

HANDHELD NON-LINEAR JUNCTION DETECTOR

«*L O R N E T*»

USER MANUAL
CERTIFICATE



USER MANUAL

1. Introduction

The non-linear junction detector “LORNET” (further NLJD) is used for search and location of electronic devices both in active and switch-off state. NLJD operation is based on the property of semiconductor components to generate a response at the 2nd and 3rd harmonics when radiated by an UHF 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 2nd and 3rd harmonics response of the radiated objects, which enables a quick and reliable identification of electronic devices and natural oxide semiconductors.

NLJD 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 NLJD automatically selects the probing signal frequency such that the noise level in 2nd 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 of 44 (pulse).

This enables to combine wide detection range and reliable identification of the devices found.

Output power automatic control mode significantly simplifies operator's work.

NLJD simultaneously displays the 2nd and 3rd harmonics levels at its LED panel. Besides, the 2nd and 3rd harmonics levels can be estimated in turn aurally by click repetition rate reproduced through a built-in loudspeaker or earphones connected to a pocket-size receiver.

A detector of the returned UHF signal envelope enables at to detect radio devices with acoustic converter aurally at continuous frequency carrier radiation.

2. Specifications

2.1. Radiated signal types:

- continuous wave carrier;
- pulse modulated carrier with a duty cycle of 44.

2.2. Carrier frequency step 0.2 MHz within a tuning range of (890.0 ... 891.0) MHz.

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

2.3. Maximum radiated power in the CW mode ≥ 0.3 W.

2.4. Peak radiated power in the pulse mode ≥ 10 W.

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

Dynamic control range of 20 dB down from the maximum output power value with 11 level gradations.

2.6. Receivers sensitivity better than -110 dBm (one LED lights up at the indicator scale).

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

2.8. Receiving path dynamic range – 24 dB (10 dB – LED indicator range, 14 dB – attenuator range at receivers input).

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

- 5 hours in the pulse mode;
- 2 hours in the CW mode.

2.10. Equipped device weight ≤ 1 kg.

2.11. Operating conditions:

- ambient temperature - 5...40° C;
- pressure - 450 ... 800 mm of mercury.

3. Delivery Set and Accessories

3.1. The device includes units and accessories stated in the Table 1 below:

Table 1

No.	Description	Q-ty
1.	A duplex antenna unit based on a telescopic arm with a control panel and a built-in container for a battery	1
2.	Changeable Li-Ion batteries	2
3.	A container for battery charging	1
4.	A charger for a duplex unit battery	1
5.	A receiver with an adapter to charge its battery and earphones	1
6.	User Manual, Certificate	1
7.	A package bag to keep and transport the device	1

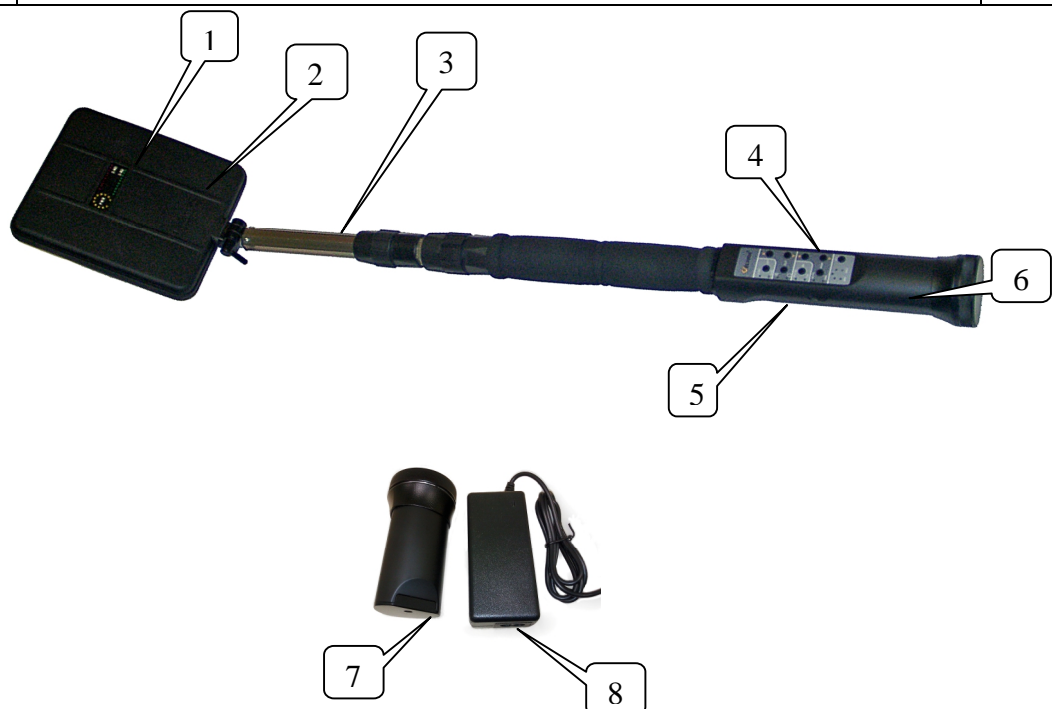


Fig. 1

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

- 1- LED indicators;
- 2- a duplex antenna unit;
- 3- a telescopic arm;
- 4- a control panel;
- 5- a power switch;
- 6- a twisted cover of the battery section;
- 7- a container for battery charging;
- 8- a charger for a duplex unit battery.



Fig. 2

Fig. 2 shows a receiver, an adapter for charging its battery and earphones.

Note: A type and appearance of the charging adapter and earphones can be different from the shown ones.

4. Purpose of NLJD Basic Units

4.1. The duplex antenna unit with LED indicators is used for:

- Analysis of distortion and interference in the instrument receiving path, which is made each time the transmitter is switched on. Therefore, if an interfering signal appears during operation (in a complicated electromagnetic environment) it is necessary to turn NLJD transmitter off and on from time to time thus selecting an optimal frequency automatically, providing the best sensitivity and detection range of semiconductor components.
- Generation UHF signal, receipt 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 appear at oxidation of connecting points of various metals.
- Demodulation of the 2nd and 3rd harmonics response, their amplification to the level required for tapping both to earphones and a built-in loudspeaker. An operator can control sound volume. An operator can listen to demodulated signals of the 2nd harmonic from lower or upper receiver ranges in turn.
- Indication of the receiver power level and levels of the 2nd and 3rd harmonics of the signals received (Fig. 3).

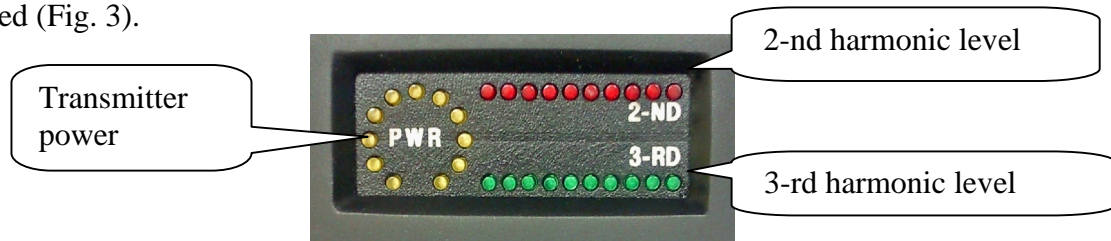


Fig. 3 LED Indicators

4.2. Flexible joint of the duplex antenna unit with a handle is designed to transform the unit into transportation position (Fig. 4). Besides, it helps the operator to fix the antenna in the position convenient for search work.



Fig.4 Flexible Joint

4.3. The control panel is used to control operation of NLJD. It consists of a housing used as an arm into which a battery is integrated (changeable). A control board, buttons for operation modes control and display LEDs are placed in the housing. 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. 5.

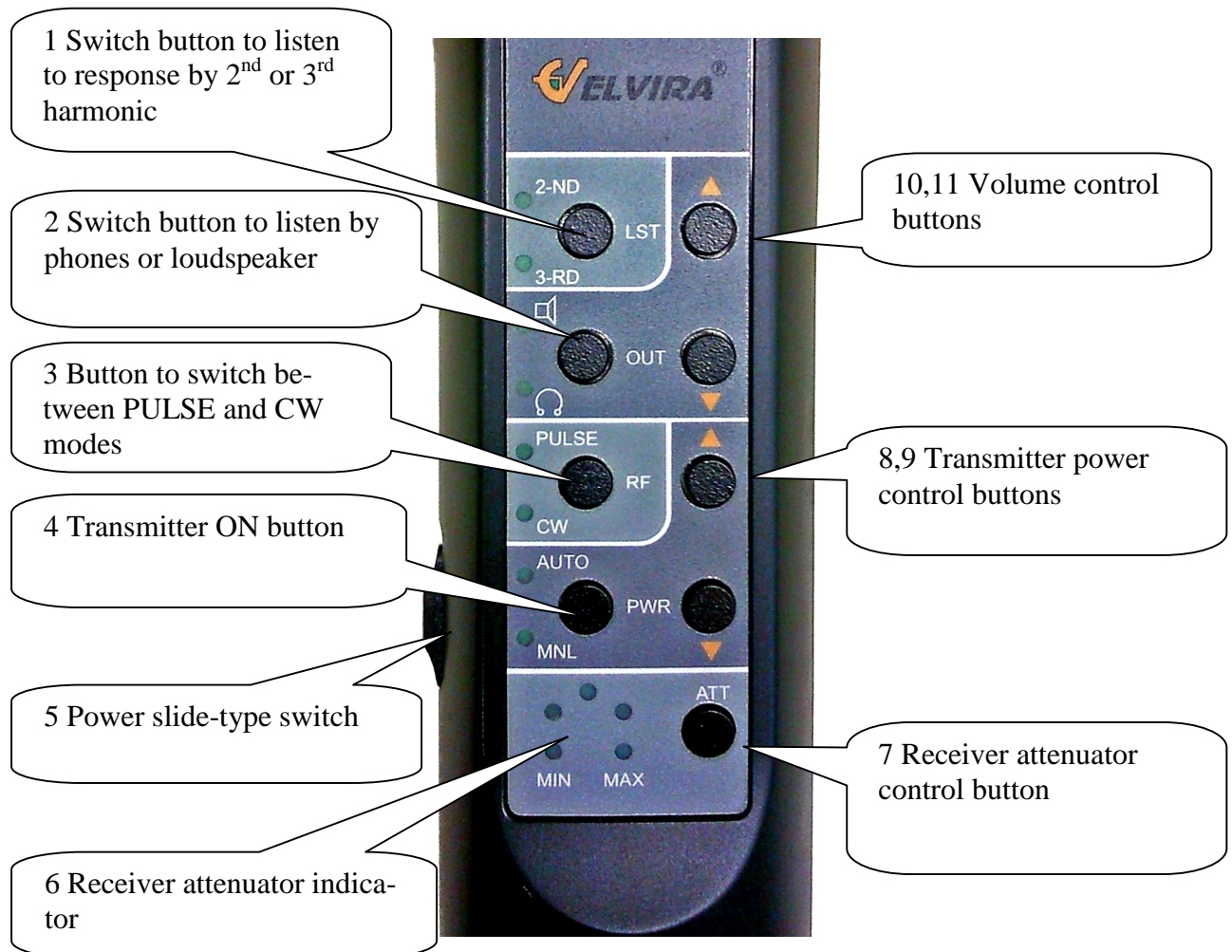


Fig. 5 Control Panel

4.4. Functions of control panel indicators: Continuous lighting of any indicator corresponds to «ON» position, absence of lighting – to «OFF» position. Simultaneous flickering of all control panel indicators shows a built-in battery is discharged and needs to be charged.

4.5. Battery charging of the duplex antenna unit is to be made with the charger included to the delivery set only. Using other chargers is not allowed. For charging it is necessary to unscrew a cover at the edge of NLJD's arm, remove a battery and place it into the container for charging (Fig.1). Connect the container to the charger.

While a charger is connecting to the power mains a red LED is lightning at its housing. When a battery is completely charged, a red LED goes out, and a green LED lights up. Charging time of a fully discharged battery is about 6 hours.

4.6. Control elements of the receiver are shown in Fig. 6.

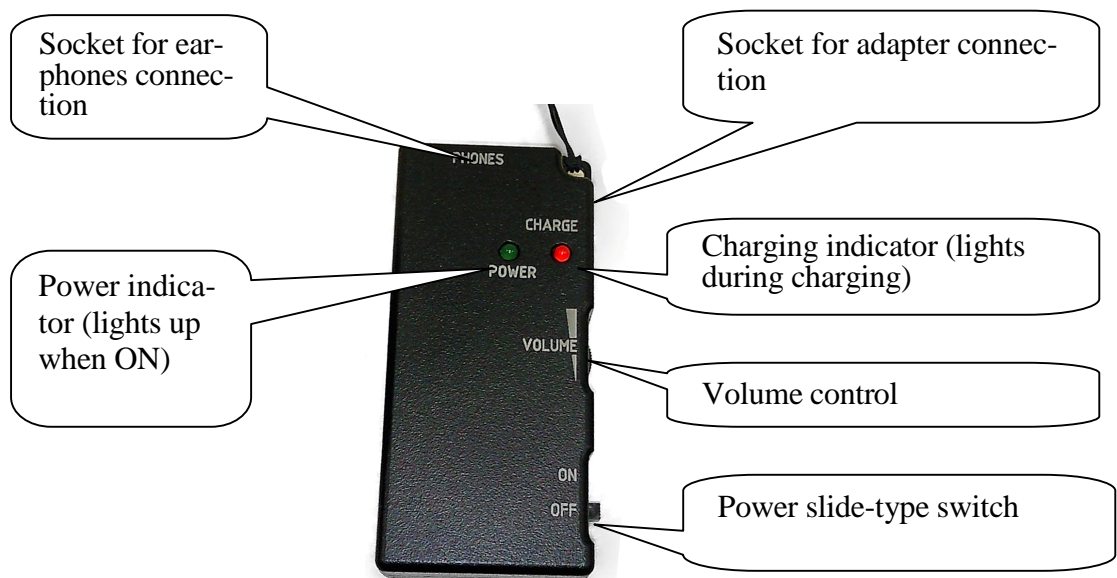


Fig. 6 Receiver

4.7. Receiver Operation Procedure

- Charge a built-in battery completely using the adapter included to the delivery set, here CHARGE indicator goes out.
- Connect earphones to the corresponding socket.
- Turn the receiver on by a slide-type switch, here POWER LED lights up.
- Set a comfortable volume level using volume control.
- If the receiver is turned on when NLJD is off, then there is a noise signal only in the earphones at higher volume. After turning on acoustic indicator signals corresponding to the operating mode of NLJD appear in the earphones.

5. Safety Measures

5.1. NLJD 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.

6. Operation Order

6.1. Remove NLJD from the package. If necessary charge the battery. After transportation at negative temperatures it is necessary to keep NLJD in the switch-off state at room temperature at least for 30 minutes. Pull out a telescopic arm as far as it will go.

6.2. Turn NLJD on by the type-slide switch placed on the arm. The 2nd and 3rd indicators on the control panel will light up, indicating that NLJD 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 in the automatic mode. Here 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). Maximum power level can be changed using the power control buttons of the transmitter (Fig. 5).

6.3. 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 output. In the given mode acoustic information (clicks) of the 2nd harmonic response is applied to the loudspeaker or earphones.

When switching on 3-RD mode by pressing LST button on the control unit, the output power of the transmitter is adjusted automatically depending on a signal level at the 3rd harmonic receiver output. Acoustic information of the 3rd harmonic response is applied to the loudspeaker or earphones.

To switch over to the manual mode of the probing signal power control (MNL indicator lights up) press one of the power control buttons when the probing signal transmitter has been turned on.

Turn the probing signal transmitter off and then turn it on using PWR button for a reverse switch over.

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

During operation in premises with a lot of electronic devices it is normally recommended to work at decreased power of the probing signal.

The optimum level of the probing signal is reached experimentally.

Press RF button to switch over to the CW mode (CW LED lights) from the pulse mode (PULSE LED lights) and vice versa.

6.4. Simultaneous flashing of all indicators on the control panel indicates that the battery is discharged. In this case turn off the power, unscrew a cover at the edge of the arm, remove a battery, place it into the container and charge using the charger.

6.5. If a response signal is to be tapped by earphones, press the corresponding button on the control panel and turn the receiver on.

Attention:

1) While operating NLJD constantly monitor battery state charging it in-time (by the indicators signal). NLJD must be kept with a battery charged.

2) Charging should be done with a charger included into the delivery set only, using of unauthorized chargers are strongly prohibited.

7. Search Recommendation

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

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

7.3. Analysis of the received 2nd and 3rd harmonics levels is made both by number of LEDs lightning on the corresponding indicator scale and by clicks repetition rate in the loudspeaker or earphones.

7.4. For more accurate location of the object under searching decrease the transmitter output power or receivers sensitivity using ATT button.

7.5. When an artificial p-n transition is found one shall normally see stable lightning of the 2nd harmonic indicator LEDs. While rapping at the suspected place of a p-n transition, readings of LEDs do not change.

7.6. When a natural p-n transition is found, one shall observe stable lightning 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 study User Manual for «LORNET» thoroughly.
- 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

Table 1

No.	Description	Q-ty
1.	A duplex antenna unit based on a telescopic arm with a control panel and a built-in container for a battery	1
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6.	User Manual, Certificate	1
7.	A package bag to keep and transport the device	1

3. Warranty

- 3.1.** Warranty period for «LORNET» 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. Acceptance Certificate

A C C E P T A N C E C E R T I F I C A T E	
Handheld Non-linear Junction <u>Detector «LORNET»</u> <small>name</small>	No <u> </u> <small>serial number</small>
is manufactured and accepted according to obligatory requirements of state standards, current technical documentation and is fit for service.	
stamp	<u> </u> <small>date, month, year</small>

5. Package Certificate

P A C K A G E C E R T I F I C A T E	
Non-linear Junction <u>Detector «LORNET»</u> <small>name</small>	No <u> </u> <small>serial number</small>
Packaged by: <u>«ELVIRA» Production JSC</u> according to the requirements stated in the given technical documentation.	
<u> </u> <small>date, month, year</small>	

