

MULTI-PURPOSE DETECTOR OF SEMICONDUCTOR COMPONENTS

# LORNET-STAR

OPERATION MANUAL

PASSPORT



# OPERATION MANUAL

## 1. Introduction

Multi-purpose detector of semiconductor components LORNET-STAR (hereinafter referred to as the detector) is designed to seek and detect electronic devices both in active and off state.

The operating principle of the detector is based on the following property of semiconductor devices: when irradiated by microwave probing signal, they re-emit 2nd and 3rd harmonics of the signal. Maximum response from semiconductor elements of artificial origin (transistors, diodes, integrated circuits) is at 2nd harmonic of the probing signal. And when irradiating oxide film of natural origin, maximum response is at 3rd harmonic of the probing signal.

The detector enables it to analyze the responses of irradiated objects both at 2nd and 3rd harmonics of the probing signal, which makes it possible to accurately identify electronic devices and natural oxide semiconductors.

The detector automatically finds the best receiving frequency channel free of interference, which makes it possible to operate the device in complex electromagnetic environment. Frequency tuning algorithm which is applied in the detector, automatically selects frequency of the probing signal with minimal reception interference of the 2nd harmonic.

The detector may have from one to three replaceable antenna units out of 5 possible:

1. antenna module (/08) of 800 MHz range allows it to operate in absorbing environments with high humidity,
2. antenna module (/08c) of 800 MHz range with integrated spectrum analyzer in addition to the option of this range, can significantly improve the identification of artificial and natural semiconductors,
3. antenna module (/24) of 2400 MHz range effectively detects small-sized (less than 1cm<sup>2</sup>) semi-conductor elements,
4. antenna module (/ 24c) of 2400 MHz range with built-in spectrum analyzer in addition to the options of this range, can significantly improve the identification of artificial and natural semiconductors,
5. antenna module (/ 36m) of 3600 MHz range enables it to carry out distance detection with spatial selection of targets.

The detector has a removable telescopic rod to easily convert the detector from an inspection device to search tool and back.

Digital processing of demodulated signal allows it to obtain high sensitivity.

The detector features two types of probing signal:

- continuous radiation of carrier frequency, or pulse modulation with low off-duty factor (CW)

- pulse modulation of carrier frequency with high off-duty factor (Pulse).

That makes it possible to combine large detection range and accurate identification of the detected devices.

The detector can display the levels of the received signals of second and third harmonics simultaneously on the LED display. In addition, the level of second or third harmonics can be estimated by ear according to click repetition rate, produced by the built-in speaker or headphones.

Envelope curve detector of re-emitted microwave signal makes it possible to detect by ear operating electronic devices containing acoustic transducer while continuous emission of carrier frequency.

When using a replaceable antenna module // 24c (or 08c //), the spectrum of the second and third harmonics can be visually analyzed. Additionally, the antenna module // 24c (or 08c //) allows it to assess the level of reflection of the first harmonic, which increases the possibility of determining the presence of shielding elements.

## 2. Specifications

Technical parameters depend on the type of antenna module and are specified in the following table:

	Detector with replaceable antenna module	08	08S	24	24S	36M
2.1	Frequency of probing signal in the range	800MHz	800 MHz	2400MHz	2400MHz	3600MHz
2.2	Automatic selection of carrier frequency according to the criterion of the minimum interference in the path of the receiver of the second harmonic in steps of	200kHz	200kHz	2MHz	2MHz	13MHz
2.3	Maximum power of probing signal (peak/average)					
	Pulse Mode	10W/230mW				18W/112mW
	Continuous Mode	/300mW				-
	Pulse Mode with low off-duty cycle (CW)	-	-	-	-	6W/375mW
2.4	Range of manual adjustment of probing signal power	20dB				
2.5	Frequencies adjustments of radio receivers are equal to double and triple frequencies of transmitter.					
2.6	Sensitivity of radio receivers	at least -110 dBm				
2.7	Dynamic range of the receiver path	24 dB				
2.8	Battery life (rechargeable battery) at max. output power in pulse/continuous mode	3 hours/1,5 hour				2,5 hours/ 1,5 hour
2.9	Dimensions of the detector (inspection)	40x20x7 cm	40x20x7 cm	40x12x7 cm	40x20x7 cm	40x20x20 cm
2.10	Dimensions of the telescopic rod	45 x 4 x 4 cm (100 x 4 x 4 cm)				
2.11	Weight of the device (inspection)	1,0 kg		0,8 kg	1,0 kg	
2.12	Weight of the telescopic rod	200 g				
2.13	Dimensions of the bag-packing	45x30x35 cm				
2.14	Weight of the delivery set in the bag-packing	4 kg (8 kg)				
2.15	Operating temperature range	from +5 to +40° C				

### 3. Composition of the product, design and accessories

3.1. Depending on the number and type of required replaceable antenna modules (RAM), the detector can have 17 choices of the delivery set, presented in the following Table:

	Delivery Set	Note
1	Lornet Star //08	One RAM of 800MHz
2	Lornet Star //08c	One RAM of 800MHz with spectrum analyzer
3	Lornet Star //24	One RAM of 2400 MHz
4	Lornet Star //24c	One RAM of 2400 MHz with spectrum analyzer
5	Lornet Star //36m	One RAM of 3600 MHz
6	Lornet Star //08//24	Two RAMs of 800 MHz and 2400 MHz
7	Lornet Star //08//24c	Two RAMs of 800 MHz and 2400 MHz with spectrum analyzer
8	Lornet Star //08//36m	Two RAMs of 800 MHz and 3600 MHz
9	Lornet Star //08c//24	Two RAMs of 2400 MHz and 800 MHz with spectrum analyzer
10	Lornet Star 08c//24c	Two RAMs of 800 MHz and 2400 MHz with spectrum analyzer
11	Lornet Star 08c//36m	Two RAMs of 3600 MHz and 800 MHz with spectrum analyzer
12	Lornet Star //24//36m	Two RAMs of 2400 MHz and 3600 MHz
13	Lornet Star //24c//36m	Two RAMs of 3600 MHz and 2400 MHz with spectrum analyzer
14	Lornet Star //08//24//36m	Three RAMs of 800, 2400 and 3600 MHz
15	Lornet Star //08//24c//36m	Three RAMs of 800, 2400 and 3600 MHz with spectrum analyzer
16	Lornet Star //08c//24//36m	Three RAMs of 2400, 3600 and 800 MHz with spectrum analyzer
17	Lornet Star //08c//24c//36m	Three RAMs of 800, 2400 MHz with spectrum analyzer and 3600 MHz

3.2. The detector consists of units, devices and accessories listed in the following table:

	Name	pcs	Note
1	Replaceable Antenna Module (RAM)	from 1 to 3	in compliance with the delivery set p.3.1
2	Remote Control with built-in rechargeable battery container	1	
3	Removable Telescopic Rod	1	
4	Replaceable Li-ion rechargeable batteries (12 V)	2	
5	Container for battery charging	1	
6	Charger for rechargeable battery	1	
7	Headphones	1	
8	Specification and Operation Manual, Passport	1	
9	Package (bag-packing at maximum items in the delivery set)	1	

3.3. The appearance of the detector components is shown in Figure 1

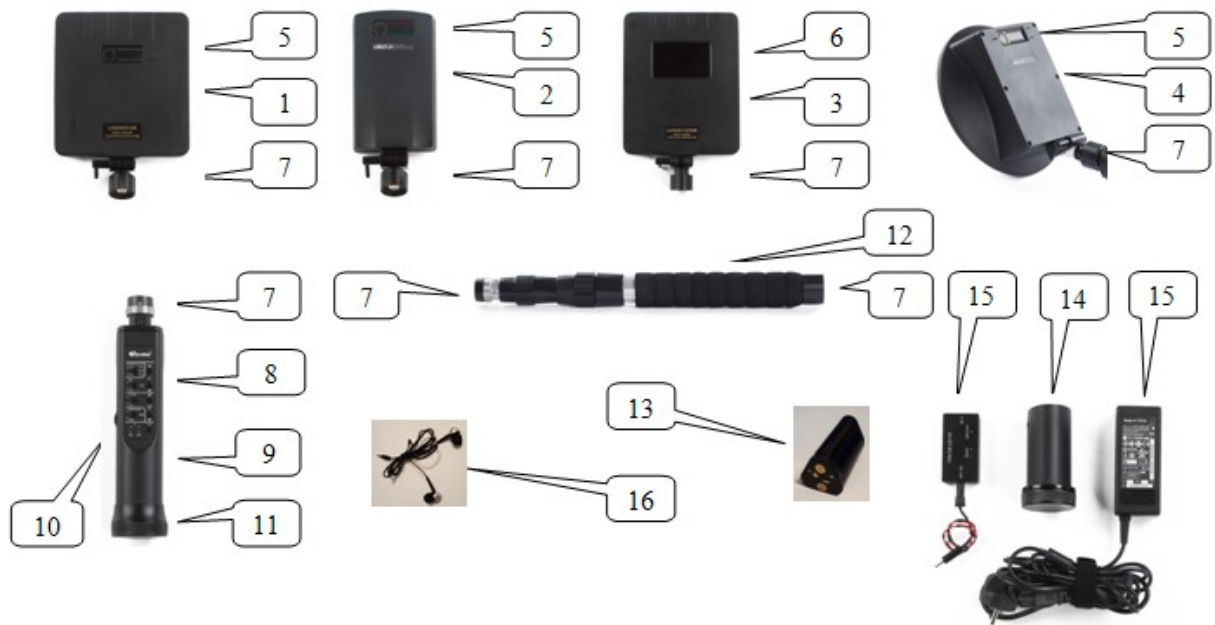


Figure 1, where:

- 1 - replaceable antenna module //08 of 800 MHz
- 2 - replaceable antenna module //24 of 2400 MHz
- 3 - replaceable antenna module //08c of 800 MHz (or //24c of 2400 MHz) with spectrum analyzer
- 4 - replaceable antenna module //36m of 3600 MHz
- 5 - LEDs;
- 6 - graphic LCD display
- 7 - detachable connection
- 8 - remote control
- 9 - control panel
- 10 - power switch
- 11 - screwed cover of the battery compartment
- 12 - telescopic rod
- 13 - Li-ion battery (12V)
- 14 - container for recharging
- 15 - battery charger
- 16 - headphones

#### 4. Purpose of the basic units of the detector

4.1. Any replaceable antenna module provides:

- The analysis of interfering load of the receiving path that is carried out each time the detector's transmitter is enabled as well as automatic selection of optimal channel of the detector's operation. That's why during operation, in case of any interfering signal (when operating in a complex electromagnetic environment), it is recommended to occasionally switch off the detector's transmitter. When you further turn on the transmitter, it automatically selects optimum frequency radiation to provide best sensitivity and detection range of semiconductor elements.

- Formation of the microwave signal, reception and digital processing of signals of second and third harmonics of radiation frequency. Simultaneous display of signal levels of second and third harmonics allows it to accurately distinguish between signals of artificial semiconductors that are part of electronic devices and natural corrosive ones, which appear during oxidation of compounds of different metals.

- Demodulation of response of second and third harmonics, increasing them to the level best for headphones or internal speaker. The detector provides the option of volume adjustment. Listening of demodulated signals of 2nd and 3rd harmonics is carried out alternately.

**4.2.** Replaceable antenna module with LED indicators (modification //08 //24 //36 m) provides indication of probing signal power, the received signal level of second and third harmonics as shown in Figure 2.



Figure 2, where

- 1 - probing signal power
- 2 - level of the received 2nd harmonic probing signal
- 3 - level of the received 3rd harmonic probing signal

**4.3.** Replaceable antenna module with spectrum analyzer (modification //08c and //24c) provides indication on a graphic display. Figure 3 shows possible representation options of transmitter power level, levels of the received signals of second and third harmonics, spectrum of the received signals of second and third harmonics, level of the reflected signal of the first harmonic.

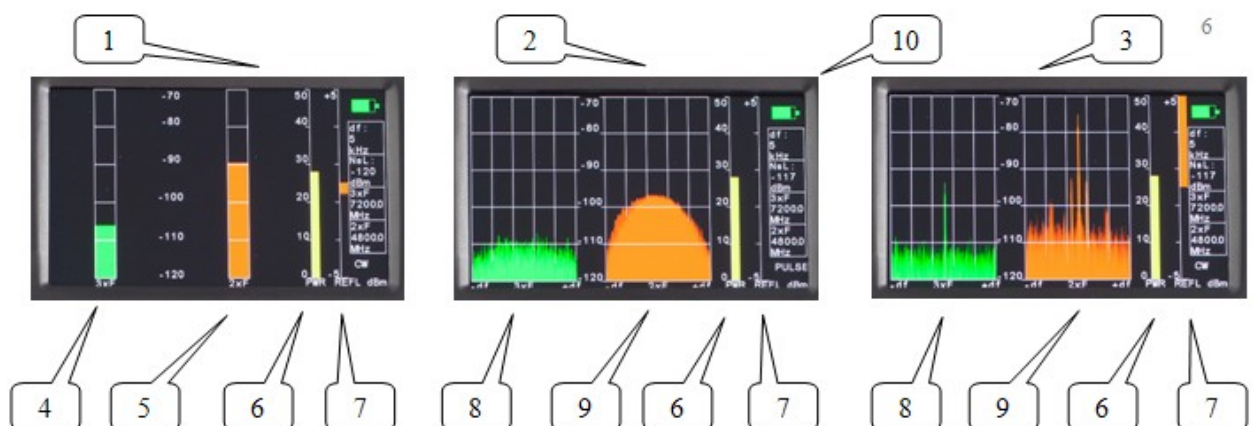


Figure 3, where

- 1 - lined indication mode of 2nd and 3rd harmonics
- 2 - spectrum analysis mode of 2nd and 3rd harmonics in pulse mode

- 3 - spectrum analysis mode of 2nd and 3rd harmonics in continuous operation
- 4 - scale of level of the received 3rd harmonic (green)
- 5 - scale of level of the received 2nd harmonic (red)
- 6 - scale of level of probing signal power (yellow)
- 7 - scale of level of the received 1st harmonics of the reflected probing signal (red)
- 8 - spectrum of the received 3rd harmonic (green)
- 9 - spectrum of the received 2nd harmonic (red)
- 10 - battery charge indication

**4.4.** Knuckle joint of the replaceable antenna module with detachable connection (Figure 4) is used to fix the position of the antenna, for easy inspection and searching.

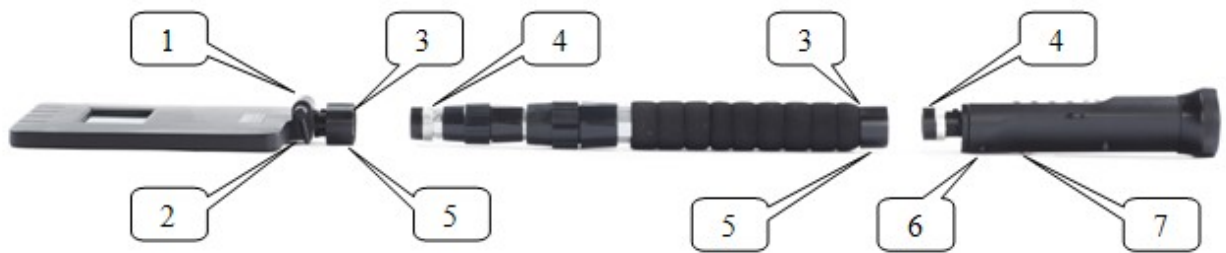


Figure 4, where

- 1 - knuckle joint
- 2 - knuckle joint handle
- 3 - connector from the fixed contacts
- 4 - connector from the spring contacts
- 5 - clamping nut of the detachable connection
- 6 - built-in speaker
- 7 - connector for headphones

**4.5.** Detachable connections of replaceable antenna modules with remote control handle, and a removable telescopic rod allows the operator to easily turn the detector from the inspection device to a search one and back. Figure 4 shows the construction of the detachable junction of the detector's elements.

**4.6.** The remote control is designed to control the operation of the detector. It consists of a body (the handle) with the rechargeable battery (replaceable) inside it. The body contains control board, modes' control buttons and LEDs indicating operating modes.

The appearance of the remote control is shown on Figure 5.



Figure 5, where

- 1 - indicator of listening to the response of the 2nd harmonic
- 2 - button to switch listening to the response of 2nd or 3rd harmonics
- 3 - indicator of listening to the response of 3rd harmonic
- 4 - indicator of listening to the response into the built-in speaker
- 5 - button to switch listening to headphones or speaker
- 6 - indicator of listening to the response onto the headphones
- 7 - indicator of pulsed operation of probing signal transmitter
- 8 - button to switch pulsed and continuous modes of operation of the probing signal transmitter in the cycle: - Pls. - Cont. (AM demod.) - Cont. (FM demod.) - Pls. - ..
- 9 - indicator of continuous operation of probing signal transmitter
- 10 - indicator of spectrum analysis mode of 2nd and 3rd harmonics response
- 11- power switch slide
- 12 - indicator of lined indication mode of 2nd and 3rd harmonics response



- 13 - button to enable probing signal transmitter
- 14 - indicator of the receivers' attenuator
- 15 - indicator of listening to the response in pulsed mode
- 16 - signal volume up button
- 17 - indicator of listening to the FM demodulator output in continuous mode
- 18 - indicator of listening to the AM demodulator output in continuous mode
- 19 - signal volume down button
- 20 - button to increase probing signal transmitter power
- 21 - button to reduce probing signal transmitter power
- 22 - control button of radio receivers' attenuator.

**4.7.** Functions of the remote control indicators: permanent light of any indicator corresponds to the 'on' position, no light - to the 'off' position. Simultaneous flashing of all indicators on the remote control indicates battery discharge.

**4.8.** Charge the battery (1-13) using the supplied charger only (1-15) (*hereinafter, the first number refers to the figure, the second one to the position in the figure*). The use of other chargers is not allowed. For charging, unscrew the cover at the end of the handle of the remote control (1-10) of the detector, remove the battery and place it in a container for charging (1-14). The container should be connected to the charger (1-15).

When the charger is plugged into the network, during charging, there is a red LED on its body. After the battery is fully charged, the red LED goes out and the green LED lights up. Charging of a completely discharged battery takes about 1.5 hours.

**4.9.** Headphones (1-16) are connected to the connector (7-4) on the remote control, the location of which is shown in Figure 4.

## **5. Safety Precautions**

**5.1.** According to the electrical safety requirements, this detector refers to class 1 protection.

**5.2.** It is required that only trained staff operates the device. These are operators who received instruction on safety precautions when working with electric appliances and radio measuring devices with open emitters of radio frequency energy.

### **5.3. ATTENTION!**

LI-ION battery (12V) (see Figure 1) in black color is designed to operate only with the standard charger supplied with the LORNET STAR detector.

**NEVER** use this battery charger to charge the LI-ION rechargeable batteries (3.7V) in blue color, which are used in the detectors Lornet, Lornet 24, Lornet 36, Lornet 0836.

**NEVER** use the LI-ION battery (12V) (see Figure 1) in black color instead of LI-ION batteries (3.7V) in blue color, which are used in the detectors Lornet, Lornet 24, Lornet 36, Lornet 0836.

## **6. Operating the Detector**

**6.1.** Unpack the detector. Charge the battery, if necessary. When transporting the product at subzero temperatures, it is required to keep the device at room temperature for at least 30 minutes without turning it on.

### **6.2.** (Modification //08c and //24c)

Enable the detector using power switch slide (5-11) located on the remote control. At the same time there will be 4 indicators on the remote control (5-1), (5-4), (5-7) and (5-15), indicating that the detector has been powered on. These indicators show that when pressing the

button (5-13) that enables probing signal transmitter, the detector will switch to pulse mode (5-7) with listening to the characteristic response (5-15) of the second harmonic (5-1) through the built-in speaker (5-4).

These initial conditions can be changed.

Press the button (5-2) to change the listening of 2nd harmonic (5-1) to listening to the 3rd harmonic (5-3) and back.

Press the button (5-5) to change listening through the built-in speaker to listening (5-4) through headphones (5-6) and back.

Press the button (5-8) to change circle-wise the operating mode from pulse (5-7) (5-15) to continuous (5-9) with listening to the signal from the output of the AM demodulator (5-18), followed by a continuous mode (5-9) with listening to signal output from the FM demodulator (5-17) and then back to the pulse mode (5-7) (5-15).

### **6.3. (Modification //08c and //24c)**

Enable probing signal transmitter by pressing the button (5-13). Thus, if the initial conditions are not changed, then pulse mode of the transmitter (5-7) is enabled with lined indication of responses on the display (5-12). On the display (3-1), the operator can analyze probing signal power (3-6), and the response of second (3-5) and third (3-4) harmonics. Scale (3-7) is not used in pulsed mode. The operator can change power of probing signal transmitter using the buttons (5-20) and (5-21). In this mode, sound information (clicks) on the response of second (5-1) or third (5-3) harmonics signal is transmitted to the built-in speaker (5-4) or headphones (5-6). The volume level can be adjusted using the buttons (5-16) or (5-19).

When pressing the button (5-8), the detector switches to continuous operation, the indicator is activated (5-9) with listening to the signal from the output of the AM demodulator (5-18). On the display (3-1), the operator can analyze probing signal power (3-6), and the response of second (3-5) and third (3-4) harmonics. In addition, according to the scale (5-7), the operator can analyze the level of received first harmonic of the reflected probing signal, which represents the occurrence of reflective materials (water, metals, etc.). This signal should be considered at low power of the probing signal. The received signal is indicated as the level of light scale relative to the average exposure (zero). Phase (positive or negative) of the signal is irrelevant.

When pressing the button (5-8) again, the detector remains in continuous operation mode, the indicator is activated (5-9), but with listening to the signal from the output of the FM demodulator (5-17). On the display (3-1), the operator can analyze probing signal power (3-6), and the response of second (3-5) and third (3-4) harmonics. In addition, according to the scale (5-7), the operator can analyze the level of received first harmonic of the reflected probing signal, which represents the occurrence of reflective materials (water, metals, etc.). This signal should be considered at low power of the probing signal. The received signal is indicated as the level of light scale relative to the average exposure (zero). Phase (positive or negative) of the signal is irrelevant.

With further pressing the button (5-8), the detector goes back to pulse mode.

### **6.4. (Modification //08c and //24c)**

When pressing the button (5-13) again, provided the initial conditions are not changed, the detector remains in pulse mode (5-7), but with the opportunity for the operator to analyze on the display (3-2) power of probing signal transmitter (3-6), as well as the spectrum of response of second (3-9) and third (3-8) harmonics. Playback modes are similar to those described in the previous section.

When pressing the button (5-8), the detector switches to continuous operation, the indicator is activated (5-9) with listening to the signal from the output of the AM demodulator (5-18). On the display (3-1), the operator can analyze probing signal power (3-6), as well as the spectrum of response of second (3-5) and third (3-4) and first (3-7) harmonics. Playback modes are similar to those described in the previous section.

Next time the button (5-13) is pressed, probing signal transmitter of the detector is switched off. In this state, there is an automatic analysis of the level of noise in the reception

channel of response of 2nd harmonic and the corresponding selection of probing signal frequency according to the criterion of minimum noise at further activation (pressing button (5-13)).

#### **6.5. (Modification //24 and //36m)**

Enable the detector using power switch slide (5-11) located on the remote control (hereinafter, the first number refers to the figure number, the second one to the position in the figure). At the same time on the remote control there will be a short indicator of LI-ION battery charge level and 3 constant indicators (5-1), (5-4), (5-7) indicating that the detector has been powered on. These indicators state, when pressing the button (5-13) that enables probing signal transmitter, the detector will switch to pulse mode (5-7) with automatic power control and listening to the characteristic response (5-15) of the second harmonics (5-1) through the built-in speaker (5-4).

One yellow LED should be on the antenna unit (dial of probing signal power indicator ) (2-1). Its initial position corresponds to the maximum power of probing signal. Meanwhile probing signal transmitter is switched off (can be switched on only after pressing the button (5-13)). Light indicators of the second and third harmonics should be off, only the first scale LEDs (2-2) and (2-3) may be on.

These initial configuration can be changed.

Press the button (5-2) to change listening of the 2nd harmonics (5-1) to listening to the 3rd harmonics (5-3) and back.

Press the button (5-5) to change listening through the built-in speaker (5-4) to listening through headphones (5-6) and back.

Press the button (5-8) to change circle-wise the operating mode from pulse (5-7) to continuous (CW) (5-9) with listening to the signal from the output of the AM demodulator (5-18) and back.

Press power control button (5-21) to set the initial probing signal power, different from the maximum one, the corresponding LED on the scale (2-1) indicating power level.

**6.6. (Modification //24 and //36m)** Enable probing signal transmitter by pressing the button (5-13). Thus, if the initial conditions are not changed, then pulse mode of the transmitter (5-7) is enabled with automatic power control. On the antenna unit, the operator can analyze probing signal power (2-1), and the response of second (2-2) and third (2-3) harmonics. Probing signal power varies according to the signal level at the receiver output of the second harmonics. In this mode, sound information (clicks) on the response of second (5-1) harmonics signal is transmitted to the built-in speaker (5-4) or headphones (5-6).

Press the button (5-2) to automatically adjust output power of the probing signal depending on the signal level at the receiver output of the third harmonics (5-3).

The volume level can be adjusted using the buttons (5-16) or (5-19).

The operator can change power of probing signal transmitter manually using the buttons (5-20) and (5-21).

When pressing the button (5-8), the detector switches to continuous operation mode (CW), the indicator (5-9) is activated with listening to the signal from the output of the AM demodulator (5-18).

With further pressing the button (5-8), the detector goes back to pulse mode.

Next time the button (5-13) is pressed, probing signal transmitter is switched off. In this state, there is an automatic analysis of the level of noise in the receiver channel of response of 2nd harmonics and the corresponding selection of probing signal frequency according to the criterion of minimum noise at further activation (button (5-13)).

#### **6.7. (Antenna Module //08)**

Enable the detector using power switch slide (5-11) located on the remote control (hereinafter, the first number refers to the figure number, the second one to the position in the figure). At the same time there will be 4 indicators on the remote control (5-1), (5-4), (5-7) and (5-15), indicating that the detector has been powered on. These indicators show that when

pressing the button (5-13) that enables probing signal transmitter, the detector will switch to pulse mode (5-7) with listening to the characteristic response (5-15) of the second harmonics (5-1) through the built-in speaker (5-4)

These initial configuration can be changed.

Press the button (5-2) to change the listening of 2nd harmonics (5-1) to listening to the 3rd harmonics (5-3) and back.

Press the button (5-5) to change listening through the built-in speaker to listening (5-4) through headphones (5-6) and back.

Press the button (5-8) to change circle-wise the operating mode from pulse (5-7) (5-15) to continuous (5-9) with listening to the signal from the output of the AM demodulator (5-18), followed by a continuous mode (5-9) with listening to signal from the output of FM demodulator (5-17) and then back to the pulse mode (5-7) (5-15).

#### **6.8. (Antenna Module //08)**

Enable probing signal transmitter by pressing the button (5-13). Thus, if the initial conditions are not changed, then pulse mode of the transmitter (5-7) is enabled with LED indication on the indicators (2). On the scale (2-1), the operator can analyze probing signal power, on the scale (2-2) the response of second harmonics and on the scale (2-3) the response of third harmonics. The operator can change power of probing signal transmitter using the buttons (5-20) and (5-21). In this mode, sound information (clicks) on the response of second (5-1) or third (5-3) harmonics signal is transmitted to the built-in speaker (5-4) or headphones (5-6). The volume level can be adjusted using the buttons (5-16) or (5-19).

When pressing the button (5-8), the detector switches to continuous operation mode (CW), the indicator (5-9) is activated with listening to the signal from the output of the AM demodulator (5-18). On the scale (2-1), the operator can analyze probing signal power, on the scale (2-2) the response of second harmonics and on the scale (2-3) the response of third harmonics.

With further pressing the button (5-8), the detector remains in continuous mode, indicator (5-9), but listening to the signal from the output of the AM demodulator is activated. On the scale (2-1), the operator can analyze probing signal power, on the scale (2-2) the response of second harmonics and on the scale (2-3) the response of third harmonics.

With further pressing the button (5-8), the detector switches to pulse mode.

Next time the button (5-13) is pressed, probing signal transmitter is switched off. In this state, there is an automatic analysis of the level of noise in the receiver channel of response of 2nd harmonics and the corresponding selection of probing signal frequency according to the criterion of minimum noise at further activation (button (5-13)).

**6.9.** Usually when working in areas with large number of electronic devices, it is recommended to operate at low power of the probing signal. Optimal level of the probing signal is set experimentally.

**6.10.** Simultaneous flashing of all LEDs on the remote control (or color change from green to red on the display (3-10) indicates discharged battery. Power off the detector, unscrew the cover at the end of the handle, remove the battery, place in into the container and charge it using charger.

**6.11.** To listen to the signal response through headphones, insert the connector of headphones into the socket (4-7) in the remote control

#### **Attention:**

1. When operating the device, constantly monitor rechargeable batteries status following signal of indicators to charge them. Batteries should be stored charged.
2. Charging should be carried out using the charger from the delivery set only. The use of non-standard chargers is strictly prohibited.

## **7. Guidelines on Searching**

**7.1.** If possible, remove electronic devices from the premises under control. If impossible, the examination should be carried out at low output power.

**7.2.** Set maximum output power and one of the operation modes of the receiver.

**7.3.** Analysis of the levels of the received signal reflected by the second and third harmonics is performed by the number of LEDs on the corresponding indicator scale (values of linear scale or spectral density value of responses on the display), and the frequency of clicks in the speaker or headphones.

**7.4.** For a more precise localization of the sought object, reduce output power of the transmitter or receiver sensitivity by using the ATT button.

**7.5.** When artificial p-n junction is detected, as a rule, there is a steady excess of LEDs glow (values of linear scale or spectral density value of responses on the display) inducing reflected signal at the second harmonic. While tapping the alleged location of the p-n junction, the LEDs indications (values of linear scale or spectral density value of responses on the display) do not change.

**7.6.** When natural p-n junction is detected, as a rule, there is a steady excess of LEDs glow (values of linear scale or spectral density value of responses on the display) inducing reflected signal at the third harmonic. While intensive tapping the alleged location the LEDs indications (values of linear scale or spectral density value of responses on the display) change.

The proposed search technique does not cover all the peculiarities that may occur in the specific cases, and serves as a guideline.

# PASSPORT

## 1. General Instructions.

- 1.1. Before use, read the operation manual for the LORNET-STAR multi-purpose detector of semiconductor components.
- 1.2. The Passport is included into the delivery set and should be kept together with the device.
- 1.3. In the case of repair or its transfer to any other place while in operation the Passport should be transferred with the product.
- 1.4. Marks in the Passport should be made in time.
- 1.5. All entries in the Passport should be made in ink clearly and accurately. Erasures, blots and unauthorized corrections are prohibited.
- 1.6. It is prohibited to make any notes in the fields and the cover of the Passport.

## 2. In Box

**2.1.** Depending on the number and type of required replaceable antenna modules (RAM), the detector can have 17 choices of the delivery set, presented in the following Table:

	Delivery Set	Note
1	Lornet Star //08	One RAM of 800MHz
2	Lornet Star //08c	One RAM of 800MHz with spectrum analyzer
3	Lornet Star //24	One RAM of 2400 MHz
4	Lornet Star //24c	One RAM of 2400 MHz with spectrum analyzer
5	Lornet Star //36m	One RAM of 3600 MHz
6	Lornet Star //08//24	Two RAMs of 800 MHz and 2400 MHz
7	Lornet Star //08//24c	Two RAMs of 800 MHz and 2400 MHz with spectrum analyzer
8	Lornet Star //08//36m	Two RAMs of 800 MHz and 3600 MHz
9	Lornet Star //08c//24	Two RAMs of 2400 MHz and 800 MHz with spectrum analyzer
10	Lornet Star 08c//24c	Two RAMs of 800 MHz and 2400 MHz with spectrum analyzer
11	Lornet Star 08c//36m	Two RAMs of 3600 MHz and 800 MHz with spectrum analyzer
12	Lornet Star //24//36m	Two RAMs of 2400 MHz and 3600 MHz
13	Lornet Star //24c//36m	Two RAMs of 3600 MHz and 2400 MHz with spectrum analyzer
14	Lornet Star //08//24//36m	Three RAMs of 800, 2400 and 3600 MHz
15	Lornet Star //08//24c//36m	Three RAMs of 800, 2400 and 3600 MHz with spectrum analyzer
16	Lornet Star //08c//24//36m	Three RAMs of 2400, 3600 and 800 MHz with spectrum analyzer
17	Lornet Star //08c//24c//36m	Three RAMs of 800, 2400 MHz with spectrum analyzer and 3600 MHz

**2.2.** The detector consists of units, devices and accessories listed in the following table:

	Name	Pcs	Note
1	Replaceable Antenna Module (RAM)	from 1 to 3-x	in compliance with the delivery set p.3.1
2	Remote Control with built-in rechargeable battery container	1	
3	Removable Telescopic Rod	1	
4	Replaceable Li-ion rechargeable batteries (12 V)	2	
5	Container for battery charging	1	
6	Charger for rechargeable battery	1	
7	Headphones	1	
8	Specification and Operation Manual, Passport	1	
9	Package (bag-packing at maximum delivery set items)	1	

### **3. Warranty**

3.1. Duration of the guarantee for LORNET-STAR detector is 12 months from the date of transfer to the customer.

3.2. The term of service till discarding is 6 years.

3.3. In the event of failure of the product during warranty period, provided the customer observed the regulations of service, transport and storage, the manufacturer is to repair the product free of charge.

Warranty does not cover batteries.

### **4. Data on Claims**

In case of damage during transportation, claims are submitted in the prescribed manner to the organization responsible for transportation.

In case of incomplete delivery or damage of the LORNET-STAR ultra portable detector of semiconductor components, at no damage to the container, a formal note is compiled together with the manufacturer's representative.

In case of defect within the warranty period, the customer must send the LORNET-STAR detector to the manufacturer with a covering letter specifying the reason for complaint.

All claims, their summary and the measures taken are recorded in the following Table.

Claim	Cause, measures taken	Notes

