

«LORNET-24»

ULTRA-COMPACT
HANDHELD
NON-LINEAR JUNCTION
DETECTOR

USER MANUAL

CERTIFICATE

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USER MANUAL

1. Introduction

The non-linear junction detector “LORNET-24” (further NLJD) is used for search and location of electronic devices both in active and switch-off state.

The detector operation is based on the property of semiconductor components to generate a response at the 2d and 3d harmonics when radiated by an RF probing signal. Semiconductor components of artificial origin will have a higher level second harmonic while semiconductor components of natural origin (e.g. oxide films) will have a higher level third harmonic respectively. An NLJD analyzes the 2d and 3d harmonics response of the radiated objects, which enables a quick and reliable identification of electronic devices and natural oxide semiconductors.

The NLJD “LORNET-24” automatically finds the best receiving frequency channel free of noise and distortion providing flawless operation even in the complicated electromagnetic environment.

The frequency tuning algorithm implemented in “LORNET-24” automatically selects the RF probing signal frequency such that the noise level in 2d harmonic receiving channel is held minimal, while digital processing of a demodulated signal gives maximum sensitivity.

There are two types of radiated signals:

- continuous wave carrier (CW);
- pulse modulated carrier with a duty cycle 4% (pulse).

This enables to combine wide detection range and reliable identification of the de-vices found.

The output power automatic control mode significantly simplifies operator’s work. “LORNET-24” simultaneously displays the 2d and 3d harmonics levels at its LED panel. Besides, the 2d and 3d harmonics levels can be estimated in turn aurally by the click repetition rate reproduced through a built-in loudspeaker or wireless ear-phones.

Detector of the returned RF signal envelope enables tapping radio microphones and using the acoustic feedback mode which facilitates search work.

2. Specifications:

2.1. Radiated signal types:

- continuous wave carrier;
- pulse modulated carrier with a duty cycle 4%.

2.2. Carrier frequency step 0.2MHz within a tuning range of (2409.6 ... 2410.4)MHz.

Automatic frequency selection. Possibility of radiation at the carrier frequency with a minimum noise level in the 2d harmonic receiver path.

2.3. Maximum radiated power in the CW mode $\leq 0.5W$.

2.4. Peak radiated power in the pulse mode $\leq 10W$.

2.5. Manual or automatic control of the radiated power level.

Dynamic control range of 30dB down from the maximum output power value with 11 level gradations.

2.6. Receivers sensitivity better than -140dBW given a 10dB signal to noise ratio.

2.7. Receivers tuning frequencies equal to the transmitter double and triple frequencies.

2.8. Receiving path dynamic range $\geq 70\text{dB}$.

2.9. Time of continuous operation with a lithium-Ion battery at the maximum radiated power:

- ≥ 3 hours in the pulse mode;
- $\geq 1,5$ hours in the CW mode;
- unlimited operation time from 220V mains with a power adapter connected.

2.10. Equipped device weight $\leq 0.7\text{kg}$.

2.11. Operating conditions:

- ambient temperature $5\dots 40^\circ\text{C}$;
- pressure $\geq 450\text{mm}$ of mercury.

3. Delivery set, design and accessories

3.1. The device includes units and accessories stated in the Table below:

Description	Q-ty
Receiver-transmitter unit with control unit and built-in battery container	1
Changeable Li-Ion batteries	2
Container for battery charging	1
Charger for receiver-transmitter unit (CH1)	1
Wireless accessories including: receiving device, earphones and charger (CH2)	1
Technical Description & User manual, Certificate (in one piece)	1
Package	1

4. Appearance

The appearance of the device is shown in Fig. 1, where:

- 1- LED indicator;
- 2- transceiver antenna unit;
- 3- control panel with a power section and battery (fixed underneath).

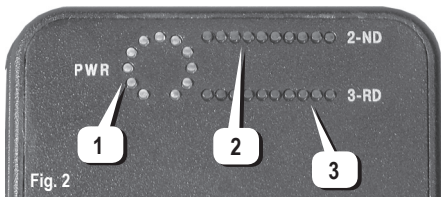


Fig. 1

Wireless earphones, chargers and additional batteries are not shown.

5. Purpose of the Detector Basic Units

5.1. The transceiver antenna unit with built-in LED indicators (shown in Fig. 2) is used for:



- Analysis of distortion and interference in the instrument receiving path, which is made each time the detector transmitter is switched on. Therefore, if an interfering signal appears during operation (in a complicated electromagnetic environment) it is necessary to turn the detector transmitter off and on from time to time thus selecting an optimal frequency automatically, which will provide the best sensitivity as well as detection range of semiconductor components.
- Generation of CW or pulsed RF signal.

- Reception and digital processing of the 2nd and the 3rd frequency harmonics. Simultaneous display of the 2nd and the 3rd harmonics levels gives the opportunity to distinguish with a high reliability between signals of artificial semiconductors integrated in electronic devices and natural corrosive ones which may appear at oxidized junction points of various metals.
- Demodulation of the 2nd and 3rd harmonics response, their amplification to the level required for tapping both by earphones and a built-in loudspeaker. The amplification is adjustable within a 20 dB range. The operator can listen to demodulated signals of the 2nd and 3rd harmonics in turn.
- Indication of the probing signal levels (1) as well as of the 2nd (2) and 3rd (3) harmonics levels (Fig. 2).

5.2 Hinge joint of the transceiver antenna unit with a knob is designed to transform the unit into transportation position. (see Fig.3). Besides, it helps the operator to fix the antenna in a position convenient for search.

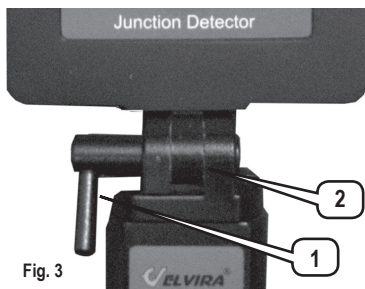


Fig. 3

Fig. 3: 1- Fixing device; 2- Hinge joint.

5.3. The control panel is used to control operation of the detector. It consists of the case combined with a battery and fixed on the arm. The control board, buttons for operation modes control and display LEDs are placed in the package. The control buttons are divided into two groups by their function: «AUDIO» placed in the upper half of the panel and «POWER RF» in the lower half. The control panel is shown in Fig.4

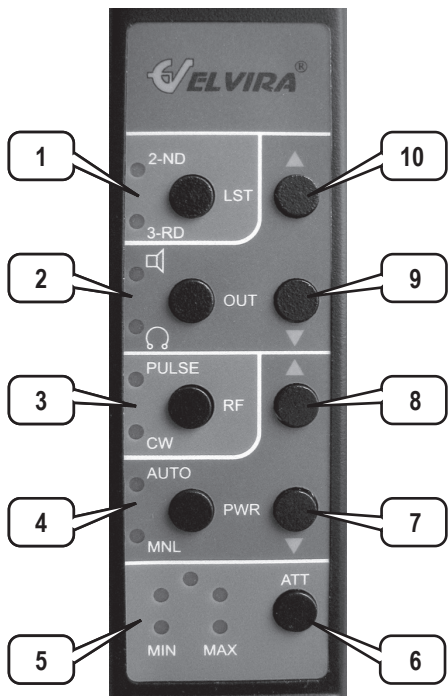


Fig. 4

The following buttons refer to the «AUDIO» group:

- 1- LEDs and LSTN button for switching of acoustic indication to the output of the 2nd or 3rd harmonics.
- 2- LEDs and OUT button for switching acoustic output to earphones or a built-in loud-speaker.
- 3- LEDs and RF button for switching between types of the radiated signal (CW – continuous, PULSE – pulsed).

The following buttons refer to the «POWER RF» group:

- 4- LEDs and PWR button for switching on/off the probing signal transmitter. On the switch on the automatic mode of output power control (AUTO) is set by default. To switch over to the manual mode of output power control (MNL) press one of the LEVEL buttons when a transmitter is turned on. To return to the automatic mode turn the transmitter off and then turn it on.
- 5,6- LED and a button for receiving unit attenuator control.
- 7,8- LEVEL buttons for control of radiated signal power in MNL and AUTO modes (↑ – high, ↓ – low). It is possible to set the maximum power level by pressing LEVEL button (↑ – high, ↓ – low) in AUTO mode before the probing signal transmitter is turned on.

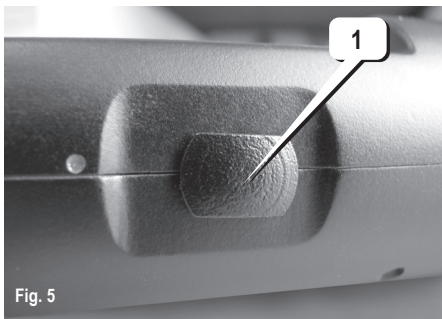


Fig. 5

9,10- Volume buttons for volume control (↑ – high, ↓ – low). Functions of control panel indicators: continuous light of any indicator corresponds to “on” position, absence of light – to “off” position. Simultaneous flickering of all indicators on the panel shows that the battery is discharged and needs to be replaced.

5.4. On the side surface of the control panel (see 1 in Fig. 5) a slide-type power switch is placed. A slide position corresponding to «ON» is marked by a contrast point. Each time before operating the device it is recommended to fully charge the battery.

5.5. Battery charging is to be made with a power adapter and a battery charger supplied with the instrument only. Using other chargers is not allowed.

For charging it is necessary to connect a low-voltage connector of the power adapter to the socket placed underneath the front side of the control panel. (see 1 in Fig.6).

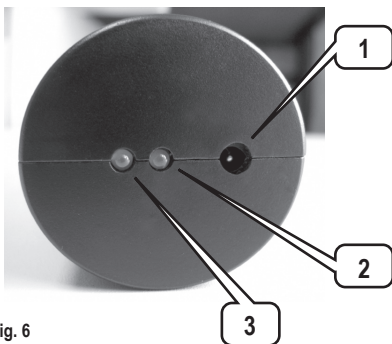


Fig. 6

A red LED (see 2 in Fig.6) is lighting while charging (see 2 in Fig.6). When a battery is completely charged, the red LED goes out, and a green LED lights up (see 3 in Fig.6). Charging time of a fully discharged battery does not exceed 5 hours (typical value is 3.5 h).

In case of a failure (charging is not complete within five hours) a charger switches off automatically, both LEDs will go out.

5.6. Wireless telephones consist of a receiving device and earphones. Appearance of the receiving device and position of control units are shown in Fig.7

Device operation order:

- Using a power adapter supplied with the instrument make sure with a help of the charge indicator that the battery is completely charged.
Using of other power adapters is forbidden.
- Connect head phones to the corresponding socket of the receiving device.
- Turn the receiving device on by a slide-type switch (control by the turn-on indicator).
- Using volume control set a comfortable volume level.
- If the receiving device is turned on when the detector is off, then there is only a noise signal in the head phones at higher volume. After turning on acoustic indicator signals corresponding to the operating mode of the detector appear in the earphones.

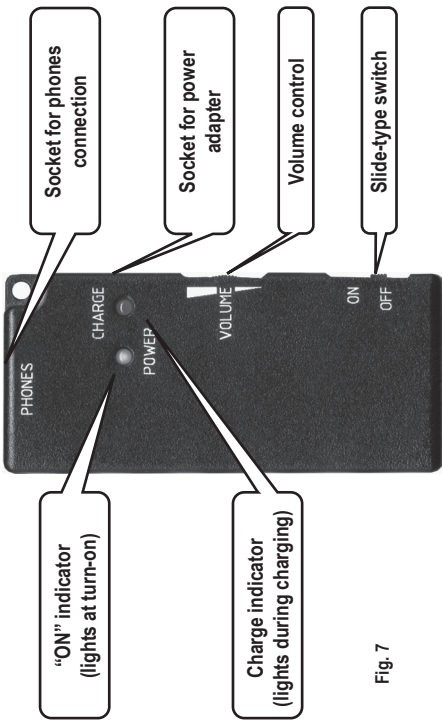


Fig. 7

6. Safety Measures

6.1. By requirements of electric safety the detector corresponds to protection class 1 (according to the Russian standard).

6.2. The instrument is to be operated only by persons who have been duly instructed for safety measures while working with electric and measuring devices with open RF energy radiators.

7. Operation Order.

7.1. Remove the detector from the package, and the battery from the protective case, connect the battery to the detector. After device transportation at negative temperatures it is necessary to keep the device in the switch-off state at room temperature at least 30 minutes.

7.2. To start operation set the battery and turn «LORNET-24» on by the power switch placed on the control panel (Fig.5). The 2nd and 3rd indicators on the control panel will light up, indicating that the

detector has been powered on.

One yellow LED should be lighting on the antenna unit (a circle scale of the probing signal power indicator). Its initial position corresponds to the maximum power of the probing signal. The probing signal transmitter is off (it is turned on after pressing PWR button only).

The 2nd and 3rd harmonics indicators should not light (flashing of the first LEDs of the 2nd and 3rd scales is permitted).

Turn the probing signal transmitter on pressing PWR button. This will switch on the transmitter pulse mode and the automatic mode of signal power control. The radiated signal power will change depending on a signal level at the 2nd harmonic receiver in-put. In the given mode sound information of the 2nd harmonic response is applied to the loudspeaker or head phones. When switching on mode 3-RD by pressing LSTN on the control unit, the output power of the transmitter is adjusted automatically depending on a signal level at the 3rd harmonic receiver input. Sound information of the 3rd harmonic response is applied to the loudspeaker or head phones.

To switch over to the manual mode of the probing signal power control (MNL indicator lights up) press one of **LEVEL** buttons after the probing signal transmitter has been turned on. Turn the probing signal transmitter off and then turn it on for a reverse switch over.

If it is necessary to tap the third harmonic response turn on mode 3-RD using LSTN button on the control panel.

During operation in premises with a lot of electronic devices, you will normally have to decrease the level of the probing signal by 2-4 points counterclockwise from the initial position.

The optimum level of the probing signal is reached experimentally.

7.3. Simultaneous flashing of all indicators on the control panel indicates that the battery is discharged and needs to be replaced urgently. In this case the power should be turned off and the battery - replaced.

7.4. If a response signal is to be tapped by phones, switch over acoustic indication to the head phones mode pressing the corresponding button on the control panel (see 2 in Fig.4) and turning wireless phones on (according to their User Manual).

Attention:

- 1) Do not direct the antenna towards the operator and people nearby.
- 2) While operating the device constantly monitor batteries state replacing them in-time (by the indicators signal). The batteries must be kept fully charged.
- 3) Charging should be done with a charger supplied with the instrument only.
- 4) Self – assembling or - disassembling and use of undue chargers is forbidden.
- 5) When the operation is finished, or during long operation breaks, it is recommended to remove the battery from the detector.
- 6) To avoid short-circuiting of leads (see 1 in Fig.6) batteries are to be kept in an iso-lated case when not used.
- 7) If necessary under complicated interference conditions as well as for more accurate localization and protection of radio-receiving devices from overloading, attenuators can be used by switching them on consequently using “ATT” button. The insertion loss of each attenuator is 2 dB. Number of attenuators - 5.

8. Search Recommendation

8.1. If possible remove electronic devices from the room examined. If it is impossible, examination should be done at a decreased radiated power.

8.2. Set maximum radiated power level and one of the operation modes of the receiver.

8.3. In the CW mode it is recommended to use manual operation mode "Man" only.

8.4. Place the antenna unit parallel to the surface examined at the distance not exceeding 10cm.

8.5. Slowly moving the antenna unit parallel to the surface examined and changing orientation of antennas, analyze changes in the signal received at the 2nd and 3rd harmonics visually by the indicator (aurally the click repetition rate should be maximum).

8.6. Analysis of the received 2nd and 3rd harmonics levels is made by number of LEDs lighting on the corresponding indicator scale.

8.7. Remove the antenna unit from the surface examined or decrease output power and repeat measurements stated in 7.4. of the present manual. For a more accurate location as well as for protection of receiving devices from overload it is possible to de-crease the signal level using attenuators.

8.8. When an artificial p-n transition is found you will normally see a stable lighting of the 2nd harmonic indicator LEDs. While rapping at the suspected place of a p-n transi-tion, readings of LEDs do not change.

8.9. When a natural p-n transition is found, you will observe a stable lighting of the 3rd harmonic indicator LEDs. While rapping at the examined surface intensively, readings of indicators by the 3rd harmonic will change, as a rule.

The search technique offered does not reflect all nuances which may appear in each exact case, and represents a recommendation only.

CERTIFICATE

1. General

1.1. Before operation thoroughly study User Manual for «LORNET-24».

1.2. The Certificate is included in the delivery set and should be always kept with the instrument.

1.3. If the device is sent for repair or to a different place during operation the Certificate is to be shipped with the instrument.

1.4. Marks in the Certificate should be done in-time.

1.5. All records in the Certificate should be made by ink only, distinctly and carefully. All unauthorized erasures, blots and corrections are not permissible.

1.6. It is forbidden to make any notes or records in the fields and on the cover of the Certificate.

2. Delivery set

Description	Q-ty
Receiver-transmitter unit with control unit and built-in battery container	1
Changeable Li-Ion batteries	2
Container for battery charging	1
Charger for receiver-transmitter unit (CH1)	1
Wireless accessories including: receiving device, earphones and charger (CH2)	1
Technical Description & User manual, Certificate (in one piece)	1
Package	1

3. Warranty

3.1. Warranty period for «LORNET-24» is 18 months upon supply to the customer.

3.2. Life time is 6 years.

3.3. If the device fails during warranty period provided the customer has followed all the operation, transportation and storage rules, the manufacturer is to make the repair free of charge or replace the device.

3.4. Warranty does not cover power elements.

4. Importer:

TS-Market Ltd.

Building 10-1 Sosnovaya Alleya, Zelenograd,
Moscow, the Russian Federation, 124489.

Tel.: +7(495) 638-8800

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5. Claims Data

In case of a package damage during transportation claims are applied to the transportation organization complying to the valid regulations.

If the delivery set is not complete or the NLJD is damaged, provided the package is not damaged, an Act is made together with a representative of the manufacturer.

If a defect appears during warranty period, the customer is to send the NLJD to manufacturer with an accompanying letter, stating the reason of the claim.

All claims with a brief description of encountered problems and measures taken are recorded in Table 1.

Claim content	Reason, measures taken	Notes

