket, there is no transmission over the loudspeaker lines.

Possible faults and their location procedure:

Insert the plug of the extension microphone of the receiver-amplifier unit into the MICROPHONE (МИКРОФОН) socket, turn the MICROPHONE - RECEIVER function switch to MICROPHONE and begin counting ONE, TWO, THREE, etc.

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If transmission is audible in the headphones inserted in AMPLIFIER OUTPUT (ВЫХОД УСИЛИТЕЛЯ) socket ПЗ-5, the cause of the fault may lie in AMPLIFIER OUTPUT (ВЫХОД ПРИЕМНИКА) socket ПЗ-2 (no contact between springs 1-2 or 3-4) and also in switch ВЗ-1 (no contact between springs 5-6 or 11-12).

If in monitoring through the headphones no transmission is audible, insert the extension microphone plug into AMPLIFIER INPUT (ВХОД УСИЛИТЕЛЯ) socket and check the transmission.

If transmission is audible, check the following contacts: 22-23 or 32-33 in relay ПЗ-1 (MPR), 5-6, 11-12, 1-2 and 7-8 in switch ВЗ-1 and contacts in AMPLIFIER INPUT socket ПЗ-3.

In all cases check the mentioned circuits and eliminate the faults by re-establishing contact through cleaning or adjusting the springs in relay ПЗ-1 (MPR) and sockets ПЗ-2 and ПЗ-3.

The absence of transmission over the loudspeaker lines may also be caused by faults in the circuits of the output switching.

If the amplifier is in good order and transmission is audible at its output, the faults may lie in the line relay contacts: 21-22 or 31-32 of relay ПЗ-3 (LLR-1) in case of relaying over the combat line; 14-15 or 32-33 of relay ПЗ-4 (LLR-2) and 22-24 of relay ПЗ-2 (BTR) in case of broadcast relaying over the crew quarters line;

22-23 and 32-33 of relay ПЗ-4 or 31-32 of relay ПЗ-2 in case of command relaying;

21-22 or 31-32 of relay ПЗ-5 (LIR-3) in case of command and broadcast relaying over the upper deck line.

In playing phonograph records the sound channel comprises: the pickup, the final stage of the receiver

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output to the amplifier input, the amplifier and its output circuits with the loudspeaker lines. If in operating from the pickup no transmission is audible across the RECEIVER OUTPUT socket, the fault may lie either in the pickup itself, or in the circuits between the pickup and its input at the receiver (receptacle block JH3-1, contacts 1-5 in tone knob B2-2).

The continuity of the final stage of the receiver is best to be checked by switching over the receiver from the PICKUP position to the NARROW or BROAD BAND positions.

If transmission is audible in the headphones connected across the RECEIVER OUTPUT socket, the failure of playback is caused by the pickup, its circuit up to receptacle block or by the section of switch B2-2 in the receiver.

The fault is located by successively ringing out the said circuits.

2. Faults in the signal system circuits, such as the absence of signal ON when transmission over the loudspeaker lines is normal, may lie in that lamp JH3-5 on the control panel has burnt out or the circuit of this lamp has become defective.

No special instructions are required on how to locate and eliminate troubles caused by faulty valves and indicated by the signal system.

6 - 4. Troubles in Supply Circuits

These are usually caused by defects in the selenium rectifier, voltage regulator and switches.

Consider some possible cases.

1. Drop in voltage across the selenium rectifier output, or the rectifier fails to operate altogether.

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The condition of the rectifier is checked by the method described under Section 4-3, f. If the instrument pointer moves beyond the black sector, disconnect the wire connected to lead 18 of transformer Tpl-3 and connect it to leads 19 or 20, thereby increasing the A.C. voltage applied to selenium stack A4-1.

2. If A.C. voltage of 110, 127 or 220 V is absent in the main-powered windings of the transformer when the installation is turned on, the fault should be looked for in the circuits feeding these windings.

When the installation is supplied from the ship's or shore-end A.C. feeder, the following troubles may occur: poor contact in interlocks B4-1, B4-2, B4-3, B4-4 and in change-over switch B3-8 or blowing of fuses Пр3-7, Пр3-8, Пр3-9 and Пр3-10 due to a short circuit in the installation.

6 - 5. Troubles in Power-Supply Switchboard

These may occur when the installation is supplied from the ship's D.C. feeder.

They may be caused:

(a) By blowing of fuses Пр7-1, Пр7-2, Пр7-3 and Пр7-4 of the HB type in the supply circuit of the converters on the D.C. side, due to troubles in converters, in the groups of relays P7-1, P7-2, P7-3, P7-4 or P7-5, P7-6, P7-7, P7-8 and in the wiring;

(b) by troubles in change-over switches B7-1, B7-2 and B7-3.

Consider some cases.

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1. When change-over switch B7-3 is turned from POWER SET 1 to POWER SET 2, with the installation in operation, power set 2 fails to start.

Causes of the fault:

(a) A break in the circuit of contacts 18, 19 and 20 in change-over switch B7-3 or in that of contacts 2-3 in tumbler switch B7-1.

Ring out the circuit according to the key diagram and correct connection.

(b) Burning of contacts 11-12 in relays P7-5, P7-6, P7-7 and P7-8. Restore contacts.

(c) Blowing of fuses Пp7-3 and Пp7-4 of the ПB type in the supply circuit of the converter.

Eliminate the cause of the fault and replace fuses.

2. When power set 1 is started manually with the aid of tumbler switch B7-2, the set stands still, while power set 2 starts from tumbler switch B7-1.

Causes of the fault:

(a) No contact in tumbler switch B7-2.

Check the switch with a tester and re-establish contact.

(b) A break in the circuit of contact 1 in tumbler switch B7-2.

Check the circuit according to the key diagram. Eliminate the fault.

(c) No contact in relays P7-1, P7-2, P7-3 and P7-4 due to reasons as those under Point 1, b.

(d) Burning of fuses Пp7-1 and Пp7-2 of the ПB type, on the D.C. side.

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6 - 6. Troubles in Loudspeaker Lines

1. Loudspeaker SPK-31A

Jarring is the main trouble which may occur in the loudspeaker after long service.

The causes of this trouble may be as follows:

1. The voice coil in the gap of the magnetic circuit is off-centred.
2. Defects in the moving system: slipping-down of the voice coil turns, warping of the voice coil, mechanical defects in the diffuser (breaks, dents, fractures).

T r o u b l e

Jarring caused by off-centring of the moving system.

R e m e d y

Remove the front cover from the housing by unscrewing four attachment screws, and unsolder the voice coil junction wires from contacts 14 and 16 of the transformer terminal plate. Unscrew the nuts securing the loudspeaker head and detach the latter from the cover.

By slightly rocking the diffuser with two fingers of both hands holding it on two sides, check by ear the centring of the voice coil in the air gap of the magnetic circuit.

If the voice coil is off-centred, a rustle will be heard as a result of the coil rubbing against the gap sides. To re-centre the coil loosen the two screws on the locating bosses of the diffuser holder and carefully shift the moving system until the coil is aligned in the air gap. Then tighten up the nuts and assemble the loudspeaker in the order reverse to its disassembly.

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T r o u b l e

The moving system is faulty.

R e m e d y

The system should be replaced.

For this purpose, in the loudspeaker head removed from the housing and detached from the cover, extract the two screws securing the centring arrangement to the diffuser holder.

The pressboard sectors and the fixed part of the diffuser flange glued to the skirting of the diffuser holder are to be wetted profusely with a solvent (acetone).

After the dry glue becomes soft, detach the moving system from the skirting of the diffuser holder. Remove the remnants of the glue from the skirting and replace the system by a new one.

The new moving system should be mounted as follows. Install the system (the diffuser with a voice coil and a centring arrangement) in the air gap and on the diffuser holder so that the leads of the coil are opposite the tags secured to the diffuser holder, while the holes in the centring ring are opposite the holes in the locating bosses of the holder. Then pass the screws through the holes and screw on the nuts.

The nuts should be tightened finally after a uniform gap is obtained between the iron core of the magnetic circuit and the bobbin of the voice coil. The coil is to be centred in the gap with the aid of four paper strips, 8 to 10 mm wide, inserted in the gap between the voice coil and the inner wall of the gap. Following this, glue the diffuser flange to the skirting of the diffuser holder with nitro-glue No.114.

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After the glue dries, check the centring of the moving system by the above method. Then, cover the skirting of the diffuser holder with a new layer of glue and attach the pressedboard sectors to the diffuser flange with nitroglue No.114.

2. Loudspeaker MAPP-1

The main defects which may occur in the loudspeaker are:

1. Jarring, when playing records.
2. Complete failure to operate.

The cause of these faults may be improper use of the loudspeaker (considerable overloading, dust, etc.).

Jarring may be invited by the voice coil being off-centred in the air gap of the magnetic circuit, slipping down of the voice coil turns, penetration of iron filings and dust onto the surface of the diaphragm through the horn outlet, etc.).

Complete failure to operate is caused by a break in the leads of the voice coil and burning out of turns of the voice coil. These troubles should be eliminated in special repair shops.

E l i m i n a t i n g F a u l t s

To remove the above troubles, replace the moving system.

For this purpose:

Extract the four screws securing the upper cover of the loudspeaker, detach the ends of the wiring conductors from the loudspeaker head and by turning the head counter-clockwise screw it off from the horn.

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After the head is detached from the horn, extract the four screws securing the chamber and detach the ends of the wiring conductors from the tags on the annular base of the moving system.

Then, remove the defective moving system and replace it by a new one.

Re-assemble the loudspeaker in the reverse order of its disassembly.

Before attempting to install a new moving system, clean the air gap in the magnetic circuit with the aid of an insulating tape wound on a thin brass strip.

Loudspeaker heads should be repaired in a clean room free from metal dust.

6 - 7. Troubles in Pickup

A crystal pickup is used in the installation.

Troubles in the pickup may be caused by a break in the contacts of the crystal or by mechanical defects which may occur in the crystal as a result of a hard knock.

To obviate these troubles, use the pickup with care so as to avoid hard knocks.

P a r t I I

KEY DIAGRAMS AND GENERAL VIEWS

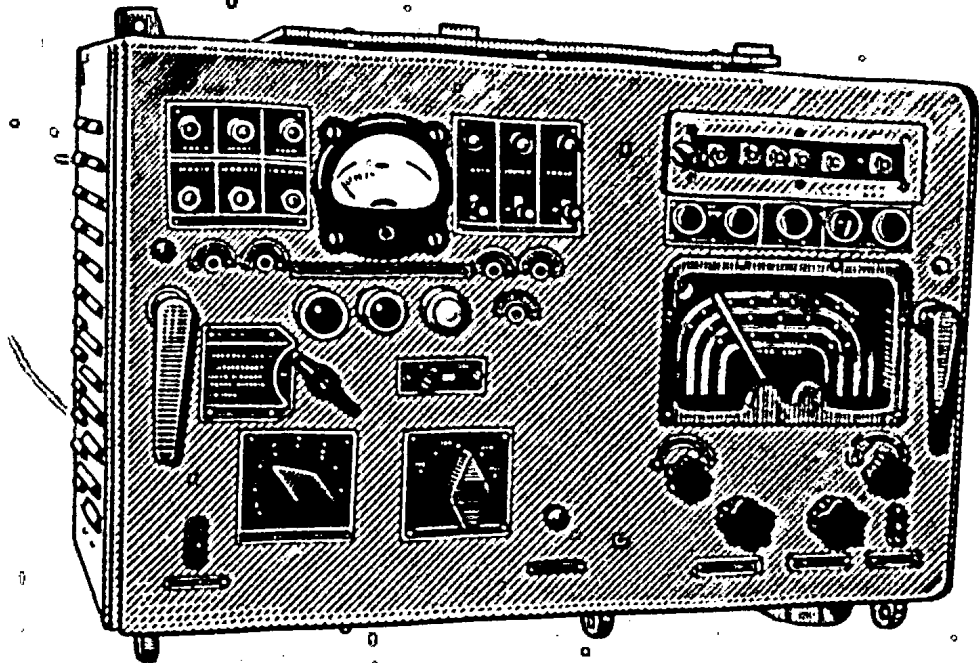


Fig. 1. General View of Receiver-Amplifier Unit

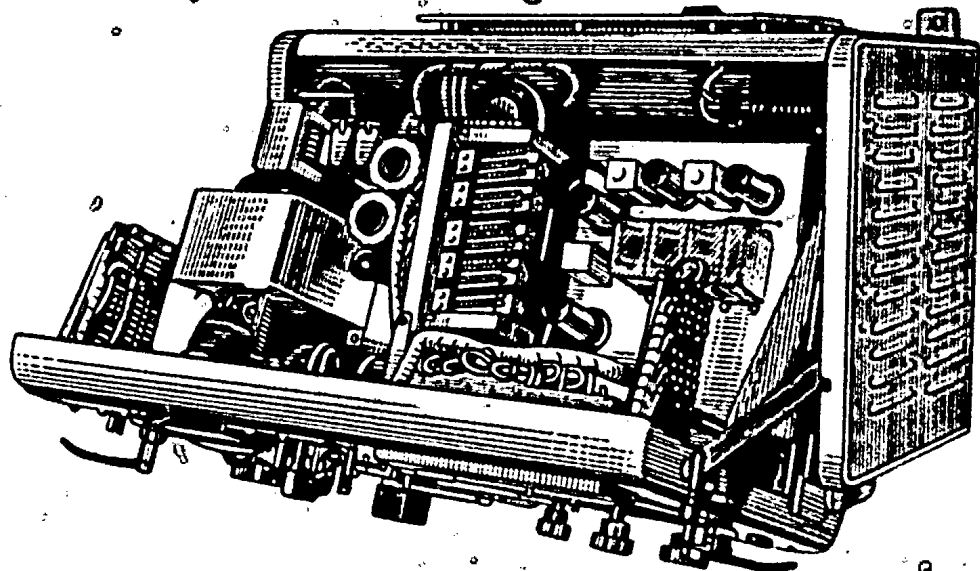


Fig. 2. General View of Receiver-Amplifier Unit with Front Panel Unfolded by 70°

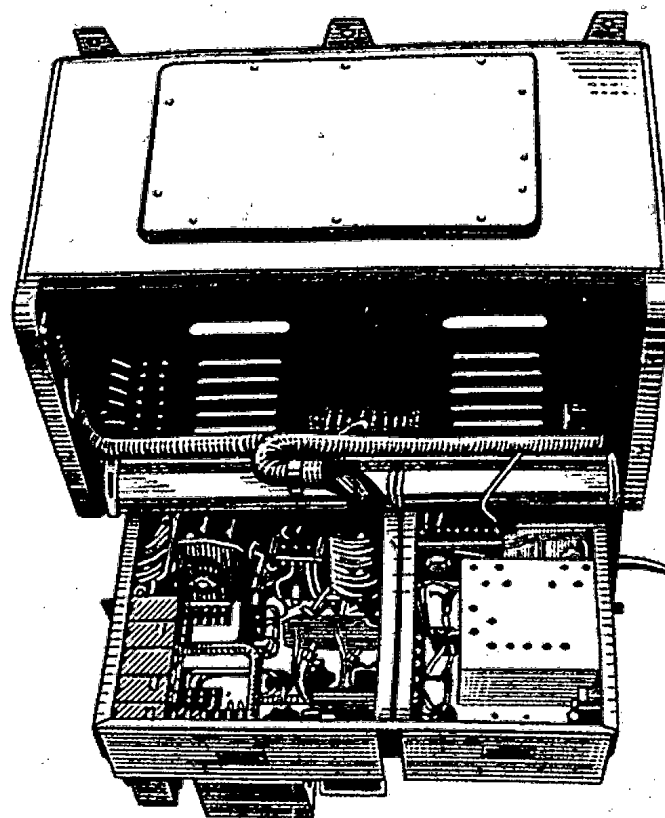


Fig. 3. General View of Receiver-Amplifier Unit with Front Panel Unfolded by 180°

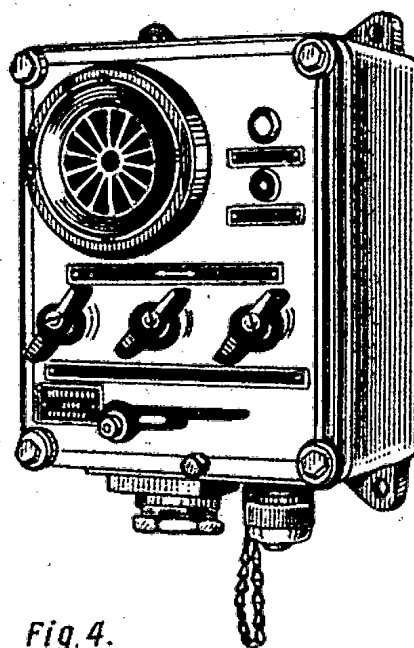


Fig. 4. General View of Microphone Post

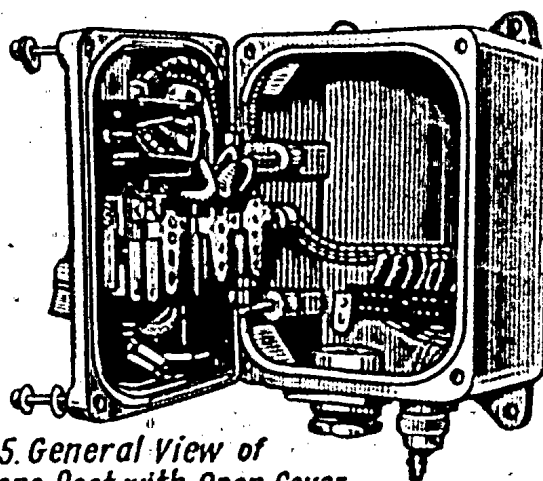


Fig. 5. General View of Microphone Post with Open Cover

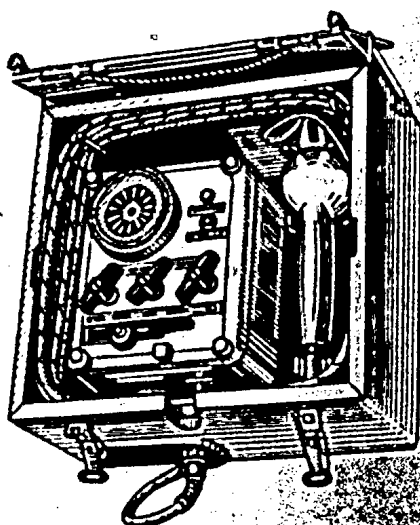


Fig. 6. General View of Microphone Post in Protective Box

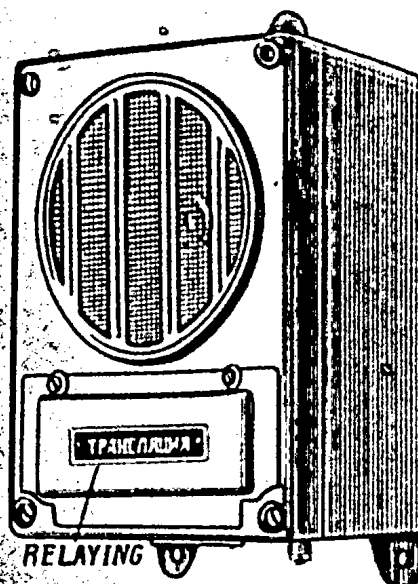


Fig. 7. General View of Moving-Coil Loudspeaker 3ГД-3МА

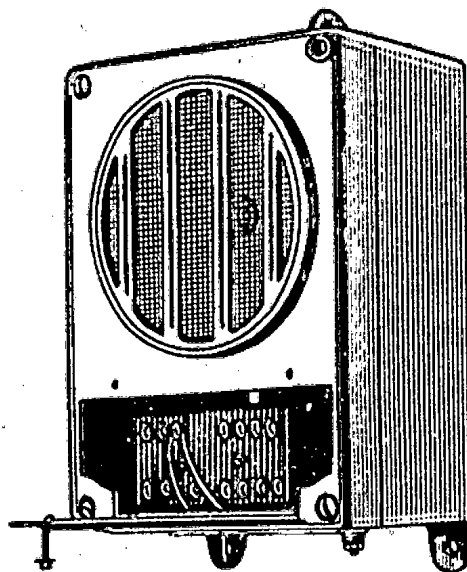


Fig. 8. General View of Moving-Coil Loudspeaker ЗГД-3МА with Open Cover

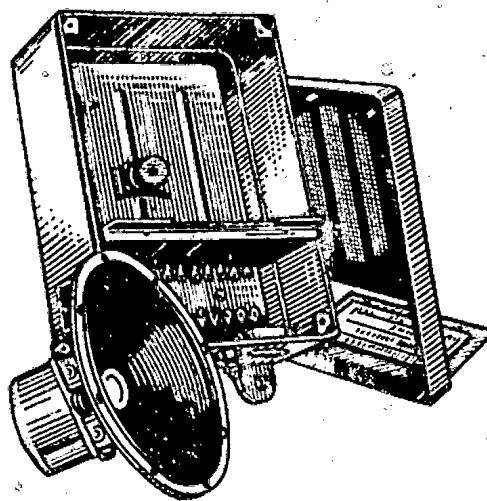
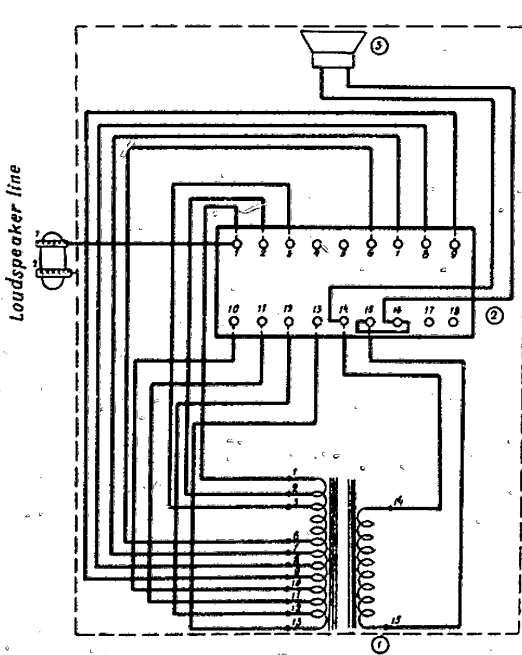


Fig. 9. Moving-Coil Loudspeaker ЗГД-3МА, Disassembled



Connection of 3ГД-3МА, depending on voltage and power, with the loudspeaker operated with PF-2 in two-or three-wire loudspeaker lines.

Connection of 3ГД-3МА		Connection of 3ГД-3МА when operated with PF-2	
10 20 30 40 50 60 70 80 90	100 110 120 130 140 150 160 170 180	When connecting, remove jumper from 3ГД-3МА between contacts 15-16	
	I-9 30V-0.5W	3-wire line	2-wire line
	I-10 60V-1W	1. Common wire-contact	1. First wire-contact 17
I-6 30V-3W	I-11 60V-0.5W	2. Command transmission wire-contacts 6 to 13 (depending on voltage and power)	2. Second wire-contact 18
I-7 30V-1W	I-12 30V-0.1W	3. Broadcast transmission wire-contact 18	
I-8 60V-3W	I-13 60V-0.1W		
		Connection of 3ГД-3МА-PF2 junction cable	
2 30V-3W section mid-point		3ГД-3МА contacts	PF-2 contacts
		1	14
		15	16
3 30V-1W section mid-point		16	24
		18	17
14-16 Speech coil contacts		6 to 13	18
		depending on voltage and power	depending on voltage and power

Note: Wire "2" of the loudspeaker line is connected to any contact (from 6 to 13) of loudspeaker 3ГД-3МА, depending on power and voltage (with the loudspeaker operated without gain control PF-2).

Fig. 10. Key Diagram of Loudspeaker 3ГД-3МА

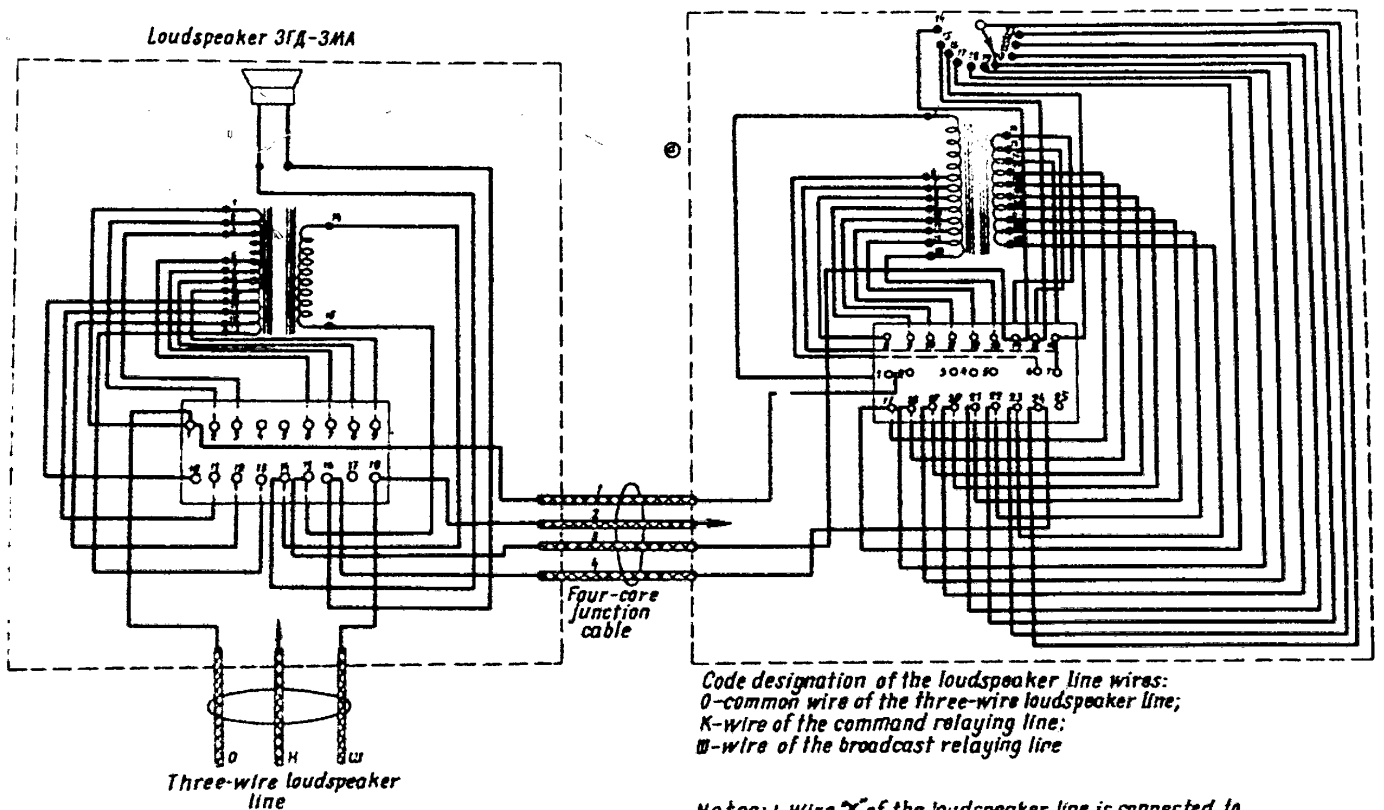


Fig. 11. Loudspeaker 3ГД-3МА and Gain Control PF-2 Connection Diagram for a Three-Wire Loudspeaker Line

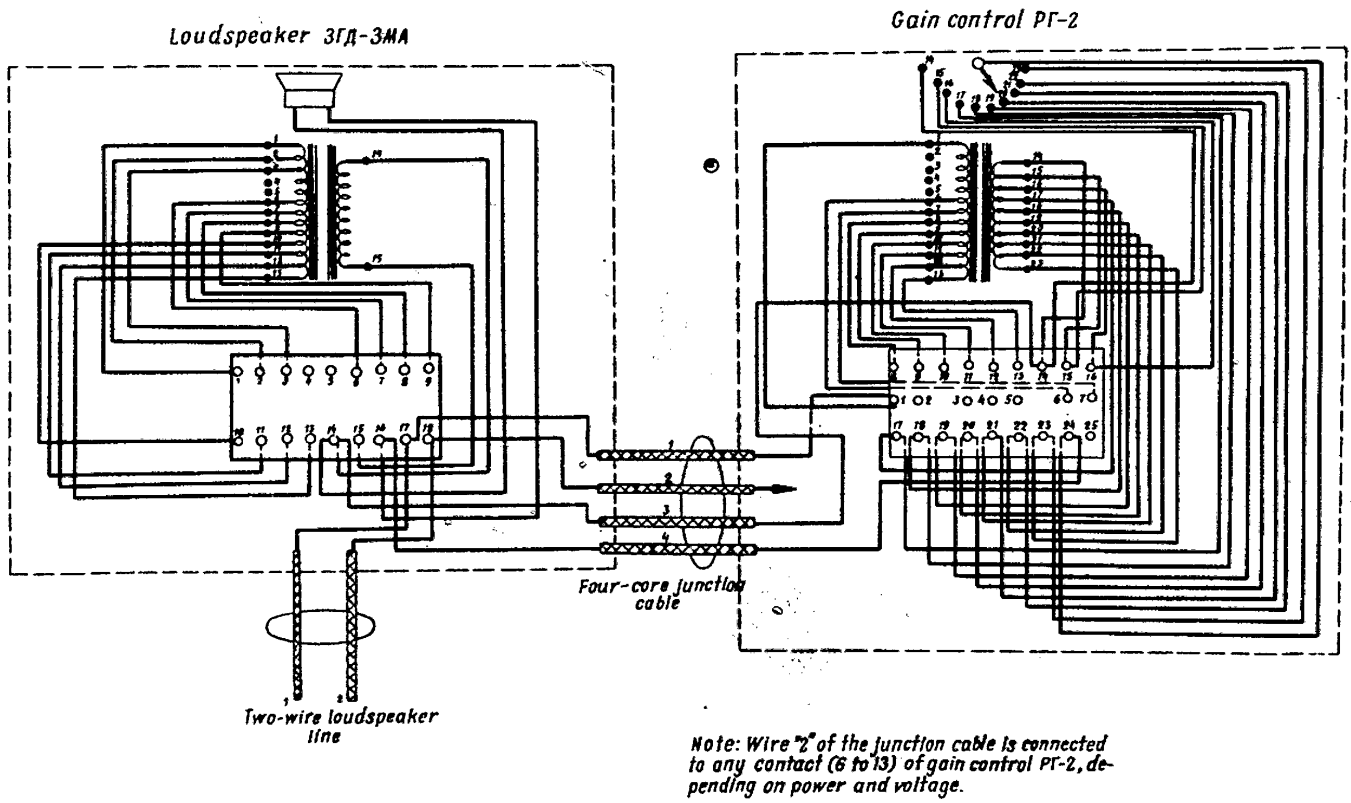


Fig. 12. Loudspeaker 3ГД-3МА and Gain Control ПГ-2 Connection Diagram for a Two-Wire Loudspeaker Line



Fig. 13. General View of Gain Control PF-2

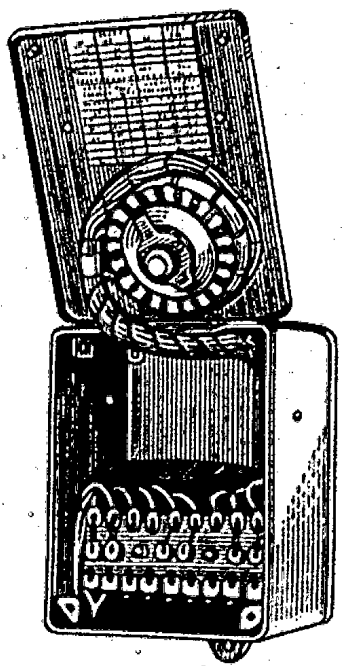


Fig. 14. General View of Gain Control PF-2 with Open Cover

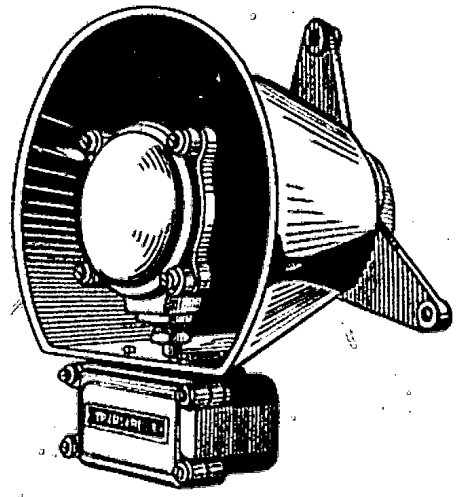


Fig. 15. General View of Loudspeaker MAPF-1

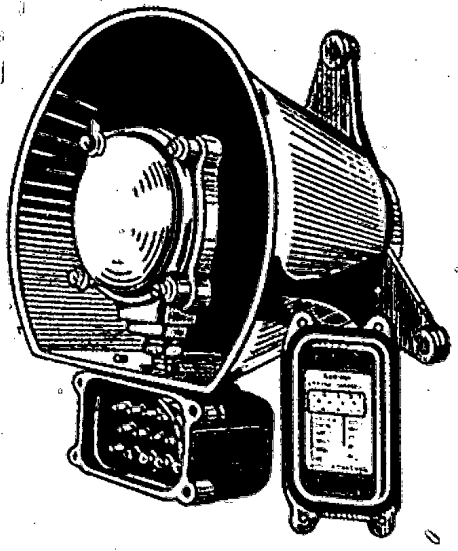


Fig. 16. General View of Loudspeaker MAPF-1 with Covers Detached

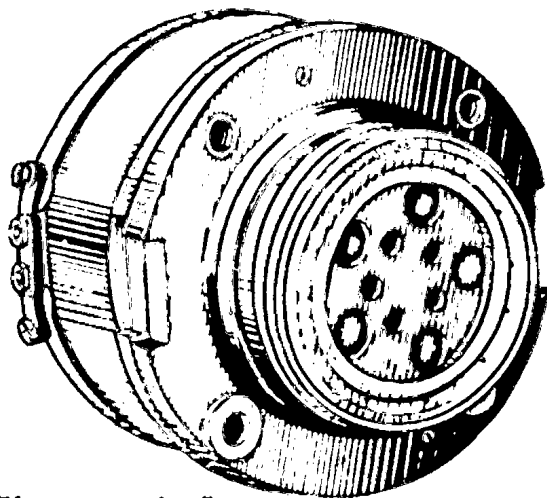
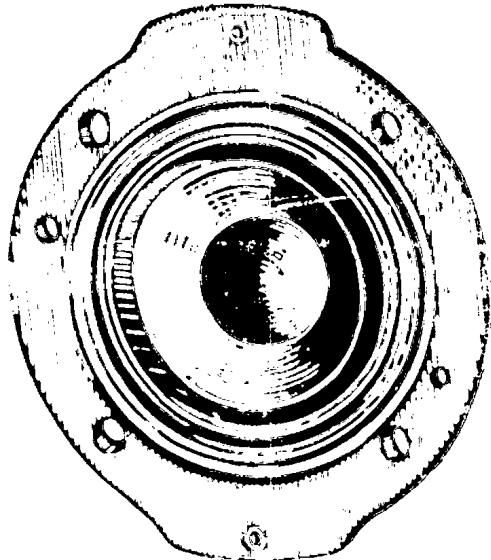


Fig. 17. Head of Loudspeaker MAPF-1



*Fig. 18. Moving System of Loudspeaker
MAPF-1*

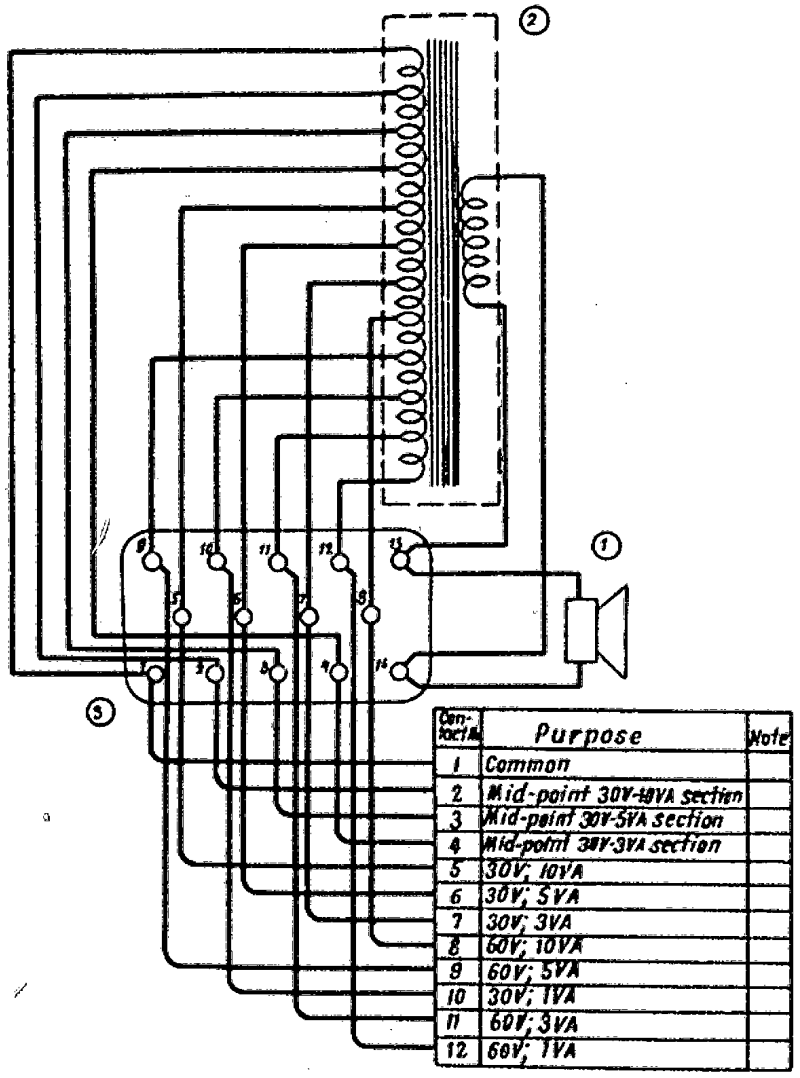
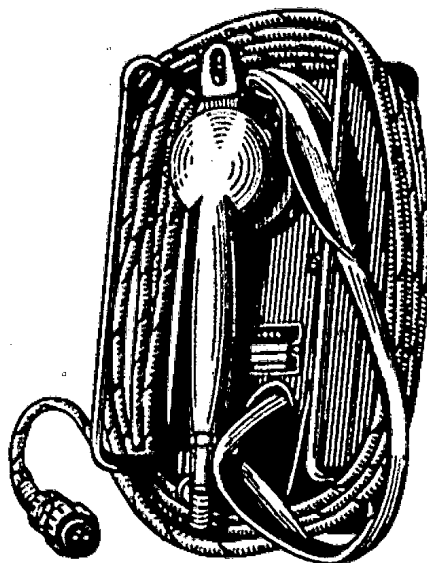


Fig.19. Loudspeaker MAPR-1. Circuit Diagram



*Fig. 20. General View of Extension
Microphone MH-6*



Fig. 21. General View of Record Player 9N

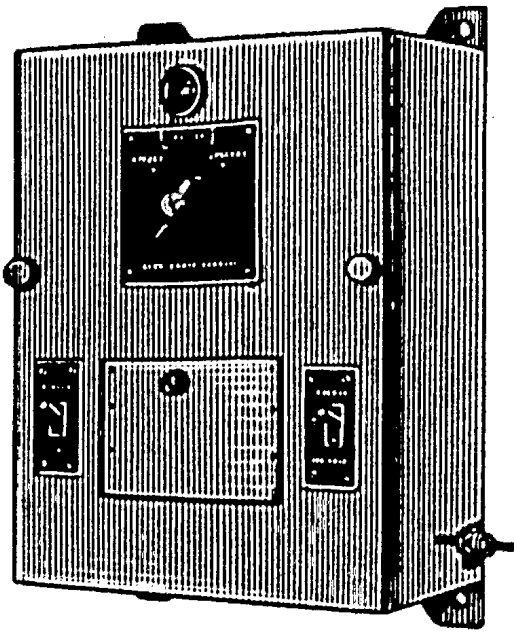


Fig. 22. General View of Power-Supply Switchboard

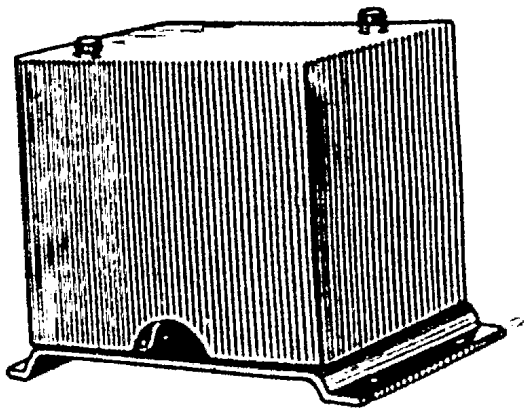
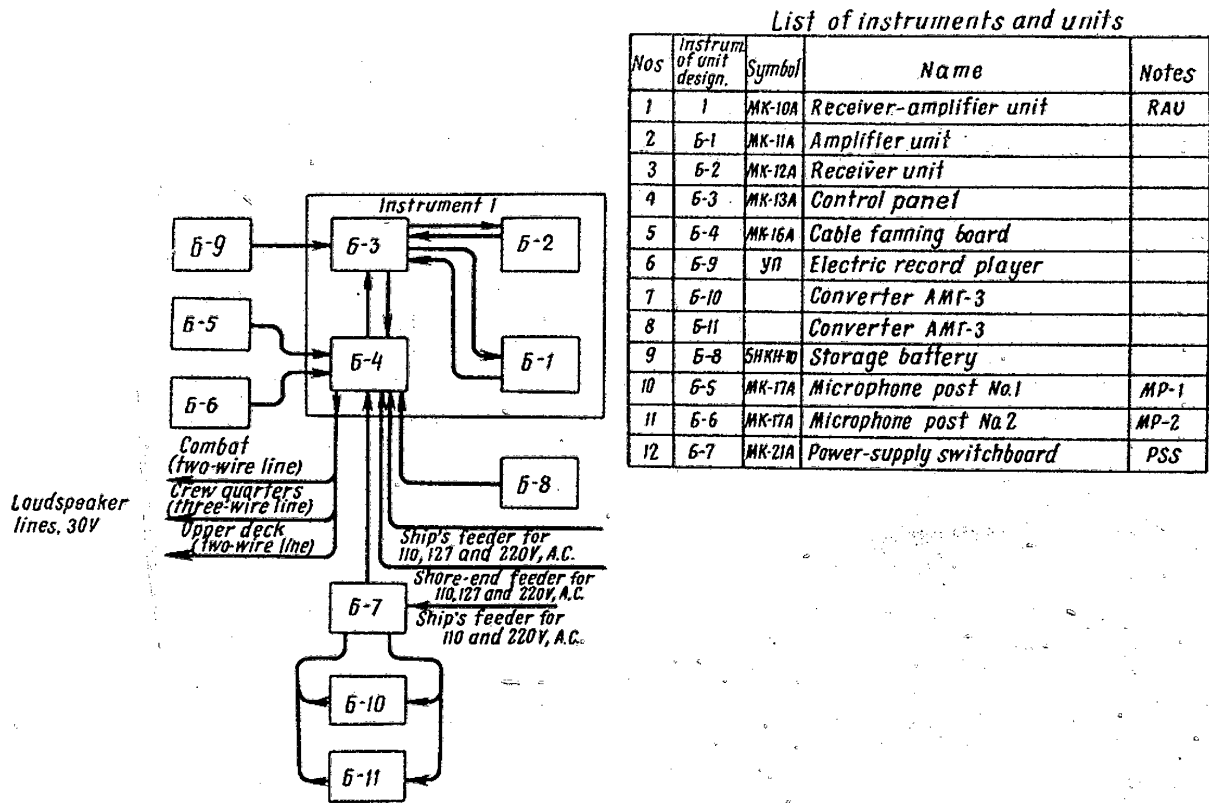


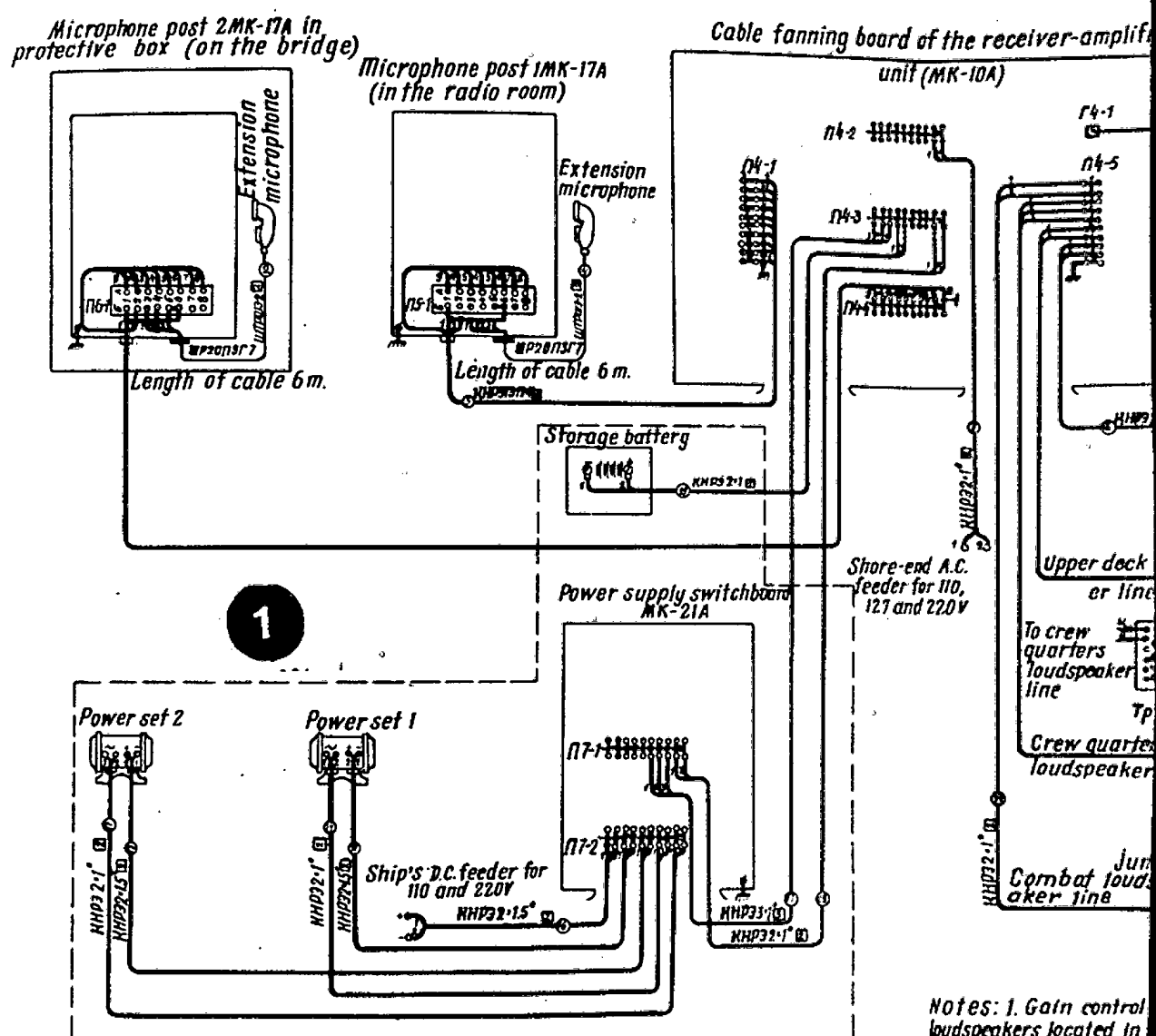
Fig. 23. General View of Intermediate Transformer NT-96



List of instruments and units

Nos	Instrum of unit design.	Symbol	Name	Notes
1	1	MK-10A	Receiver-amplifier unit	RAU
2	6-1	MK-11A	Amplifier unit	
3	6-2	MK-12A	Receiver unit	
4	6-3	MK-13A	Control panel	
5	6-4	MK-16A	Cable fanning board	
6	6-9	YN	Electric record player	
7	6-10		Converter AMT-3	
8	6-11		Converter AMT-3	
9	6-8	SHKH-10	Storage battery	
10	6-5	MK-17A	Microphone post No.1	MP-1
11	6-6	MK-17A	Microphone post No.2	MP-2
12	6-7	MK-21A	Power-supply switchboard	PSS

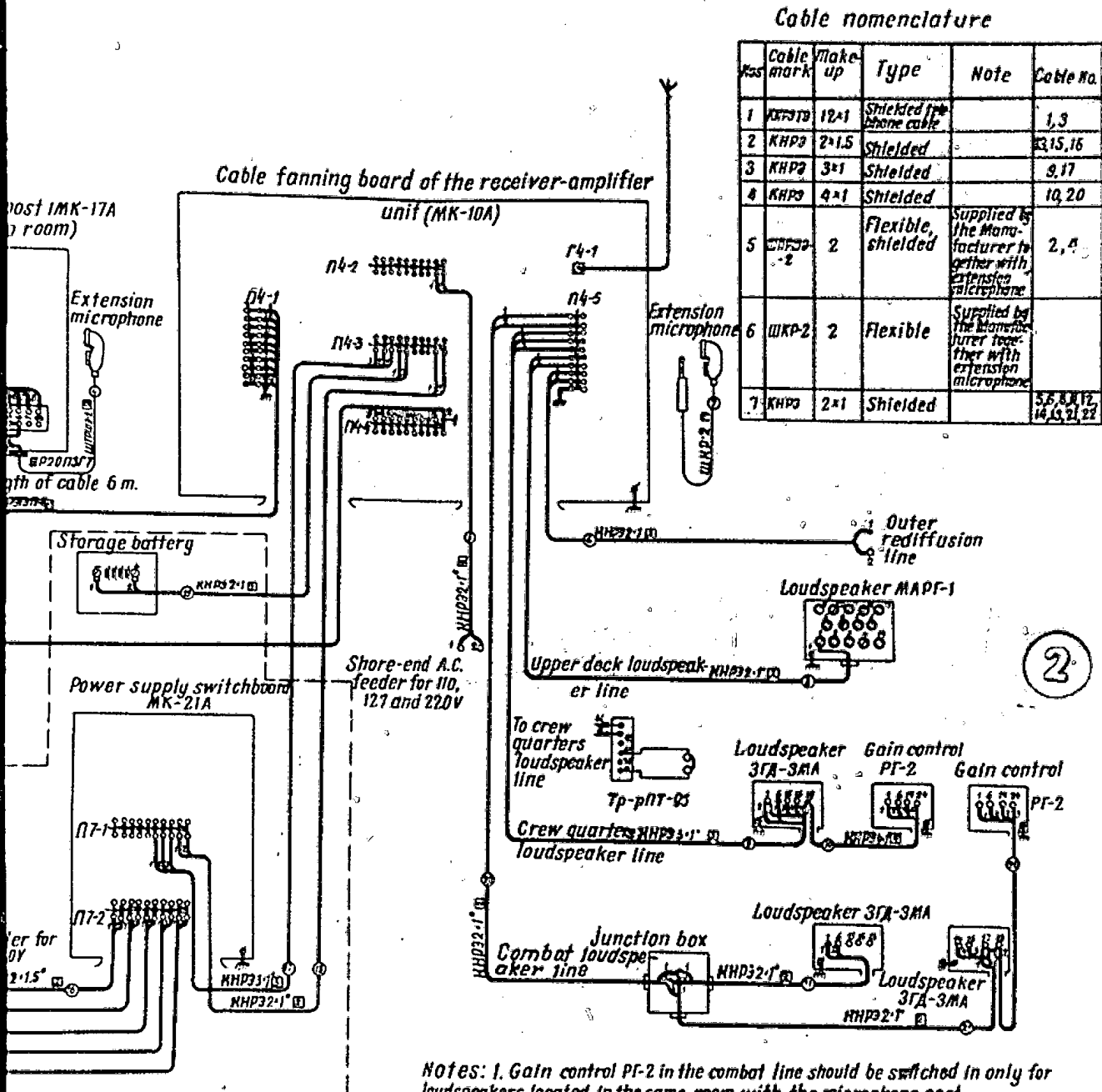
Fig. 24. Block-Diagram of MKTY-15c Installation



Elements delineated with dotted line are supplied in case the installation is fed from the ship's D.C. mains

Fig. 25. Connection Diagram of MKTY-15c Installation

- Notes:
1. Gain control loudspeakers located in...
 2. With the installation of the latter should be connected board via cable No. 18.
 3. Depending on the power switched in according to...
 4. In this diagram loudspeakers 3A-3MA are switched in...
 5. The extension microphone...
 6. The outer rediffusion and should be connected to n4-5/9 of the cable fanning board.



Cable nomenclature

Pos	Cable mark	Make up	Type	Note	Cable No.
1	MKP3-1	12x1	Shielded telephone cable		1,3
2	MKP2	2x1.5	Shielded		2,15,16
3	MKP2	3x1	Shielded		9,17
4	MKP2	4x1	Shielded		10,20
5	MKP2-2	2	Flexible, shielded	Supplied by the Manufacturer together with extension microphone	2,4
6	MKP-2	2	Flexible	Supplied by the Manufacturer together with extension microphone	
7	MKP2	2x1	Shielded		5,6,8,12,14,19,21,22

Post MK-17A (room)

Extension microphone

Length of cable 6 m.

Storage battery

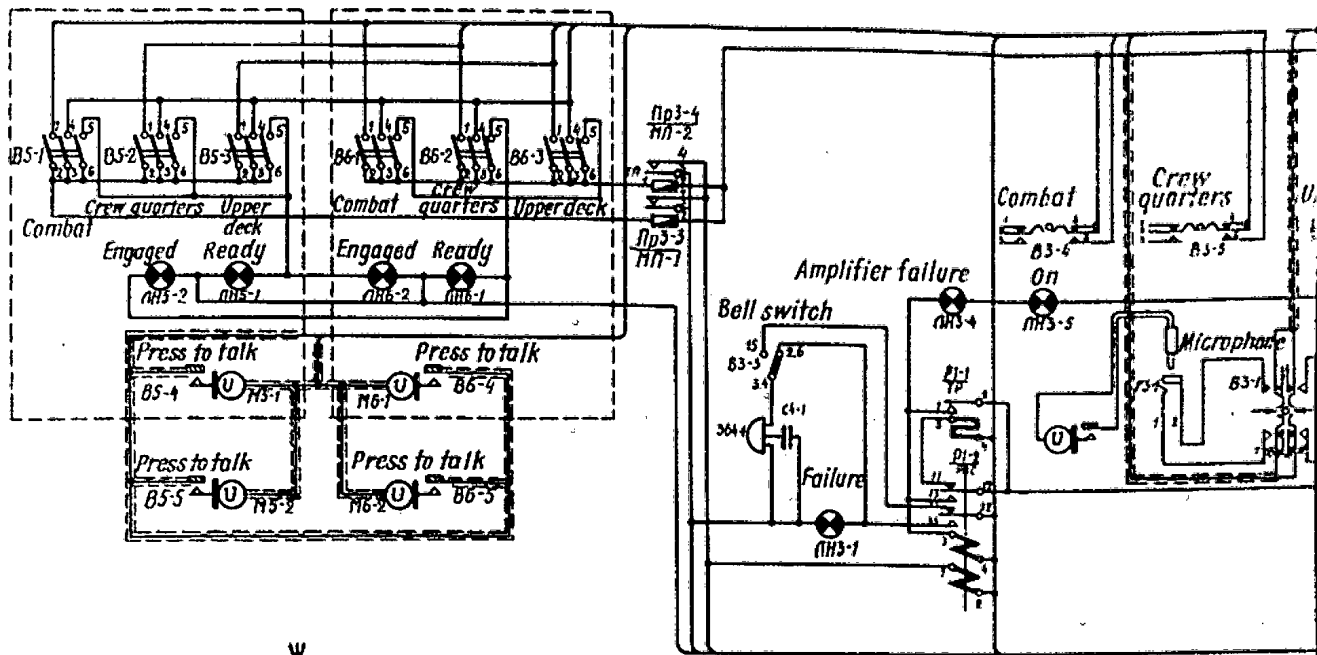
Power supply switchboard MK-21A

Shore-end A.C. feeder for 110, 127 and 220V

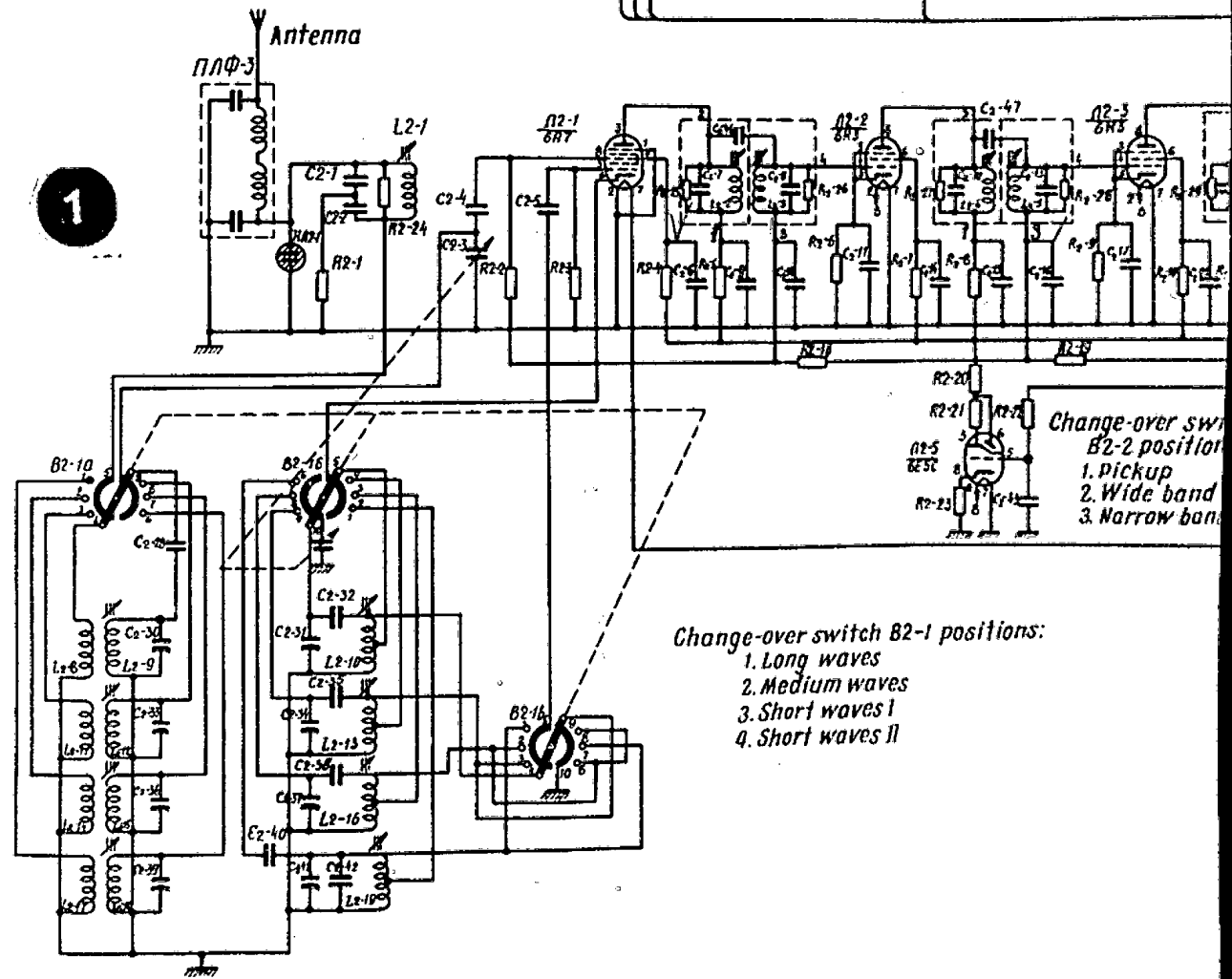
are supplied in the ship's D.C.

am of MKTY-156

- NOTES: 1. Gain control PF-2 in the combat line should be switched in only for loudspeakers located in the same room with the microphone post.
 2. With the installation supplied from the ship's 110, 127 or 220V A.C. feeder, the latter should be connected to contacts n4-3/9, n4-3/10 of the cable fanning board via cable No. 18.
 3. Depending on the power and voltage required, the loudspeaker should be switched in according to the table on the cover of the contact box of the loudspeaker.
 4. In this diagram loudspeaker MAPF-1 is switched in for 30V, 3VA; loudspeakers 3GA-3MA are switched in for 30V, 3VA.
 5. The extension microphone is inserted in the MICROPHONE socket on RAU.
 6. The outer rediffusion line may come in from both sides and should be connected to the same terminals n4-5/8 and n4-5/9 of the cable fanning board.



1



Change-over switch B2-1 positions:
 1. Long waves
 2. Medium waves
 3. Short waves I
 4. Short waves II

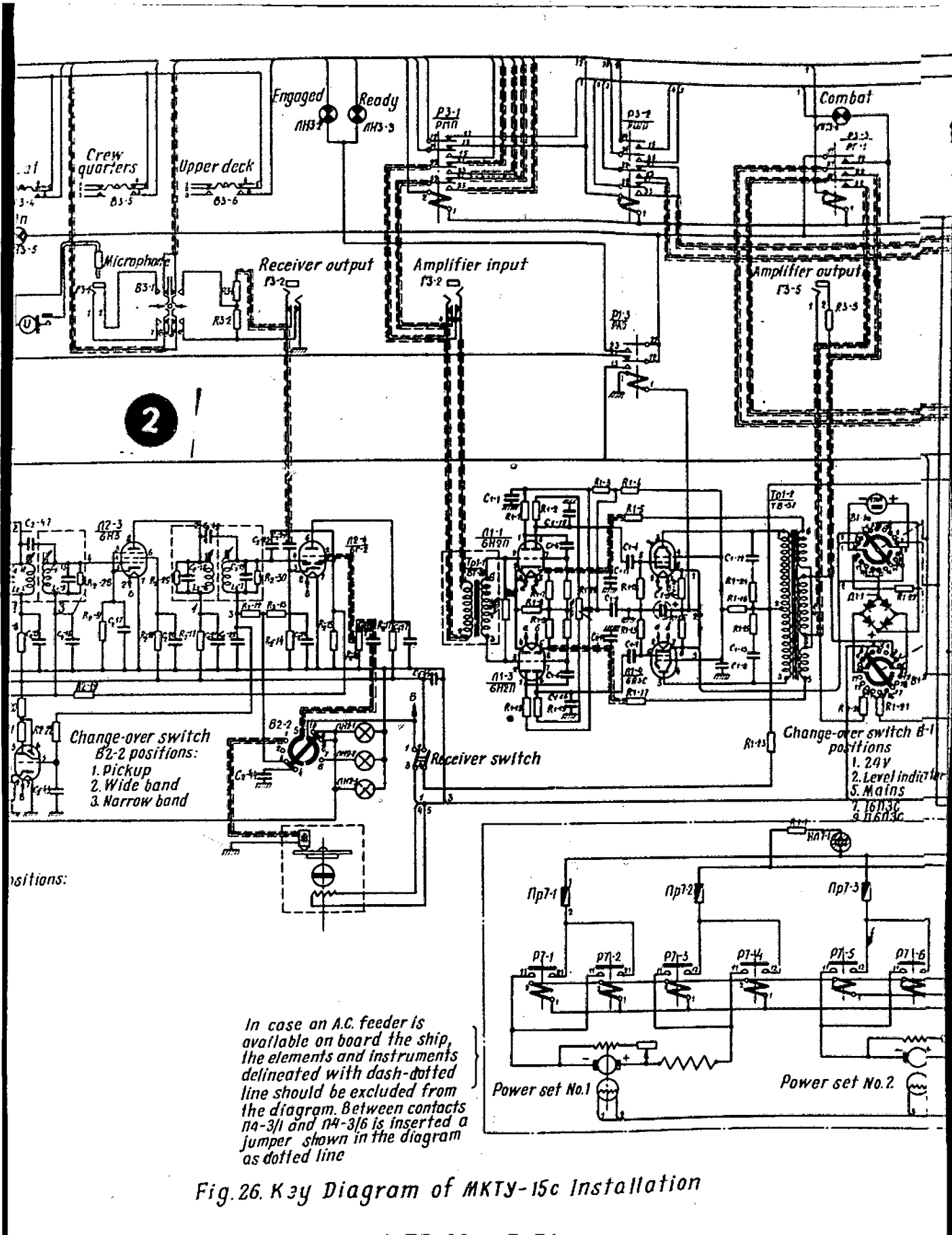
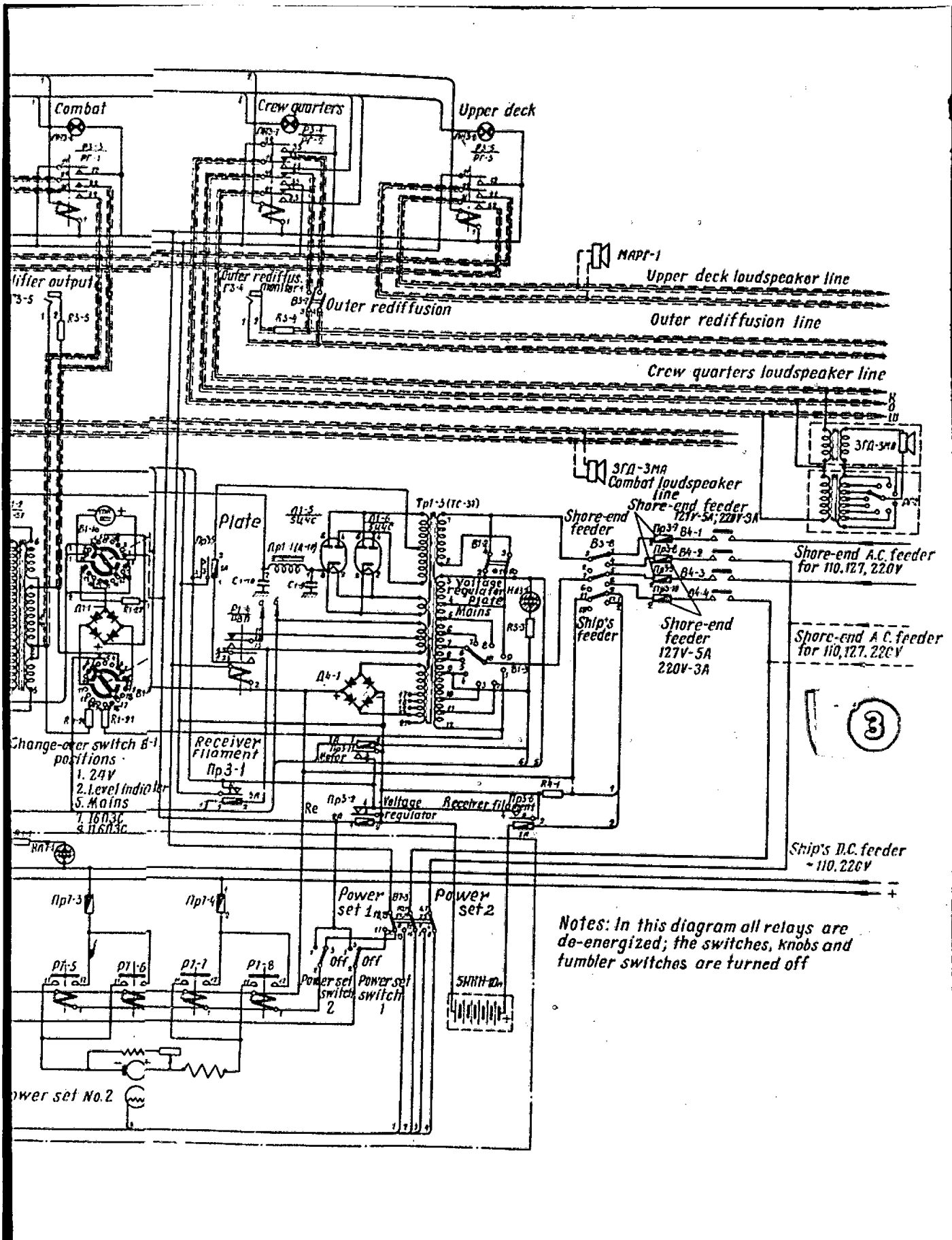
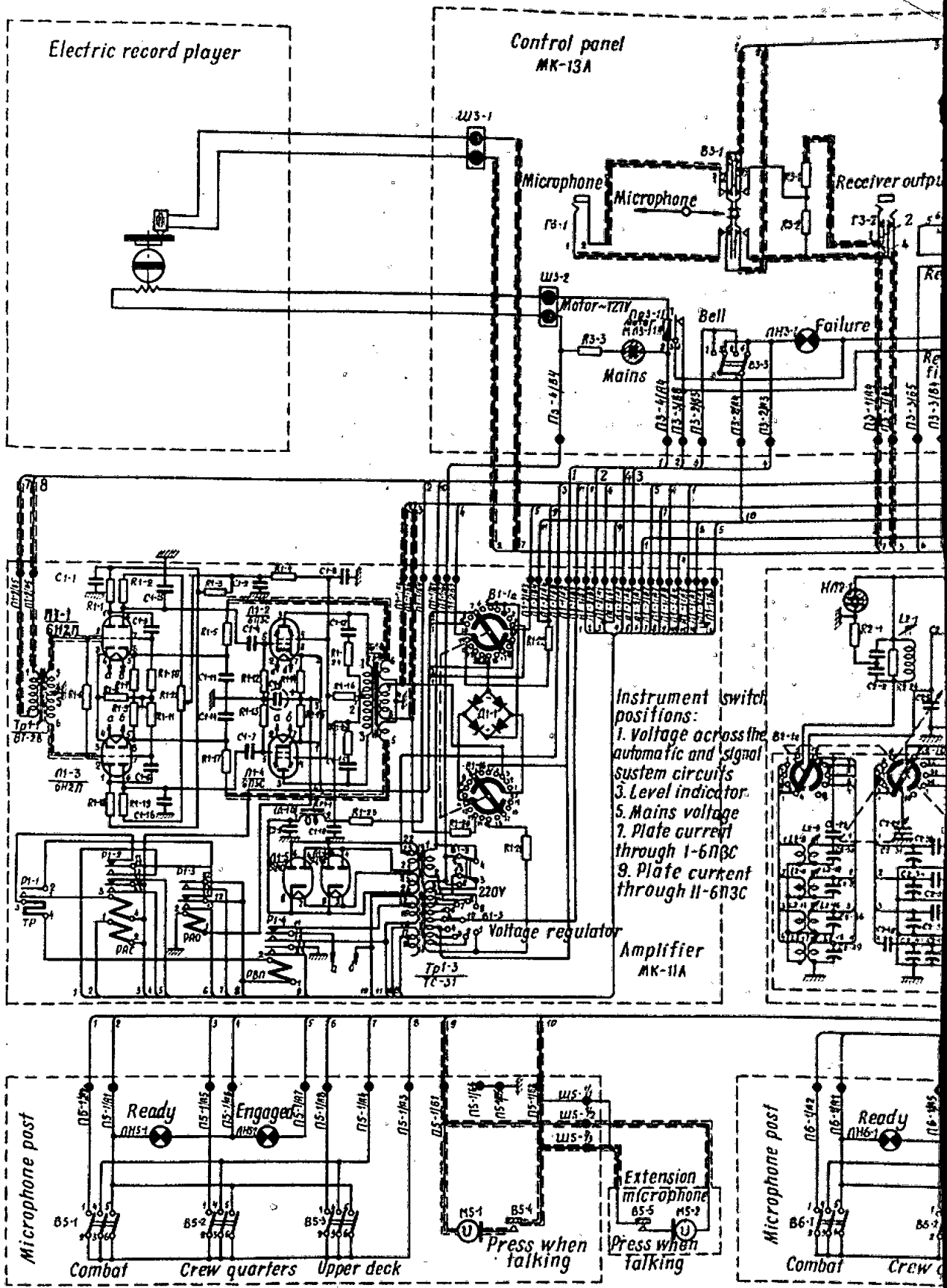


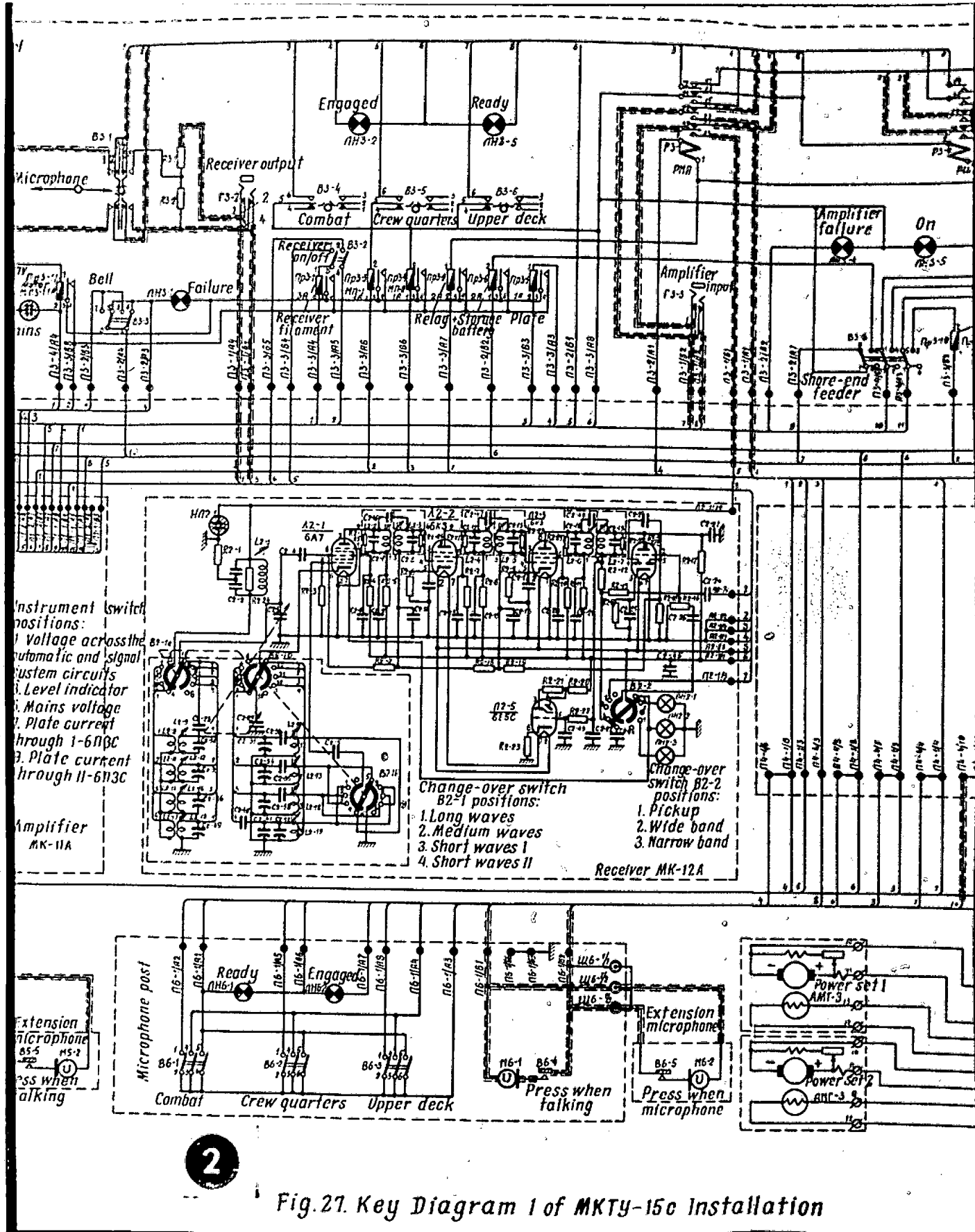
Fig. 26. Key Diagram of MKTY-15c Installation



Notes: In this diagram all relays are de-energized; the switches, knobs and tumbler switches are turned off

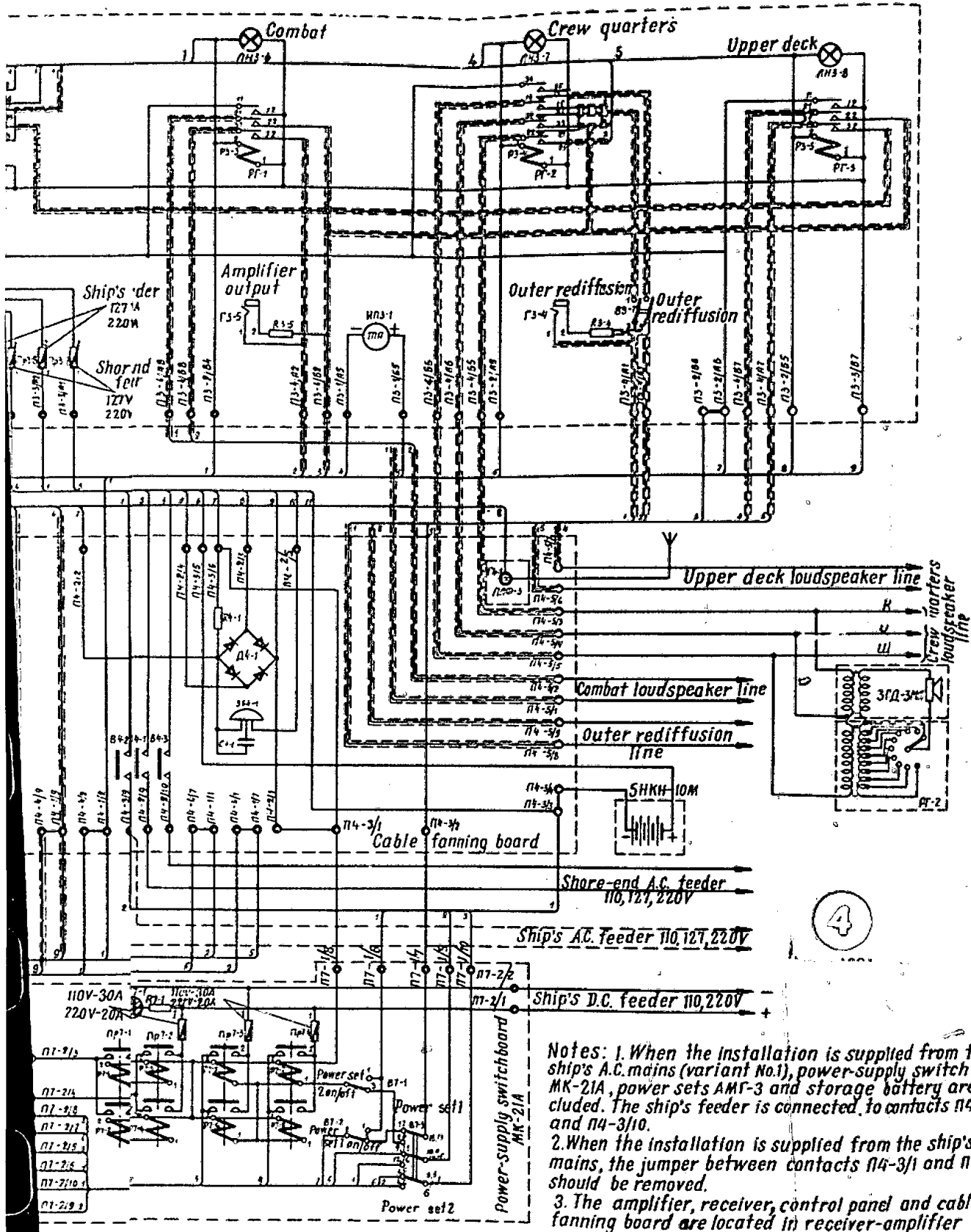


Instrument switch positions:
 1. Voltage across the automatic and signal system circuits
 3. Level indicator
 5. Mains voltage
 7. Plate current through I-6N3C
 9. Plate current through II-6N3C



2

Fig. 27. Key Diagram 1 of MKTY-15c Installation



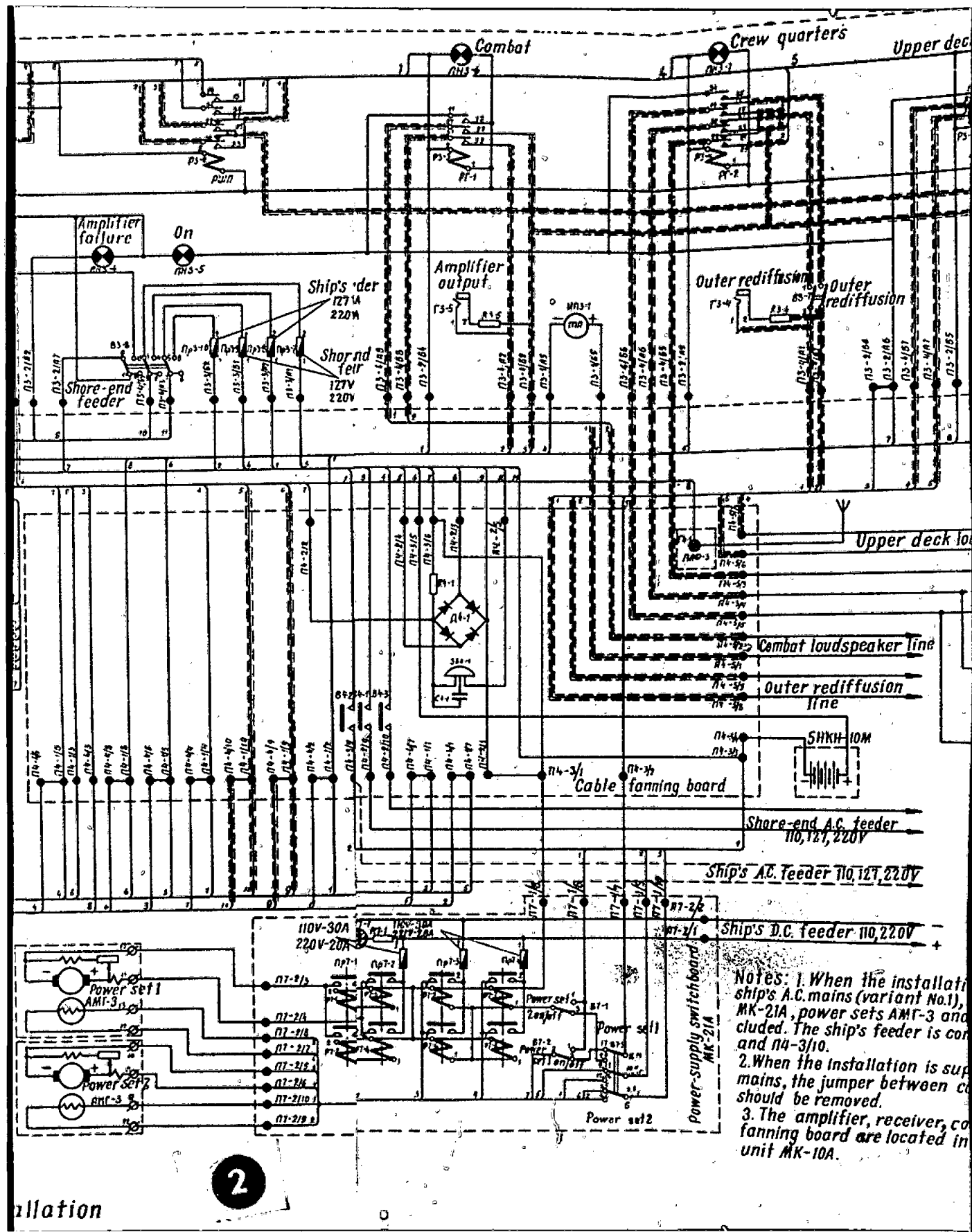
Notes: 1. When the installation is supplied from the ship's A.C. mains (variant No.1), power-supply switchboard MK-21A, power sets AMF-3 and storage battery are excluded. The ship's feeder is connected to contacts N4-3/9 and N4-3/10.
 2. When the installation is supplied from the ship's D.C. mains, the jumper between contacts N4-3/1 and N4-3/6 should be removed.
 3. The amplifier, receiver, control panel and cable fanning board are located in receiver-amplifier unit MK-10A.

LIST OF COMPONENTS

Position symbol	Name and type	Rating	Qty	Note
1	2	3	4	5
<u>Low-frequency amplifier unit MK-11A</u>				
R1-1	Resistor MMT-0.5-0.3-II	300 kilohms	1	
R1-2	Resistor MMT-0.5-51000-II	51 kilohms	1	
R1-3	Resistor MMT-0.5-30000-II	30 kilohms	1	
R1-4	Resistor MMT-0.5-15000-II	15 kilohms	1	
R1-5	Resistor MMT-0.5-5100-II	5.1 kilohms	1	Selected during adjustment
R1-6	Resistor MMT-0.5-0.3-II	300 kilohms	1	
R1-7	Resistor MMT-0.5-3300-II	3.3 kilohms	1	
R1-8	Resistor MMT-0.5-2000-II	2 kilohms	1	
R1-9	Resistor MMT-0.5-3300-II	3.3 kilohms	1	
R1-10	Resistor MMT-0.5-0.51-II	510 kilohms	1	
R1-11	Resistor MMT-0.5-0.51-II	510 kilohms	1	
R1-12	Resistor MMT-0.5-0.1-II	100 kilohms	1	
R1-13	Resistor MMT-0.5-0.1-II	100 kilohms	1	
R1-14	Resistor, wire-wound, 2.02 ohms	2.02 ohms	1	Instrumentally-selected

1	2	3	4	5
R1-15	Resistor, wire-wound, 2.02 ohms	2.02 ohms	1	Instrumentally-selected
R1-16	Resistor MPT-2-16000-I	16 kilohms	1	
R1-17	Resistor MPT-0.5-5100-II	5.1 kilohms	1	Selected during adjustment
R1-18	Resistor MPT-0.5-0.3-II	300 kilohms	1	
R1-19	Resistor MPT-0.5-51000-II	51 kilohms	1	
R1-20	Resistor MPT-0.5-0.47-I	47 kilohms	2	Selected during adjustment
R1-21	Resistor MPT-0.5-22000-I	22 kilohms	1	Selected during adjustment
R1-22	Resistor MPT-0.5-51000-I	51 kilohms	1	Selected during adjustment
R1-23	Resistor H3-15-4500-II	4.5 kilohms	1	
R1-24	Resistor MPT-1-2000-II	2 kilohms	1	
R1-25	Resistor MPT-1-2000-II	2 kilohms	1	
R1-26	Resistor CH-1-2-100A-4J	100 kilohms	1	
C1-1	Capacitor MBFT-1-600-A-2-III	2 uF	1	
C1-2	Capacitor MBFT-1-600-A-2-III	2 uF	1	
C1-3	Capacitor KSF-M ₂ -600-0.01-II	0.01 F	1	
C1-4	Capacitor KSF-M ₂ -600-0.03-II	0.03 F	1	
C1-5	Capacitor KSF-1-B- $\frac{50}{20}$ M	20 F	1	

1	2	3	4	5
C1-6	Capacitor КБГ-М ₂ -600-0.01-II	0.01 μ F	1	
C1-7	Capacitor КБГ-М ₂ -600-0.03-II	0.03 μ F	1	
C1-8	Capacitor МБГП-2-600-A-2-III	2 μ F	1	
C1-9	Capacitor МБГП-2-600-4-III	4 μ F	1	
C1-10	Capacitor МБГП-2-600-4-III	4 μ F	1	
C1-11	Capacitor КСО-5-B-500-2700-II	2700 pF	1	
C1-12	Capacitor КСО-5-A-500-1500-II	1500 pF	1	
C1-13	Capacitor КСО-5-A-500-1500-II	1500 pF	1	
C1-14	Capacitor КСО-5-B-500-2700-II	2700 pF	1	
Л1-1	Valve 6Н2П		1	
Л1-2	Valve 6П3С		1	
Л1-3	Valve 6Н2П		1	
Л1-4	Valve 6П3С		1	
Л1-5	Valve 5Ц4С		1	
Л1-6	Valve 5Ц4С		1	
Тр1-1	Input transformer		1	
Тр1-2	Output transformer		1	
Тр1-3	Power transformer		1	
Др1-1	Choke		1	
В1-1	Change-over switch 2Пх9х2		1	
В1-2	Double-pole tumbler switch ТП1-2		1	



2

1	2	3	4	5
B1-3	Change-over switch 1Nx9		1	
A1-1	Copper-oxide rectifier MKB-5-1		4	
P1-1	Thermorelay		1	
P1-2	Relay PKM		1	
P1-3	Relay PKHY		1	
P1-4	Relay PKHY		1	
C1-15	Capacitor KCO-2-B-500-510-III	510 pF	1	
C1-16	Capacitor KCO-2-B-500-510-III	510 pF	1	
<u>Receiver MK-12A</u>				
R2-1	Resistor MMT-0.5-10000-II	10 kilohms	1	
R2-2	Resistor MMT-0.5-0.3-II	0.3 megohm	1	
R2-3	Resistor MMT-0.5-22000-II	22 kilohms	1	
R2-4	Resistor MMT-1-56000-II	56 kilohms	1	
R2-5	Resistor MMT-0.5-10000-II	10 kilohms	1	
R2-6	Resistor MMT-0.5-300-II	300 ohms	1	
R2-7	Resistor MMT-0.5-0.3-II	0.3 megohm	1	68 - 300 kilohms
R2-8	Resistor MMT-0.5-10000-II	10 kilohms	1	
R2-9	Resistor MMT-0.5-300-II	300 ohms	1	
R2-10	Resistor MMT-0.5-0.3-II	0.3 megohm	1	68 - 300 kilohms
R2-11	Resistor MMT-0.5-10000-II	10 kilohms	1	
R2-12	Resistor MMT-0.5-0.3-II	0.3 megohm	1	

1	2	3	4	5
R2-13	Resistor MMT-0.5-1-II	1 megohm	1	
R2-14	Resistor MMT-0.5-3000-II	2 kilohms	1	
R2-15	Resistor MMT-0.5-1-II	1 megohm	1	
R2-16	Resistor CH-1-2-680-A-60H	0.68 megohm	1	
R2-17	Resistor MMT-0.5-68000-II	68 kilohms	1	
R2-18	Resistor MMT-0.5-0.3-II	0.3 megohm	1	
R2-19	Resistor MMT-0.5-3-II	3 megohms	1	
R2-20	Resistor MMT-0.5-10000-II	10 kilohms	1	
R2-21	Resistor MMT-0.5-1-II	1 megohm	1	
R2-22	Resistor MMT-0.5-3-II	3 megohms	1	
R2-23	Resistor MMT-0.5-1500-II	1.5 kilohms	1	
R2-24	Resistor MMT-0.5-0.1-II	0.1 megohm	1	
R2-25	Resistor VJM-0.12-360-II	0.36 megohm	1	
R2-26	Resistor VJM-0.12-360-II	0.36 megohm	1	
R2-27	Resistor VJM-0.12-360-II	0.36 megohm	1	
R2-28	Resistor VJM-0.12-360-II	0.36 megohm	1	
R2-29	Resistor VJM-0.12-360-II	0.36 megohm	1	
R2-30	Resistor VJM-0.12-360-II	0.36 megohm	1	
C2-1	Capacitor KCO-2-500-A-1000-I	1000 pF	1	
C2-2	Capacitor KCO-2-500-A-1000-I	1000 pF	1	
C2-3	Capacitor, variable	12 - 495 pF	1	
C2-4	Capacitor KCO-2-500-A-470-II	470 pF	1	

1	2	3	4	5
C2-5	Capacitor КТК-1-Д-47-III	47 pF	1	
C2-6	Capacitor КБГ-М ₁ -600-0.03-III	0.03 μF	1	
C2-7	Capacitor КСО-2-500-В-330-I	330 pF	1	
C2-8	Capacitor КСО-2-500-В-330-I	330 pF	1	
C2-9	Capacitor КБГ-М ₁ -300-0.03-III	0.03 μF	1	
C2-10	Capacitor КБГ-М ₁ -600-0.03-III	0.03 μF	1	
C2-11	Capacitor КБГ-М ₁ -600-0.03-III	0.03 μF	1	
C2-12	Capacitor КСО-2-500-В-330-I	330 pF	1	
C2-13	Capacitor КСО-2-500-В-330-I	330 pF	1	
C2-14	Capacitor КБГ-М ₁ -300-0.03-III	0.03 μF	1	
C2-15	Capacitor КБГ-М ₁ -600-0.03-III	0.03 μF	1	
C2-16	Capacitor КБГ-М ₁ -600-0.03-III	0.03 μF	1	
C2-17	Capacitor КБГ-М ₁ -600-0.03-III	0.03 μF	1	
C2-18	Capacitor КСО-2-500-В-330-I	330 pF	1	
C2-19	Capacitor КСО-2-500-В-330-I	330 pF	1	
C2-20	Capacitor КБГ-М ₁ -600-0.03-III	0.03 μF	1	
C2-21	Capacitor КБГ-М ₁ -600-0.03-III	0.03 μF	1	
C2-22	Capacitor КТК-1-Д-100-II	100 pF	1	
C2-23	Capacitor КТК-1-Д-47-III	47 pF	1	
C2-24	Capacitor МБФН-2-200А-4-III	4 μF	1	
C2-25	Capacitor КБГ-М-200-0.02-III	0.02 μF	1	
C2-26	Capacitor КБГ-М-200-0.02-III	0.02 μF	1	
C2-27	Capacitor МБФО-2-400-1-III	1 μF	1	

1	2	3	4	5
C2-28	Capacitor KCO-2-500-A-220-I	220 pF	1	
C2-29	Capacitor, variable	12 - 490 pF	1	
C2-30	Capacitor КПК-1-8/30	8 - 30 pF	1	
C2-31	Capacitor КПК-1-8/30	8 - 30 pF	1	
C2-32	Capacitor KCO-2-500-A-220-I	220 pF	1	
C2-33	Capacitor КПК-1-8/30	8 - 30 pF	1	
C2-34	Capacitor КПК-1-8/30	8 - 30 pF	1	
C2-35	Capacitor KCO-5-500-B-2700-I	2700 pF	1	
C2-36	Capacitor КПК-1-8/30	8 - 30 pF	1	
C2-37	Capacitor КПК-1-8/30	8 - 30 pF	1	
C2-38	Capacitor KCO-2-500-B-470-I	470 pF	1	
C2-39	Capacitor КПК-1-8/30	8 - 30 pF	1	
C2-40	Capacitor KCO-2-B-500-220-I	220 pF	1	
C2-41	Capacitor КПК-1-8/30	8 - 30 pF	1	
C2-42	Capacitor КПК-1-И-39-I	39 pF	1	
C2-43	Capacitor КБФ-Н ₁ -600-0.03-III	0.03 μ F	1	
C2-44	Capacitor KCO-5-A-500-1500-III	1500 pF	1	
C2-45	Capacitor КБГО-2-400-4-III	4 μ F	2	In parallel
C2-46	Capacitor КПК-1-И-6-II	6 pF	1	
C2-47	Capacitor КПК-1-И-6-II	6 pF	1	
C2-48	Capacitor КПК-1-И-6-II	6 pF	1	
L2-1	Rejector filter coil		1	

1	2	3	4	5
L2-2	I.F. filter plate coil I		1	
L2-3	I.F. filter grid coil I		1	
L2-4	I.F. filter plate coil II		1	
L2-5	I.F. filter grid coil II		1	
L2-6	I.F. filter plate coil III		1	
L2-7	I.F. filter grid coil III		1	
L2-8	Coupling coil of short waveband II		1	
L2-9	Input circuit coil of short waveband II		1	
L2-10	Heterodyne circuit coil of short waveband II		1	With tap
L2-11	Coupling coil of short waveband I		1	
L2-12	Input circuit coil of short waveband I		1	
L2-13	Heterodyne coil of short waveband I		1	With tap
L2-14	Coupling coil of medium waveband		1	
L2-15	Input circuit coil of medium waveband		1	
L2-16	Heterodyne coil of medium waveband		1	With tap
L2-17	Coupling coil of long waveband		1	
L2-18	Input circuit coil of long waveband		1	

1	2	3	4	5
I2-19	Heterodyne coil of long waveband		1	With tap
I2-1	Valve 6A7		1	
I2-2	Valve 6K3		1	
I2-3	Valve 6K3		1	
I2-4	Valve 6F2		1	
I2-5	Valve 6E5C		1	
HJ2-1	Neon lamp MH-3		1	
JH2-1	Midget incandescent lamp MH-14	6.3 V, 0.28 A	1	
JH2-2	Midget incandescent lamp MH-14	6.3 V, 0.28 A	1	
JH2-3	Midget incandescent lamp MH-14	6.3 V, 0.28 A	1	
B2-1	Band switch		1	
B2-2	Tone switch		1	
	Universal electric record player		1	
	YH-1			
	<u>Control panel MK-13A</u>			
R3-1	Resistor MMT-0.5-510-II	510 ohms	1	
R3-2	Resistor MMT-0.5-100-II	100 ohms	1	
R3-3	Resistor MMT-1-130000-ID	180 kilohms	1	
R3-4	Resistor MMT-0.5-22000-II	22 kilohms	1	
R3-5	Resistor MMT-0.5-22000-II	22 kilohms	1	
HJ3-1	Neon lamp MH-3		1	
JH3-1	Lamp CH-14	26 V, 5 W	1	
JH3-2	Switchboard lamp KH-3	24 V, 0.105 A	1	

1	2	3	4	5
ИИЗ-3	Switchboard lamp KI-3	24 V, 0.105 A	1	
ИИЗ-4	Switchboard lamp KM-3	24 V, 0.105 A	1	
ИИЗ-5	Lamp CL-14	26 V, 5 W	1	
ИИЗ-6	Switchboard lamp KM-3	24 V, 0.105 A	1	
ИИЗ-7	Switchboard lamp KM-3	24 V, 0.105 A	1	
ИИЗ-8	Switchboard lamp KI-3	24 V, 0.105 A	1	
B3-1	Switch KTPO V 3-3		1	
B3-2	Tumbler switch TH-1-2		1	
B3-3	Tumbler switch TH-1-2		1	
B3-4	Switch KTPO V 3-3		1	
B3-5	Switch KTPO V 3-3		1	
B3-6	Switch KTPO V 3-3		1	
B3-7	Tumbler switch TH-1-2		1	
B3-8	Cam switch K-33		1	
ИИЗ-1	Instrument of M358 type	1 mA	1	
P3-1	Relay PKM		1	Alter according to drawing ИИ4.500.000
P3-2	Relay PKM		1	Alter according to drawing ИИ4.500.000
P3-3	Relay RKI		1	

1	2	3	4	5
P3-4	Relay PKM		1	Alter according to drawing ИД4.500,000
P3-5	Relay PKM		1	
Пр3-1	Signal fuse	3 A	1	
Пр3-2	Signal fuse	2 A	1	
Пр3-3	Signal fuse	1 A	1	
Пр3-4	Signal fuse	1 A	1	
Пр3-5	Signal fuse	1 A	1	
Пр3-6	Signal fuse	2 A	1	
Пр3-7	Tube fuse ПН-45	3 A (5 A)	1	110 V, 127 V-5 A 220 V -3 A
Пр3-8	Tube fuse ПН-45	3 A (5 A)	1	110 V, 127 V-5 A 220 V -3 A
Пр3-9	Tube fuse ПН-45	3 A (5 A)	1	110 V, 127 V-5 A 220 V -3 A
Пр3-10	Tube fuse ПН-45	3 A (5 A)	1	110 V, 127 V - 5 A 220 V -3 A
Пр3-11	Signal fuse	1 A	1	
Г3-1	Two-spring socket		1	
Г3-2	Socket ПМТ I-2-2		1	
Г3-3	Socket ПМТ I-2-2		1	
Г3-4	Two-spring socket		1	

1	2	3	4	5
Г3-5	Two-spring socket		1	
R4-1	Resistor ПЗ-15-100-II	100 ohms	1	
C4-1	Capacitor КБП-II ₂ -500-0.03-II	0.03 μ F	1	
B4-1	Interlock		1	
B4-2	Interlock		1	
B4-3	Interlock		1	
B4-4	Interlock		1	
Л4-1	Selenium stack BC-47		1	
ЗВ.4-1	Direct current bell, 24 V		1	
	<u>Microphone post MH-1 (MK-17A)</u>			
МН5-1	Switchboard lamp KM-3	24 V, 0.105 A	1	
МН5-2	Switchboard lamp KM-3	24 V, 0.105 A	1	
B5-1	Cam switch K-22		1	
B5-2	Cam switch K-22		1	
B5-3	Cam switch K-22		1	
B5-4	Microphone foot switch (right-hand)		1	
B5-5	Foot switch		1	
М5-1	Microphone inset МЭМ-4И		1	
М5-2	Extension microphone MH-5		1	

1	2	3	4	5
	<u>Microphone post III-2 (IK-17A)</u>			
JH6-1	Switchboard lamp KM-3	24 V, 0.105 A	1	
JH6-2	Switchboard lamp KM-3	24 V, 0.105 A	1	
B6-1	Cam switch K-22		1	
B6-2	Cam switch K-22		1	
B6-3	Cam switch K-22		1	
B6-4	Microphone foot switch (right-hand)		1	
B6-5	Foot switch		1	
M6-1	Microphone inset ДЭМ-4М		1	
M6-2	Extension microphone MH-E		1	
	<u>Power-supply switchboard MK-21A</u>			
R7-1	Resistor RHT-1-0.18-II	0.18 megohm	1	
UH-7	Neon lamp MH-3		1	
B7-1	Tumbler switch III-45		1	
B7-2	Tumbler switch III-45		1	
B7-3	Cam switch K-52		1	
P7-1	Relay PKC with contact group for 20 A		1	
P7-2	Relay PKC with contact group for 20 A		1	
P7-3	Relay PKC with contact group for 20 A		1	

1	2	3	4	5
P7-4	Relay PKC with contact group for 20 A		1	
P7-5	Relay PKC with contact group for 20 A		1	
P7-6	Relay PKC with contact group for 20 A		1	
P7-7	Relay PKC with contact group for 20 A		1	
P7-8	Relay PKC with contact group for 20 A		1	
Пp7-1	Fuse HB20-30 A		1	For ship's
Пp7-2	Fuse HB20-30 A		1	mains=110V--30A
Пp7-3	Fuse HB20-30 A		1	=220V--20A
Пp7-4	Fuse HB20-30 A		1	

C-O-N-F-I-D-E-N-T-I-A-L
NO FOREIGN DISSEM



50X1



C-O-N-F-I-D-E-N-T-I-A-L

GROUP 1
Excluded from automatic