MF/HF/VHF GMDSS Tester

Description
and operating manual

Contents

1. Purpose

The tester of ship GMDSS equipment (here and after "device") is designed for check of transmitting and receiving parts of the GMDSS complex according to the requirements of a part IV of Rules on conventional equipment of sea vessels of the Register and DSC Protocol of the IMO requirements 493-8 and 541-7x without emitting to the broadcast on distress frequencies on MF/HF/VHF.

During the test of the transmitting channel the device allows to:
- check the reliability of formation and reception of the DSC messages of Distress format on frequencies MF, HF- 2187,5 kHz, 8414,5 kHz; VHF - 156,525 MHz without emission to the broadcast;
- check the decoding of the received DSC signals;
- display the received DSC signals on LCD;
- sound the reception of the DSC signal;
- indicate the time of reception of the DSC message;
- indicate the power level of the transmitting GMDSS equipment on LCD;
- indicate the synchronized bit quantity, message, previous to the DSC message phase, indicating the correct operation of the transmitting HF path of the GMDSS equipment of a vessel;
- make qualitative estimation of the transmitting HF path: the transmitter - linkage - antenna of the GMDSS equipment by level of power;
- estimate the frequency's stability of the checked transmitter by the received DSC message;
-print test results;

During the test of the receiving channel the device allows to:
- form and send to the input of the MF/HF receiver not less than three types of DSC messages :'Distress -5', "Distress - 1", "Safety" for MF, HF on the frequencies 2187,5 kHz, 8414,5 kHz; for VHF on the frequency 156,525 MHz.
- form and send to the input of the VHF receiver not less than three kinds of the messages DSC "Distress-5", "Distress-1", "Safety" on frequency 156,525 MHz;
- estimate the receiver ability to restore the information by sending of the messages with a single mistake;
- print the test results of receiving section

The sensitivity of the receiving section, providing the signal levels, sent to the input of the receiving section on frequencies MF/HF - 2187,5 kHz; 8414,5 kHz and VHF 156,525 MHz on HF outputs "1", "2", "3", is checked according to the table 1.1

Table 1.1

HF output	MF/HF	VHF
1	6 mkV + 6 db - 0 db	2 mkV + 6 db - 0 db
2	60 mkV + 6 db - 0 db	20 mkV + 6 db - 0 db
3	6 mkV + 6 db - 0 db	2 mkV + 6 db - 0 db

Indirectly check of the frequency band, the oscillator's stability and filters of the reception device:
- forming the DSC signal on frequencies 2187,5 kHz and 8414,5 kHz with stability – not less 10 Hz;
- forming DSC signal on frequency 156,525 MHz with stability - 5x10 -6;
- providing the signalling of the DSC message transfer to the input of the receiver;
- providing indication of the DSC message transfer to the input of the receiving section;
- displaying the time of the DSC message transfer to the input of the receiver.

2. Basic parameters and characteristics.

2.1. The supply voltage of the device is 24 V +8V, -6V; power is no more than 10 W, without the printer and no more than 18 W - with the printer.
2.2. The resistance of the artificial antenna of the MF/HF device - 50/75 Ohm 2,5 Ohm.
2.3. The resistance of the artificial antenna of the VHF device - 50 Ohm-2,5 Ohm.
2.4. The power level supplied to the artificial antenna input:
- MF/HF75 Ohm ≤ 400 W
- MF/HF50 Ohm ≤ 250 W

- VHF 50 Ohm ≤ 40 W
2.5. The signal level on the device input with attenuation - 0 db is from 0,5 up to 1 V.
2.6. Operational frequencies of the device for MF/HF - 2187,5 kHz and 8414,5 kHz; for VHF - 156,525 MHz.
2.7. Precision of the frequency set:
- MF/HF - 10 Hz;
- VHF - 5x10 -6;
2.8. The device provides transmission of three kinds of the DSC messages: "Distress-5", "Distress-1" and "Safety";
2.9. The device provides reception of the DSC messages in "Distress" format on frequencies MF/HF - 2187,5 kHz and 8414,5 kHz; VHF - 156,525 MHz;
2.10. The device provides cyclic mode of operation during reception of the messages such as "Distress-5" with periodicity not less than 5 minutes at P ≤ 250 W and 10 minutes at P ≤ 400 W.
During reception of the single messages with 3 mines cycle period - not less than 7 hours, with the subsequent one hour's interval.
2.11. The device allows to print the check protocols of the receiver and transmitter on a tape which width is 58 mm (24 symbols in a line). Protocols consist of the basic parameters of message.

It is possible to input the name of a vessel, first name, middle initial, last name of representative of a vessel and date of check in the Russian and English alphabet with the help of buttonboard.

3. The set of the device

3.1. The delivery set of the device should corresponds to table 3.1.

Table 3.1

#	Name	Qt	note
1.	GMDSS Tester	1	
2.	50 Ohm artificial	1	
3.	25 Ohm artificial	1	Add. ordered
4.	The printer	1	Add. ordered
5.	Power supply cable	1	
6.	LF Cable	1	
7.	LF Socket	1	
8.	HF transition	2	
9.	Paper (width 58 mm)	1	Add. ordered
10.	HF Cable	2	
11.	Set of spare parts	2	
12.	Specification	1	
13.	Device's package	1	

4. Structure and operation of the device

The device consists of three functional blocks:
- the block of the controller;
- the block of a radiopath;
- the block of artificial load
And the printer.

4.1. Block of the controller

The controller of the device is intended to provide the operation of the button board, indicator and provides formation of necessary sequences of DSC messages, also it is intended for decoding of the messages, received DSC messages, for their comparison with standard and for showing the kinds of mistakes. Besides controller takes measurement of the signal amplitude, received by a radiopath, (after its detecting and integration), forms sound signals and provides constant operation of the electronic clock.

The block of controller provides the transmission of the information to the printer.

The central processor device is the 8-digit controller with internal memory for the programs and data. The quartz reference generator with the resonant 24MHz frequency provides sufficient precision of the formation of the frequencies "1" and "0", and also baud duration during DSC message transmission in MF/HF and VHF ranges. The formation of frequencies "1" and "0" is made with use of internal timers, and the accuracy of baud duration is

provided by repetition factor of the reference frequency division by external hardware prescaler. The same principle is used during reception and decoding of the received messages.

The central processor device (CPD) operates with peripheral processor controllers (PPC) or through the serial port (with the controller of the keyboard and with the controller of the indicator), or through the controller of the bus through the bus I2C (with the analog-digital converter, the RAM hours-, the synthesis circuit of frequencies). The external static RAM is used for expansion of the data memory.

The controller of the keyboard (8- digit controller with internal memory for the programs and data) independently supplies 16 - button keyboard and transfers the information about the pressed button to the CPD serial port. The synchronizing second pulses are transferred through the same controller in CPD.

The controller of the indicator makes indication of the information (40 * 4 character cells), controller receives through a serial port the macroinstruction from CPD. Strings of the messages and service program of the indicator are contained in the memory of the programs of the controller.

The sound indication is made directly by CPD through the buffer.

The information about the current time is shown on the indicator after CPD will receive a synchronizing second pulse, will generate query and will receive the information through the I2C bus from the peripheral controller (RAM hours-).

The measurements of amplitude of detected and rectified HF - signal in MF/HF and VHF is taken by PPC ADC(analog-digital converter) after CPD query through the I2C bus. The received information about the signal size is shown on the indicator both in a graphic mode, and in numerical. Two ADC channels are used for measurement of the supply voltages +24B and +5B.

The frequencies synthesis circuit is controlled by CPD through the bus I2C, and it is commuted by the receiver and transmitter through 2 digit parallel port and analog buttons.

The transmitted message is formed by CPD through one-digit port in TTL levels and then the former balances the message relative to the average level and reduces the amplitude.

At reception, the pulses from the two-level comparator come to the hardware interruption CPD input. CPD captures the receiving message if the synchronizing bit of the given frequency is present . The message is decoded and, if it has phasing sequences, is saved in one of the five pages of the external RAM. Thus, five received messages can be placed in the RAM. Each of these messages is compared with standard and by pressing the appropriate button is indicated with the information about mistakes, if they the mistakes are present.

CPD transfers the information to the printer through a serial port.

The supply +5V voltage, the external RAM and calculation of the control sum of the CPD's read-only memory are controlled in check mode. Besides the operation of the closed paths the controller - transmitter - receiver - comparator - controller can be checked up in modes MF/HF/ VHF, and the test of the printer is carried out. The results of the tests are displayed on the indicator.

The controller is supplied by stabilizers +12V and +5V.

4.2. Block of radiopath.

The module of the transceiver consists of the next basic units: the controlled attenuator, VHF-RECEIVER of 70-th channel, the MF/HF receiver, the single sideband MF/HF modulator, the oscillator of FM -modulated generator in VHF-RANGE with a PLLF(phase-locked-loop frequency control) loop, the MF/HF range generator with PLLF loop.

Controlled attenuator is intended for the coordination of input /output signal's levels of the device and checked equipment. Attenuator consists of three П-figurative parts with attenuations -20 db. Input and output resistance of the attenuator is 50 Ohm.

THE VHF-RECEIVER of the 70-channel is assembled on the classical oscillator circuit with one transformation of frequency. The intermediate frequency makes 10,7 MHz; the basic selectivity of the receiver is provided with the quartz IF filter with the passband 2Df=15 kHz. The receiver provides demodulation of a FM-signal with the frequency carrier 156,525 kHz and FM subcarrier 1700 Hz..

The MF/HF receiver is intended for carrying of the spectrum of FM carrier frequencies 2187,5 and 8414,5 kHz to the sound 1700 Hz subcarrier. The receiver is assembled on the circuit of direct transformation of the frequency with phase method of suppression of the mirror channel on frequencies 2184,1 and 8414,5 kHz. The receiver consists of: the strip filter; two amalgamators, supplied by the quadrature signals of the oscillator; two amplifiers of sound frequency; the two-channel low-frequency 4x phase shifter ensuring relative phase shift of signals - between channels 90+-0,5 degrees.

The single-sideband MF/HF modulator is intended for carrying of a spectrum frequency – manipulated 1700 Hz cubcarrier on carrier frequencies 2187,5 and 8414,5 kHz. In the modulator is transforms according to the next expressions:

2185,8 kHz + 1,700 kHz = 2187,5 kHz.
8412,8KHz +1,700KHz = 8414,5KHz

The mirror channel on frequency:

2185,8 kHz - 1,700 kHz = 2184,1 kHz

8412,8KHz - 1,700 kHz = 8411,1 kHz

and it is suppressed by the phase method. The modulator consists of: the active 3x LCF (low-cut filter), elliptic 5x loop filter. The two-channel low-frequency phase shifter similar to the phase shifter of the receiver, the quadrature amalgamator and amplifier of the single-sideband signal.

The FM generator (FMG) ins intended for formation of FM carrier of 70-th channel 156,525 MHz. FMG consists of: the actually generator controlled by voltage (GCV), the П-figurative buffer amplifier, the agreeing attenuator, the electronic attenuator ,the large-scale array PLLC. GCV has two control inputs. The signal of modulation (1700+-400) Hz is entered through the one input. And through another the stabilization of frequency by the PLLC loop is carried out.

The MF/HF generator is intended for formation of the quadrature fluctuations with frequencies 2185,8 and 8412,8KHz, necessary for the MF/HF receiver and the MF/HF modulator. The generator consists from GVC, forming fluctuation by frequency 4x2185,8 KHz=8743,2 kHz and 4x8412,8KHz=33651,2KHz; a divider on 4, the large-scale array PLLC.

4.3. Block of artificial load.

The block of the artificial load is the high-frequency coordinated powerful load with the wave resistance - 50 Ohm/75 Ohm for MF/HF range and 50 Ohm for VHF range.

75 Ohm load- for MF/HF range is provided with consecutive connection of 25 Ohm artificial with 50 Ohm artificial.

The necessary power of the artificial is provided by HF resistors installation on heat sink.

The 50 Ohm combined artificial has the output of HF signal with a divider ~ (1:100) for a radiopath, and the output (U =) of the constant voltage proportional to the level of power on the artificial antenna.

4.4. Printer.

The printer contains the stabilizer of the voltage forming the supply voltage Us = + 5 V from voltage + 12 **Vin** controller, the print control block and the print mechanism.

The print control block contains the microcontroller, which receives the information, processes it and saves in the operative remembering device. Control of the mechanism of print is made through buffer elements.

As the patterns of the documents are contained in memory of the controller, the time of test result transfer of makes no more than 1 second. Time of printing of the one check protocol is no more than 25 seconds.

5. Preparation for operation and operating procedure

5.1. Blocks of control and connection

The four-lower case indicator and buttonboard are located on the forward panel of the device.
The sockets for connection of the supply cables both cables of the attenuator block and printer are located on the back panel. Here there is the sound regulator of the loudness and toggle - switch on the circuit.

5.2. Connection to the supply circuit.

Study the in detail given instruction before the beginning of operation of the device. The device does not require the special preparation for work. The device is connected to the supply circuit by the cable without grounding

Connect the device with supply circuit of the direct current 18.. 32 V or through the adapter 220V 50Hz. Turn on the toggle - CIRCUIT. On the indicator the message of the main menu will appear through 10... 15 seconds:

Cur. TIME

POWER SUPLLY:XX,X V
NUMBER OF UNIT: XXXXXX

Cur.TIME - current time in format: hours, minute, second.
XX,X V - value in Volts of the measured voltage of the onboard circuit.
XXXXXX – 6-unit individual number of the device.

The main menu of the device is appeared no the indicator through 5... 6 seconds:

Cur. TIME

"MORSVIAZ-SERVIS" v1.7. 2001
<MF/HF> VHF TEST SETTING DEVICE
SELECT MODE ← , → & PUSH ↵

The device is ready to operate.

The next turning on should be carried out 10... 30 seconds later after turning off.

5.3. The check mode.

The device has three check modes:
- the test of the MF/HF path;
- the test of the VHF path:
- the test of the memory.

It is necessary with the help of ← , → buttons choose in the main menu the TEST function and press a button↵ for realization of the test I. The next message will appear in the third line of the indicator:

TEST: <MF/HF> VHF MEMORY MAIN MENU

Choose the kind of the test with the help of ← , → buttons, and make the appropriate test by pressing of ↵ button.

The SAFETY message is formed during the test of MF/HF and VHF through the radiopath of the transmitter on the receiver's input, which then is decoded and is compared with initial. There is a message during the test in the left part of the first line of the indicator:

TRANSMIT – RECEPT

If tests end normal the indicator will show:

MESSAGE 1 IN XXXXXXXXXX CUR.TIME
Format: Individual call 0
Category: Safety

In case of the incorrect test in MF/HF mode in the left part of the first line of the indicator shows:

TEST ERROR N1

In VHF mode:

TEST ERROR N2

That means that message was received incorrectly.
Two seconds later the indicator shows the message in the left part of the first line:

TEST ERROR N7

That MEANS that the control sum is not correct.

In the mode of the memory test the device allows:

1. *Testing of the RAM accompanied with the message in the left part of the first line of the indicator:*

TEST MEMORY XXXXH

With indication of the checked address XXXXH.
If test of the memory ends normally the indicator shows:

TEST MEMORY O`K

And if there is n error indicator shows the address of the first broken cell.

2. Testing of the supply voltage is accompanied by the message:

TEST Ucc O'K

If it ends normal and:

TEST ERROR N3

If the voltage is below allowable.

3. The calculation of the control sum of program memory of the basic controller is accompanied by the message:

TEST CRC O`K

If it ends normal :

TEST ERROR N5

If it ends incorrect.

Testing of the RAM, the supply voltage and the calculation of the control sum are made consistently.

5.4. Setting of the device.

In < SETTING DEVICE > mode the current time can be corrected, and also the information for the correction of the current time can be inputted

Choose the < SETTING DEVICE > mode in the main menu by ← , → buttons and press ↵ button . The indicator shows the message in the third line

<TIME> INFORM. FOR CONTROL MAIN MENU

5.4.1. Set of the current time.

The set or correctness of the current time is made in the SETTING mode of the DEVICE by choice (TIME) and pressing of ↵ button. The indicator shows the message in a third line:

SETTING OF VALUES BY NUMBER KEYS

The cursor appears in hours character cell. If necessary it is possible to change this value pressing one of digital buttons 0... 2, then the cursor moves on units of hours. The set of hours units and further tens of hours and units of minutes is made by digital buttons. The moving of the cursor to the necessary category is carried out by ← , → buttons. In this case value of the categories does not change. The set time is entered by ↵ button. If cursor is on seconds, seconds are clearing. After turning off the hours continue operation.

5.4.2. Data input in < INFORM. FOR CHECK >mode

The input of the initial data for the subsequent printing of the check protocol is made in INSTALLATION mode of the DEVICE by choice of the <INFORM. FOR CHECK > and pressing of the ↵ button

After that the decimal identification number of checked station can be set in the first line of the indicator by digital buttons. Press the ↵ button to enter the number.

After that the name of the vessel can be entered. Before entering of the vessel name all line should be cleared by pressing of **#** button.

The input of the name is carried out symbol-by-symbol in each character cell, marked by the cursor. Move the cursor by the ← , → buttons and type the number by 0... 9 digital buttons. The register of operation of the digital buttons is shown in the fourth line:

<DIGIT> - input of figures;
<EN> - English alphabet;
<RU> - Russian alphabet.

Press the ***** button to change the register of digital buttons

The numbers can be entered in the <DIGIT>register.

The English and Russian letters are entered in the registers <EN> and <RU>. In these two registers each of digital buttons enters one after another four letters or symbol. For example, the button "1" in the register <RU> by the first pressing enters the letter "А", by the second pressing "Б", by the third pressing "В" at fourth "Г". Move the cursor to set the following symbol by pressing of → button. Thus by buttons 0... 9 it is possible to enter text, but no more than 24 symbols.

The conformity of digital buttons and entered symbols is shown in the table 5.1.

Table 5.1.

Digit button	**<En>**				**<Ru>**			
	Qt				**Qt**			
	1	2	3	4	1	2	3	4
1	A	B	C	D	А	Б	В	Г
2	E	F	G	H	Д	Е	Ж	З
3	I	J	K	L	И	Й	К	Л
4	M	N	O	P	М	Н	О	П
5	R	S	T	Q	Р	С	Т	У

6	U	V	W	X	Ф	Х	Ц	Ч
7	Y	Z	[	¢	Ш	Щ	Ъ	Ы
8	]	^	-	′	Ь	Э	Ю	Я
9	,	—	.	/	а	б	в	г
0	space	!	"	#	12	15	↵	

After setting the name of vessel press button ↵.

The first name, middle initial, last name of REPRESENTATIVE of the VESSEL, the first name, middle initial, last name of person who made the check and the DATE are entered by a similar way.

Press ESC button to exit the SETTING DEVICE mode after entering of the date.

The entered information will be used when the protocol is being made and printed.

The set of the device are kept after its switching-off from the onboard circuit.

5.5. Operation with the device.

The device provides the following control modes of the DSC equipment:

- message transfer from the device to the tested DSC equipment in the MF range on frequency 2187,5 kHz; HF - 8414,5 kHz
- Reception of the messages from the tested DSC equipment in the MF range on frequency 2187,5 kHz; HF on 8414,5 kHz.
- message transfer from the device to the tested DSC equipment in the VHF range on frequency 156,525 MHz (Ch 70);
- Reception of the messages from the tested DSC equipment in the VHF range on frequency 156,525 MHz (Ch 70).

In all cases the following messages in DSC format can be transferred and can be received:

a single message individual call (safety) on typed MMCI;

- Single distress (fire) message with the indication of the current time of transfer and fixed coordinates;
- The five times repeated distress (grounding) message with the indication of the current time of transfer and fixed coordinates.

In all modes the DSC messages can be transferred with a single mistake for check of restoring ability of the examinee of the receiver.

5.5.1. Operation in the MF/HF ranges.

In the main menu:

CUR. TIME

"MORSVIAZ-SERVIS " v1.7. 2001
<MF/HF> VHF TEST SETTING DEVICE
SELECT MODE ← , → & PUSH ↵

Choose, if necessary, the mode <MF/HF> by the ← , → buttons and press a button ↵.
The indicator shows in the third line:

<MODE MF> MODE HF MAIN MENU

That the menu allows to choose MF/HF mode.

5.5.1.1. Reception in MF mode.

Choose < MODE MF >, press ↵ button. The indicator displays

MF/HF: <RECEPT> TRANSMIT MAIN MENU

In the left corner MF pointer appears and will be appeared until MF mode is on.

Connect an artificial to the tested transmitter's output instead the antenna.
Output of the artificial connect with HF input of the device.
In mode:

MF/HF: <RECEPT> TRANSMIT MAIN MENU

Press a button ↵. The indicator shows:

WAIT RECEPT 1

Five minutes later the indicator of power level of the received signal is displayed in the second line and the sound second pulses are given . The device is ready to reception of the first message from the tested transmitter. The process of reception is accompanied by a characteristic sound signal and indication of the power level in the second line of the indicator. In the right part of this line the power level is displayed in the digital view in relative units.

After end of reception of the first message the device is ready to receive the next. Five messages can be totally received (various or same).After reception of the fifth message the indicator shows:

RECEPT COMPLETE

The contents of each received message can be viewed by pressing one of the digital buttons (1, 2, 3, 4, 5), appropriate to the message number, (in the any order).

The reception can be stopped after any received message. For this purpose press the ↵ button. The contents of the received message can be viewed by pressing one of the digital buttons 1... 5.Press the ESC button to return to the MF/HF menu.

Contents of the received (for example 1st) messages are displayed in the next form:

MESSAGE1 IN XXXXXXXXXX CUR.TIME
Format:
Category: DDD
The additional information

Where, XXXXXXXXXX - ten-unit identification number of transmitting station (last figure on the ship equipment is not displayed and as a rule is equal to zero);

DDD - quantity of the received incorrectly bits of the synchronizing bit sequence. It is calculated in accordance with 200 - bit synchronizing sequence. Thus, if the 200 bit synchronizing sequence was transferred - and all 200 bits are received - DDD = 0. If 196 bits are receive, DDD=4. By transfer 20 - bit synchronizing sequence (for example in a mode VHF - reception), if all 20 bits are received DDD = 180.

The additional information is displayed in the forth line (after "distress" reception there are coordinates of a vessel). The time of transfer is shown in second line when "distress" is received.

5.5.1.2. Transfer in MF mode.

Connect the "MF/HF TRANSMITTER" output to the input of the tested receiver instead of the antenna.

In mode:

MF/HF: (RECEPT) TRANSMIT MAIN MENU

Choose the (TRANSFER) mode by ← , → buttons and press the ↵ button. The indicator shows the message:

IN XXXXXXXXXX CUR. TIME
" MORSVIAZ-SERVIS " v.1.7 2001
SETTING OF VALUES BY NUMBER KEYS
SELECT MODE ← , → & PUSH ↵

The cursor will blink in the left position of identification number. If it is necessary, with the help of digital buttons type the MMSI of the receiving equipment and press ↵. In two seconds the indicator shows the message in the third line:

< MFHF1 > MFHF2 MFHF3 MAIN MENU

If < MF/HF 1 > is chosen the SAFETY message with the typed MMCI is transmitted to the checked receiver. Typed MMCI is kept and after turning off the supply. If the < MF/HF2> is chosen the unitary DISTRESS message (fire in the checked receiver) is transmitted , and if the < MF/HF 3 > is chosen the five-multiple DISTRESS (grounding) message is transmitted with the fixed coordinates and current time . During transfer the indicator shows

TRANSMIT

After the end of transmission the indicator displays:

TRANSMIT COMPLETE

To repeat the transfer of the same message press the **ESC** button, and then ↵.
Leave the menu to change the MMSI :

<MF/HF> VHF TEST of INSTALLATION of the DEVICE

Choose the <MF/HF>, < MODE MF > and (TRANSMIT) set the MMSI.

5.5.2. Operation in HF range.

Choose the <MODE HF >, press ↵ button. The indicator shows:

MF/HF: (RECEPT) TRANSMIT MAIN MENU

In the left corner HF pointer appears and will be appeared until HF mode is on. The reception and transfer in HF mode is made similarly to MF mode (see. unit 5.5.1.1 and unit. 5.5.1.2)

5.5.3. Operation in VHF range.

Press the ↵ button in the main menu to enter the <VHF> mode. The reception and transfer in HF mode is made similarly to MF mode (see unit. 5.5.1.1 and unit. 5.5.1.2).

5.6. Work with the printer.

The printer is connected to the socket located on the back panel of the device.
Connect the printer when the device is switched off!

After turning off the device the print mechanism has to be positioned. The constantly flashing indicator shows that the device is ready for operation.

The special rolled 58 mm paper is used for the check protocols.

The MD 910ASS cartridge is used in the printer for the print mechanism.

It is necessary to insert the paper into the print mechanism, press and than release the button located on the printer. Press the button again, if necessary

5.6.1. The printer test.

When the printer is ready for operation (the indicator constantly shines) press , release and than press again the button located on the printer. 7 second later the indicator will be turned off. And when it is turned off, release the button. 3-5 seconds later printer will begin to print.

Enter the next menu to test the communication line of the printer and block of the controller:

TEST: <MF/HF> VHF MEMORY MAIN MENU

by pressing of a button *

5.6.2. Printing of the check protocol of the receiver.

Press button # after transfer of the DSC message from the device to the checked receiver. Comparing the transmitted blocks of the DSC message with received, mark by buttons "1" or "0" correctness or incorrectness of the received information. After last item the CONTROL SUM the check protocol of the receiver will be printed . Press the button ↵ to return the device from print mode

5.6.3. Printing of the check protocol of the transmitter.

After reception of DSC message from the checked transmitter, it is possible to print the check protocol of the transmitter of any five received messages.

Choose by digital 1... 5 buttons one of the received messages press the **#** button. Press ↵ the button to return the device from print mode.

Note. If the indicator of the device shows the message: PRINTER DOES NOT ANSWER
repeat printing procedure. When the indicator constantly shines, release and again press the button on the printer. When the indicator is blinking release the button. Approximately in 10 seconds the printer will be ready for operation (indicator constantly shines).
Attention! The printer operates only with the GMDSS equipment Tester, there is no individual power supply, and it does not operate with other devices (including personal computers).

5.7. Turning off the device

To turn off the device:
1. Switch off the toggle - "CIRCUIT" switch located on the back panel of the device.
2. Disconnect the adapter from the supply circuit or disconnect a supply circuit cable from supply voltage.
3.Disconnect a supply circuit cable from the device.

6. Check of the ship equipment by the device.

6.1. Connect the device to the +24 V supply circuit and turn on the " CIRCUIT" button with display of value of the voltage on LCD after turning on during ≤ 3 seconds÷ 5 seconds, and when the check protocol to check the voltage of the onboard supply circuit.

6.2. Quality of the DSC message transfer, power of the transmitter, distortions which are made by the transmitter MF/HF path is checked under the block diagram of the fig. 6.1. Connect the 50 Ohm artificial instead of the antenna.

Perform the unit 5.5.1.. Type on the checked equipment and to transfer 5 messages with the determinant format: Distress call or Individual call (category: Safety). Perform the unit 5.5.1.1. Perform the units 5.6. and 5.6.3 to print the protocol.

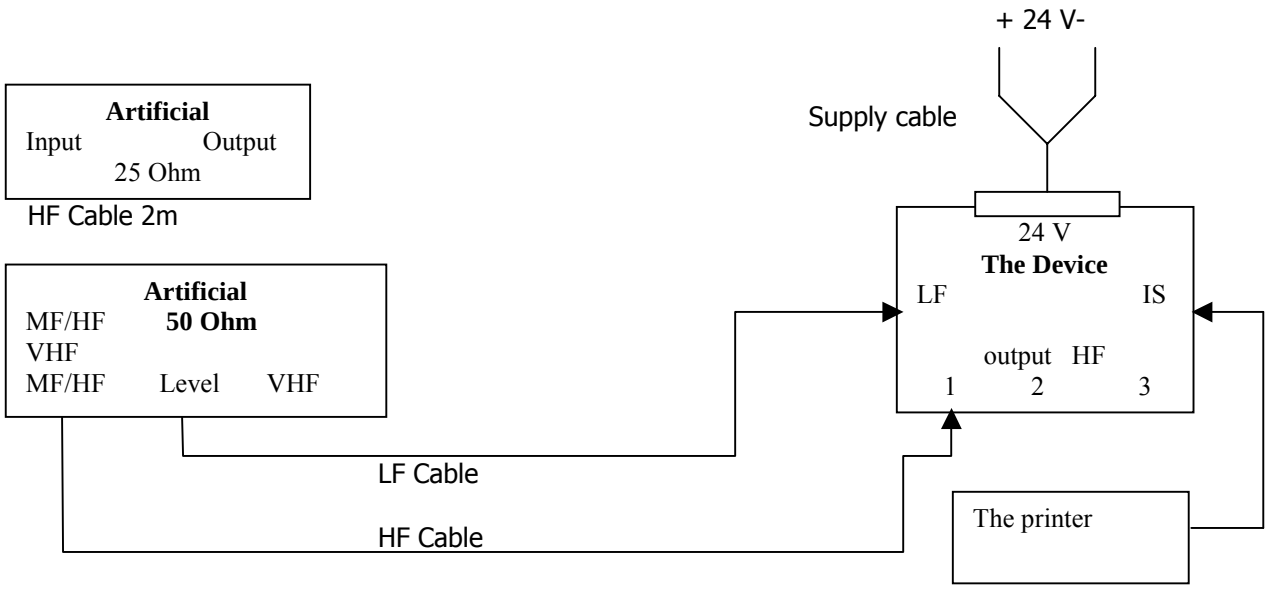


Fig.6.1.

The note:

To check the MF/HF transmitters with 75 Ohm output it is necessary to assembly the Ohm artificial 75, connected the 25 Ohm artificial with the 50 Ohm artificial. Then connect the output of the transmitter and "input" of the 25 Ohm artificial.

Check the message under the block diagram of a fig. 6.1.

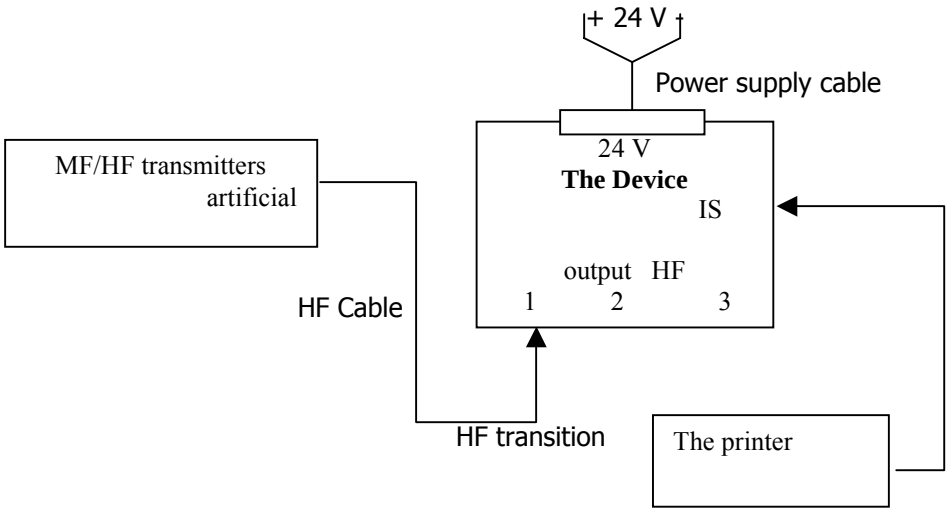


Fig.6.2.

6.3. Quality of the reception of the DSC messages in MF/HF ranges is checked under the block diagram of a fig. 6.2, connect " Output. HF-1 " HF- cable of the device with MF/HF antenna input of the DSC receiver of the checked equipment.
Perform unit 5.5.1.2.
Perform unit. 5.6 and 5.6.2 for printing of the protocol

6.4. Quality of the DSC message transfer, power of the transmitter, distortions made by the VHF path transmitter is checked under the block diagram of a fig. 6.3, connect the instead of the transmitting VHF antenna the 50 Ohm artificial by a cable HF 2m VHF

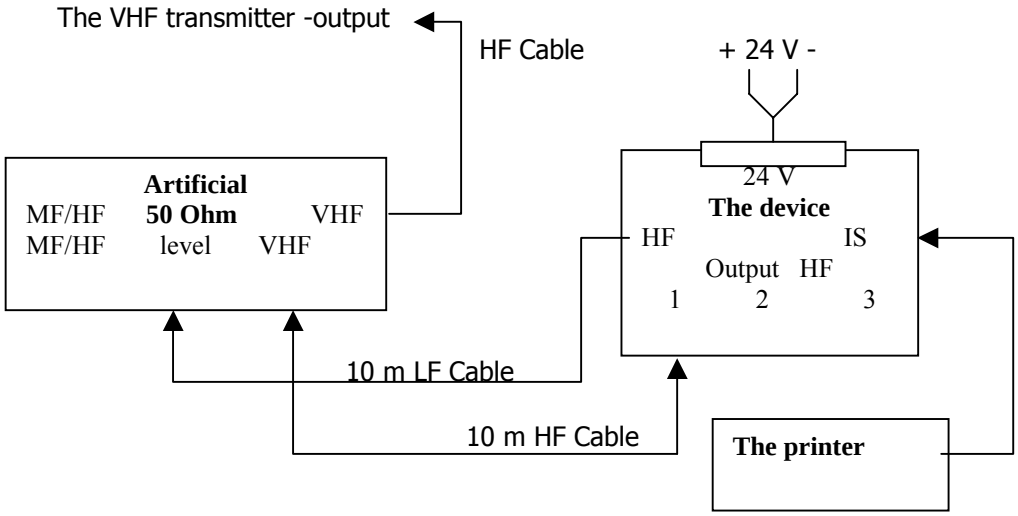


Fig.6.3.

Perform unit 5.5.3. Type on the checked equipment and transfer 5 messages with the determinant of the format: Distress call or Individual call (category: Safety).
For listing the protocol to perform unit. 5.6 and 5.6.3.
6.5. Quality of reception of the DSC messages is checked by VHF path under the block diagram showed on fig.. 6.4, connect the VHF receiver input instead of the VHF antenna by the cable HF " Output HF -1 " of the device.

+ 24 V -

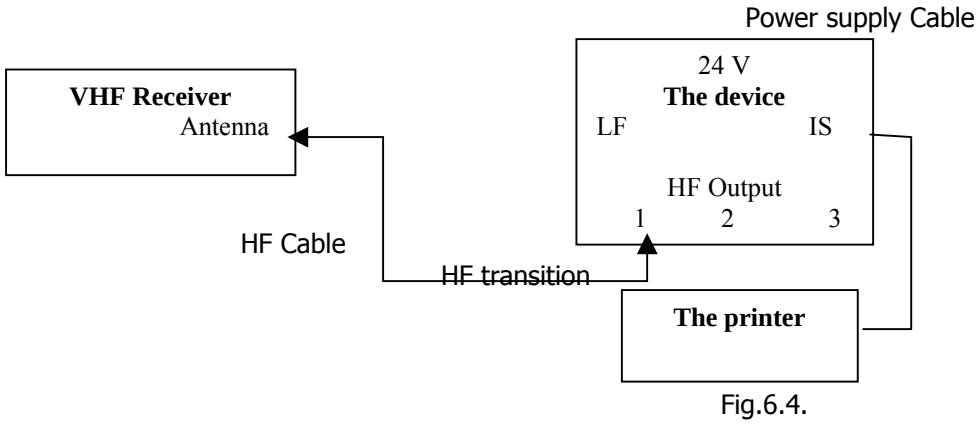


Fig.6.4.

Perform unit 5.5.3.
Perform unit 5.6. and 5.6.2 for printing the protocol.

6.6. Device operation on " low frequency ".
The LF-socket, available in the device, allows to operate on 1700 Hz FM sound subcarrier. For this purpose unsolder the LF-socket included in the complete set of delivery, according to the table

Table.6.1.

Contact #	purpose	Direction	Note
1	LF-	input	Input resistance-2 KOhm Input volatge (0,7...3) V; galvanic uncoupler 16 V
2	total	----	
3	LF-Tx	output	peak-to-peak value: 1,5...2,5 B; galvanic uncoupler 63 B
4	Power level	input	Do not use
5	Baud frequency	output	peak-to-peak value 3,2 V ≥1 KOhm galvanic uncoupler 63 V

The operation of the device on LF does not differ from operation through the radiopath except that the signal does not move on HF input of the device.

7. The check of the device

7.1. Check of the device on capacity for operation and the conformity to the requirements of specifications is carried out every 24 months of operation. The device has to be checked on the enterprise - manufacturer or service centre in accordance with instructions ordered additionally.
7.2. Check the device supplied by the 24± 1,2 V voltage in normal climatic conditions:
- Temperature of air (20±5) ºC;
- Relative humidity from 30 up to 80 %;
- Atmospheric pressure from 84 up to 106 kilopascal.

7.3. Before tests note about periodic check of the instrumentation and the nonstandard equipment .
7.4. Conformity to the requirements of unit 1 of table 1.2. is checked by external examination, checking with the circuits, drawings, measurement of the dimensional basic and adjusting sizes by the measuring tool ensuring required drawings and ГОСТ 8.051-81 accuracy, required by the drawings,
7.5. The supply voltage of the device is checked under the diagram in fig. 7.1.

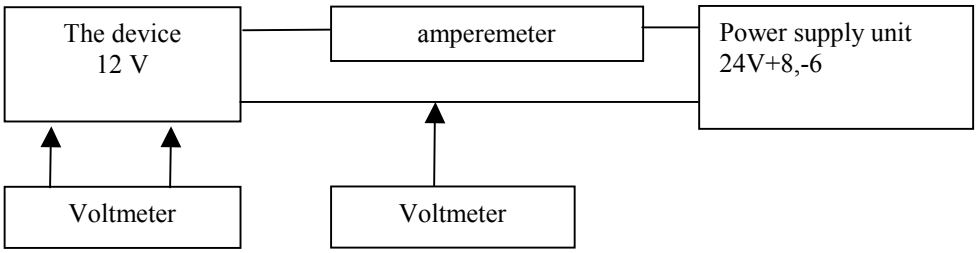
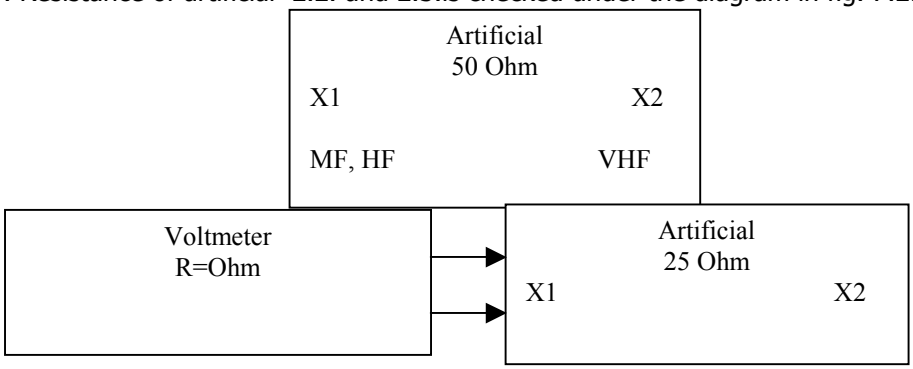


Fig 7.1

Changing the supply voltage of the device from 32 V to 18 V measure the voltage on the stabilizer 12V by the voltmeter, on contacts № 3,4 sockets X 6. The voltage should be 12 V ± 0,25 B.
7.6.Supply power of the device is checked under the diagram in fig. 7.1. Connect the device through the ammeter to power unit of the direct 24V current. Measure the supply voltage and current of the device. Power is calculated under the formula:
P=UI, where U – value of voltage, V.
I – value of current, A.

7.7. Resistance of artificial 2.2. and 2.3.is checked under the diagram in fig. 7.2.



Connect the voltmeter to the X1 - 1, X2 - 1 socket of the 50 Ohm artificial and to the X1 - X2 socket of the 25 Ohm artificial.

7.8.The power level on the input of the artificial is checked under the diagram showed in fig. 7.3.

Supply circuit 220 V, 50 Hz

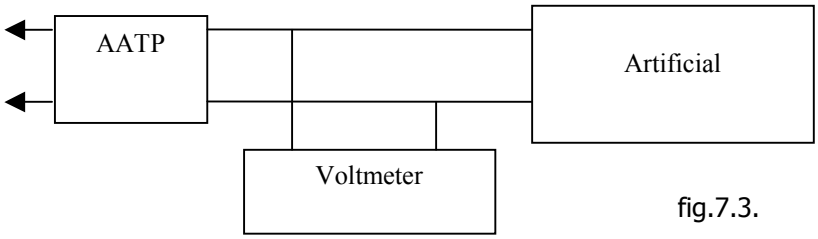


fig.7.3.

Connect the MF/HF 25 Ohm artificial to the MF/HF 50 Ohm artificial and power supply the input by voltage U1=173,2 V, which corresponds to 400 W power. Wait for 1 minute.

Cool down the MF/HF 50 Ohm artificial within 5 minutes. Power it X input by the voltage U2=112 , that corresponds 250 W power. Wait for 1 minute.

Power the input of the artificial by voltage U3=45 V, that corresponds 40 W power. Wait for 10 seconds. Measure resistance of the artificials in accordance with unit 2.2. and 2.3.

7.9. The signal level on the input of the device in accordance with unit 2.5. is checked under the diagram showed on fig. 7.4.

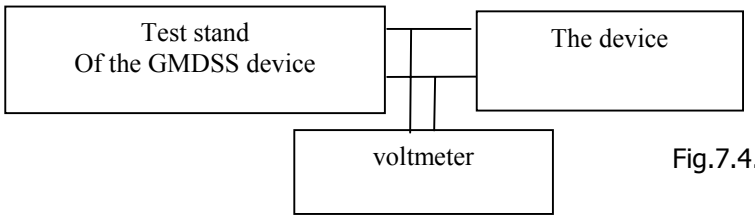


Fig.7.4.

7.9.1. Choose MF/HF operational mode – stand of the device. Set the minimum level of the output signal. Check up the reception of the "Safety" and "Distress-5" messages. The messages should be received by the device without mistakes.

7.9.2. Set the maximum level of output signal of the stand. Repeat the unit 7.9.1.

7.9.3. Switch the stand and the device in VHF mode. Set the minimum level of the output signal of the stand. Repeat the unit 7.9.1.

7.9.4. Set the maximum level of the output signal of the stand. Repeat the unit 7.9.1.

7.10. Operational frequencies of the device and accuracy of their set is checked under the diagram showed on fig. 7.5.

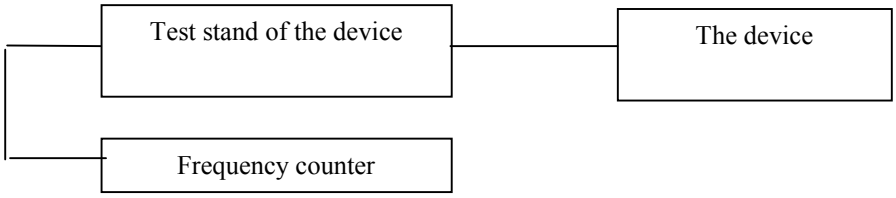


Fig.7.5.

Turn on the device. Set the mode of transfer on frequency 2187,5 KHz. Transmit the signal to the input of the stand. Connect the frequency counter to the F socket.
Measure the frequency.
7.11. The DSC Message transfer is checked with the help of the specialised STAND of CHECK СП-1А (further stand) under the following circuit rice 7.6:

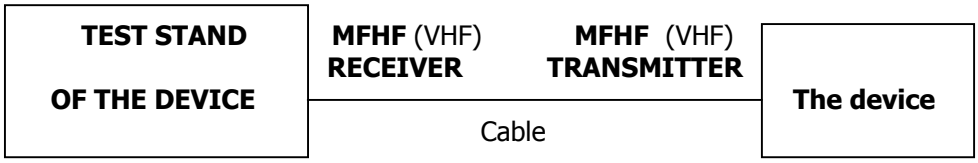


Fig. 7.6. The diagram showing the connection of the device to the stand.

Turn on the device and connect it to the stand СП1-А according to the diagram showed on fig. 7.6. Connect by cable the socket " MF/HF TRANSMITTER " of the device and socket " MF/HF RECEIVER " of the stand to check in MF/HF mode. connect by the cable a socket " VHF TRANSMITTER " of the device and socket " VHF RECEIVER " of the stand to check in VHF mode.

7.11.1. Check of DSC message transfer in HF/MF mode.

1. Choose in the MF/HF menu of the device the TRANSFER mode and press the ↵ button.
2. Choose the first message <MFHF1> and press the ↵ button. The transfer of the message is accompanied by characteristic sound signal.
3. Repeat the unit 2 four times. The indicator of the stand shows the message "RECEPTION IS COMPLETED".
4. Pressing consistently 1... 5 digital buttons of the stand, control the correctness of reception of the transferred five messages by the stand. The next features confirm the correct reception:
- Absence of the message about mistake in right top corner of the indicator;
- Displaying by the indicator of the message about reception from the MMSI device;
- The format of the received message should correspond INDIVIDUAL CALL;
- The category of the received message should correspond SAFETY;
- The quantity of not received synchronizing bit should be no more than 4;
- The amplitude of the signal should be 100... 150 units.
5. Choose the second message <MFHF2> and press the ↵ button. The transfer of the message is accompanied by a characteristic sound signal.
6. Repeat unit 5 four times. The indicator of the stand shows the message "RECEPTION IS COMPLETED"
7. Pressing consistently 1... 5 digital buttons of the stand, control the correctness of reception of the transferred five messages by the stand. The next features confirm the correct reception:
- Absence of the message about mistake in right top corner of the indicator;
- Displaying by the indicator of the message about reception from the MMSI device;
- The format of the received message should correspond DISTRESS;
- The category of the received message should correspond FIRE;
- The received coordinates should correspond;
- The received value of time should correspond transferred;
- The quantity of the not received synchronizing bit should be no more than 4;
- The amplitude of a signal should be 100... 150 units.

8. Choose the third <MFHF3> message and press ↵ button. The message transmission is accompanied by a characteristic sound signal.
9. The indicator of the stand shows the message RECEPTION IS COMPLETED after ending of the five-multiple message.
10. Pressing consistently 1... 5 digital buttons of the stand, control the correctness of reception of the transferred five messages by the stand. The next features confirm the correct reception:
- Absence of the message about mistake in right top corner of the indicator;
- Displaying by the indicator of the message about reception from the MMSI device;

- The format of the received message should correspond DISTRESS;
- The category of the received message should correspond GROUNDING;
- The received coordinates should correspond;
- The received value of time should correspond to the transferred
- The quantity of the not received synchronizing bit should be no more than 4;
- The amplitude of a signal should be 100... 150 units.

11. If units 4, 7 and 10 are performed the device operates correctly in MF/HF mode.

7.11.2. Check of the DSC message transfer in VHF mode

1.Choose in the VHF menu of the device the TRANSFER mode and press the ↵ button .
2. Choose the first message<VHF1> and press the ↵ button.
3. Repeat unit 2 four times. The indicator of the stand shows the message RECEPTION IS COMPLETED.
4. Pressing consistently 1... 5 digital buttons of the stand, control the correctness of reception of the transferred five messages by the stand. The next features confirm the correct reception:
- Absence of the message about mistake in right top corner of the indicator;
- Displaying by the indicator of the message about reception from the MMSI device;
- The format of the received message should correspond INDIVIDUAL CALL;
- The category of the received message should correspond SAFETY;
- The quantity of the not received synchronizing bit should be 180 ...182 ;
- The amplitude of a signal should be 100... 150 units.

5. Choose the second message<VHF2> and press the ↵ button.
6. Repeat unit 5 four times. The indicator of the stand shows the message RECEPTION IS COMPLETED.
7. Pressing consistently 1... 5 digital buttons of the stand, control the correctness of reception of the transferred five messages by the stand. The next features confirm the correct reception::
- Absence of the message about mistake in right top corner of the indicator;
- Displaying by the indicator of the message about reception from the MMSI device;
- The format of the received message should correspond DISTRESS
- The category of the received message should correspond FIRE;
- The received coordinates should correspond;
- The received value of time should correspond to the transferred;
- The quantity of the not received synchronizing bit should be 180 ...182;
- The amplitude of a signal should be 100... 150 units.

8. Choose the third message<VHF3> and press the ↵ button.
9. The indicator of the stand shows the message RECEPTION IS COMPLETED after ending of the five-multiple message.
10. Pressing consistently 1... 5 digital buttons of the stand, control the correctness of reception of the transferred five messages by the stand. The next features confirm the correct reception:

- Absence of the message about mistake in right top corner of the indicator;
- Displaying by the indicator of the message about reception from the MMSI device;
- The format of the received message should correspond DISTRESS
- The category of the received message should correspond GROUNDING;
- The received coordinates should correspond;
- The received value of time should correspond to the transferred;
- The quantity of the not received synchronizing bit should be 180... 182;
- The amplitude of the signal should be 100... 150 units.

11. If units 4, 7 and 10 are performed the device operates correctly in VHF mode.

7.12. Check of the DSC messages reception.
The reception of the DSC messages is checked with the help of the specialized CHECK STAND СП-1А (the stand) under the following diagram showed on fig 7.7:

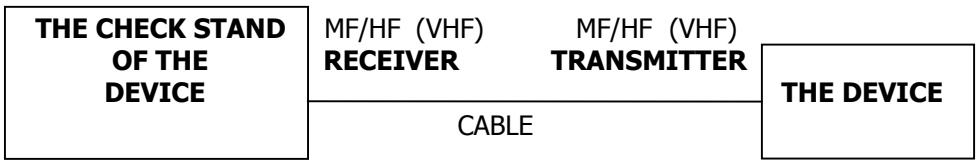


fig . 7.7 Connection of the device to the stand

Turn on the device and connect it to the СП1-А stand according to the diagram on fig. 7.7. Connect by cable the socket " MF/HF TRANSMITTER " of the device and socket " MF/HF RECEIVER " of the stand to check in MF/HF mode. connect by the cable a socket " VHF TRANSMITTER " of the device and socket " VHF RECEIVER " of the stand to check in VHF mode.

7.12.1. Check of the DSC messages reception in MF/HF mode.

1. Choose in the MF/HF menu of the device the RECEPTION mode and press the ↵ button.
2.Choose the first message <MFHF1> and press the ↵ button. The transfer of the message is accompanied by characteristic sound signal.
3. Repeat unit 2 four times. Repeat the unit 2 four times. The indicator of the stand shows the message "RECEPTION IS COMPLETED".
4. Pressing consistently 1... 5 digital buttons of the stand, control the correctness of reception of the transferred five messages by the stand. The next features confirm the correct reception:
- Absence of the message about mistake in right top corner of the indicator;
- Displaying by the indicator of the message about reception from the MMSI device;
- The format of the received message should correspond INDIVIDUAL CALL;
- The category of the received message should correspond SAFETY;
- The quantity of not received synchronizing bit should be no more than 4;
- The amplitude of the signal should be 100... 150 units.
5. Choose the second message <MFHF2> and press the ↵ button. The transfer of the message is accompanied by a characteristic sound signal.

6. Repeat unit 5 four times. The indicator of the stand shows the message "RECEPTION IS COMPLETED"
7. Pressing consistently 1... 5 digital buttons of the stand, control the correctness of reception of the transferred five messages by the stand. The next features confirm the correct reception:
- Absence of the message about mistake in right top corner of the indicator;
- Displaying by the indicator of the message about reception from the MMSI device;
- The format of the received message should correspond DISTRESS;
- The category of the received message should correspond FIRE;
- The received coordinates should correspond;
- The received value of time should correspond transferred;
- The quantity of the not received synchronizing bit should be no more than 4;
- The amplitude of a signal should be 100... 150 units.

8. Choose the third <MFHF3> message and press ↵ button. The message transmission is accompanied by a characteristic sound signal.
9. The indicator of the stand shows the message RECEPTION IS COMPLETED after ending of the five-multiple message.
10. Pressing consistently 1... 5 digital buttons of the stand, control the correctness of reception of the transferred five messages by the stand. The next features confirm the correct reception:
- Absence of the message about mistake in right top corner of the indicator;
- Displaying by the indicator of the message about reception from the MMSI device;
- The format of the received message should correspond DISTRESS;
- The category of the received message should correspond GROUNDING;
- The received coordinates should correspond;
- The received value of time should correspond to the transferred
- The quantity of the not received synchronizing bit should be no more than 4;
- The amplitude of a signal should be 100... 150 units.
11. If units 4, 7 and 10 are performed the device operates correctly in MF/HF mode.

7.12.2. Check of reception of the messages DSC in the VHF mode.

1.Choose in the VHF menu of the device the RECEPTION mode and press the ↵ button .
2. Choose the first message<VHF1> and press the ↵ button.
3. Repeat unit 2 four times. The indicator of the stand shows the message RECEPTION IS COMPLETED.
4. Pressing consistently 1... 5 digital buttons of the stand, control the correctness of reception of the transferred five messages by the stand. The next features confirm the correct reception:
- Absence of the message about mistake in right top corner of the indicator;
- Displaying by the indicator of the message about reception from the MMSI device;

- The format of the received message should correspond INDIVIDUAL CALL;
- The category of the received message should correspond SAFETY;
- The quantity of the not received synchronizing bit should be 180 ...182 ;
- The amplitude of a signal should be 100... 150 units.

5. Choose the second message<VHF2> and press the ↵ button.
6. Repeat unit 5 four times. The indicator of the stand shows the message RECEPTION IS COMPLETED.
7. Pressing consistently 1... 5 digital buttons of the stand, control the correctness of reception of the transferred five messages by the stand. The next features confirm the correct reception::
- Absence of the message about mistake in right top corner of the indicator;
- Displaying by the indicator of the message about reception from the MMSI device;
- The format of the received message should correspond DISTRESS
- The category of the received message should correspond FIRE;
- The received coordinates should correspond;
- The received value of time should correspond to the transferred;
- The quantity of the not received synchronizing bit should be 180 ...182 ;
- The amplitude of a signal should be 100... 150 units.

8. Choose the third message<VHF3> and press the ↵ button.
9. The indicator of the stand shows the message RECEPTION IS COMPLETED after ending of the five-multiple message.
10. Pressing consistently 1... 5 digital buttons of the stand, control the correctness of reception of the transferred five messages by the stand. The next features confirm the correct reception:

- Absence of the message about mistake in right top corner of the indicator;
- Displaying by the indicator of the message about reception from the MMSI device;
- The format of the received message should correspond DISTRESS
- The category of the received message should correspond GROUNDING;
- The received coordinates should correspond;
- The received value of time should correspond to the transferred;
- The quantity of the not received synchronizing bit should be 180... 182;
- The amplitude of the signal should be 100... 150 units.

11. If units 4, 7 and 10 are performed the device operates correctly in VHF mode.

8. General operational instructions.

Before operation keep the device in packages for 2 hours after storage

After storage in conditions of the high humidity keep the devices before turning on in normal conditions for 12 hours.

9. Storage Rules

The device should be stored in package in warehouse room protecting it from influence of the atmospheric precipitation.

Store the device at temperature from 278 K (5°C) up to 313 To (40°C) and at the relative humidity of air no more than 80 %.