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TELEVISION MODULE

TM-1104-3

Operating Manual

T33.623.912-03P3

Invent N of orig.	
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Signature and Data	

CONTENTS

1 Description and Operation	6
1.1 Description and Operation of Device	6
1.1.1 Application	6
1.1.2 Main Technical Parameters	7
1.1.3 Device Contents	7
1.1.4 Device Structure and Operation	8
1.1.4.1 Video Signal Generation, Processing and Displaying System	8
1.1.4.2 Genlocking system	9
1.1.4.3 Control System	10
1.1.4.4 Automated Checkout System	15
1.1.4.5 Chronometrical Information Input System	21
1.1.4.6 Power Supply System	21
1.1.4.7 Auxiliary Communication System	23
1.1.4.8 Device Design	24
1.1.4.9 Measurement Instrumentation, Tools and Accessories	25
1.1.4.10 Marking	25
1.2 Description and Operation of Device Component Parts	25
1.2.1 BC-2 Television Monitor	25
2 Operation	29
2.1 Operating Conditions and Safety Rules	29
2.2 Device preparation for Operation	29
2.2.1 Safety Precautions during Installations	29
2.2.2 External Examination of Device	30
2.2.3 Initial Position of Controls before Use of Device	30
2.2.4 Interconnection with other Devices	30
2.2.5 Switching-On and Testing of Device	30
2.3 Usage of Device	31
2.3.1 Personnel Operation during Intended Use of Device	31
2.3.2 Checking Operability of Device	31
2.3.3 Possible Troubles and Remedies thereof	32
2.3.4 Switching the Device off	34

2.3.5 Safety Precautions during Usage of Device	34
2.4 Measures under Emergency Conditions	34
3 Maintenance	35
3.1 Servicing of Device	35
3.1.1 General Guidelines	35
3.1.2 Safety Measures	35
3.1.3 Maintenance Execution Order	35
3.1.4 Replacement of Modules in Device	36
3.1.5 Device Operability Check-Up	38
Appendix A List of Abbreviations and Special Terms Used in this Manual	49
Appendix B Figure B1 General View of TM-1104-3 Television Module	41

TЭ3.623.912-03PЭ				
Rev.	P.	Dokument N	Signature	Data
Television Module TM-1104-3			Liff	P.
Operating Manual			3/H	Pages 41

P.	TЭ3.623.912-03PЭ			
4	Rev.	P.	Dokument N	Signature

1.1.2 Main Technical Parameters

The device has the following main technical parameters:

- number of video signal inputs - 21;
- number of video signal outputs - 4;
- swing of input and output video signals - $(1 \pm 0,3) V$;
- load resistance in video signal circuit - $(75 \pm 5\%) \Omega$;
- video channel bandwidth, at least 7,3 MHz;
- scanning - interlaced, 625 lines, 25 frames a second;
- number of RCLI channels for data exchange with the TM1215-4 control module and TM-1213 terminal module - 4;
- number of RCLI channels for data exchange with the TM-1304 combine modules - 6;
- lock mode - autonomous;
- number of DGP output signals - 6;
- two independent channels for receiving chronometrical information from device "ГНОМ-2МЭ";
- supply voltage - three-phase, from 180 to 231 V;
- feeding voltage frequency - $(50 \pm 1) Hz$;
- power consumption - no more than 500 VA, including total power consumption of external load not exceeding 350 VA;
- continuous operation time - 5000 h;
- overall dimensions – no more than 1722 x 360 x 629 mm;
- weight, maximum - 125 kg.

1.1.3 Device Contents

The device includes the parts shown in Table 1.

Table 1

Designation	Code	Part Name	Qty.
TЭ2.045.544	BC-2	Television monitor	1
TЭ2.067.408	ФСП-3В	Interference rejection filter	6
TЭ2.072.492	ЭМ-1211	Diagnostics module	1
TЭ2.201.769	ЭМ-1213	Power supply unit	3
TЭ2.242.434-01	ЭМ-1204-1	Videoswitch module	1
TЭ2.242.435-01	ЭМ-1205-1	Videoswitch module	1
TЭ2.275.261	ЭМ-1242	Interface unit	1

TЭ3.623.912-03PЭ

P.
7

Rev. P. Dokument N Signature Data

Table 1 (continued)

Designation	Code	Part Name	Qty.
TЭ3.057.439-01	ЭМ-1209-1	Controller	1
TЭ3.679.117-01	ЭМ-1212-1	Control module	1
TЭ5.883.022		Assembly unit	1

1.1.4 Device Structure and Operation

Modules and units of the device form several functional systems, that are parts of the corresponding systems of the TV-complex. This functional systems are listed below:

- system providing generation, processing and displaying of video signals;
- genlocking system;
- control system;
- automated checkout system;
- chronometrical information input system;
- power supply system;
- auxiliary communication system.

Most modules included by the device contain units that are parts of different systems.

The description of the device and operation thereof refers to elements in the TM-1104-3 TЭ3.623.912-03PЭ TV-module electric connection diagram and the TЭ1.133.110-02PЭ TV-complex general electric diagram.

1.1.4.1 Video Signal Generation, Processing and Displaying System

The system of video signal generation, processing and displaying provides:

- "mirror" rotation of the image arriving from the KT-257 TV-camera;
- multiplexing of 21 input video signals to five outputs;
- generation of a video signal for displaying information on the TV-complex state on the BC-2 TVM;
- displaying of video information from the TVDs of the TV-complex on the screen of the BC-2 TVM.

The device contains three main modules of the video signal generation, processing and displaying system:

- videoswitch module, ЭМ-1204-1 (A31);
- videoswitch module, ЭМ-1205-1 (A32);
- BC-2 television monitor (A11);
- ЭМ-1211 diagnostics module (A21) that generates the video signal containing data on the TV-complex state.

The ЭМ-1205-1 videoswitch module converts the inverse image from the KT-257 TV-camera (created by the lens of pull-out optical device "Сигнал-3") to an erect image. The ЭМ-1205-1 videoswitch module provides several modes of image rotation: by line, by frame and by both at the same time. The rotation mode is set by parallel binary code that is used for remote control. The code comes from the ЭМ-1204-1 videoswitch module.

P.
8

TЭ3.623.912-03PЭ

Rev. P. Dokument N Signature Data

The video signal from the KT-257 TV-camera comes to connector X1 of the device and then – to the input of the ЭМ-1205-1 videoswitch module. The ЭМ-1205-1 videoswitch module contains a DAC, an ADC and a PLIC. The ADC performs conversion of the analog video signal into a digital one. Then, the PLIC provides writing of the data into the internal RAM and reading the content of the RAM in an inverse order thereby performing the image rotation required. The rotation process is initiated on a remote control command. From the output of the PLIC the digital data come to the DAC that does the conversion into an analog output video signal.

The ЭМ-1204-1 videoswitch module performs multiplexing of 21 input video signals to five outputs in accordance with remote control commands that come from the ЭМ-1209-1 controller via RCLI lines.

The ЭМ-1204-1 videoswitch module contains an analog matrix multiplexer providing commutation of 24 input signals to 6 outputs. The device employs only 21 inputs and five outputs. The matrix multiplexer is driven by a built-in microcontroller (MC) receiving commands from the ЭМ-1209-1 controller.

The video signal from the output of the ЭМ-1205-1 videoswitch module comes to input 1 of the ЭМ-1204-1 videoswitch module. The signals from the TVDs of the TV-complex are connected to inputs 2 to 20. "Video Input 21" of the ЭМ-1204-1 videoswitch module is reserved and not used in the TV-complex. The output video signals of the ЭМ-1204-1 videoswitch module are assigned as follows:

"Video Output 1" via connector X22 of the device comes to TVM BC-2-1 No.1 of the TV-complex (first CP of TV-complex);

"Video Output 2" via connector X23 of the device comes to TVM BC-2-1 No.2 of the TV-complex (second CP of TV-complex);

"Video Output 3" via connector X24 of the device comes to the BC-1-1 No.1 of the TV-complex (third CP of the TV-complex);

"Video Output 4" comes to connector X25 of the device and is not used in the TV-complex;

"Video Output 5" comes to the video input of the ЭМ-1211 diagnostics module and then - to the BC-2 TVM.

The ЭМ-1211 diagnostics module performs switching between video signals for the BC-2 TVM coming from the ЭМ-1204-1 videoswitch module and a diagnostics signal that is generated by the ЭМ-1211 diagnostics module by itself.

Commutation of video signals is done by pressing the buttons on the front panel of the ЭМ-1211 diagnostics module. By pressing button SELECT the video signal from the ЭМ-1204-1 videoswitch module (from the TVD chosen on the ЭМ-1212-1 control module) is connected to the BC-2 TVM. Pressing button ENTER provides connection of the video signal formed in the ЭМ-1211 diagnostics module, containing data on the TV-complex state, to the screen of the BC-2 TVM.

1.1.4.2 Genlocking System

The genlocking system provides centralized synchronization of all the TVDs of the complex by forming DGP signals on the six output connectors of the device. The DGP signal constitutes a pulse sequence with a swing of 3 V, frequency of 15625 Hz and duration of 5 μS. Every 625-th pulse has a duration of 12 μS. The centralized synchronization reduces the mutual interference level and simplifies video signal processing.

The main unit of the genlocking system is the EM-1209-1 controller. The PLIC of the unit forms the DGP signal basing on clock pulses of a quartz oscillator and supplies it to the six DGP outputs via a buffer amplifier. This signals are fed to connectors X26-X31 of the device and finally arrive to the TM-1304 combined modules. One DGP output (connector X31) is reserved and not used in the TV complex.

1.1.4.3 Control System

The functional control system (CS) is formed by the ЭМ-1209-1 controller (A33) along with microcontrollers and microprocessors of the main device modules interconnected via RCLI lines. The ЭМ-1209-1 controller constitutes a dedicated computer performing the main control functions of the TV complex. The microcontrollers and microprocessors that are parts of the ЭМ-1204-1 videoswitch module (A31), ЭМ-1211 diagnostics module (A21), ЭМ-1212-1 control module (A22), and ЭМ-1242 interface unit (A23) perform local control functions.

The control system provides:

- communication with the TM-1215-4 control modules and the TM-1230 control module of the TV complex CPs to receive control instructions from the module buttons;
- input of control instructions from the ЭМ-1212-1 control module, that is a part of the device, during the TV complex operation check.
- processing of control instructions and output of instructions to the execution units of the device and other modules of the TV complex to provide power supply and control of the TVDs, correction and commutation of video signals, centralized genlocking and video recording.
- receiving and analysis of replies of execution units and indication of instruction fulfillment results;
- preparation and output of data about the state of the TV-complex to the automatic checkout system (ACS).

The ЭМ-1209-1 controller is the main control element of both the device control system and the whole TV complex. The working software of the controller is written to ROM and provides control of the TV complex via serial duplex communication channels. The ЭМ-1209-1 controller incorporates a power supply supervisor and a watchdog timer, controlling the working program execution and automatically resetting the system in case of a fault. The ЭМ-1209-1 controller provides 14 serial duplex interface channels (RCLI) and an RS-232 channel. The working program can be reset by pressing the RESTART button, mounted on the front panel of the controller. The ЭМ-1209-1 controller is installed on the third floor of the device in the rightmost row (see Appendix B, pos.13). To the left of that the two ЭМ-1209-1 controllers of the BSP are installed.

The modules that are parts of the device as well as other modules included by the TV-complex are controlled via RCLI channels.

The RCLI channels have the following parameters:

- loop-type channel, duplex, four-wire, two wires are used for output datastreams (data transmission lines) and two wires are used for input datastreams (data reception lines);
- data transmission and reception circuits are galvanically decoupled;
- baud rate - 19200;
- number of data bits - 8;
- number of stop bits – 1;
- LSB is transferred first;
- pause, stop bit and logic one are transferred as current from 0 to 1 mA;
- start bit and logic 0 are transferred as current from 15 to 25 mA;

Invent N of orig.	Signature and Data
Subst. of invent N	Signature and Data
Invent N of doubl	Signature and Data

Rev.	P.	Dokument N	Signature	Data	TЭ3.623.912-03PЭ	P.
						9

P.	TЭ3.623.912-03PЭ				
10		Rev.	P.	Dokument N	Signature

- receiver operation threshold is from 5 to 8 mA.

Data in the RCLI channels is transmitted as byte arrays. Data arrays are transferred with a frequency from 10 to 25 Hz. The pause between arrays is no less than 1 ms. Pause between neighboring bytes within an array is no more than 100 μS. Every array ends with a check sum. Data exchange in RCLI channels is started by the ЭМ-1209-1 controller by transmission of the corresponding command instruction arrays. On reception of the command instruction array all the units and modules of the TV-complex start transmission of reply arrays.

Data exchange between the ЭМ-1209-1 controller and the TM-1304 No.1 - TM-1304 No.5. combined modules is performed via channels " RCLI 1" – " RCLI 5". During this exchange the datastream passes through assembly modules, TM-1308 No.1- TM-1308 No.3.

Every command array consists of nine bytes and contains the following data: command to switch on the power supplies of four TVDs, video signal correction factors for four TVDs, type of synchronizing pulses and delay of those for synchronization of four TVDs, instructions for control of TVD modes. The reply arrays contain data on functioning of the modules that are parts of the TM-1304 combined modules, supply voltage presence on four TVDs, presence of video signals from four TVDs, diagnostic information from four TVDs.

Data exchange between the ЭМ-1209-1 controller and the TM-1213 terminal module is performed via channel " RCLI 7". During this exchange the datastream passes through connector X38 of the device and the TM-1308 No.4 assembly module.

The command array contains commands to light up the LEDs of the TM-1215-4 No.1 and the TM-1230 control modules, commands for control of the ДЕ-118-1 VRD, data for mixing into the video signal before video recording (abbreviated name of TVD, date and time). The reply array contains the codes of the buttons pressed on the control modules, TM-1215-4 N 1 and TM-1230, and also information about the state of the ДЕ-118-1 VRD.

Data exchange between the ЭМ-1209-1 controller and the TM-1215-4 No.2 control module is performed via channel " RCLI 8". During this exchange the datastream passes through connector X38 of the device, the TM-1308 No.4 assembly module and the TM-1201 No.1 terminal module. The command array contains commands to light up the LEDs of the TM-1215-4 No.2 control module. The reply array contains the codes of the buttons pressed.

Data exchange between the ЭМ-1209-1 controller and the TM-1215-4 No.3 control module is performed via channel " RCLI 9". During this exchange the datastream passes through connector X39 of the device, the TM-1308 No.5 assembly module and the TM-1201 No.2 terminal module. The command array contains commands to light up the LEDs of the TM-1215-4 No.3 control module. The reply array contains the codes of the buttons pressed.

The ЭМ-1209-1 controller transmits data to the ЭМ-1211 diagnostics module via channel " RCLI 11". The data array contains information on data transfers between the ЭМ-1209-1 controller and all the peripheral modules, information on the state and control of all the TVDs and VRDs.

Channel " RCLI 12" is used for data exchange between the ЭМ-1209-1 controller and the ЭМ-1212-1 control module. The command array contains instructions for controlling the LEDs of the ЭМ-1212-1 control module. The reply array contains the codes of the buttons pressed.

Channel " RCLI 13" is used for data exchange between the ЭМ-1209-1 controller and the ЭМ-1242 interface module. The command array contains a request for transferring chronometrical information from the first or the second channel of the ЭМ-1242 interface module. The reply array contains chronometrical information from the requested exchange channel of the ЭМ-1242 interface module.

Channel " RCLI 14" is used for data exchange between the ЭМ-1209-1 controller and the ЭМ-1204-1 videoswitch module. The command array contains instructions for commutation of the input video signals to the six outputs. The reply array contains information on the instruction execution.

Channels " RCLI 6" and " RCLI 10" are brought out to connectors X37 and X39 of the device. They are reserved and not used in the TV-complex.

The RS-232 channel is brought out on connector X43 of the device. This channel is used for setup and debugging of the TV-complex.

The ЭМ-1209-1 executes the program stored in its non-volatile memory. This program periodically, with a frequency of 10 to 25 Hz, carries out the following actions:

- communication with the TM-1215-4 control modules, TM-1230 control module and ЭМ-1212-1 control module via the RCLI channels;

- handling of commands coming from the TM-1215-4 control modules, TM-1230 control module and ЭМ-1212-1 control module when their buttons are pressed;

- forming of control instructions for all the modules connected to the ЭМ-1209-1 via the RCLI channels.

- transferring of instructions via the RCLI channels and interrogation of the ЭМ-1204-1 video signal commutation module, ЭМ-1242 interface module, ЭМ-1202 control and synchronization modules in the TM-1304 combined modules, ЭМ-1241 control modules in the TM-1220-1 optical TV-units and the KT-257 TV camera;

- forms and transfers the diagnostic data to the ЭМ-1211 diagnostics module.

The ЭМ-1212-1 control module (Fig.1) provides manual command input for the ЭМ-1209-1 controller with the buttons mounted on the front panel and LED indication of execution of the following commands:

- switching on and off of any of the 20 TVDs of the TV-complex with buttons GROUP1- GROUP5, CHANNEL1-CHANNEL4, OFF.

- enabling the night mode of the KT-257 TV-camera with button NIGHT MODE;

- control of the selected TM-1220-1 optical TV-module with button TEST ON.

- indication of location of faulty TVDs under servicing or servicing completion with buttons TVD TO CHECK and TVD FROM CHECK.

- testing LEDs and buttons of the ЭМ-1212-1 control module with button TEST of the ЭМ-1212-1.

Invent N of orig.	Signature and Data
Subst. of invent N	Signature and Data
Invent N of doubl	Signature and Data

Rev.	P.	Dokument N	Signature	Data	TЭ3.623.912-03PЭ	P.
						11

Rev.	P.	Dokument N	Signature	Data	TЭ3.623.912-03PЭ	P.
12						

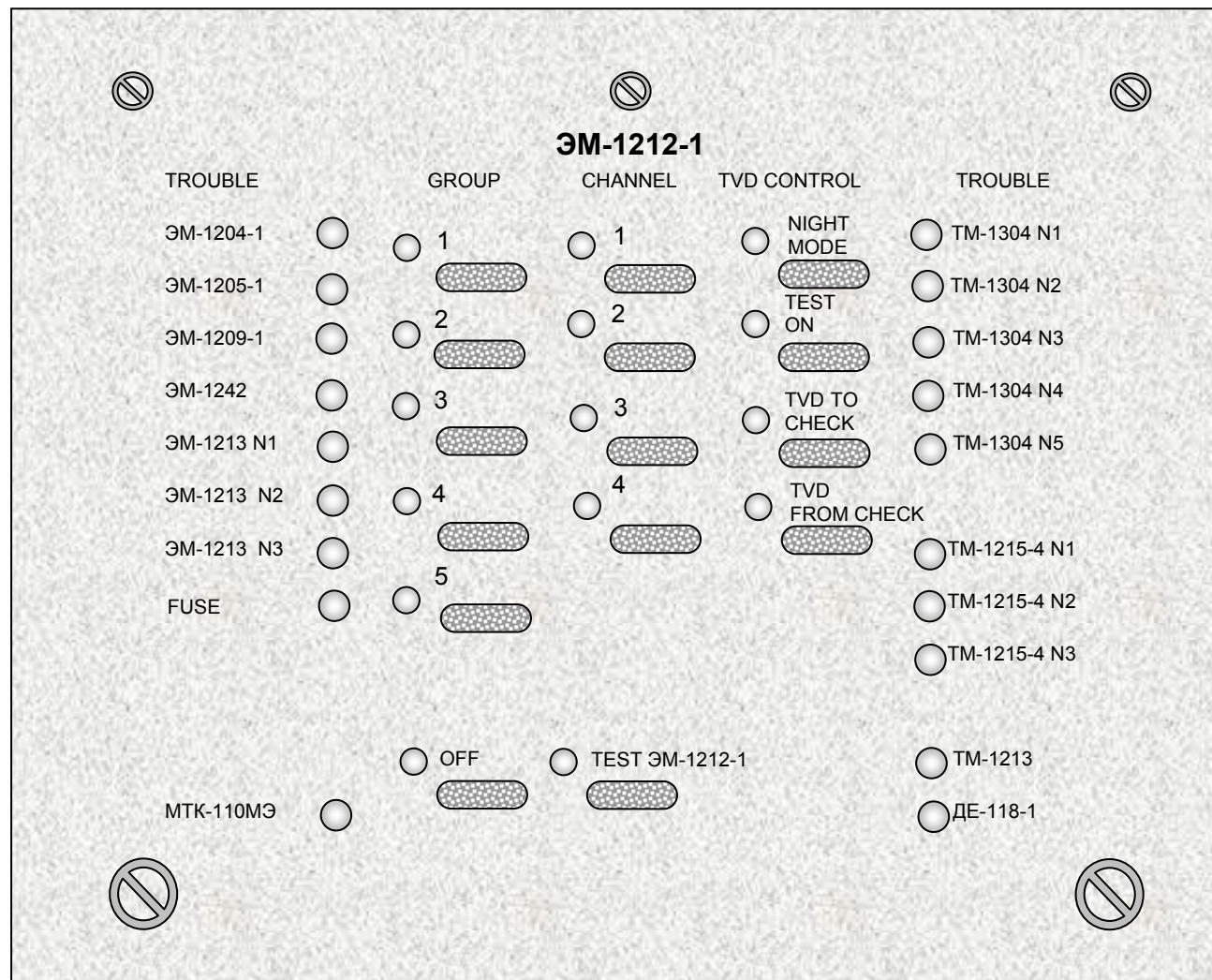


Fig. 1 – Front panel of the ЭМ-1212-1 control module.

Functioning of the ЭМ-1212-1 control module as a part of the control system is provided by microcontroller CS, PLIC, interface and buttons with LEDs. The microcontroller (MC) together with the PLIC inquires the buttons. On request from the ЭМ-1209-1 controller the MC forms a reply array with the codes of the buttons pressed and transfers it via the RCLI channel to the ЭМ-1209-1 controller.

The MC of CS receives from the ЭМ-1209-1 controller a command array with instructions for lighting up the LEDs and switches on the corresponding LEDs by means of the PLIC. The working program of the ЭМ-1209-1 controller analyses the button state and decides whether to light up the LEDs.

Correspondence between group numbers, channel numbers, TVD installation places and the designation on the TM-1215-4 control module is shown in Table 2.

The ЭМ-1211 diagnostics module has a microprocessor and an interface receiving arrays with data on the CS state from the ЭМ-1209-1 controller and provide visualization of the data in video frames of the ACS.

The ЭМ-1204-1 videoswitch module contains a MC and an interface that receive instructions from the ЭМ-1209-1 controller for commutation of video signals and control their execution.

Table 2

Group-channel	Place of TVD installation	Video signal source	Designation on TM-1215-4
1-1	Device "Сигнал-3"	KT-257	PERISCOPE
1-2	Fore end, – 6 frame	TM-1220-1	FE –6FR
1-3	1 room, 1 deck, starboard side	HeoToH-08-2	1R 1D STB
1-4	1 room, 2 deck	HeoToH-08-1	1R 2D
2-1	1 room, 1 deck, port side	HeoToH-08-1	1R 1D PS
2-2	Superstructure, 20 frame	TM-1220-1	SUPRSTR 20FR
2-3	3 room, 1 deck	HeoToH-08-2	3R 1D
2-4	3 room, 3 deck	HeoToH-08	3R 3D
3-1	4 room, 1 deck	HeoToH-08-2	4R 1D
3-2	BF, winch automated communication system	TM-1220-1	WINCH ACS
3-3	4 room, 2 deck, starboard	HeoToH-08-1	4R 2D STB
3-4	4 room, 2 deck, port side	HeoToH-08-1	4R 2D PS
4-1	5 room, port side	HeoToH-08-2	5R PS
4-2	5 room, starboard	HeoToH-08-2	5R STB
4-3	Pod, winch sonar system	TM-1220-1	WINCH SS
4-4	4 room, 2 deck, PCS	HeoToH-08	4R 2D PCS
5-1	6 room, 1 deck, aft	HeoToH-08-1	6R 1D A
5-2	6 room, 1 deck, fore	HeoToH-08-1	6R 1D F
5-3	Tiller compartment	HeoToH-08	TC
5-4	Pod, 108 frame	TM-1220-1	POD 108FR

The ЭМ-1242 interface unit contains a MC and a PLIC that form an array with chronometrical data on request from the ЭМ-1209-1 controller.

The ЭМ-1209-1 controller working program provides various priorities for the ЭМ-1212-1 and TM-1215-4 control modules as per enabling and control of the TVDs. The ЭМ-1212-1 control module has the highest control priority. The second comes the TM-1215-4 No.1 control module, then - the TM-1215-4 No.2 control module and TM-1215-4 No.3 control module.

The ЭМ-1209-1 prohibits accidental enabling the night channel of the KT-257 TV-camera in the day time. On the first press on button PERISCOPE NIGHT on any of the TM-1215-4 control modules, the ЭМ-1209-1 controller will switch on the day channel of the

Signature and Data					
Invent N of doubl					
Subst. of invent N					
Signature and Data					
Invent N of orig.					
Rev.	P.	Dokument N	Signature	Data	P.
					13

ТЭ3.623.912-03РЭ

P.					
14					
Rev.	P.	Dokument N	Signature	Data	

ТЭ3.623.912-03РЭ

The ADC of the ЭМ-1211 diagnostics module samples the d.c. voltages from the three ЭМ-1213 power supply units, outputs of fuses F1-F16, power supply units built into the device modules and control voltages +27V from connectors X38 and X39. The ЭМ-1211 diagnostics module measures these voltages and finds faulty modules that fall out of the corresponding tolerances.

Via a RCLI channel the diagnostics module receives data from the ЭМ-1209-1 controller on the state of the TV-complex units and modules. This information is prepared during data exchanges via the RCLI channels and contains data on the presence of feeding voltages and video signals, character of data exchanges between different modules of the TV-complex, state of the TVDs, VRDs and the TM-1215-4 control modules. The ЭМ-1211 diagnostics module transfers data for light indication of faulty units and modules to the ЭМ-1212-1 control module via a separate RCLI channel.

The ЭМ-1212-1 control module forms three video frames of the ACS for indication of the TV-complex state on the screen of the BC-2 TVM.

The ACS frame No.1, "STATE OF MTK-110MЭ" (Fig.3), is formed on pressing button ENTER. In this frame enabled modules and units are shown as their codes against a light background, disabled – as theirs codes against a dark background and faulty ones – as their codes against a blinking background.

The states of the main modules and fuses F1-F16 of the device are shown in the upper part of the frame. The state of the TM-1215-4 No. 1- TM-1215-4 No.3 control modules is shown below. The TM-1215-4 No.1 interacts with the TM-1213 terminal modules having the ЭМ-1240 interface unit therein and the ДЕ-118-1 VRD. This devices are grouped together in the frame. Near the ДЕ-118-1 VRD its state is shown. The following states of the VRD are shown: "STOP", "OFF", "RECORD", "PLAY", "PAUSE", "REWIND <<", "FAST FORWARD >>", "NO VIDEO CASSETTE", "VRD TROUBLE", "NO CONTROL".

The five columns of the units related to the TM-1304 No.1 - TM-1304 No.5 combined modules are shown below. There are the states of the ЭМ-1202 control and synchronization modules, ЭМ-1203 video amplifier modules, БПИ-183-a power supply units incorporated by the TM-1304 combined modules shown together with the states of the four TVDs connected to each TM-1304 module depending on their location. In the lower area of the frame are shown the data and time that are received by the ЭМ-1242 interface unit from device "Гном-2МЭ". In case of signal absence in any of the channels for exchange with device "Гном-2МЭ" dashes are displayed instead of date and time.

The number of the ACS frame No.2 is shown in the right lower corner.

The ACS frame No.2, "STATE OF MTK-110MЭ TVDs" is shown in Fig.4.

The left column, "N", shows the numbers (group-channel) of the TVDs. The group number is the number of the TM-1304 combined module. The channel number corresponds to the TVD connected to this TM-1304 combined module.

The "NAME" column contains the location of the TVD.

The "CODE" column contains the code of the TVD.

STATE OF MTK-110MЭ																			
TM-1104-3																			
ЭМ-1212-1				ЭМ-1242				ЭМ-1204-1				ЭМ-1205-1				ЭМ-1209-1			
F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	F15	F16				
ЭМ-1213 N1				ЭМ-1213 N2				ЭМ-1213 N3				ЭМ-1211							
TM-1215-4 N1				TM-1215-4 N2				TM-1215-4 N3											
TM-1213																			
ЭМ-1240																			
ДЕ-118-1=> NO VIDEO CASSETTE																			
TM-1304 N1				TM-1304 N2				TM-1304 N3				TM-1304 N4				TM-1304 N5			
ЭМ-1202				ЭМ-1202				ЭМ-1202				ЭМ-1202				ЭМ-1202			
ЭМ-1203				ЭМ-1203				ЭМ-1203				ЭМ-1203				ЭМ-1203			
БПИ-183-a				БПИ-183-a				БПИ-183-a				БПИ-183-a				БПИ-183-a			
PERISCOPE				1R 1D PS				4R 1D				5R PS				6R 1D A			
FE-6FR				SUPRSTR 20FR				WINCH ACS				5R STB				6R 1D F			
1R 1D STB				3R 1D				4R 2D STB				WINCH SS				TC			
1R 2D				3R 3D				4R 2D PS				4R 2D PCS				POD 108FR			
DATE AND TIME FROM "ГНОМ -2МЭ" DEVICE																			
CHANNEL 1 ЭМ-1242								CHANNEL 2 ЭМ-1242											
30-01 -05 12:45:30								30-01-05 12:45:39								N1			

Fig.3 –ACS Frame No.1 "STATE OF MTK-110MЭ".

Signature and Data
Invent N of doubl
Subst. of invent N
Signature and Data
Invent N of orig.

Rev.	P.	Dokument N	Signature	Data	ТЭ3.623.912-03PЭ	P.
						17

P.	ТЭ3.623.912-03PЭ				
18		Rev.	P.	Dokument N	Signature

STATE OF MTK-110MЭ TVDs					
N	NAME	CODE	ON	CTRL	CHECK
1-1	PERISKOPE	KT-257	1	1 DAY	---
1-2	FE-6FR	TM-1220-1	2 3	2 TEST	---
1-3	1R 1D STB	HEOTOH-08-2	----	---	1
1-4	1R 2D	HEOTOH-08-1	4	---	---
2-1	1R 1D PS	HEOTOH-08-1	----	---	---
2-2	SUPRSTR 20FR	TM-1220-1	----	---	---
2-3	3R 1D	HEOTOH-08-2	----	---	---
2-4	3R 3D	HEOTOH-08	----	---	---
3-1	4R 1D	HEOTOH-08-2	----	---	---
3-2	WINCH ACS	TM-1220-1	----	---	---
3-3	4R 2D STB	HEOTOH-08-1	----	---	---
3-4	4R 2D PS	HEOTOH-08-1	----	---	---
4-1	5R PS	HEOTOH-08-2	----	---	---
4-2	5R STB	HEOTOH-08-2	----	---	---
4-3	WINCH SS	TM-1220-1	----	---	---
4-4	4R 2D PCS	HEOTOH-08	----	---	---
5-1	6R 1D A	HEOTOH-08-1	----	---	---
5-2	6R 1D F	HEOTOH-08-1	----	---	---
5-3	TC	HEOTOH-08	----	---	---
5-4	POD 108FR	TM-1220-1	----	---	---

Fig.4 –ACS Frame No.2 "STATE OF MTK-110MЭ TVDs".

The "ON" column contains the numbers of the CPs, from which the TVDs were switched on. If the same TVD was switched on from several CPs, their numbers are displayed via blanks. The device including the ЭМ-1212-1 control module and the BC-2 TVM is designated as CP No.4 of the TV-complex. The "CTRL" column shows the number of a CP of the TV-complex and the remote control command being executed from this CP.

The "CHECK" column shows the number of CP of the TV-complex from which the TVD was chosen for servicing.

The number of ACS frame No.2 is shown in the right lower corner.

The ACS frame No.3, "MODULE FEEDING VOLTAGES" is shown in Fig.5.

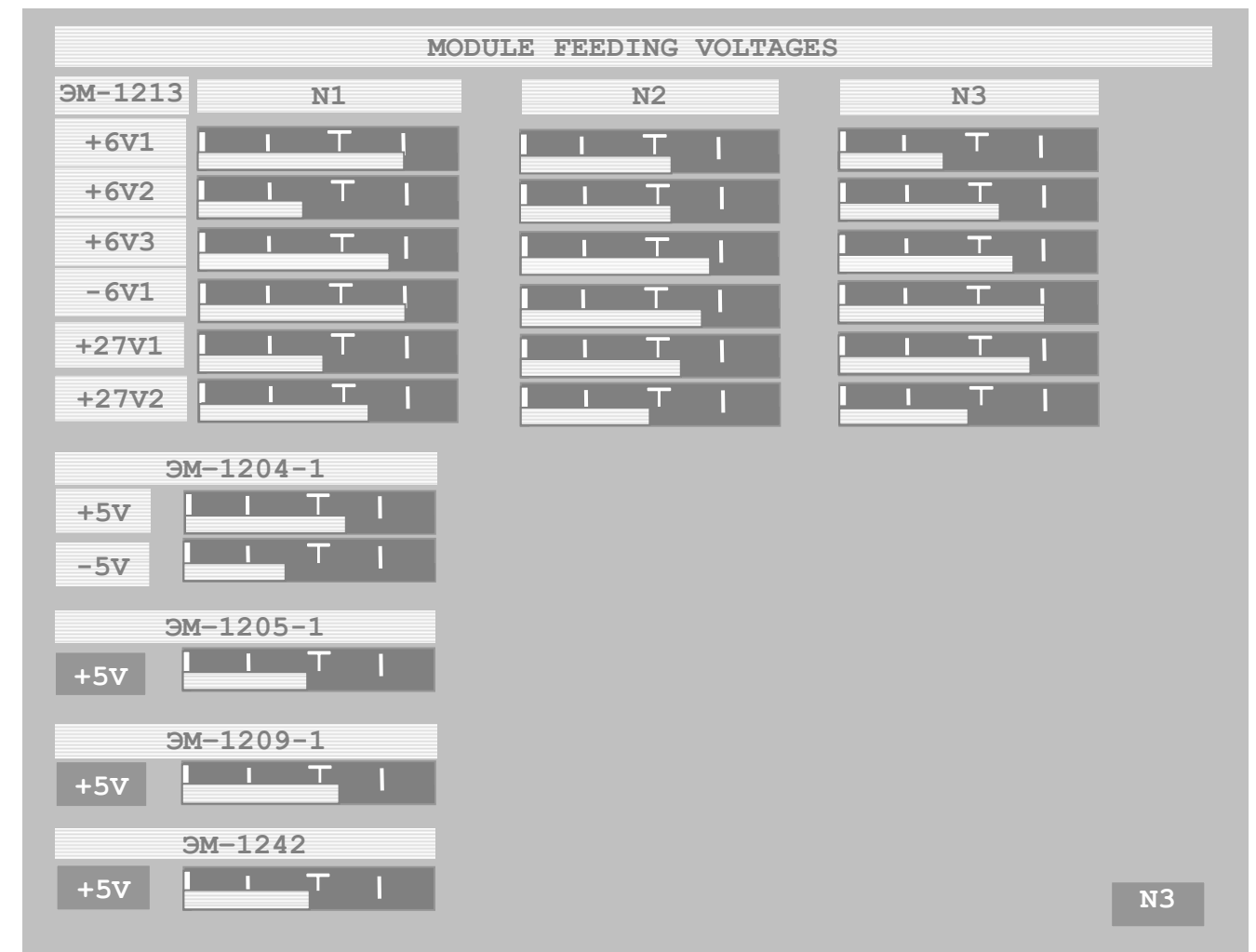


Fig. 5 – ACS Frame No.3 "MODULE FEEDING VOLTAGES".

The feeding voltages are symbolically shown as horizontal lines with four marks. The leftmost mark represents the zero point. The next three marks represent the minimum, nominal and maximum values of the voltage. The length of a line denotes the voltage in a non-linear scale. The position of the minimum mark corresponds to 95% of the rated voltage. The position of the rightmost mark corresponds to 105% of the rated voltage. If the voltage controlled falls out of the tolerance limits, the line blinks that is a sign of a fault in the module. The output voltages of the three ЭМ-1213 power supply units are displayed in the upper part of the frame. The supply voltages produced by power supply cells in the corresponding modules are displayed below. The number of ACS frame No.3 is shown in the right lower corner.

Frames are switched over by pressing the arrow buttons on the front panel of the ЭМ-1211 diagnostics module (Fig.2).

The ЭМ-1212-1 control module indicates faulty modules of the TV-complex with the LEDs, in accordance with the information received from the ЭМ-1211 diagnostics module via the RCLI channel. Light-up of the LED of the MTK-110MЭ indicates a fault in some unit or module not represented on the ЭМ-1212-1 control module front panel. To get more specific information about the faulty module, the ACS frame No.1 should be output on the TVM screen.

Signature and Data
Invent N of doubl
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Signature and Data
Invent N of orig.

Rev.	P.	Dokument N	Signature	Data	TЭ3.623.912-03PЭ	P.
						19

P.	TЭ3.623.912-03PЭ	Rev.	P.	Dokument N	Signature	Data
20						

Table 3

+27V power supply unit	fuse number	Device external connector	External load
ЭМ-1213 No.1 (A61)	F1	X32	TM-1304 No.1
ЭМ-1213 No.3 (A72)	F2	X32	TM-1304 No.1
ЭМ-1213 No.2 (A71)	F3	X33	TM-1304 No.2
ЭМ-1213 No.3 (A72)	F4	X33	TM-1304 No.2
ЭМ-1213 No.3 (A72)	F5	X34	TM-1304 No.4
ЭМ-1213 No.1 (A61)	F6	X34	TM-1304 No.4
ЭМ-1213 No.1 (A61)	F7	X35	TM-1304 No.5
ЭМ-1213 No.2 (A71)	F8	X35	TM-1304 No.5
ЭМ-1213 No.2 (A71)	F9	X36	TM-1304 No.3
ЭМ-1213 No.3 (A72)	F10	X36	TM-1304 No.3
ЭМ-1213 No.3 (A72)	F11	X37	Reserved
ЭМ-1213 No.1 (A61)	F12	X37	Reserved
ЭМ-1213 No.1 (A61)	F13	X38	TM-1213, TM-1215-4 No.1, TM-1215-4 No.2
ЭМ-1213 No.2 (A71)	F14	X38	TM-1213, TM-1215-4 No.1, TM-1215-4 No.2
ЭМ-1213 No.2 (A71)	F15	X39	TM-1215-4 No.3
ЭМ-1213 No.3 (A72)	F16	X39	TM-1215-4 No.3

The TM-1308 assembly modules and TM-1201 terminal modules via which the 27 V voltage passes in transit are not shown in Table 3.

All the 27 V and 6 V d.c. voltages produced by the ЭМ-1213 power supply units are fed to the analog inputs of the ЭМ-1211 diagnostics module (A21). The ЭМ-1211 diagnostics module performs continuous tolerance check-up of these voltages. Also fed to the ЭМ-1211 diagnostics module are the 27 V d.c. voltages from the outputs of fuses F1-F16 and voltages from internal power supply cells of the modules that are parts of the device.

1.1.4.7 Auxiliary Communication System

The auxiliary communication system provides wire duplex communication between different modules of the TV-complex that is used during servicing of the complex.

There is a connector X42 for connecting the auxiliary communication device (ACD). The auxiliary communication lines come in parallel to the TV-complex modules via connectors X32-X39. The +27 V feeding voltage is applied to an ACL via a current-limiting resistor for feeding the ACD.

The TC-0120 ACD is included into the TV-complex BSP.

1.1.4.8 Device Design

As per design the device constitutes a splash-proof cabinet with an amortization base. The general view of the device is shown in Fig. B1 (appendix B). The floors of the cabinet are numbered top-down.

The modules comprised by the device are located as follows.

In the upper part of the cabinet the assembly unit (1) is installed. The feed switch and the fuses are mounted under the drop cover (23) to the left of the assembly unit front panel. The indicators (28) of phase voltage presence (220 V, 50 Hz) are fastened on the front panel of the assembly unit.

The BC-2 TVM (2) is installed on the first floor. The TVM can be pulled out on a movable base.

On the second floor are installed the ЭМ-1211 diagnostics module (3), ЭМ-1212-1 control module (4) and ЭМ-1242 interface unit (5).

On the third floor are installed (from left to right): the ЭМ-1204-1 videoswitch module (6), ЭМ-1205-1 videoswitch module (7), ЭМ-1204-1 videoswitch module of the BSP (8), ЭМ-1205-1 videoswitch module of the BSP (9), ЭМ-1211 diagnostics module of the BSP (10), ЭМ-1209-1 controller of the BSP (11), ЭМ-1209-1 controller of the BSP (12) and ЭМ-1209-1 controller (13).

The fourth floor contains modules of the BSP such as the ЭМ-1211 diagnostics module (14), ЭМ-1212-1 control module (15) and ЭМ-1242 interface unit (17).

On the fifth floor are installed the panel (17) with fuses F1-F16 and the LEDs.

The ЭМ-1213 No.1 (18) power supply unit and ЭМ-1213 (19) of the BSP are installed on the sixth floor.

On the seventh floor are installed the ЭМ-1213 No.2 and ЭМ-1213 No.3 (18) power supply units.

The ФСП-3B interference rejection filters are mounted near the connectors of the ЭМ-1213 power supply units under the rear cover (21) of the cabinet. There are two ФСП-3B interference rejection filters per power supply unit.

The ЭМ-1204-1 and ЭМ-1205-1 videoswitch modules, ЭМ-1209-1 controllers, ЭМ-1211 diagnostics modules, ЭМ-1212-1 control modules, ЭМ-1213 power supply units and ЭМ-1242 interface units constitute a frame with two horizontal slide rails. On the frames are mounted one or two PCBs with connectors. The front panel of the module is fastened to the frame. There are slide ways for each module in the cabinet. This modules are fixed in the working position with special locks and screws.

The BC-2 TVM is fastened to a pull-out base that is mounted on telescopic holders. The BC-2 TVM is fixed in the working position with four screws.

The cabinet has a door with a rubber gasket, closing the modules from the second to the seventh floors. The door has four locks providing its fixing in the closed position. There are glassy windows opposite to the ЭМ-1212-1 control module (4). The ORDER OF UNITS (26) and a special wrench for module extraction/mounting (27) are fastened on the internal side of the door.

Signature and Data
Invent N of doubl
Subst. of invent N
Signature and Data
Invent N of orig.

Rev.	P.	Dokument N	Signature	Data	P.
TЭ3.623.912-03PЭ					23

Size A3 /A4

P.					
TЭ3.623.912-03PЭ					
Rev.	P.	Dokument N	Signature	Data	
24					

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