SPECIFICATION
of
BEACON TESTER

TABLE OF CONTENTS

1. Purpose 3
2. Basic parameters and characteristics 3
3. The set of the device 5
4. Operation of the device 6
5. Preparation for operation and operational procedure 7
6. Measurement of BEACON's parameters. 20
7. Check of the device. 23
8. Common guideline in maintenance 23
9. Storage rules 23

Appendix 1 24
Appendix 2 25
Appendix 3 26

1. PURPOSE

The BEACON Tester is designed for check of the COSPAS SARSAT BEACONs of all types with rigid fixing of antenna and antenna connection through high-frequency socket in accordance with the requirements of the SOLAS Convention - 74/88, IMO Resolutions A.695 (17) and A. 810 (19), Recommendations 633 OF IMO, specifications C/S T-001, C/S T-007 of COSPAS-SARSAT Committee and Rules of the Sea Register of Navigation.

The Tester allows to:

- check the frequency carrier - 406 MHz;
- check the presence of the frequency carrier - 121,5 MHz;
- measure the values of positive and negative phase of modulated signal;
- the duration of the message on frequency 406 MHz;
- evaluate the duration of unmodulated preamble on frequency 406 MHz;
- measure the signal power on frequency 406 MHz;
- measure the signal power on frequency 121,5 MHz;
- check the presence of the sweep-tone;
- decode the received emergency information on the 406 channel MHz for all types of the protocols appropriate to the Recommendations C/S T-001;
- print the protocol of BEACON's check;
- check BEACON's parameters as through a connector (with use of an artificial), as through broadcast by antenna.

The device is designed for operation at temperature range + 5 C up to + 45C with relative humidity of air up to 95%.
The device is supplied by 24 V onboard power circuit (with usage of the supply unit) or by built-in battery.

2. BASIC PARAMETERS AND CHARACTERISTICS

2.1 The device provides the check of the 406 MHz frequency carrier accurate within ±50 Hz.
2.2 The device provides the check of the 121,5 MHz frequency carrier and sweep-tone presence .
2.3 The device provides the reception and complete decoding of the received emergency message for all types of the protocols appropriate to the Recommendations C/S T-001, allows to display the information as in hex-codes (separately 1-112 bits, 26-108 bits, 26-85 bits, 113-144 bits) as in text format with indicating of basic message's parameters. Besides, device makes the calculation of the BCH code remainder and compares it with received.
2.4 The device makes measurement of a positive and negative phase of the modulated signal accurate within ± 2 degrees.
2.5 The device provides the check of the common time of transmission of the message accurate within ±2 % and time of a preamble accurate within +- 2%.
2.6 The device makes indication of a signal's power level on frequency 406 MHz in a range 1,6-7W accurate within ± 2,5 db.
2.7 The device makes indication of a signal's power level on frequency 121,5 MHz in a range 10-55 mW accurate within ± 2,5 db.

2.8 The device allows to check the BEACON's parameters as through a connector (using the artificial of an antenna), as through the broadcast by antenna.
2.9 Resistance of artificial antenna is 50 Ohms ±1,5 Ohms.
2.10 Standing-wave ratio of artificial antenna on frequency 406 MHz ≤ 1,15.
2.11. Voltage damping factor (VDF) of an artificial antenna :
on frequency 406 Mhz VDF = –38db±1,5 dB;
on frequency 121,5 Mhz VDF = – 54db±5db
2.12 Standing-wave ratio of antenna:
on frequency 406 MHz < 1,1
on frequency 121,5 MHz < 1,6
2.13 The device allows to make measurements in an automatic mode (measurement of all parameters during one message) and individually (each parameter during one message).
2.14 The device allows saving in non-volatile memory 10 blocks of the measured parameters.
2.15 Time of one cycle of measurement is no more than 2 minutes.
2.16 The device provides the output of the measurement's results on display and printing of the check protocol. Time of printing is no more than 1 minute.
2.17 The device is power supplied by 24 V onboard power circuit (with usage of a supply unit) or by built-in battery.

2.18 The current consumed by a supply unit from 24V circuit is:
no more than 0,5 A - without the printer
no more than 1,4 A - with the operating printer.
2.19 The onboard power circuit voltage should be 24 V + 1V - 4 V
2.20 Operational life of the device supplied by the battery unit is not less than 6 hours.
2.21 The device provides recharge of a battery unit through a supply unit. The maximum time of recharge is no more than 16 hours.
2.22 The device provides automatic stop after completion of the recharge.
2.23 The device displays voltage of a battery unit accurate within ± 5%.

3. THE SET OF THE DEVICE

The deliver set of the device should the same as shown in table # 1

Table #1

№	Name	Qt	comment
1	BEACON's Tester ААГН 468.223.002	1	
2	Measurement antenna ТИЦА 464.651.001	1	
3	Artificial antenna – attenuator ААГН 464.659.005	1	
4	Supply unit – charger ААГН 469.315.000	1	
5	Block of accumulators ААГН 436.631.000	1	
6	Printer	1	Add. Order
7	High –frequency cable ААГН 685.661.000	2	
8	Low-frequency cable ААГН 685.611.000 (24 V power supply)	1	
9	Package of spare parts: fuse link ВП1-1 1А fuse link ВП1-1 2А	1 2	
10	Operation Manual	1	
11	Device package	1	
12	Power supply cable	1	

4. OPERATION OF THE DEVICE

The BEACON's parameters can be measured through cable and artificial or through the broadcast by antenna. An antenna or artificial is connected to a socket on the upper panel of the device. The measurements can be taken autonomously - in this case the device is power supplied by the battery unit or by an exterior supply unit connected to an onboard power 24 V circuit.

The battery unit can be charged by a charger. The printing of the check protocol is carried out through the supply unit, which supplies the printer and provides the transmission of the data from the device.

The signal from the tested BEACON (See application 1) through an artificial or through the broadcast by an antenna comes to duplixer, after which the signal of the message is processed by a 406 MHz radiopath, and signal of sweep-tone by a 121 MHz radiopath. The processed signals from radiopathes are transmitted to the block of measurement of the frequency and block of the central controller. The high-frequency counters and separate microcontroller make the measurement of frequency.

The measurement of all other parameters is taken by the central controller. Both controllers are clocked by frequency from the high stable basic generator. The block of the central controller, except processing of signals from BEACON, supplies the indicator, the pad and acoustical piezo-oscillator. Besides through a voltage commutator the central controller turns on the power supply only to those blocks, which are necessary in the given moment (it reduces the common power drain), turns on and off the charger, and also transmits data to the printer.

The reference-voltage source is used for increase the measurements' precision of the signals amplitude.

5. PREPARATION FOR OPERATION AND OPERATIONAL PROCEDURE

The device can be supplied as by an internal source (built-in accumulators) as by 24 V supply unit.

5.1 The tools of the control and connection.

The four-rowed indicator and keyboard are located on the device's forward panel (fig. 5.)The upper right **POW** button is intended for turning on the device. Average **RST** button -for turning it off. Left upper button is intended for turning on /turning off the illumination of the indicator. The lower set of the ←, **ESC, ENT,** → buttons are intended for changing the menu items and for their execution.
The antenna's or the artificial's connector is located on the upper panel of the device. The supply unit's connector is located on the left panel of the device.

5.2 Turning on and off the device.

The device is turned on by pressing the **POW** button and keeping it until the information about the voltage value and the inside temperature's value appears on the display:

WELCOME!
BEACT XXXX
U = XX, XXV
ALEXS V 1.3

and beeps. Then release the **POW** button. The keeping of the **POW** button during 5 seconds turns off the device.

The voltage of accumulators is displayed after turning on the device. Normal voltage is 8,4 V. If the voltage of accumulators is lower than 8,4 V, but not less than 7,7 V after turning on the device the indicator shows the message:

CHARGE BAT
"Charge storage battery"

In this case, during some time, the device still can operate. But if the voltage of the battery falls below 7,7 V, the device will not operate and if it is not switched off, the device will be switched off automatically in 2 minutes.
The device is turned off in the following cases:

- Pressing and release of the RST button;
- Pressing of the POW button, keeping it in the pressed mode for 10 seconds and consequent release;
- any button is not pressed within 15 minutes (except a warming up mode);
- The voltage of accumulators is lower than 7,7 V.

5.3 Device menu.

After turning on and displaying the battery voltage and the temperature inside a body, the

device displays the message:

WARMING UP
"Warming up the device"

The warming up time guaranteeing the precision of the checking parameters is equal to 15 minutes, after which the device displays the main menu. However, it is possible to enter the main menu before ending of the warming up period if necessary.

The device's menu has the structure, shown on application 2. The horizontal travel is carried out by buttons ← and → (according to arrows on keyboard < and >).
The vertical travel is carried out by the **ENT** buttons - downwards or execution and **ESC** - up or exit from the submenu. It is also possible to leave the submenu by buttons ← and →
The main menu consists of five submenus:
<MEASURE> - the measurement of the BEACON's parameters;
<VIEW> - viewing of the measurement's results;
<LINKS> - printing of the test report by the peripheral device;
<SETUP> - parameter setup, saving of the data in non-volatile memory and charge of a storage battery;
<TEST> - testing of the device's parameters.
Each menu has the submenu, the menu can be selected by the same buttons.
The ESC button used to return to the main menu.

5.3.1. Menu MEASURE > - MEASUREMENT

After device is turned on (including warming up) display shows the menu:

MEASURE >
"MEASUREMENT"

After pressing the **ENT** button submenu <AUTO> is displayed - automatic measurement mode.

By pressing → button the manual mode replaces automatic. It allows checking individually the next parameters:
<406025> - measurement of the 406 MHz frequency carrier;
<121500> - checking the presence of the 121,5 MHz frequency and sweep-tone.
<PHASE> - the phase's measurement;
< T SEQ > - measurement of the message duration on the 406 MHz frequency;
<POW.406> - measurement of the signal power on the 406 MHz frequency;
<POW.121> - measurement of the signal power on the 121 MHz frequency;
<RESERV> - backup submenu of the menu (it is not recommended to use).

5.3.1.1. Submenu AUTO > - automatic measurement mode.

All BEACON's parameters are measured in auto mode <AUTO>.

- Measurement of the 406 MHz frequency carrier;
- Checking the presence of the 121,5 MHz frequency and the sweep-tone.
- Measurement of the values of the positive and negative phase;
- Checking of the message duration of the signal on 406 MHz frequency;
- Checking of the preamble time i.e. period from the beginning of the 406 MHz

carrier's transmission to the beginning of the phase modulation;

- Measurement of the signal power on 406 MHz frequency;
- Measurement of the signal power on 121 MHz frequency;
- Complete decoding of the received message.

After pressing the **ENT** button in submenu <AUTO> the display shows the message:

ON BEACON
AND GO ON
" Switch on BEACON and go away"

The pressing of the **ENT** button turns the device into the measurement mode of BEACON's parameters. The display shows the message:

MEASURING!
WAIT!
" THERE ARE MEASUREMENTS! "
"WAIT"!

The measurements are accompanied by sound indication of the sweep-tone signal. All cycle of measurements is not longer than 2 minutes. Then the device displays:

OFF BEACON
" SWITCH OFF BEACON "
ACCOUNT
" THE EVALUATIONS " ARE MADE

After the evaluations the device shows the message:

VIEW
AUTO
NEXT?
"VIEWING"
"AUTOMATIC MODE "
" FOLLOWING PARAMETER? "

The measured parameters can be sequentially viewed, not entering the VIEW mode– by pressing any of the ←, **ENT**, → buttons.

The measured parameters are displayed in the following sequence:

- Value of the 406 MHz frequency carrier - in hertz;
- Checking the presence of the 121 MHz frequency and sweep-tone :YES or NO;
- Value of the positive and negative phase - in degrees;
- Value of the message duration - in milliseconds;
- Value of 406 MHz power - in watts;
- Value of 121 MHz power - in milliwatts;
- Decoding of the received message.

The received message is displayed in different views.

Entering the menu "SEQUENCE" - "MESSAGE" with the help of the ←, →buttons and fixing a choice by the ENT button makes it possible to view the message in HEX - format from 1 up to <112 bits-1-112 >, from 25 up to 108 bits - < 25-108 >, from 26 up to 85 bits - < 26-85 > and from 113 up to 144 bits < 113-144 > (if message is 144 bits).

While entering the menu < BCH code> BCH's remainder is calculated according to the received bits and the bit-by-bit comparison of the calculated and the received remainder of BCH code is carried out. In case of complete concurrence the next message appears on the display:

BCH OK
" CODE BCH In NORM ",

or

BCH BAD
" CODE BCH NOT In NORM ".

This test allows estimating correctness of BCH code calculations in the message and absence of errors.
If the **ESC** button is pressed in submenu SEQUENCE the display shows the message:

VIEW
AUTO
NEXT?

by pressing **ENT**, the fragments of the received message are displayed in ASCII format (as text).
In submenu <MAIN> "BASIC" the code of the country and the BEACON's number or coordinate and belonging to a defined type are viewed.

In the submenu <EXT.1> - the presence of a drive and its type, way of the BEACON's turning on are decoded.

The device decodes all types and subtypes of BEACONs, in accordance to the engineering requirements COSPAS - SARSAT C/S T.001. The details of decoding are in the application 4.

The <EXT 2> submenu is intended for the future modifications.
From any submenu it is possible to leave to the main menu by pressing the ESC button.
The measured and calculated parameters are saved till the next check or turning off the device, but it is possible to view them only by entering in <VIEW> - "SCANNING".

5.3.1.2. Submenu of the menu <406025>- measurements of the 406 MHz frequency carrier.

This and the consequent (right) submenus of the menu <MEASURE > make one-time, hand-operated measurement of one selected parameter.

After pressing **ENT** in the <406025> menu the display shows the message:

MEASURING!
WAIT!

and measurements of 406 MHz frequency carrier are made, in hertz.

If the checking frequency does not belong to range from 403 MHz up to 409 MHz the display shows the message:

FREQ. OUT RANGE
" FREQUENCY OUTSIDE OF a RANGE "

The last measured value is saved till not turning off the device and it can be viewed in menu <VIEW>.

5.3.1.3. Submenu of the menu <121500> - determination of presence of the 121 MHz frequency carrier.

After pressing of the ENT button in the <121500> menu the display shows the message:

MEASURING!
WAIT!

accompanied by a signal of the sweep-tone.
After measurement and analysis of a spectrum of sweep-tone the display shows the message:

CARR. YES/NO F121
" CARRIER F 121 yes / no "

depending on presence or absence of the carrier in 121 MHz and on the correctness of a spectrum of sweep-tone.
The results of last measurements are saved in viewer <VIEW> till not turning off power supply.

5.3.1.4. Submenu of the menu <PHASE> - change of a phase.

By pressing the **ENT** button in the <PHASE> menu, the display shows the message

MEASURING!
WAIT!

Then

OFF BEACON
ACCOUNT

and device makes measurement and calculation of a positive and negative value of a phase Results of measurements and calculation are displayed in degrees. The calculations are made, according to the specification C/S T.001, by first 16 bits of message. During measurement of a phase the received message has been receiving and decoding and can be viewed in the menu <VIEW>. Results of the last measurements until turning off the power supply are saved and can be viewed by <VIEW>.

5.3.1.5. Submenu of the menu < T SEQ > - the measurement of the duration of the message.

After pressing the ENT button in the <T SEQ>, menu the display shows the message:

MEASURING!
WAIT!

and, then, the results of measurement in milliseconds.
Results of last measurements until turning off the power supply of the device are saved and can be viewed by VIEWer.

5.3.1.6. Submenu of the <POW.406> menu – the measurement of the power on 406 MHz frequency.

After pressing the **ENT** button in the<POW.406> menu the display shows the message:

MEASURING!
WAIT!

And, then, the results of measurements, in watts.
The results of last measurements are saved until turning off the device and can be viewed in the menu <VIEW>.

5.3.1.7. Submenu of the <POW.121> menu – the measurement of the power on 121 MHz frequency.

After pressing the **ENT** button in the <POW.121> menu the display shows the message:

MEASURING!
WAIT!

accompanied by signal of sweep-tone and, then, shows the results of measurements in milliwatts.
The results of last measurements are saved until turning off the device and can be viewed in

the <VIEW> menu

5.3.1.8. Submenu of the menu <REZERV> - the backup submenu.

This submenu is backup and it is not recommended to press the button **ENT** in this submenu

5.3.2. Menu <VIEW> - viewing of the measurements results.

This menu is intended for viewing the data and has three submenus:
< AUTO > - viewing of the results which have been measured out in an automatic mode;
<MANUAL> - viewing of the results which have been measured out in a hand-operated mode;
< DUMP> - viewing of the memory's contents of the controller.

The results of measurements can be viewed in <VIEW> menu immediately after measurements or after loading from non-volatile memory. No more than 10 blocks of measurements can be stored in non-volatile memory.

5.3.2.1. Submenu AUTO > of the menu < VIEW >.

This submenu is intended for viewing of the last values measured in the <AUTO> mode or read from the memory (but measured in <AUTO> made too).

Choose the necessary parameter for viewing by the ← and → buttons.
and viewing by the **ENT** button. As against viewing in <MEASURE> mode, <AUTO> - in <VIEW>, <AUTO> the parameters < T PHASE > - the time of increase of a phase which has an evaluative character and < T PRE > - time of a preamble in milliseconds (time from the beginning of the 406 MHz carrier's transmission prior to the beginning of the message passing (prior to the beginning of the phase modulation)).

Other menus is the same with the viewing in a <MEASURE> mode (see 5.3.1.1.).

After data loading from the memory, they also are viewed by the help of buttons ← and→, **ENT**.

5.3.2.2. Submenu <MANUAL> of the menu <VIEW>.

Through this submenu last values measured in a hand-operated "single" mode can be viewed or read from the memory (but measured in the hand-operated " single " mode too).

Values of < T SEQ > - time of the phase increase (evaluative parameter), < T PRE > - time of the preamble, the decoding of the received message <SEQ.HEX> - in HEX format and <SEQ.ASC> - in a textual format can be viewed only after measurement of a phase in a hand-operated mode by <PHASE> of the menu MEASURE >.
The viewing of the parameters is the same with unit 5.3.2.1.

5.3.2.3. Submenu < DUMP - the menu < VIEW >.

This submenu is intended for viewing of the controller's memory and has a technological

purpose.

5.3.3. Menu <LINKS> - the data transmission to the peripheral devices.

This menu is intended for transmission of the measured results to the printer by submenu <PRINT >. Select submenu <PRINT > and by the ENT button enter the submenu:
<AUTO > - print the check protocol which has been made in AUTO mode;
<MANUAL> - print the check protocol which has been made in a hand-operated mode;
< DUMP> - print the memory area of the controller (has a technological character).
Press the button ENT in the selected submenu to print the results.

The printer should be connected (see unit 5.6). If there is no printer the display shows the message:

NO ANSWER

After transmission of the message the display shows

TRANSMITED

The submenu of the< PC> menu is reserve and does not make the transmission of data.

5.3.4. Menu <SETUP> - the parameter's setup of the device.

This menu is intended for saving and calling the measurements' results from the non-volatile memory, and setting the parameters of the device and charging the storage battery. The menu <SETUP> has seven submenus:
<SAVE > - save the results of measurement of BEACON's parameters in non-volatile memory;
<LOAD> - call the results of measurements, saved in non-volatile memory, to view by the menu <VIEW>;
<CURRENT> - restore the current results of the measurements;
<DATE> - set of the check date;
<CHARGE> - charge the storage battery;
< N MEAS. >- - indication of the number of measurements, made by device;
< BLC.OFF> - check the presence or absence of the backlighting during turning on of the device.

5.3.4.1. Submenu <SAVE> - saving of results of measurements.

The device has the non-volatile memory keeps the saving data when the device is turned off. Size of this memory allows to store the information of 10 measurements. The blocks containing all parameters measured in the <AUTO > mode and all last parameters, measured in hand-operated (single) mode are saved in the memory.

Each block saved in the memory has the number from "0" up to "9". By this number, and by the date of saving and the current number of measurement it is possible then to read the necessary block from the memory by the <LOAD> submenu. For block saving it is necessary to make measurement in <AUTO> mode.

Press **ENT** in submenu <SAVE > to read the block of the parameters. The display shows the message in a bottom line:

BEACON X

X - Number of the block from "0" up to "9".
The number of blocks are given automatically, from "0" and up to "9", then again "0" etc. Thus, memory contains 10 last blocks.
When pressing the **ENT** the memory saves the block. When pressing the button **ESC** the memory doesn't save the block. It is impossible to save doubly the same block.

5.3.4.2. Submenu <LOAD> - call of the measurements results saved in non-volatile memory.

Any block saved in the memory can be viewed by <VIEW>.menu
After pressing the button **ENT** in the <LOAD> submenu the display shows the message:

LOAD?
NM = XXXXX
XX.XX.20XX
BEACON X

The display shows in the bottom line the number of the block which can be viewed now. The data of the measurements is shown too.

It is recommended after device's turning on to set the date, as the device has not an internal hours or calendar (see unit 5.3.4.4).

The five-unit number of measurements is shown in the second line of the display. Each check in <AUTO> mode increases this number by one, that gives the information about the total number of measurements, made by the device, and helps to identify the block. The same number is printed out in the protocol.
If now press the **ENT** button the given block is read for viewing by the menu <VIEW>.

It is possible to read in <VIEW> any of 10 blocks by hitting the button ← and→
Press the **ESC** button to cancel the viewing.

5.3.4.3. Submenu <CURRENT> - restoring in <VIEW> of the current block of measurements.

When entering the <VIEW> menu - viewer of the block of parameters from non-volatile memory, the available in <VIEW> data are reloaded to the temporary buffer and can be restored by pressing of the **ENT** button in the <CURRENT> submenu.

This submenu can be used, when after the measurements it is necessary to compare the obtained data with the data saved earlier in non-volatile memory. The necessary block is load in <VIEW> from the submenu <LOAD> and then, by the submenu <CURRENT>, if it necessary the measured parameters can be saved in non-volatile memory.

5.3.4.4. Submenu <DATE> - set of the current date.

The device has not an internal hours and calendar and consequently it is necessary to set the current date manually. The date is printed in the check protocol, and also helps to

identify the data blocks saved in non-volatile memory.
<DATE> - has two submenus:
<ENT.DATE > - set and correction of the date;
< CLR DATE> - clearing of the date.

Set the necessary date by the button <- , -> and ENT in menu DATE>:

Number Month Year

Press the **ESC** button to leave the menu.
Press the **ENT** button in <CLRDATE>submenu to clear the date.
In this case, the spaces will be printed instead of the exact date.

5.3.4.5. Submenu <CHARGE> - charge of a storage battery.

The device has a storage battery allowed to take the measurement without supply unit within 6-8 hours. It is necessary to connect a supply unit and in the <CHARGE> submenu press the ENT button to charge the accumulators.

The display shows in a third line the values of accumulators' voltage in volts. If the voltage of a storage battery exceeds 10,2 V, recharge can be made and display shows:

NO NEED
" THERE IS NO NECESSITY "

The charge of accumulators will be automatically stopped when the battery voltage is equal to 10,2 V and the device will be automatically disconnected 18 minutes later.
Press the button ESC to leave the menu <CHARGE> and stop the charging of the battery
The recommended time of a charge is not more than 14 hours.

5.3.4.6. Submenu < N MEAS. > - viewing of number of last measurement.

Each measurement in <AUTO > mode increases the number of measurement by one. Current five – unit number of measurements is put to the check protocol and is displayed in blocks of the measurements which have been saved in non-volatile memory.
Press the button ENT to view the current number of measurements. It is impossible to change this number.

5.3.4.7. Submenu < BLC.OFF> – set of the backlighting during turning on of the device.

Press the button **ENT** to change the mode of the backlighiting from ON to OFF.
ON- the backlighiting is turned on after during operation of the device.
OFF- the backlighiting is turned off after during operation of the device.

5.3.5. MENU < TEST> - testing of the device parameters.
5.3.6.

This menu is intended for obtaining of the special and technological information and consists of 8 submenus:
<UCC > - indication of the storage battery voltage;

<TEMPERAT> - indication of temperature inside the device;
<FREQ> - indication of a value of intermediate frequency;
<DAC> - set and indication of a code of digital-to-analog converter;
<PhTEST> - measurement testing mode of phase with indication and calculation of its values on each half-baud;
<PhTEST1> - measurement of duration of each halfcycle of IF preamble;
<PhTEST2> - measurement of duration of each halfcycle of IF message;
< POW TEST> - measurement of a power in an uninterrupted mode.
<UCC> and **<TEMPERAT>** has the greatest interest for the user from all these. Other submenus serve for technological testing of the device and detailed research of BEACON's operation. Therefore we shall examine only two submenus.

5.3.5.1. Item UCC > - indication of effort(voltage) of a storage battery.

To display the voltage of the storage battery press the button ENT. The minimum voltage at which the device can operate is Ucc= 8.4V. If the voltage is equal to 10 V, the accumulators are enough charged.

5.3.5.2. Item <TEMPERAT> - indication of the temperature inside the device.

To display the temperature inside of the device in C degrees press the button **ENT** in submenu <TEMPERAT> .
It is necessary to know this parameter in hot conditions of operation. The value of the temperature should not exceed 50 C and in operated mode should not be lower than15C degrees.

5.4. Device operation from a supply unit.

Use a supply unit including to the device's set and supplied by the current 24 V voltage

5.4.1. Supply unit.

The supply unit is intended for power supply of the device with fixed voltage 14 V, power supply of the printer by fixed voltage 9 V, and also for information connection of the device with the printer.
The supply unit is connected to a board circuit of a direct current 24 V by a cable included in a set of the device. The supply unit is connected with the device by a cable. The supply unit is connected with the printer by a cable.
The supply unit has three locks (on 24 V, 14 V and 9 V circuits) and three LEDs indicating the correct operation of the appropriate voltage circuits . One more LED indicates the correct operation of the circuit of data transmission.

5.4.2. Connecting the device to a supply unit.

Connect a cable in supply unit to a connector in the left-hand side of the device. Connect a

cable to a board 24 V circuit of direct current, taking into account the polarity of power supply. Connect a connector of the cable to the 24V connector of supply unit. All four LEDs should shine.
Turn on the device according to unit 5.2.
After warming up the device is ready to operation.

5.5. Operation of the device from a storage battery and its charge.
5.6.

The device has a built-in storage battery which provides, at full charge, operation within 6-8 hours. The degree of accumulators' discharging can be by the menu < TEST, UCC >. Maximum voltage of accumulators is 10,2 V, minimum 8,4 V.
The device still can operate at voltage less than 8,4 V, but not less than 7,7 V, but the display remainders the necessity of recharge after turning on and before each measurement and shows the message:

CHARGE BAT

At voltage of the battery less than 7,7 device shows:

CHARGE BAT
ON EXT.UCC

" CHARGE a storage BATTERY "
" INCLUDE the EXTERIOR POWER SUPPLY "

and the device doesn't respond to the buttons and doesn't enter any menu. In this case it is necessary to connect the device to a supply unit or to switch it off. If the device is not switched off in two minutes, it will be disconnected automatically.
The device automatically checks the voltage of a storage battery after turning on and before each measurement.

5.5.1. Charge of a storage battery.

Use the supply unit included in the device set to charge the storage battery
If it is necessary, connect the device to a supply unit according to unit 5.4.2., and connect the supply unit to a circuit of direct current 24 V (I > 0,5 A).
Turn on the device (unit 5.2). Enter the menu <SETUP>. Press the button **ENT** and, select the submenu <CHARGE>, and again press ENT. Display shows the voltage value in volts.

<SETUP>.
<CHARGE>
U = XX, XXV

Using this value it is possible to control the charging process. When the voltage is equal to 10.22V the device will stop the charging of the battery, give a sound signal, and display

CHARGE O'K

" CHARGE of ACCUMULATORS IS COMPLETED "

Then, if do not touch the buttons, the device will be automatically disconnected 18 minutes later .
If enter the menu <CHARGE> the display shows the message :

NO NEED

The accumulators do not require to be recharged.

5.5.2. Recommendation for a charge of a storage battery.

It is recommended to charge the storage battery during 14-16 hours.
Do not recharge the storage battery if it is not necessary, if its voltage is more than 9,8 V. The given type of accumulators has the greater life expectancy at deep discharge - charge cycles. But it is not necessary let the voltage drops below 7,3 V, even in during the storage of the device.

5.6. Operation of the device and printer

The device allows to print the BEACON's check protocol of the . As the printer it is possible to use only printers manufactured by "MUSSON-MORSVYAZ-SERVICE". The device prints only results of measurements and decoding, the protocol is generated in the printer. Before printing the check date (unit 5.3.4.4) should be correctly set. The general view of the protocol is shown in an Application 3.

5.6.1. Printer.

The printer is power supplied by 9V DC supply unit and is connected to it by a cable in the printer.
It is possible to print the check protocol only if the printer is connected to power supply unit , as through connective cables is carried out both power supply, and transmission of data.
The connection of the printer is made only at the switched off supply unit.
The constantly flashing indicator on the printer testifies the availability for operation.
The special paper is used for printing. The cartridge can be removed when using the chemicalixation paper.
The printer uses the MD 910 ASS cartridges.
Insert the paper into the printer and press and release the button on the printer
ATTENTION! The printer operates only if it connected to the device, it has not an individual power supply and does not operate with other devices, including the personal digital computer.

5.6.1.1. The printer test.

When the printer is ready to print (the indicator is on) press, release and press again the button 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.

5.6.2. Output of the protocol of trials on a printing.

The form of the check protocol is saved in the memory of the printer. The device only

transmits the necessary data to the printer..
The data are transmitted from the viewer <VIEW>, so it is possible to print not only just measured data but saved in the memory. Thus, it is possible to make series of measurements (no more than 10), save them in non-volatile memory < SETUP >, SAVE > (unit 5.3.4.1.), and then print the necessary protocols, selecting data by < SETUP >, < LOAD > (unit 5.3.4.2)..
It is necessary to connect the device to a supply unit and printer, then connect a supply unit to a curcuit of a direct current 24 V, insert a paper into the printer before printing. Also prepare data in <VIEW> (if data are loaded from memory). Select in the menu <LINKS>, <PRINT> submenu AUTO > (if it is necessary to print the complete check protocol), press the button **ENT**. After data transmission display shows:

TRANSMITED
" TRANSMISSION of DATAS "

and the printer begins to print.
But if the display shows:

NO ANSWER

check up a reliability of connections, serviceability of a supply unit (all four indicators should be turned on) and readiness of the printer (constantly lighting indicator and presence of an inserted paper) and try to print again .
If during measuring of the BEACON's parameters the printer was connected to a supply unit, it is possible to print the protocol without loading to the memory by <PRINT>.
The common time of printing is no more than 1 minute.
The current consumed by the printer during printing is no more than 0,7 A.

6. MEASUREMENT OF BEACON'S PARAMETERS

6.1. The device allows to check the BEACONs of all types.
a) With an antenna connected through a HF - connector;
б) With rigid fixing of antenna.
6.2. To check the BEACON with an antenna connection through HF- connector follow the diagram (figure 1.)

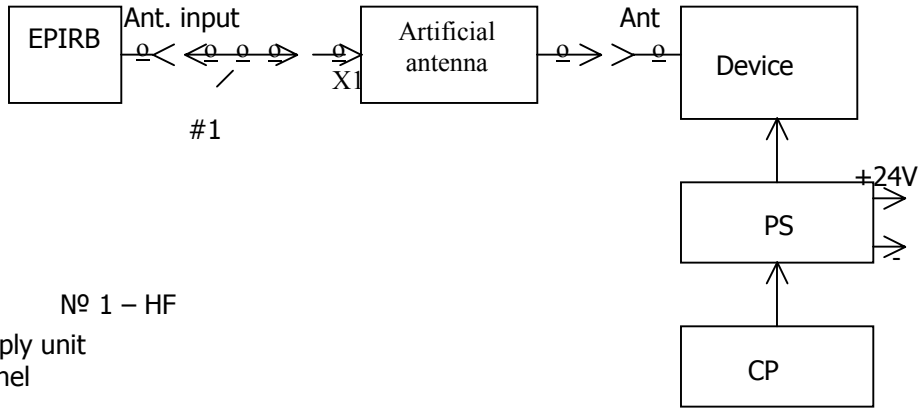
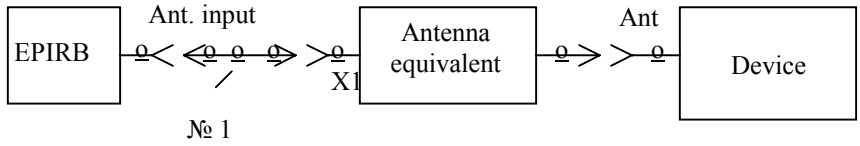


Figure1. Beacon's check with an antenna connected through HF- connector

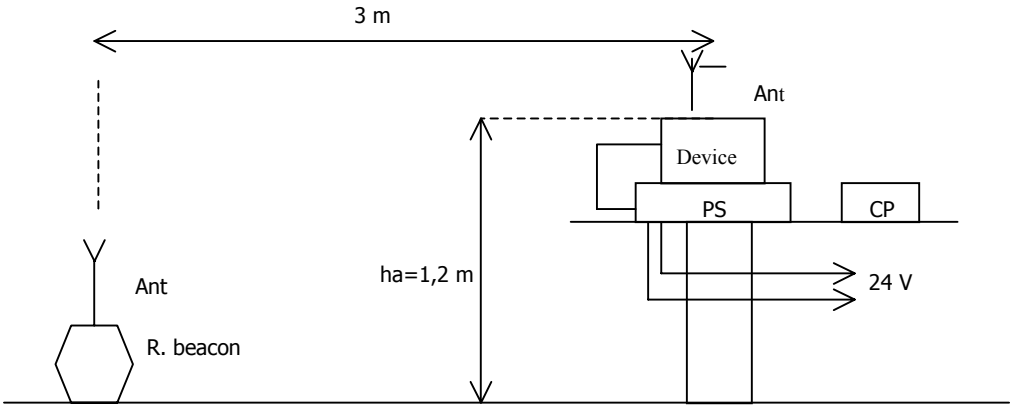
6.2.1. Turn on the BEACON, supply unit 24V, device and to warm it up for 15 minutes before measurements.
6.2.2. Check the BEACON in accordance with specification
6.2.3. Use the diagram 2 to check the BEACON when the device is power supplied from internal accumulators.



№ 1 – HF cable

Figure 2. BEACON's check when the device is power supplied from internal accumulators.

6.2.4. Turn on the BEACON, supply unit 24V, device and to warm it up for 15 minutes before measurements. Check the BEACON in accordance with unit 5 of specification
6.3 Check the BEACON with a rigid fixing of an antenna under the using the diagram piq.3, piq.4. and technique explained in the specification C/ST.007.
It is supposed to check the BEACON in usual shielded room with dimensions not less 6m x 4m x 2,5 m. but with some lowering of an exactitude of power measurement.
6.3.1 Place the BEACON in accordance with fig. 3.1. on a metal floor or sheet of metal with the sizes 1,5m x 1,5m.Ensure in radius i 1,5 м the absence of any subjects.
6.3.2. Place the device with supply unit and control console on distance 3 m from BEACON. A position of antenna is h = 1,2 м +-0,1. Ensure in radius > 1,5 m absence of any subjects.
6.3.3. Turn on the BEACON, supply unit 24V, device and to warm it up for 15 minutes before measurements.
6.3.4. Check the BEACON in accordance with unit 5 of specification.
6.3.5. Check the BEACON with the device power supplied from the internal block of accumulators according to fig. 4.
6.3.6. Turn on the BEACON, the device and to warm up it for 15 minutes before measurements.
6.3.7. Check the BEACON in accordance with unit 5 of specification.



PS = power supply unit CP = control panel

Figure 3. Position of object to be tested

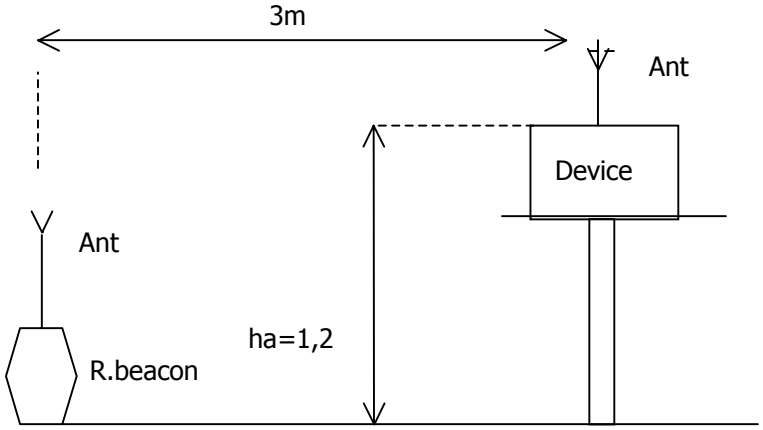


Figure 4. Position of object to be tested

7. CHECK OF THE DEVICE

The device is the specialized complicated electronic device, therefore it has to be checked only at the enterprise - manufacturer with the appropriate equipment.

Check of the device is carried out once per 2 years, but no more than after 1000 cycles of measurements.

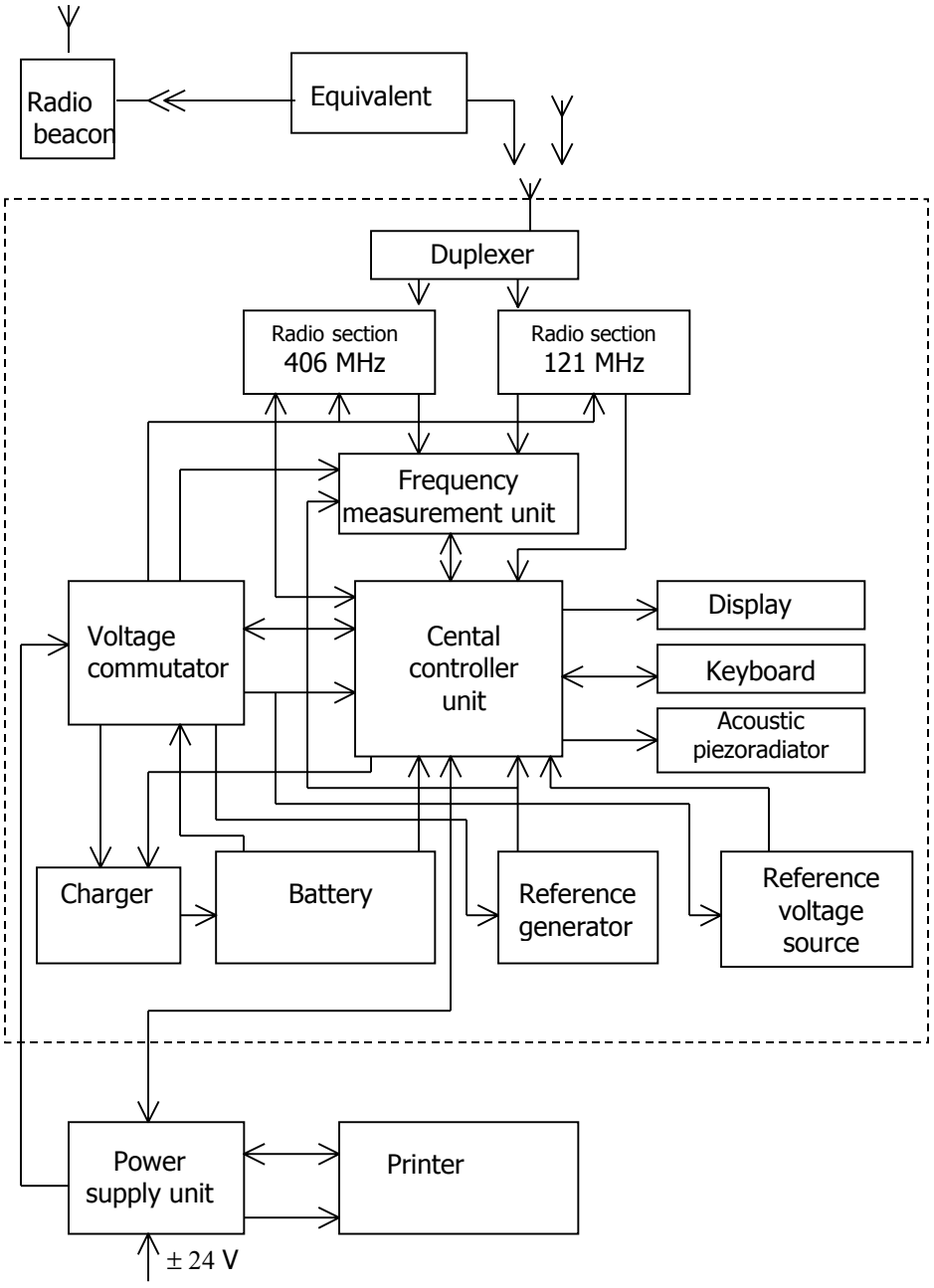
8. COMMON GUIDELINE IN MAINTENANCE

At high temperature deference it is necessary to keep the device in package not less then two hours at normal conditions.
After storage of the device in conditions of high humidity keep it the package in at normal condition within 12 hours.

9. STORAGE RULES

The device should be stored in package in warehouse locations defending it from effect of atmospheric precipitation.
Temperature in warehouse should be ensured from 278 K (5 C) up to 313K (40 about C) and relative humidity of air no more than 80%

Appendix 1.



Functional diagram of the device

Appendix 2

PROTOCOL OF TESTING
COSPAS-SARSAT BEACON
TESTING MODE:
AUTO
FORMAT SEQUENCE:
SHORT
COUNTRY:
00456
PROTOKOL FLAG
USER'S
USER PROTOKOL:
MARITIME
789000 M
RLD: 121,5
ON: AUTO
SEQUENCE OF HEXADECIMAL:
FFFE2F5C84E1019A69A68A96
8590=1-112 bit
B909C30334D34D1=26-85 bit

BCH: O'K
FREQUENCE 406025, Hz
406026170
FREQUENCE 121500, Hz
CARR. - YES
PHASE+ : (°) PHASE- : (°)
60,40 60,66
POWER 406025, W:
5,00
POWER 121500, mW
60
TIME SEQUENCE, mc
443,12
SWEEP TONE:
STATE OF FLASH:
STATE OF. MARKER:
GEAR OF SEPARATION: _____
BATTERY: _____
CERTIFICAT: _____
NEXT DATA TESTING: _____
DATE
18.05.2000
BEACON TESTER:
0001
NM= 65283
CONTROLER _____
RADIOENGINEER _____
L.S.

Radio beacon test protocol.
Protocol print out begins with a general message:
"Test protocol of COSPAS-SARSAT beacon"
Then the testing mode is indicated:
AUTO-automatic /MANUAL - manual, single.
Then the format of transmitted signal follows
SHORT - short/LONG - long 144 bit,
5-digit country code
and other attributes of radio beacon type in accordance with decoding (see supplement 4)

Then the complete received message is printed in HEX format and separately the bits
26 to 85.

Then results of calculation check of BCH code reminder follow

BCH: O' K/BAD

Then measured value of 406 MHz in hertz and availability of carrier frequency 121 MHz are indicated.

YES/NO

Further values of positive and negative phases are indicated in degrees, value of 406025 power in watts and value of 121500 power in milliwatts.

Then duration of the full transmitted signal is indicated in milliseconds.

Other test results are filled in by hand:
SWEEP TONE:- availability of sweep tone
STATE OF FLASH:- serviceability of flashing beacon
STATE OF.MARKER: - state of marking
GEAR OF SEPARATION: - mechanism of separation
BATTERY:- service life of battery
CERTIFICAT:- certificate number
NEXT DATA TESTING:- date of the next test

Then the date of carried out test is printed, number of the device and number of the test carried out with this device.

Then the signatures of the inspector and the responsible person follow and the seal.

Appendix 3

Decoding of radio beacon type.

According to the specification C/S T.001 the coding of numeric message of EPIRB – 406 MHz is divided into six fields:

1. Symbol synchronization bits — bits from 1 to 15
2. Frame synchronization bits — bits from 16 to 24
3. Protected field — bits from 25 to 85
4. Correcting code (BCH code reminder) — bits from 86 to 106
5. Distress type (bits used at national discretion) — bits from 107 to 112
6. Long message (optional) — bits from 113 to 144

Sequence for symbol synchronization shall consist of "1" (15 bits). Sequence for frame synchronization at the normal operation shall be "000101111".

In the radio beacon self -testing mode the frame synchronization code shall be "011010000".

The device automatically decodes the protected field content of the signal and indicates the decoded information on the display.

Bit 25 indicates the signal format:

"0" – short format (112 bits);

"1" – long format (144 bits).

Bit 26 indicates the protocol flag:

"0" – maritime protocol with coordinates;

"1" – user's protocol.

In case of maritime protocol with coordinates the 3-digit maritime identifier (country code) CONTRY XXX (menu <MAIN>), 6-digit board radio station identifier M XXXXXX and coordinates (N - north, S -south, W -west, E -east) appear on the display.

The type of beacon switch on is indicated in the menu <EXT.1>:

ON: MANUAL – manual switch on,

ON: AUTO – automatic and manual,

as well as kind of bits 109 - 112 use:

NAT.USING – national using,

CODE XXXX – distress code.

In case of user's protocol the device indicates 3-digit maritime identifier (country code) menu <MAIN>) and the type of user's protocol. The last 6 digits of board radio station identifier M XXXXXX and the number of ship's beacon N BEACON X are indicated for maritime user's protocol (bits 37-39 are equal to "010")

The last 6 digits of board radio station identifier RC XXXXXX and the number of ship's beacon N BEACON X are indicated for the protocol with call signs