

GMDSS SART TESTER

**Description and
Operating Manual**

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1. Purpose

GMDSS SART Tester is designed to check any SART manufactured by any company in accordance with the requirements of SOLAS-74/88, Recommendations ITU-R M.628-2 "Rules of Sea Shipping Register".

To check SART the device automatically generates an interrogation pulse signal with the following parameters:

- carrier frequency of interrogation pulses $f_{i.p}$ within the range of 9200 ÷ 9500 MHz;
- frequency of interrogation pulse repetition $Tr.i.p.$ within the range of 400 ÷ 4000 Hz;
- duration of interrogation pulse $\tau_{i.p.}$ within the range of 0,6 ÷ 1,4 microseconds;

In the automatic mode the device provides for:

- measurement of response signal carrier frequency within the range of $f_r = 9140...9560$ Mhz;
- measurement of response signal duration $Tr.$ within the range of 50 ÷ 150 mcs;
- indication of response signal power level within the range of $Pr = 300 \div 950$ mW;
- calculation of frequency sweep number in the response signal;
- control of voltage with indication on the liquid crystal display;
- printout of the complete device test protocol;

The device has two modes of power supply:

- from the built-in battery 6 V with consumption current ≤ 270 mA;
- from the board power network + 24 V.

According to service conditions the device is designed for operation in the internal shielded ship rooms at the temperature $+5^\circ\text{C} \div +55^\circ\text{C}$, and relative air humidity of 95 %.

Time of SART testing in automatic mode including information output to the liquid crystal indicator (LCI) does not exceed 2 minutes.

2. Main parameters and characteristics.

- The device generates interrogation pulses having parameters specified in the table.2.1.

Table 2.1.

#	Parameter Description	Range (values)	Units	Accuracy (±)
1.	Carrier frequency	9200...9500	MHz	20 MHz
2.	Repetition frequency	400;800;1250; 2000;2500;4000	Hz	10%
3.	Duration	0,6;0,8; 1,0;1,2;1,4	micro seconds	10%

- The device provides for measurement of response signal parameters according to the table 2.2.

Table 2.2

#	Parameter description	Range (values)	Units	Accuracy (±)
1.	Carrier frequency	9140...9560	MHz	10 MHz
2.	Duration	50...150	micro seconds	5%
3.	Power level indication	300..950	mW	2,0 dB

- The device provides for automatic measurement of SART parameters. The time of one measurement cycle does not exceed 2 minutes.
- The device guarantees the accuracy of voltage monitoring and indication on liquid crystal display within $\pm 5\%$.
- Duty cycle of the device without battery unit recharge is not less than 7 hours (without LCI lightning).

- The consumption current of battery operated device (built-in battery 6 V) in standby mode is ≤ 85 mA per one standby period and ≤ 270 mA per one measurement in measurement mode.
- When operated from a power supply unit the consumption current of the device in the standby mode is ≤ 95 mA per one standby period and ≤ 300 mA per one measurement..
- The built-in battery of the device can be charged by power supply unit. Maximum battery charging time does not exceed 16 hours.
- The device provides for automatic monitoring of checked parameters, bringing them to LCI and result printout.
- The device provides for the storage of 10 measured parameter blocks in the nonvolatile memory.

3. The set of the device and delivery variants.

Standard set of delivery is specified in the table 3.1.

Table 3.1

Pos	Description	Designation	Qty	Note.
1.	Variants of device: <u>Variant 1</u> SART Tester	AMXA.464415.00 0	1	
	<u>Variant 2</u> SART Tester	AMXA.464415.00 0	1	
	Power supply unit - Charger	AMXA.464415.00 0-1	1	
		AMXA.464415.00 0		
		ААГН.469315.00 0		

	Variant 3 SART Tester Printer	AMXA.464415.00 0-2 AMXA.464415.00 0	1 1	
	Variant 4 SART Tester Power supply unit Charger Printer	AMXA.467259.00 0 AMXA.464415.00 0-3 AMXA.464415.00 0 ААГН.469315.00 0 AMXA.467259.00	 1 1 1	
2.	Battery unit	AMXA.436631.00 0	1	Built-in
3.	Power cable		1	To the var. 2,4
4.	Low frequency cable	ААГН.685611 000	1	To the var. 2,4
5.	Computer cable	ААГН.685622.00 5	1	Optional
6.	Spare part set: - Fuse link ВП1-1А - Fuse link ВП1- 2А		1 2	To the variant 2,4
7.	Log book	AMXA.464415.00 0 ФО	1	
8.	Technical description and operational manual	AMXA.464415.00 0 ТО	1	

4. Device design and function

The complete delivery set includes:

- the device with built-in battery and connecting cables;
- power unit - charger (hereinafter - "power unit")
- printer;

SART parameters are measured through the air.

The measurements can be carried out using the built-in battery or from power unit connected to the board direct current network 24 V. The built-in battery of the device is charged by the power unit - charger.

The test protocol can be printed out only if the printer is connected to the power unit, which energizes the printer and provides data transfer from the device.

Initiating pulse from the device enters the SART to be tested through the air and SART responds with sweeping frequency. The device receiver receives the signal from the SART, generates underfrequency pulses and the microcontroller unit measures required parameters and brings the data to the LCI.

The measurement of upper and lower frequencies of sweeping signal is carried out by means of frequency transformation into amplitude, measurement of minimum and maximum voltage and frequency calculation according to characteristic dependence. The parameters of the dependence are determined using internal reference frequencies transferred to the radio channel. An average value results from the 256 measurements.

Power is measured by the value of rectified voltage converted to power. Sweeping time is calculated by duration using timer of microcontroller. The results of 256 measurements are averaged out.

The sweeping pulse number is counted on the base of counting of leading and trailing edges of standardized signal with subsequent averaging out of 256 measurements.

In addition to SART signal processing the central controller unit services indicator, keyboard and acoustic piezoradiator. Using voltage commutator the central controller unit energizes only those units which are necessary at the moment (reduction of general power consumption), switches on an off the charger and transfers data to the printer.

A reference-voltage source is used to increase the accuracy of signal swing measurement.

5.Pre-starting and operational procedures

The device can operate both from internal power source (built-in battery) and from unit power 14 V.

5.1 Controls and connections.

A four-row indicator and a keyboard are on the front panel of the device.

The right upper key ON turns on the device. The left key OFF turns off the device.

The keys of lower row <, ESC, ENT, > provide for menu advancing and menu execution.

The plug for power unit connection is in the lower part of the device.

5.2 Turn ON / OFF

To turn on the device press the key ON and hold it till battery voltage U and internal SART temperature appear on the display:

**WELCOME!
SARTT XXXX
U= XX,XXV
ALEXS V 1.3 ;**

and beep sounds. Release the key. In case the key is held 5 second longer the device will turn off automatically.

When turning on the device the battery voltage is indicated. The voltage exceeding 5.76 V shall be considered as normal.

If when turning on the battery its voltage is below 5.76 V, the indicator will display message:

CHARGE BAT

In this case the device can still be operated for a short time. But if the voltage drops below 5.25 V, the device will not function and, if not turned off, it will automatically turn off in 2 minutes.

The device can be turned off in the following cases:

- press and release OFF button;
- press ON button and hold it for 10 seconds then release;

- if no button is pressed within 15 minutes (excluding warming up mode);
- battery voltage is below 5,25 V.

5.1 Menu.

After the device is turned on and battery voltage and internal temperature are indicated the message appears:

WARMING UP

Warming up time which guarantees the accuracy of measured parameters is 15 minutes, after this time the device will switch to the main menu.

If necessary, the device can also be switched to the main menu by pressing any key without warming up.

Menu structure is shown in Supplement 2.

Horizontal movements are executed with < and > keys (according to the indicator arrows < and >).

Vertical movements are executed using the ENT key (down or execution) and ESC key (up or exit from subitem). It is also possible to select subitems using keys < and >.

The main (upper, basic) menu includes six items:

- <MEASURE>** - Measurement of SART parameters;
- <CONTROL>** - selection of measurement mode;
- <VIEW>** - measurement results scanning;
- <LINKS>** - test protocol transfer to a peripheral device;
- <SETUP>** - setting up of device parameters, data storage in the nonvolatile memory and battery charging
- <TEST>** - testing of device parameters.

Each item has its subitems which are selected in the some manner as the items of main menu. To return to the main menu press the ESC key.

5.3.1. Menu **<MEASURE>** - MEASUREMENT

After complete turn on of the device (including warmin up) menu:

<MEASURE>

appears.

When pressing ENT key the device changes to subitem <AUTO> - automatic measurement mode.

To change over to manual mode press > key . The manual mode provides for individual measurement of the following parameters:

- <FREQ,kHz>** -measurement of upper and lower frequency of sweeping signal;
- <POWER>** - determination of SART radiating power;
- <T SEQ.>** -measurement of complete signal duration received from SART;
- <DOTS>** -measurement of sweeping pulses number;
- <REZERV>** -reserve subitem of the menu (the use is not recommended).

5.3.1.1. Subitem <AUTO> - automatic measurement mode.

Comprehensive measurement of all SART parameters is carried out in the automatic measurement mode <AUTO>

- measurement of upper and lower frequency of sweeping signal;
- determination of SART radiating power;
- measurement of complete signal duration received from SART;
- measurement of sweeping signal number.

After pressing ENT key when being in the subitem <AUTO>, the message:

ON SART

appears on the display.

If the SART to be tested is turned on, the device switches to adjustment mode to verify the accuracy of mutual orientation and numbered scale appears on the display (see It. 5.3.2.1.). To enter the parameter measurement mode press > key. The message:

GO ON!

appears on the display.

Approximately in 1.5 minutes SART parameter measurements will be carried out. The measurements can be executed without 1.5 minutes time delay. In this case press ENT key. The message:

**MEASURING!
WAIT!**

appears on the display,

then

OFF SART

and

ACCOUNT

The measurements are accompanied by acoustic signals.

The complete measurement cycle does not exceed 1 minute. Then the messages:

**VIEW
AUTO
NEXT?**

appear on the display.

The consequent scanning of measured parameters can be executed without entering VIEW mode. For this purpose press any of keys < , ENT, >

.

The measured parameters are displayed as follows:

- upper and lower frequency of sweeping signal;
- SART radiating power;
- complete signal duration received from SART;
- number of sweeping signals.

Then parameters are displayed which are visually determined and manually entered :

- STENDBY – ready to operate mode;
- LED – light-emitting diode indication;
- BEEP – sound indication.

The last three parameters shall be entered manually with
<, > keys

from the list: YES, NO and space . Space means absence of this parameter in the tested SART.

Measured and calculated parameters are saved till next measurement is carried out or till device is turned off. But they can be scanned only when selecting the item VIEW of main menu.

5.3.1.2. Menu subitem <FREQ,kHz> - measurement of upper and lower frequencies of SART response signal

This and the following (right) subitems of menu line MEASURE provide single manual measurement of one selected parameter.

When pressing ENT key the message :

MEASURING!
WAIT! .

is displayed in the menu <FREQ,kHz> and the measurement of lower and upper frequencies of SART response signal are executed.

Frequency value is shown on the display in kHz.

The last measured value is saved till the device is turned off and can be called out by the menu item VIEW.

5.3.1.3. Menu subitem <POWER> - Measurement of SART radiating power

On pressing ENT key the message:

MEASURING!
WAIT!

is displayed when being in the menu <POWER> and then the measurement results are indicated in milliwatts.

The last measurement result is saved till the device is turned off and can be called out by the menu item VIEW.

5.3.1.4. Menu subitem <T SEQ> - measurement of complete duration of SART response signal

On pressing ENT key the message:

MEASURING!
WAIT!

appears when being in the menu <T SEQ> and then measurement results in microseconds.

The last measurement results are saved till the device is turned off and can be called out by the menu item VIEW.

5.3.1.5. Menu subitem <DOTS> - measurement of sweeping pulses number

On pressing ENT key the message:

MEASURING!
WAIT!

appears when being in the menu <DOTS> and then the number of sweeping pulses is indicated on the display.

The last measurement results are saved till the device is turned off and can be called out by the menu item VIEW.

5.3.1.6. Menu subitem <REZERV> - reserve subitem.

This is a reserve subitem and it is not recommended to press the key ENT when being in this subitem.

5.3.2. <CONTROL> - measurement mode selection.

This menu item is used for the selection of measurement mode.

On pressing ENT key the device switches to the menu subitem <USTIR> - device adjustment before measurements.

When pressing the key → the device switches to the subitems::
<F REP> - selection of trigger pulse repetition rate;
<T GEN> - selection of trigger pulse duration.

5.3.2.1. Menu subitem <USTIR> - device adjustment before measurement

The adjustment is executed before measurement. To adjust the device turn on the SART and when being in the subitem <USTIR>, press ENT. The device starts to sent trigger pulses and to receive

Note: Exite from the mode MEASURE / REZERV is possible only by device turn off (OFF key).

SART response estimating signal power (in relative units). When moving the device relative to SART (or vive versa) at the constant distance between them the maximal value of received signal shall be achieved. The signal value can be estimated by the scale and digits which are displayed in the lower line of the indicator.

The relative position of the device and SART shall not be changed after adjustment..

5.3.2.2. Menu subitem <F REP> - selection of trigger pulse repetition frequency

Entering this subitem provides for selection of trigger pulse repetition frequency within the range 400, 800, 1250, 2000, 2500, 4000Гц.

The selected mode is fixed with the keys ENT or ESC. The mode of 4000 Hz is set by default

5.3.2.3. Subitem <T GEN> - selection of trigger pulse duration

Entering this subitem provides for selection of trigger pulse duration with step keys within the range:

1.4, 1.2, 1.0, 0.8, 0.6 mcs.

The selected mode is fixed with the keys ENT or ESC. The mode of 1.4 mcs is set by default.

5.3.3. Menu <VIEW> - scanning of measurement results.

This menu item is intended for data scanning and includes three subitems :

<AUTO> - scanning of parameters measured in automatic mode;

<MANUAL> - scanning of parameters measured in manual (single) mode;

<DUMP> - scanning of data stored in the controller memory.

Measured parameters enter the scanning unit <VIEW> immediately after measurement or when being loaded from the nonvolatile memory. Maximum 10 blocks of measured parameters can be stored in the nonvolatile memory.

5.3.3.1. Subitem <AUTO> menu <VIEW>.

This menu subitem is used for scanning of the last parameter values measured in the mode <AUTO> or called out from the memory (but also measured in the mode <AUTO>).

To select the required parameter use < and > keys. To scan the selected parameter use ENT key.

Unlike scanning in the mode <MEASURE>, <AUTO> - when scanning in the mode <VIEW>, <AUTO> additional parameters are displayed: <TANS> - correctness of SART response time of trigger pulse and <MINMAX> - relative values of upper and lower frequencies of received signal.

These are illustrative parameters.

Other menu items are the same as the items of <MEASURE> mode (see It..5.3.1.1.).

On loading from the memory data can be selected and scanned with the keys < and > and ENT.

5.3.3.2. Subitem <MANUAL> menu <VIEW>.

This subitem is used to scan the last parameter values measured in the manual "single" mode or called out from the memory (but also measured in the manual "single" mode).

Unlike scanning in the mode <MEASURE> - when scanning in the mode <VIEW>, <MANUAL> additional parameters are displayed: <T

ANS> - correctness of SART response time of trigger pulse and
<MINMAX> - relative values of upper and lower frequencies of received signal.

These are illustrative parameters.

Other menu items are the same as the items of <MEASURE> mode (see It..5.3.1.1.).

The scanning procedure is the same as in It..5.3.3.1.

5.3.3.3. Subitem <DUMP> menu <VIEW>.

This subitem is used to scan the controller memory and is intended for technological purpose.

5.3.4. Menu <LINKS> - data transfer to the peripheral units.

This subitem is intended for transfer of measured parameters to the printer using the subitem <PRINT>. On selection of subitem <PRINT> press the key y ENT to switch to the submenu:

<AUTO> - printing out of protocol of tests carried out in the <AUTO> mode;

<MANUAL> - printing out of protocol of tests carried out in the "single" manual mode;

<DUMP> - printing out of controller memory domain (is intended for technological purpose)

To print out the data press the key ENT when being in the selected subitem.

Printer shall be connected to the device (see It. 5.6). If the printer is not connected to the message appears:

NO ANSWER

After data transmission the message appears:

TRANSMITED

Only the data required to fill in the set form of test protocol are transmitted to the printer (see Supplement3), but not the protocol itself..

Menu subitem <PC> provides for data transfer to PC (see program description).

5.3.5.Menu <SETUP> - setting of device parameters.

This menu item provides for storage and call out of measured parameters from the nonvolatile memory as well as for setting of the device parameters and battery charging.

Menu item <SETUP> has eight subitems:

- <SAVE>** - saving of measured SART parameters in the nonvolatile memory;
- <LOAD>** - call out of measured parameters from the nonvolatile memory for scanning in the menu **<VIEW>**;
- <CURRENT>** - restoration of current measurement results;
- <DATE>** - setting of test date;
- <CHARGE>** - battery charging;
- <N MEAS.>**- - indication of measurement number carried out by the device;
- <BLC.OFF>** - presence or absence of indicator illumination when turning on the device;
- <NAME>** - entry of the name of the person, who performs tests.

5.3.5.1. Subitem <SAVE> - saving of measurement results.

The device is provided with a nonvolatile memory for data storage when the power is off. Memory capacity provides for storage of 10 measurement blocks. Data blocks including all parameters measured in the **<AUTO>** mode and all the last parameters measured in the manual (single) mode are entered into the memory.

A number from "0" to "9" is assigned to each data block stored in the memory. This number as well as entry date and current measurement number are used for call out of required data block from the memory using subitem **<LOAD>** . To save the data block the measurements shall be carried out in the **<AUTO>** mode.

To enter the data block into the memory press ENT when being in the subitem **<SAVE>**. In the lower line of the display the message appears:

BEACON X

X – is block number from от "0" to "9".

The number assignment is executed automatically beginning from "0" to "9", then again "0" and so on. Thus the last 10 data blocks are saved.

Pressing the key ENT provides for saving the data block in the memory under the assigned number. By pressing of ESC key instead of ENT data block will not be saved. It is impossible to save the same data block twice.

5.3.5.2. Subitem <LOAD> - call of measurement results stored in the nonvolatile memory.

Any of saved data blocks (last 10 blocks of measured parameters) can be called out from the memory and scanned using menu item <VIEW>

After the key ENT is pressed when being in the subitem <LOAD> the message appears: :

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

In the lower line appears data block number, which can be called out and looked through using menu VIEW. In the foregoing line appears the date on which the parameters of this block were measured.

It is recommended to enter the date after switching on because the device has no built-in calendar – clock (see It. 5.3.4.4).

The second line displays 5-digit number of measurement. Each measurement carried out in the <AUTO> mode increments this number by one, which gives information about the total quantity of carried out measurements and helps to identify the data block.

The same number is printed out in the protocol.

If the key ENT is pressed, this data block will be loaded for scanning in the menu <VIEW>. To prepare for loading a data block having the foregoing or next number press the key < or >, in this manner any of 10 data blocks may be loaded into <VIEW>.

To cancel loading into <VIEW> press the key ESC.

5.3.5.3. Subitem <CURRENT> - restoring of current measurements block in <VIEW>.

When loading information into <VIEW> (menu for scanning of parameter block from the nonvolatile memory) the data being in <VIEW> is reloaded into buffer and may be restored with the ENT key pressed when being in the menu subitem <CURRENT>. This subitem may be used for comparison of actually measured parameters with the data stored in the nonvolatile memory. The required data block is loaded from the subitem <LOAD> into <VIEW>, looked through

and then by entering the subitem <CURRENT> the measured parameters may be restored and when necessary saved in the non volatile memory.

5.3.5.4. Subitem <DATE> - actual date entry .

The device has no built-in calendar clock and so the actual date shall be entered by hand. The date is transferred to be printed out in test

protocol and helps to identify data block stored in the nonvolatile memory.

- <DATE> - has two subitems:
- <ENT.DATE> - date entry and correction;
- <CLR DATE> - date zeroing.

On entering subitem <ENT.DATE> the required date is set with the keys < , > and ENT in the format:

day month year

Exit from menu subitem is executed with the key ESC.

Pressing the key ENT in the subitem <CLR DATE> results in date "zeroing".

In this case spaces will be printed out instead of digits. The date shall be filled in by hand.

5.3.5.5. Subitem <CHARGE> - battery charging.

The device has a built-in battery providing for measurements within 6 – 8 hours without power unit. To recharge the battery hook up the power unit and when being in the subitem <CHARGE> press ENT key.

Battery voltage in volts are displayed in the third indicator's line.

If the battery voltage exceeds 7.27 V, recharging is not executed and the message appears:

NO NEED

The battery charging is automatically stopped when battery voltage reaches 7.27 V and the device turns off automatically in 18 minutes.

On pressing ESC key and exit from the menu <CHARGE> battery charging is stopped.

Recommended charging time shall not exceed 16 hours.

5.3.5.6. Subitem <N MEAS.> - Scanning of last measurement number

Each measurement carried out in the mode <AUTO> increments the measurement number by one. Current 5-digit measurement number is fixed in the protocol printout and indicated by scanning of measurement blocks stored in the nonvolatile memory.

Pressing the key ENT when being in the subitem <N MEAS.> provides for scanning of current measurement number. It is impossible to change this number.

5.3.5.7. Subitem <BLC.OFF> -illumination setting when turning on the device

Pressing the key ENT when being in the subitem < BLC.OFF.> provides for turn ON or turn OFF of indicator illumination after switching on the devices.

5.3.5.8.Subitem <NAME> - saving the name of checking person.

This subitem is intended for saving of the name of checking person. This name will be printed out in protocol. The subitem includes two additional subitems:

<ENT.NAME > - name entering. Selection of letters is executed with the keys for right/left movement, and fixing and shift with the key ENT. Ten signs may be entered (including spaces). Entered signs are stored in the nonvolatile memory.

<CLR.NAME> – clearing. Pressing ENT key when being in this subitem provides deletion of entered name and space in the protocol unless another name will be entered.

5.3.6. Menu <TEST – device parameter testing.

This menu item is intended for receipt of special and technological information and consists of 10 subitems:

UCC> - indication of battery voltage;

<TEMPERAT> - indication of device internal temperature;

<SELFTEST> - device selftesting ;

<FRQ.TEST> - frequency measurement;

<TIM.TEST> - special test;

<MPX> - multiplexer switching;

<DAC1> - channel 1 voltage setting;

<DAC2> - channel 2 voltage setting;

<POW TEST> - continuous power measurement;

<POW.SUP> - voltage application to radio channel unit.

The items <UCC> <TEMPERAT> are <SELFTEST> the most important for a user. Other items are used for a technological test of the device and detailed examination of SART operation. Therefore it is reasonable to describe only the above three items.

5.3.6.1. Subitem <UCC> - battery voltage indication

On pressing ENT key when being in the menu item UCC> battery voltage in volts appears on the display. Minimal voltage providing device operation for a short time is $U_{cc} = 5.76$ V. If the voltage value is $U_{cc} \approx 6.8$ V the battery can be considered as sufficiently charged.

5.3.6.2. Subitem <TEMPERAT> - indication of internal device temperature.

On pressing ENT key when being in the menu item <TEMPERAT> the value of internal device temperature in ° C appears on the display.

This parameter is very important for the operation in high-temperature conditions. The temperature value shall not exceed 50 ° C and after warming up shall be not less than 15 ° C.

5.3.6.3. Subitem <SELFTEST> - device selftesting.

This subitem is used to check the serviceability of the device in closed - circuit system: trigger pulse transmission, its reflection, pulse reception. The duration of trigger pulse in this mode is increased to 20 microseconds.

When transmitting the receiver is On and can receive transmitter's signal reflected from the screen. Signal reception shows that the device is serviceable (transmission and reception channels function). Information about signal reception is displayed as intensity and numerical value scale and is accompanied by a tone. Availability of these data indicates the serviceability of the device

Any reflecting surface (metal plate or just a palm) being at the distance of 5-15 cm from the device's end (opposite to plug) may be used as a screen

5.4 Device operation from power supply unit.

As power supply source for the device the power supply unit shall be used which belongs to the delivery set and is energized from the power network of direct current 24 V.

5.4.1 Power supply unit.

The power supply unit supplies the device with the direct voltage 14V, and the printer with the direct voltage 9 V and provides for data transfer from the device to the printer.

The power supply unit shall be connected to the board power network of direct current 24 V with the cable included in the delivery set. A cable going out of power supply unit provides for the connection to the device. Printer is connected to the power supply unit with the cable going out of the printer.

The power supply unit has three fuses (for the circuits 24 V, 14 V и 9V) and three light diodes, indicating serviceability of the relevant circuits. One more light diode indicates serviceability of data transfer system.

5.4.2 Device connection to the power supply unit.

Connect the cable going out of power supply unit to the plug on the right side of the device. Connect the cable to the board direct current network 24 V, observe the polarity. Connect the cable to the plug 24 V of the power supply unit. All four light diodes shall light.

Turn on the device according to the it. 5.2

After warming up the device is ready for operation.

5.5. Device operation from built-in battery and battery charging.

The device has a built-in battery which provides continuous operation within 6 - 8 hours, if completely charged. State of battery charge can be determined by voltage measurement using menu <TEST UCC>. The maximum battery voltage is 7,27 V, the minimum is 5,76 V.

When the voltage is below 5,76 V but exceeds 5,25 V the device still functions. But prior to turn on and before each measurement a reminding message appears on the display:

CHARGE BAT .

At the battery voltage below 5,25 V message:

**CHARGE BAT
ON EXT.UCC**

appears.

After displaying this message the device neither responds pressing of movement keys nor enters menu.. In this case the device shall be connected to the power unit or turned off. If the device is not turned off within two minutes it will turn off automatically.

When turned on and prior to each measurement the device automatically checks the battery voltage.

5.5.1. Battery charging.

The built-in battery is charged by power unit supplied with the device..

To charge the battery connect the device to the power unit according to It. 5.4.2.and the power unit to a direct voltage source 24 V ($I > 0,5$ A).

Turn on the device (It. 5.2.) and select menu <SETUP>. Press ENT key and having selected subitem <CHARGE> press ENT again.

The value of battery voltage in volts appears on the display.

<SETUP>.

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

The charging procedure can be monitored by the value of this voltage.

Upon attainment of battery voltage $U = 7,27 \text{ V}$ the device stops the charge automatically, sounds a signal and displays message:

CHARGE O'K

If no key is actuated, the device turns off in 18 minutes.

If when selecting subitem <CHARGE> the message:

NO NEED

appears, the charging of battery is not required.

5.5.2 Battery charging advises.

The complete charging of battery takes 14 to 16 hours. It is not recommended to recharge the battery (unless in case of emergency), if its voltage exceeds 6.7 V . Batteries of this type have a long service life at deep cycles discharging – charging.

At the same time the battery voltage shall be not less than 5V .

5.6 Device and printer operation.

The device provides the output of SART test protocol to the printer. Only the original printing device manufactured by the DNPP "Musson-Morsvyaz-Service" can be used. The form of the protocol is stored in the printer memory and the device transfers to the printer only results of measurements and their interpretation. Prior to transfer to the printer the proper date of test shall be set (It..5.3.4.4.) because it is fixed in the protocol. The sample of the protocol is shown in the Supplement 3.

5.6.1. Printer.

The printer is energized with the voltage $+9 \text{ V}$ from the power unit and is connected to the power unit by the cable going out of printer.

The protocol printout is possible only with the device and the printer connected to the unit power, because connecting cables provide for both power supply and data transfer.

ATTENTION! Connect the printer only if power unit is turned OFF.

After turn on of power unit with connected printer the printing mechanism shall be positioned (if it is not positioned before). The continuously lightening indicator shows that the device is ready for operation.

To print out the test protocols special roll paper 58 mm in width shall be used. If chemically impregnated paper is used, the cartridge may be removed.

Cartridge for printing mechanism MD 910 ASS is used.

To insert the paper put the edge of paper into the slot of printing mechanism, press and release the button on the printer body. Pressing the button once results in four paper run through. If necessary, press the button once more.

Attention! The printer can operate only from the device, it has not individual power supply and can not function with other devices, including PC.

5.6.1.1. Printer testing.

When the device is ready for operation (the indicator lights continuously) press, release and press again the key for paper run through. After approximately 7 seconds the indicator goes out. When the indicator is out release the key for paper run through. In 3 – 5 seconds the protocol or test printing out begins.

5.6.2. Test protocol transfer to printer

The form of test protocol is stored in the printer memory and the device transfers only data required for protocol.

The data stored in the scanning unit <VIEW> are transferred to printer and so it is possible to print out not only actually measured parameters but also the data loaded from the nonvolatile memory. In this manner a series of measurement can be carried out (not more than 10), the results saved in the nonvolatile memory <SETUP>, <SAVE> (It..5.3.4.1.), and then required protocols can be printed out selecting data with <SETUP>, <LOAD> (It..5.3.4.2.). It is convenient to do, if the measurements were carried out with the battery operated device.

To print out the protocol connect the device and the printer to the power unit, the power unit shall be connected to a direct current network 24 V.

Insert paper into the printer. Select data for printing out using <VIEW> (if they are loaded from the memory). When selecting the subpoint <AUTO> in the menu <LINKS>, <PRINT> (if it is necessary to print out the complete protocol of tests carried out in the <AUTO> mode) and <MANUAL> (if the measurements were carried out in the manual "single" mode) press ENT key. After the data transfer the message appears:

TRANSMITED

and printing out will start. If the message appears:

NO ANSWER

check connections, serviceability of power unit (all four indicators must light) and readiness of printer (the indicator must light continuously and paper must be available) and repeat data transfer to the printer. Sometimes it is possible to reset printing out and to repeat data transfer to the printer. To reset printing out press the paper through key and while indicator lights continuously release this key and press it again. Then release the key while the indicator blinks. 10 minutes later the printer will be ready to print (the indicator lights continuously).

If when measuring SART parameters the printer was connected to power unit, data can be printed out direct using menu point <PRINT> without reloading into the nonvolatile memory.

The total time for printing out does not exceed 1 minute.
Consumption current for printing out is 0,7 A.

6. SART parameters measurement.

The device provides for testing of SART manufactured by any company.

The directional pattern axis of the device SHF antenna matches the longitudinal axis of the device and the polarization of radiated/received radiation is perpendicular to the device (indicator) plane, i.e. by horizontal position of the device the radiation polarization will be vertical.

The operative position of SART is vertical, at the same time the radiation polarization must be horizontal .

6.1 Measurement of SART parameters.

6.1.1 Position SART and the device as shown on the fig.1 or fig.2

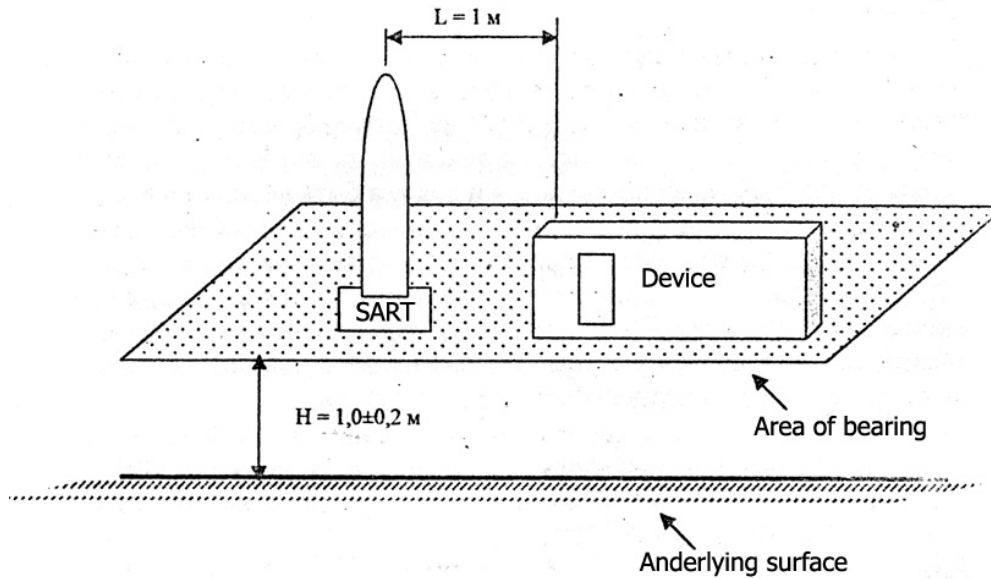


Fig. 1 Diagram of SART parameters measurement (variant 1)

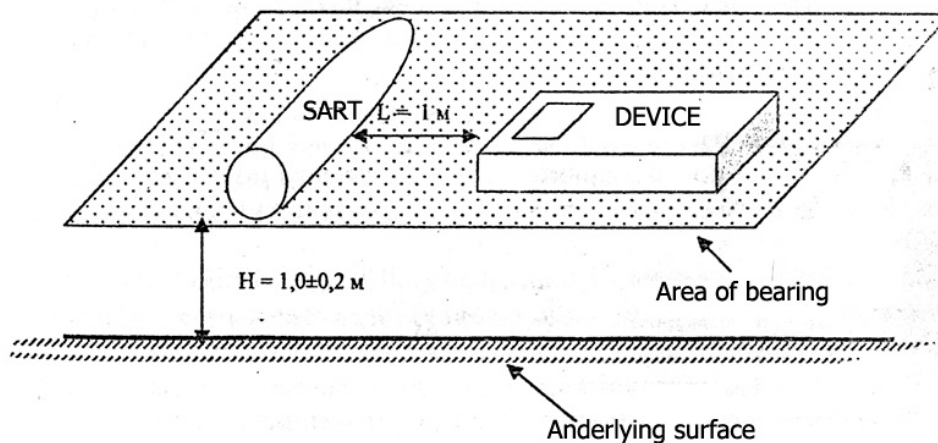


Fig. 2 Diagram of SART parameters measurement (variant 2)

Any radio transparent surface of suitable size (e.g. wooden table) may be used as support surface. The power scale of the device is calibrated for the distance of $L=1,0$ m; height H - determines strength of extraneous reflected wave from the underlying surface and shall be not less than $0,8$ m.

To eliminate the effect of external microwave radiation sources (mainly ship's radars) the measurements shall be carried out in an anechoic shielded room $5 \times 3 \times 2,5$ m. It is allowed to test SART in common shielded rooms of the same size or larger. The aforementioned area shall be free of any conductive objects.

Note:

The measurements may be carried out in the conditions which differ from the regulated but the accuracy of measurements can not be guaranteed.

6.1.2. After switching on when being in the mode "CONTROL/USTIR" or "MEASURE/AUTO/USTIR" the device shall be oriented exactly towards SART to achieve the maximum of power indication. For this purpose the angle and the distance between the device and the SART shall be continuously varied.

6.1.3. Measure required SART parameters according to the item 5 of this technical description without change of positional relationship of the device and SART. Enter the results of measurements into the memory.

6.2. Protocol printout

6.2.1. Connect the device and the printer to the power source using standard cables supplied with the device. Connect the power unit to the source 24 V.

6.2.2. Call actual (CURRENT) data in the mode "VIEW" or load the data from the memory (SETUP/LOAD). Print the protocol: LINKS/PRINT/...

7. Device verification

The SART Tester is a specialized complex electronic device, therefore it shall be verified only by original manufacturer having suitable equipment.

The device shall be verified every 2 years but not later than after 1000 measurement cycles.

ATTENTION! The device automatically switches off after 1000 measurement cycles and it is impossible to switch it on.

The next switch on of the device is possible only after verification by original manufacturer or by an authorized laboratory.

8. General operational instructions

If the difference between the temperature in storehouse and the temperature in working space is large the devices received from stock shall be kept in their packages in normal conditions not less than two hours.

After storage in spaces with high humidity the devices shall be kept within 12 hours in normal condition before switch on.

9. Safety precautions

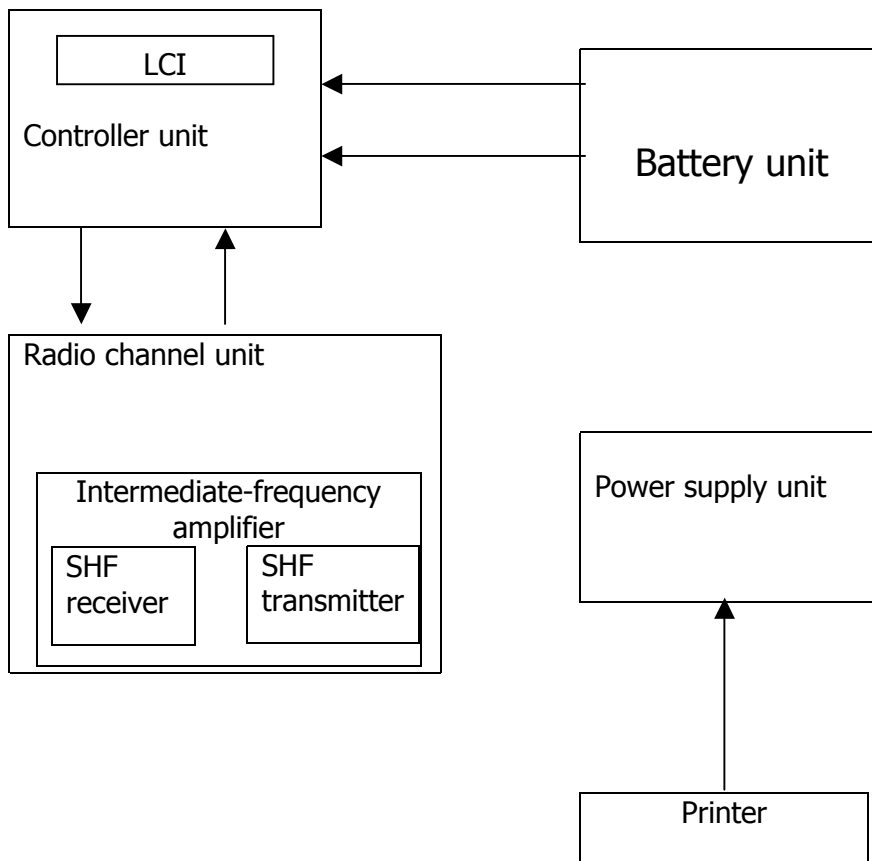
Only persons being acquainted with the technical description, operational manual and safety precautions are authorized to operate the device.

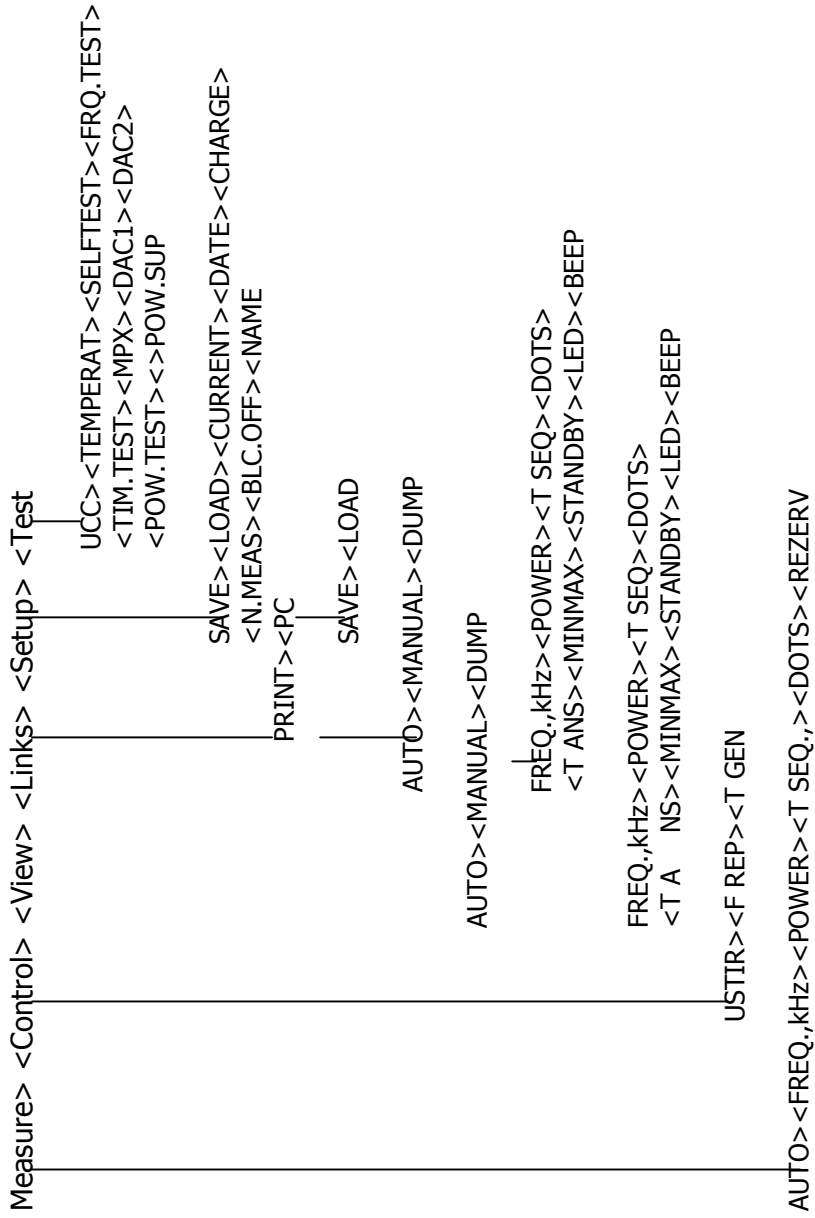
10. Storage conditions.

The device shall be stored properly packed in the rooms which provide for protection against precipitation, the air in the warehouse shall be free of acid, alkali vapors or other aggressive impurities.

The temperature in the warehouse shall be within the range 278 K (5°C) to 313 K (40°C) and air humidity not more than 80%.

Appendix 1.





**Protocol of SART
Testing**

PROTOCOL OF TESTING
SART

TESTING MODE:
AUTO

FREQUENCY OF SART, kHz
FH= 9513833
FL= 9171318

POWER OF SART, mW:
PW= 707

SART SEQUENCE TIME:
102,8 mks

DOT QUANTITY:
D= 12 qt.

TIME OF GENERATION:
TG= 1,5 mks

FREQUENCY OF REPETITION:
FR=4000 Hz

STANDBY INDICATION:
YES

LED INDICATION:
YES

BEEPER:
YES

NEXT DATE OF TESTING:

DATE
18.10.2001

SART TESTER:
0003
NM= 00004

CONTROLLER

RADIOENGINEER _____
L. S.

The printout of the protocol begins with a general message:

"Protocol of testing SART"

Then mode of measurement follows:

<AUTO>-automatic

<MANUAL> - manual, single.

After that the maximum (FH) and the minimum (FL) frequencies of SART response pulse are indicated in kHz

Further :

- Power of SART in milliwatts;
- Duration of response pulse in microseconds;
- Number of changes/frequency sweeping in the response pulse

After that the parameter of trigger pulse generated by the device are indicated:

- pulse duration, microseconds;
- frequency of repetition, Hz.
-

Other test results shall be filled in by hand:

STANDBY INDICATION: - presence of standby mode indication (waiting mode);

<LED INDICATION>: - presence light-emitting diode indication suitable for this SART model;

<BEEPER>: - presence of sound indication suitable for this SART model;

<NEXT DATE OF TESTING>: - date of next device testing.

Then the date of carried out test shall be printed, as well as device number and number of measurement performed with this device.

Further the signatures of persons having tested the instrument shall be affixed and the seal.