ST 110
EMF DETECTOR ST 110

Specification and User's Guide

CONTENTS

1. INTRODUCTION

This User's Guide contains information necessary for correct operation and maintenance of the ST110.

Before operating your ST 110, read this User's Guide carefully and consult it every time you have questions about the operation of the unit.

The information in this User's Guide is subject to change without prior notice.

The manufacturer reserves the right to change the product's specifications in such a manner not worsening or reducing the product's functionality.

2. PURPOSE

ST 110 is designed for detecting and localization of radio-wave radiation devices (RD) which are designed or used for unauthorized data transfer via radio channel.

These facilities include the following:

- Radio-microphones;
- telephone radio retransmitter;
- wireless stethoscope;
- Video-cameras with radio channel for data transfer;
- Technical equipment for high frequency spatial high-frequency irradiation systems in radio-frequency range;
- Radio beacons for people, vehicles or cargos tracking systems;
- Mobile phones and radio modems of «GSM» and «DECT» standards;
- Data transmission devices of «BLUETOOTH» and «WLAN» standards.

3. SPECIFICATIONS

MAIN BLOCK

Frequency ranges, MHz	50-2500
Threshold input sensitivity, dBm	minus 75 (50 MHz) minus 70 (1500 MHz) minus 50 (2500 MHz)
Dynamic range of indication, dB	55 (50-2000 MHz) 40 (2000-2500 MHz)
Sensitivity of frequency meter, dBm	minus 35 (50 MHz) minus 50 (500 MHz) minus 20 (2500 MHz)

Inaccuracy of frequency measuring, %	0.005
Cut-off frequency of LF filter, MHz	750
Built-in power supply battery	3.6 V Li-Polymer rechargeable
Consumption current less than or equal to, mA:	65
Dimension, mm	90x54x21
Weight, kg	0.15
Super-high frequency antenna-detector ST110.SHF	
Frequency ranges, MHz	2000-7000
Threshold sensitivity, W/cm^2	(2-9)*10^{-10}
Dynamic range, dB	45
Consumption current less than or equal to, mA	25
Dimension, mm	D=72, L=16

4. BASIC DELIVERY SET

You will find the following in the basic ST 110 set:

1. Main block
2. HF antenna
3. SHF antenna-detector «ST110.SHF»*
4. USB cable
5. Power supply/charger
6. Mini-CD
7. Specification Description and User's Guide.

* (info) be supplied optionally

5. OPERATING PRINCIPLES AND REFERENCE

Principle of operation of ST110 is based on broad band demodulation of electrical field. Frequency meter provides frequency measuring of stable signal. Identification of digital data transfer signals is performed on basis of unique algorithms of signal analysis and processing. Graphic and digital information is displayed on color OLED display, sound detected signal is reproduced by built-in sound source or headphones. The device is controlled with help of six-button membrane switch.

By using SHF antenna-detector the frequency range of ST110 is expanded up to 7GHz.

«ST 110 Analyzer» firmware provides ST110 operation under PC control widening user possibilities in received data visualization, its storing and further analysis.

5.1 OPERATING MODES

ST 108 operates in two main modes: SEARCH and MONITORING.

Additional modes include: LOG VIEW, OSCILLOGRAPH and RECORDER.

5.1.1 SEARCH MODE

This mode is intended for search and detection of RD location. Usage of this mode is based on visual estimation of signal level on 32-segmental scale. Additionally separate indication of continuous and inpulse signals, displaying of identified signals of GEM, DECT, BLUETOOTH and WLAN, types as well as indication of time stable signal frequency are used.

The possibility of acoustic control by means of headphones is provided.

5.1.2 MONITORING MODE

This mode is intended for independent operation of ST110 on pre-set conditions. The information about detected signals is saved by means of nonvolatile memory of the device (9 banks, each for 999 events). Scheduled workoperation is also provided.

5.1.3 LOG VIEW MODE

This mode is intended for viewing the log of events taking place in the result of the unit running in MONITORING mode.

The classification of the events by time, duration or signal level is provided.

5.1.4 OSCILLOGRAPH MODE

This mode is intended to view the oscillogram of the detected signal. Manual and automatic setting of the signal amplitude and trace and also marker measurements of signal parameters are provided.

5.1.5 RECORDER MODE

This mode indicates how the level of received signals has been changing during the period of time specified by the user (from 30 sec up to 60 minutes).

5.2 DESCRIPTION OF THE MAIN BLOCK

A color graphical display and keypad are situated on the front panel of the block.

The top of the detector has SMA port for HF antenna connecting and MINI DIN port for additional SHF antenna-detector connecting.

The left side of the detector has USB port and port (3.5 mm) for connecting headphones.

The right side of the detector has main supply switch.

5.3 SHF ANTENNA-DETECTOR «ST110.SHF» DESCRIPTION

The construction of «ST110.SHF» consists of broad-band logarithmic detector and circular pattern antenna.

5.4 SERIAL NUMBER AND INTEGRITY SEAL

On the back of the block is a nameplate. The following information is written on it by metallography:

— type of device;

— serial number.

5.5 PACKAGING

For transportation and storing the unit components are placed in a box made of corrugated cardboard with the dimensions of 170 x 150 x 60 mm.

For convenience and safety of the unit components packing, the foamed polyurethane inserts are provided.

6. OPERATING THE ST 110

6.1 DISPLAY AND CONTROLS

6.1.1 INDICATION

Displaying of the operation results is performed on the color graphical OLED display having 160x128 resolution.

Indication, which is common for all the operational modes is shown on fig.1.

1 — indicator of power supply condition (see item 6.2)
2 — indicator of connection with PC
3 — indicator of connected external unit (SHF antenna-detector)
4 — mute
5 — preset volume level
6 — indicator of cheduled operation in MONITORING mode
7 — real time clock (if preset by user).

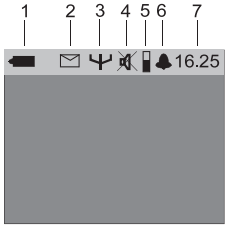

Fig. 1

6.1.2 CONTROLS

Supply switch is intended for switching-on (ON) or switching-off (OFF) of the built-in power supply battery to electric circuit of the device. Switching-off of the power supply battery is recommended in the case of

long-time storage (in this case the current time is cleared).

The button PWR/MODE is intended for operative switching-on/switching-off (see table 1).

The following message will appear after switching-on of ST110 for a shirt moment:

"ST 110 Version X.X. "

Where X.X.- is the installed firmware version number.

The control keys functions are listed in table 1.

TABLE 1

Button	Main function	Additional function Is used while the device is set through MENU
Font color	White	Yellow
PWR/MODE	Sequential choice of working modes SEARCH, MONITORING and operative switch on/off of the device	—

ZERO ◄┐	Set of indication limits in SEARCH mode	Back to the previous MENU item. Moving between bank of the events in LOG VIEW mode, exit from LOG VIEW mode. Manual choice of vertical scanning range or zeroing of the marker value in OSCILLOGRAPH mode.
SENS EXIT	Set of indication scales sensitivity	Exit from MENU and OSCILLOGRAPH mode. Exit from marker measurements in OSCILLOGRAPH mode. Back to SEARCH or MONITORING mode in LOG VIEW mode.
VOL+ ▲ VOL– ▼	Adjustment of volume level	Moving between MENU items. Moving between events in LOG VIEW mode. Choice of horizontal scanning range or marker movement in OSCILLOGRAPH mode.
MENU ◄┘	MENU enter	Confirmation of choice. Enter into marker measurements in OSCILLOGRAPH mode.

6.2 POWER SUPPLY

The ST 062 can be powered by:

— a built-in Li-Pol rechargeable battery;

— external power supply/charger;

— USB port of PC.

At built-in rechargeable battery running its status is represented by ◁▭ icon.

When the battery is fully charged it is indicated by a filled battery pictogram. When the battery is almost completely discharged, the battery indicator will turn from solid to blinking outline.

When the battery level is too low, the display will show "BATTERY DISCHARGED" for ten seconds.

An average operation time of the detector with a fully charged battery is approximately 5 hours.

When an external power supply/charger is used or when operating from USB port the battery icon will change to DC icon ⇶▬.

6.2.1 Battery charge

Turn the power switch in position «ON».

Connect power supply/charger to USB port or using the attached cable to USB port of PC.

When the device is switched off by button PWR/MODE the charge process during first ten seconds will be provided with phrase "BATTERY CHARGE", "BATTERY IS CHARGED" message will be shown when the charge process is finished.

When the device is switched on, the battery charging process will be provided with running segments of the , icon, the end of charging process is displayed by fully hatched icon.

It takes approximately 2.5 hours to charge the battery to 100% using the charger and about 8 hours using USB port.

6.3 FIRST TURNING ON

Attach the SHF antenna to the main unit.

Turn the unit on.

If the text "BATTERY DISCHARGED" appears on the display, you will need to charge it (see 6.2.1.).

6.4 OPERATING IN SEARCH MODE

6.4.1 Indication

The state of the display at the first switching -on is shown on Fig. 2.

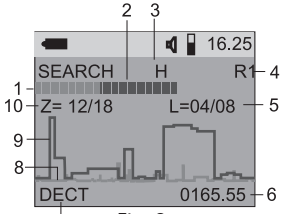

Fig. 2

1 — 32-segmental indicator of impulse component level of radio-frequency radiation source (is pointed on impulse radio transmitters, such as GSM, DECT etc.);

It is displayed by red color;

2 — 32-segmental indicator of integral power of radio-frequency radiation source (is pointed on constant output radio transmitters).

It is displayed by blue color;

3 — Chosen sensitivity of the indication scales («H» – low, «C» – medium, «B» – high);

4 — Frequency ranges («Д1», «Д1Ф», «Д2» , «Д12» or «Д12Ф») /short-period indication of set zero scale level («НОЛЬ»);

5 — Current value of impulse/constant component level, comparing with zero level, dB;

6 — Value of periodic signal frequency, MHz;

7 — Identified data transfer standards (GSM, DECT, DECT BASE, BLUETOOTH or WLAN);
8 — Periodic change of signal level with dominant constant component;
9 — Periodic change of signal level with dominant impulse component;
10 — Current value of zero level for constant/impulse component of signal.

The state of the display, when SHF antenna-detector is connected is shown on fig. 3.

1 — 32-segmental indicator of impulse component level of radio-frequency radiation source; It is displayed with red color;

2 — 32-segmental indicator of integral power of radio-frequency radiation source. It is displayed with blue color;

3 — Sign of connected SHF antenna-detector;

4 — Current value of impulse/constant component level, comparing with zero level, dB;

5 — Current value of zero level for constant/impulse component of signal.

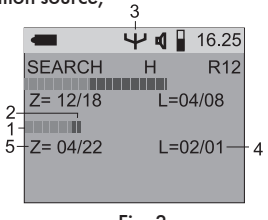

Fig. 3

6.4.2 Control

Set of indication limit related to the current level of radio signals ((background diminutionsignal subtraction) is realized by [ZERO] short-time [ZERO] pressing of button. Simultaneously you will see a message «ZERO» for a short time (item. 4 fig. 2) and the clearance of indicators will happen showing the digital number in item 5.

After each set of the "zero point" the scale of indicators will change by the leftover principle. For example, if the absolute value is 24 dB, the scale of indication will become linear distributed between 24 and 55 dB (approximately 1dB for each segment), if the absolute value of zero level is 12 dB, then the scale of indication will become linear distributed between 12 and 60 dB (1,5 dB for each segment) etc.

Cancellation of indication limit set with indication zeroing in item 10 is provided by pressing button [ZERO] during the indication of the message «ZERO» in item 4, fig. 2.

Set of indication scale sensitivity is provided by short-time continuous pressing of the button [SENS] By doing so the chosen value of scale sensitivity is indicated in item 3, fig. 2:

«H» — low, all scale 55 dB,
«C» — medium, all scale 35 dB,
«B» — high, all scale 15 dB.

6.4.3 Operating in SEARCH mode

Set the indication limit. Set the indication limit. This operation to be repeated in one of the premises nearest to the checked room, in which the level of background signal doesn't differ much from the level in the checked room, and placement of RD is not reasonable . It is prohibited to set the limit exactly in the checked room, because if RD that has been placed already in this room operates, then the level of its radio radiation will be determined as "zero".

When ST 110 approaches RD, the number of colored indication level sectors will increase depending on frequency and type of signal (red – impulse component of the signal dominates, blue – constant dominates).

Such interpretation of signals is rather conditional and is realized for comfortable work with ST 110.

Search of RD is provided by systematic walking around the room (object), moving along the walls and observing furniture and other things, which are placed here. While walking around the antenna of ST 110 has to be hold on the distance not more than 20—25 cm from the observed surfaces. Orienting it in different places the maximum level of the signal is approached. In the case of large city and typical for it signal interference the range of searching low-power RD usually is not more than half-meter. In the case of suburban zone or countryside the range can be about several meters.

If all segments of the level indicator scale are lightened and the placement of RD is not detected, it is necessary to decrease consequently the sensitivity of indication scales («B» - «C» - «H») and/or set zero limit relatively to the present signal level (button ZERO). Repeat these steps until exact localization of RD has reached.

It should be noted, that distribution of high-frequency radio signals under conditions of reinforced-ferroconcrete building has an undefined character. It can appear in mismatch of signal level indication and real distance to RD (remirror of radio waves effect).

Indication of the identified digital data transfer standards in one period of time is provided for only one

type of the signal. If in the place of operating there are several sources of different standards their identification may be difficult. In this case it is recommended to switch off legal radiation sources.

The signal identified by the amplitude detector is sent to headphones or built-in oscillator sound source for acoustic control.

To decrease the impact of the signals with frequency higher than 900 MHz (mostly of these signals are from basic GSM, DECT and Wi-Fi stations) switch on flow-frequency filter (See item. 6.7 TABLE 4). The connection of filter is confirmed by indication of sign «Φ» in upper right corner of the display.

6.5 OPERATING IN MONITORING MODE

6.5.1 Indication

The state of the display at the first switching -on is shown on Fig. 4

1 — Indicators of RD signal level;

2 — Graphic illustration of alarm limit levels;

3 — Sign of no permission for recording in EVENT LOG;

4 — 5-second interval countdown;

5 — Current value of impulse/constant signal component level, comparing with absolute level, dB;

6 — Numeric value of the alarm limit levels .

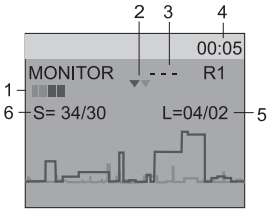

Fig. 4

6.5.2 Control

Configuration according to that mode is chosen from MENU.

In that mode there are two conditions:

— indication scales show levels from 0dB to 55dB;

— buttons ZERO and SENS EXIT are locked·

6.5.3 Operating in MONITORING mode

The first five seconds after switching to this mode in the upper right corner of indicator a five-second countdown will be seen. This period of time provides measurement of electromagnetic field peak level. These measurements serve as basis for automatic configuration respectively to the alarm level. Change of that value is made from the MENU.

Use program «ST110 Analyzer» when extended parameters of alarm level settings are configured.

Correction of choice is checked experimentally, taking into consideration the distance of search and interfering situation, using legal radiation sources (mobile phone, radio station etc.) and with help of skills after operating in SEARCH mode.

In the case of exceeding of the the preset limit by the signal a full-sized wordscreen message «ALARM» will be shown on the display.

To prevent the chaotic filling of the event log during the preparative events, record is prohibited by default setting in EVENT LOG (sign «---» in item 3). To allow record is possible through MENU (see. item. 6.7 table 2). When

choosing the allowance of record you should control the appearance of event counter "000" in item 10 and blinking message "MONITOR". It will mean under presence of the alarm conditions, information about event will be registered in ST110 EEPROM.

Events that happened during one period of monitoring are recorded in separate bank. There are 9 banks. Bank number 1 always has the newest events, number 9 – the oldest. When all banks are full, events from bank 9 are erased. Maximum number of the events in one bank is 999. Maximum number of the events in all banks is 4096.

Minimum time between two same events is 1 sec. (to change this value is possible from the MENU). These events will be registered in two log events. If the second event (in the same frequency range) will happen in a period less than 1 sec. it will not be registered as a new event. Only the duration of event will be fixed.

An option of automatic scheduled switch on/off is provided in MONITORING mode, which is set in submenu "SYSTEM" – Table 5. Before using that option a real-time clock have to be set. It should be understood, that switching off the device by the power switch will result in zeroing of real-time clock.

6.6 LOG VIEW MODE

This mode may be chosen from the MENU.
If the log is empty, the message: «PROTOCOL IS EMPTY» will appear on the display.

The state of the display in this mode is shown in Fig. 5.

1 — Number of viewed bank /Number of banks in action.

2 — Number of viewed event/Number of events in bank.

3 — Frequency range, in which the alarm happened (D1 — 50-2500MHz, D2 — 2500-7000 MHz).

4 — Signal properties in the moment of alarm limit excess.

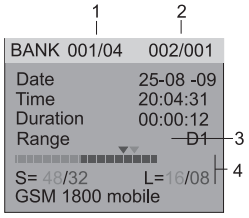

Fig. 5

Switching between banks is performed using [ZERO] button.
The bank with the most recent events will have the lowest number.
Use [VOL+] [VOL-] buttons for switching between events.

The events are numbered according to the inputted parameters of classification (configured through MENU).

The events are numbered according to the sorting criterion (set in the MENU).

If you choose sorting by a parameter other than time in the Menu, the message "Sorting." may appear briefly on the screen. Please Wait.". To exit the Event Log view mode, press [SENS EXIT] key.

6.7 OSCILLOGRAPH MODE

6.7.1 Indication

1 — Type of configuration (A - automatic P - manual) and relative value of vertical tracescanning (from 1 to 7).

2 — Oscillogram.

3 — Value of horizontal trace in conversion to full-screen values (from 1, 2, 4, 8, 16 and 32ms).

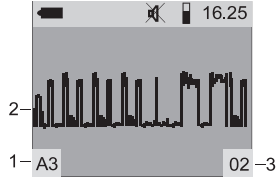

Fig. 6

6.7.2 Control

The set of **automatic vertical scanning value choice** is performed by pressing [SENS EXIT] button, while appearance of the sign «A» in item 1 and chosen relative value (from 1 to 7).

Manual horizontal scanning value choice is performed by pressing continuously [ZERO] button (sign «P» in item 1). The choice is made between relative values from 1 to 7.

Horizontal scanning value choice is made by pressing [VOL+] and [VOL-] buttons between the following values: 2, 4, 8, 16 и 32 ms.

Freezing of image from oscillogram happens after pressing [MENU] button, in the lower line of display appears «mark». To continue dynamic indication button [SENS EXIT] has to be pressed.

When repeating pressing button [MENU] the switching-over between three sub-modes of the marker changes happens: "mark", "time" and "shift". Pressing button [ZERO] it is possible to switch from these three to sub-mode "zero". The indication of sub-modes is in the lower line of display.

In sub-mode "mark" freezing of viewed time period occurs with duration, specified in item .., with an option of making the mark changes. This is confirmed by the message "mark", which is located in the lower part of the display and relative value of mark location (vertical white line) on the time scale.

In sub-mode "time" the possibility of horizontal scanning value changing for frizzed image is provided.

In sub-mode "shift" the "scrolling" of whole recorded segment is provided by pressing buttons [VOL+] and [VOL-] in range of 32 ms.

By pressing button [ZERO] from every sub-mode of mark measurements it is possible to provide measurement of each segment viewed on the display. At that time [VOL+] and [VOL-] it is possible to move marker relatively to "zero" value including corresponding indication of the measured time segment digital value in the lower part of display. Exit from the sub-mode "zero"is possible by pressing button [MENU].

Exit from to mode "Oscillograph" from sub-modes of mark measurements is made by pressing button [SENS EXIT].

It should be noted, that enter in mark measurements mode is provided with memorizing (freezing) of oscillogram with 32 ms length and 5120 counts. To provide the detailed analysis of such an oscillogram sub-modes "time", "shift" and "zero" can be used.

Exit from mode "zero" is possible by pressing button [SENS EXIT].

6.8 MENU

To enter the MENU, press the [MENU] key.

Options of MENU are shown in table 2.

Use [VOL+] and [VOL-] keys to highlight the required menu item. To choose a menu press [MENU].

To go up one level press [ZERO].

TABLE 2

Oscillograph	Enter in OSCILLOGRAPH mode
Range	Table 3
Monitor	Table 4
Log	Table 5
System	Table 6
Recorder	Switch on/off signal level changes displaying, depending on time as well as setting time interval to be displayed (30sec/2min/10min/20 or 60min)

TABLE 3

Range			
Option	**Description**	**Value**	**Default settings**
Frequency range	Choice of frequency range	Range 1 On/off	Chosen
	Switch on/off LF filter	Range 2 On/off	Chosen
		UHF On/off	Not chosen
Frequency-meter	Choice of priority between frequency measurement and identification of data transfer standards	From 1 to 5	3

TABLE 4

Monitor			
Option	**Description**	**Value**	**Default settings**
Setting of the events by which alarm indication is made	**Alarm level** Setting of relative alarm level limit	From 1 to 60 dB with step 1 dB	20dB
	Frequency capture Frequency value indication	Chosen / Not chosen	Chosen
	Sygnal Indication of identified standard GSM, DECT, BLUETOOTH, WLAN	Chosen / Not chosen	Chosen
	Event delay Setting of duration between the events, which should be recorded in a log as two different events	From 1 to 120 sex with step 1 sec	8 sec

Indication of alarm type setting	**Screen** Full-screen message «ALARM» is indicated	Chosen / Not chosen	Chosen
	Alarm capture Indication of alarm stays until one of the button is pressed	Chosen / Not chosen	Not chosen

TABLE 5

Log		
View	Log view enter	
Record	Allowance/prohibition of record in EVENT LOG	Not chosen

Sort	Classification of records in log by one of the attributes	By time – in fact no classification, because the events appear in time	Chosen
		By level – classification by maximum level in decreasing order	Not chosen
		By range – classification by frequency range	Not chosen
		By length – classification by event length in decreasing order	Not chosen
Delete all	Erasing of all information about events. Additional question will appear: Are you sure? ENTER - yes, ANOTHER BUTTON - cancel". To confirm erasing button SENS EXIT must be pressed. After that action phrase "Log deleted" will appear. If the erase cannot be provided, an automatic erase of the bank with the oldest information will happen when the memory is full.		

TABLE 6

System			
Option	**Description**	**Value**	**Default settings**
Language	**Language** Language choice for information displaying	English / Russian	Russian
Indication	**Brightness** Level of brightness settings for highlighting	from 10 to 100% with step 10	50
	Display switch off Time setting for automatic display switching off after the last button press	From 8 sec to 2 min, with 8 sec step. Extreme position of mark (99:99 sec) means that display will not be switched off.	40 sec
	Automatic display switch off When the signal detected, the display will switch on (if switched off)	Chosen / Not chosen	Chosen
	Sound signals Sound signal confirming the pressing of the button. Periodical sound signal when phrase "BATTERY IS LOW" appears. Alternate sound signal in the case of signal detecting	Chosen / Not chosen	Chosen

Time	**Schedule** Setting of working schedule in AUTOMATIC mode Setting time in hours (from 0 to 23) for one-time or daily switching on the AUTOMATIC MODE for defined period of time. The detected signals are recorded in a separate bank.	Time set	Time of switch on. By default 9 a.m. Time of switch off. By default 5 p.m.	Chosen
		Daily		Not chosen
	Clock set Date and time set	Sequential setting: HOURS (Ч), MINUTES (М), SECONDS (С), DAY (Д) and MONTH (М). After each setting you should press ENTER to move on the next position ENTER.		
	PC Synchronization Automatic synchronization with PC clock while transferring any information	Chosen / Not chosen		Chosen
	Correction setting Daily correction of clock movement setting	from - 2 min to + 2 min with discretization one second per day		00:00

Default settings	All parameters of the device take default settings

7. 7 WORKING WITH THE COMPUTER

To begin the work, install the software from the MiniCD or download the latest version from the manufacturer Web-site.

Connect the main block to the computer with USB cable that comes with the detector. When prompted to install the device driver choose the installation path. BE SURE TO confirm the installation by agreeing with the prompt. If the computer is connected to Internet, the download of driver will start automatically.

7.1 «ST 110 ANALYZER» SOFTWARE

The software is intended to:

— time graphic display of data and the results of operation of the ST 110;
— the ST 110 remote full control using PC;
— extended settings assignment for MONITORING mode;

— load and display textual and graphical information of the operation of the ST 108 in MONITORING mode (Event Log);

— the full manual on the software is recorded on the MiniCD and in the program menu "Help".

7.2 FIRMWARE UPDATING VIA INTERNET

Select the appropriate firmware version from the manufacturer website You will be presented with the following prompt: "Would you like to open the file or save it to your computer?" Choose the first line and within a few seconds the application will be downloaded and launched.

Connect the USB cable to a free USB port on your PC. Press button [MENU] on ST 110 and hold it while pressing button [PWR/MODE]. The following title must appear on the display of ST 110 «ST 110 -> PC».

Monitor updating process on your computer display. If this process fails, the application will offer you to try again.

You can copy the downloaded updater application to any portable media and use it on another PC running Microsoft Windows™ as needed.

8. SOME LIMITATIONS AND RECOMMENDATIONS

8.1. Use the original packaging for storing and transporting the ST 108 set.

If you are not using the unit for a long period of time, keep it in a closed, heated room with a temperature

of 10 to 35°C (50° to 95° F) and relative humidity of no more than 80 %.

When transporting the unit in the original packaging, take measures to prevent it from blows or excessive pressure.

8.2 After the unit has been exposed to temperatures below –5°C (23° F) for prolonged periods (over 4 hours), turn it on only after making sure there are no visible traces of condensation.

8.3 When operating the ST 108 , try to protect it from concentrated moisture (rain, drizzle, and snow).

8.4 Prevent the LCD from prolonged exposure to direct sunlight.

9. WARRANTY INFORMATION

9.1. The manufacturer guarantees that the unit will comply with the specifications for a period of 12 months beginning from the day of purchase.

9.2 The manufacturer will carry out repairs of the unit and its accessories or replace them if they malfunction or if the functioning will not comply with the stated specifications free of charge during the guarantee period.

9.3 This warranty only covers free-of-charge repair or adjustment of faults that are not the result of improper use, failure to follow the usage tips and recommendations stated in the User's Guide, improper storage

or shipment, and mechanical damage to the unit or its parts. The warranty will only be ensured with a guarantee claim accompanied by a properly filled out certificate of warranty.

9.4 The manufacturer offers post-guarantee servicing of the unit.

10. QUALITY CONTROL CERTIFICATE

The «ST110» manufacture _____ is produced according to the specifications, accepted and approved as ready for operation.

Q.C. chief

Stamp

_____

Year, month, day