NON-LINEAR JUNCTION DETECTOR

LORNET-STAR

USER MANUAL

2021

1. Introduction

A multifunction non-linear junction detector «LORNET-STAR(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 2^{nd} and 3^{rd} 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.

NLJD analyzes the 2^{nd} and 3^{rd} 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 digital processing of a demodulated signal gives maximum sensitivity.

From one to three transmitter heads of five available can be chosen for NLJD:

- a transmitter head (option //08) for 800 MHz enables to operate in damping medium of high humidity,
- a transmitter head (option //08s) for 800 MHz with a built-in spectrum analyzer in addition to the range features enables to increase detection of artificial and natural semiconductors significantly,
- a transmitter head (option //24) for 2400 MHz enables high-efficiency detection of small-size (less than 1 cm^2) semiconductors,
- a transmitter head (option //24s) for 2400 MHz with a built-in spectrum analyzer in addition to the range features enables to increase detection of artificial and natural semiconductors significantly,
- a transmitter head (option //36m) for 3600 MHz enables to make remote detection with spatial target selection.

NLJD is equipped with a telescopic arm easily making the device from an inspection one into a search one and vice versa.

The digital processing of the demodulated signal applied enables to get high sensitivity. There are two types of radiated signals:

- continuous wave carrier (CW);
- pulse modulated carrier (pulse).

This enables to combine wide detection range and reliable identification of the devices found. NLJD simultaneously displays the 2^{nd} and 3^{rd} harmonics levels at its LED panel. Besides, the 2^{nd} and 3^{rd} harmonics levels can be estimated in turn aurally by click repetition rate reproduced through a built-in loudspeaker or connected to a pocket-size receiver.

When option //24s (or //08s) is used it is possible to analyze signal spectrum of the 2^{nd} and 3^{rd} harmonics visually. In addition, option //24s (or //08s) enables to evaluate reflecting level of the 1^{st} harmonic increasing the possibility to detect shielding elements.

2. Technical Characteristics

The specification depends on a transmitter head type and is given in the Table below:

	NLJD with a replaceable transmitter head	//08	//08s	//24	//24s	//36m
2.1	Probing signal frequency within	800 MHz	800 MHz	2400 MHz	2400 MHz	3600 MHz
2.2	Automatic selection of the carrier frequency by minimum noise in the 2^{nd} harmonic receiver path with pitch of	200 kHz	200 kHz	2 MHz	2 MHz	13 MHz
2.3	Value of maximum power of a probing signal (peak/average)					

	Pulse mode (Pulse)	10 W/230 mW				18 W/112 mW
	Continuous mode	/300 mW				-
	Pulse mode with small duty cycle (CW)	-	-	-	-	6 W/375 mW
2.4	Manual adjusting range of probing signal power	20 dB				
2.5	Receivers tuning frequencies equal to the transmitter double and triple frequencies					
2.6	Receiver sensitivity better than	minus 110 dBm				
2.7	Receiving path dynamic range	24 dB				
2.8	Operation time with a Lithium-Ion battery at the maximum radiated power in pulse/CW mode	3 h/1,5 h				2,5 h/1,5 h
2.9	Size (inspection version)	40x20x7 cm	40x20x7 cm	40x12x7 cm	40x20x7 cm	40x20x20 cm
2.10	Size of a telescopic arm	54x4x4 cm (86x4x4 cm)				
2.11	Weight (inspection version)	1,0 kg		0,8 kg	1,0 kg	
2.12	Weight of a telescopic arm	200 g				
2.13	Size of a transportation bag	45x30x35 cm				
2.14	Weight of the whole set in a transportation bag (maximum)	4 kg (8 kg)				
2.15	Operating temperature range	+5 … +40°C				

3. Delivery Set And Accessories

3.1. Delivery set includes units and accessories stated in the Table below.

	Name	Quantity	Notes
1	A replaceable transmitter head (RTH)	1 - 3	According to options (see cl.3.2)
2	A control panel with a built-in container for a battery	1	
3	A removable telescopic arm	1	
4	Changeable Li-Ion batteries (12 V)	2	
5	A container for battery charging	1	
6	A battery charger	1	
7	Headphones	1	
8	User Manual and Certificate	1	
9	A package (a transportation bag for maximum delivery set)	1	

3.2. 17 options are available depending on the quantity and type of the replaceable transmitter heads (RTH) required. They are given in the Table.

	Delivery set name	Notes
1	Lornet Star //08	One RTH for 800 MHz
2	Lornet Star //08s	One RTH for 800 MHz with a spectrum analyzer
3	Lornet Star //24	One RTH for 2400 MHz
4	Lornet Star //24s	One RTH for 2400 MHz with a spectrum analyzer
5	Lorent Star //36m	One RTH for 3600 MHz
6	Lornet Star //08//24	Two RTH for 800 and 2400 Mhz
7	Lornet Star //08//24s	Two RTH for 800 and for 2400 MHz with a spectrum analyzer
8	Lornet Star //08//36m	Two RTH for 800 and 3600 MHz
9	Lornet Star //08s//24	Two RTH for 2400 and for 800 MHz with a spectrum analyzer

10	Lornet Star //08s//24s	Two RTH for 800 and 2400 MHz with a spectrum analyzer
11	Lornet Star //08s//36m	Two RTH for 3600 and for 800 MHz with a spectrum analyzer
12	Lornet Star //24//36m	Two RTH for 2400 and 3600 MHz
13	Lornet Star //24s//36m	Two RTH for 3600 and 2400 MHz with a spectrum analyzer
14	Lornet Star //08//24//36m	Three RTH for 800, 2400 and 3600 MHzМГц
15	Lornet Star //08//24s//36m	Three RTH for 800, 3600 and 2400 MHz with a spectrum analyzer
16	Lornet Star //08s//24//36m	Three RTH for 2400, 3600 and 800 MHz with a spectrum analyzer
17	Lornet Star //08s//24s//36m	Three RTH for 800, 2400 with a spectrum analyzer and 3600 MHz

3.3. Appearance of NLJD items is shown in Fig. 1

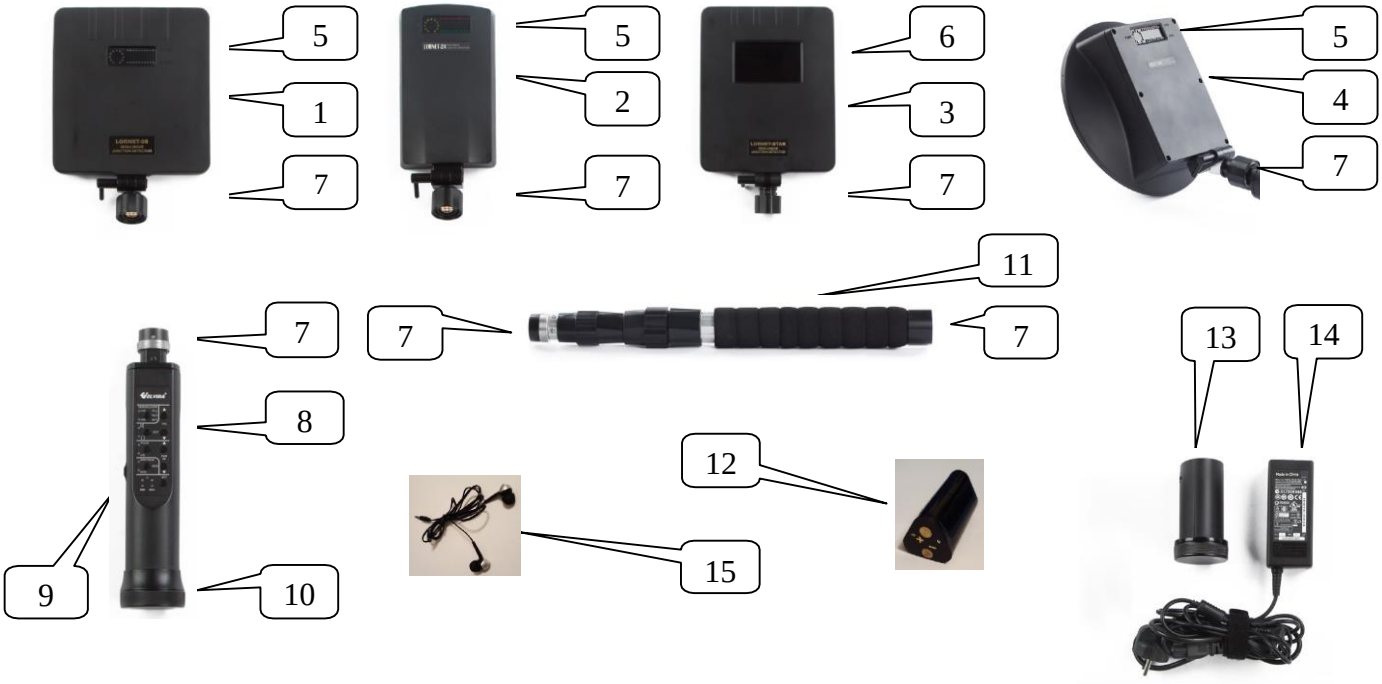

Fig. 1, where:

1- Replaceable transmitter head //08 for 800 MHz
2- Replaceable transmitter head //24 for 2400 MHz
3- Replaceable transmitter head //08s for 800 MHz (or //24s for 2400 MHz) with a spectrum analyzer
4- Replaceable transmitter head //36m for 3600 MHz
5- LEDs
6- Graphic LCD
7- Plug connection
8- Control panel
9- Power switch
10- Twisted cover of a battery section
11- Telescopic arm
12- Li-ion battery (12V)
13- Container for battery charging
14- Battery charger
15- Headphones

4. Purpose of NLJD Basic Units

4.1. Any replaceable transmitter head 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 rangesin turn.

4.2. A replaceable transmitter head with LEDs (options //08, //24, //36m) displays power levelof the probing signal and levels of the 2nd and 3rd harmonics received signals as shown in Fig. 2.

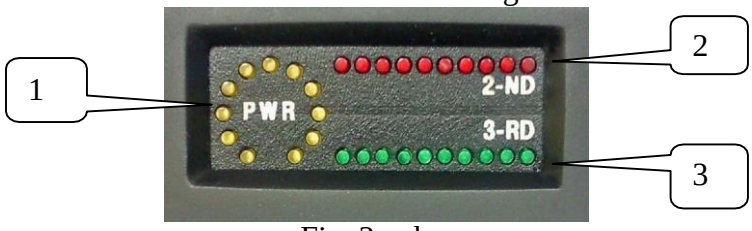

Fig. 2, where

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

4.3. A replaceable transmitter head with a spectrum analyzer (options //08s and //24s) shows indication at the graphic display. Fig. 3 shows possible display formats for receiver power level, levels of the 2nd and 3rd harmonics received signals, spectra of the 2n and 3rd harmonics received signals, a level of the 1st harmonic reflected signal.

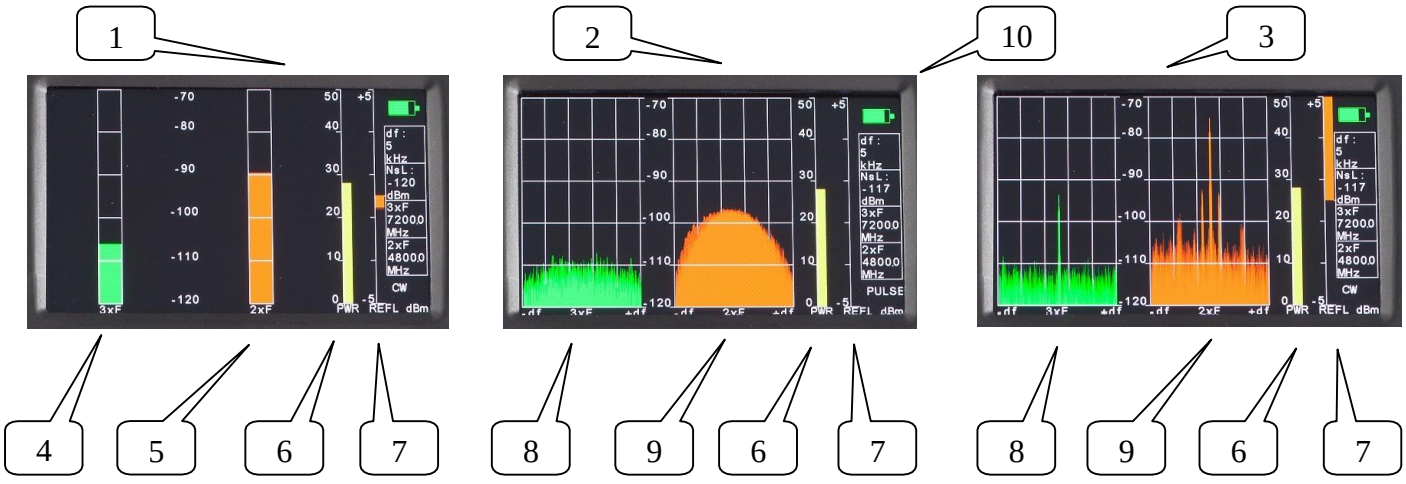

Fig.3, where

1- Mode of linear indication of the 2nd and 3rd harmonics
2- Mode of spectrum analysis of the 2nd and 3rd harmonics in pulse operation mode
3- Mode of spectrum analysis of the 2nd and 3rd harmonics in continuous operation mode
4- Level scale of the 3rd harmonic received (green)
5- Level scale of the 2nd harmonic received (red)
6- Level scale of the probing signal power (yellow)

7- Level scale of the received 1st harmonic of the reflected probing signal (red)
8- Spectrum of the 3rd harmonic received (green)
9- Spectrum of the 2nd harmonic received (red)
10- Level of the battery charging

4.4. Flexible joint of the replaceable transmitter head with a plug connection (Fig.4) is used to fix the head in the position convenient for inspection and search.

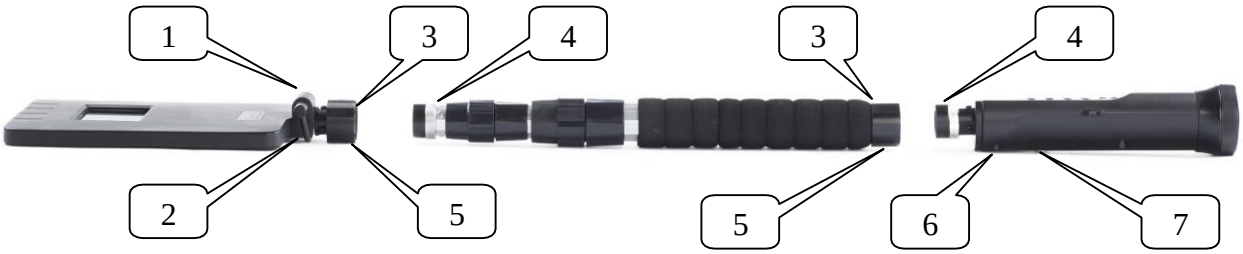

Fig. 4, where

1- A flexible joint
2- A detent handle of a flexible joint
3- A connector from outside of fixed contacts
4- A connector from outside of spring contacts
5- A jaw nut of plug connection
6- A built-in loudspeaker
7- A socket for headset

4.5. Plug connections of transmitter heads with a panel-handle and a removable telescopic arm enable an operator to make NLJD from an inspection one into a search one and vice versa. A construction of detaching connections of NLJD is given in Fig.4.

4.6. A 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.
A control panel is shown in Fig. 5.

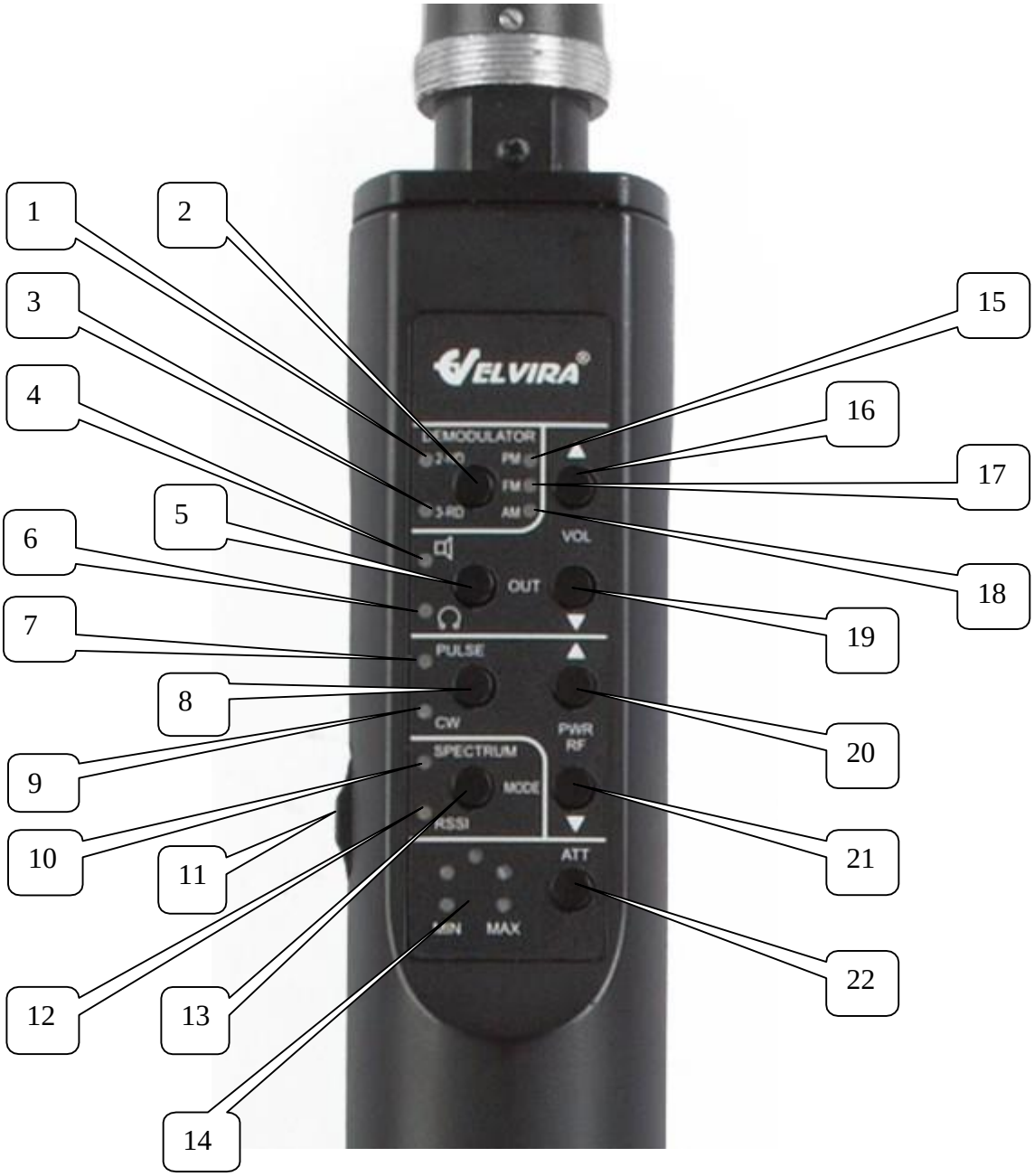

Fig. 5, where

1- An indicator of listening to the 2nd harmonic response
2- A button for switching over of listening between the 2nd and 3rd harmonic response
3- An indicator of listening to the 3rd harmonic response
4- An indicator of listening of responses to the in-built loudspeaker
5- A switch button for listening to the headphones or loudspeaker
6- An indicator of listening of responses to the headphones
7- An indicator showing pulse operation mode of the probing signal transmitter is On
8- A button to switch over pulse and continuous operation modes of the probing signal transmitter in the following cycle: . - pulse – cont(AM demodulation.) – cont.(FM demodulation) – pulse-..
9- An indicator showing continuous operation mode of the probing signal transmitter is On
10- An indicator showing a mode of spectrum analysis of the 2nd and 3rd harmonic responses is On
11- A slide-type switch
12- An indicator showing a mode of linear display of the 2nd and 3rd harmonic responses is On
13- A button to switch the probing signal transmitter
14- An indicator of receiver attenuator
15- An indicator for response listening in the pulse mode
16- A button to increase volume of a signal under listening
17- An indicator for listening output of FM demodulator in the continuous mode
18- An indicator for listening output of AM demodulator in the continuous mode

19- A button to decrease volume of a signal under listening
20- A button to increase power of the probing signal transmitter
21- A button to decrease power of the probing signal transmitter
22- A button to control receiver attenuator

4.7. 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 LOW BATTERY indication shows a built-in battery is discharged and needs to be charged.

4.8. Battery charging is to be made with a battery charger (1-15) included to the delivery set only (hereinafter the first figure refers to Figure number, and the second one – position in Figure). Using other chargers is not allowed. For charging it is necessary to twist a cover at the edge of the handle (1-10) off, remove a battery and place it into the container for charging (1-14). Connect the container to the charger (1-15).

While a charger is connecting to the power mains a red LED is lightning at its housing. When a battery is completely charged, the red LED goes out, and a green LED lights up. Charging time of a fully discharged battery does not exceed 1,5 hours.

4.9. Headphones (1-16) are connected to a socket (7-4) of the control panel shown in Fig. 4.

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.

5.2. ATTENTION !!!

Li-Ion battery (12 V) (Fig.1) of black color is designed to operate with a standard chargersupplied with NLJD «LORNET-STAR».

It is strictly FORBIDDEN to use this charger to charge Li-Ion batteries (3.7 V) of blue colorused in NLJD «LORNET», «LORNET-24», «LORNET 36» and «LORNET 0836».

It is strictly FORBIDDEN to use Li-Ion batteries (12 V) (Fig.1) of black color instead of Li-Ion batteries (3.7 V) of blue color used in NLJD «LORNET», «LORNET-24», «LORNET-36» and «LORNET-0836».

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.

6.2. **Options //08s and //24s**. Turn NLJD On using a slide-type switch (5-11) placed at the handle-control panel (hereinafter the first figure refers to Figure number, and the second one – position in Figure). Herewith, 4 indicators (5-1), (5-4), (5-7) and (5-15) light up at the control panel showing NLJD is powered On. These indicators show that when the button to switch the probing signal transmitter (5-13) is pressed NLJD switches to the pulse mode (5-7) listening to the built-in loudspeaker (5-4) of the specific response (5-15) by the 2^{nd} harmonic (5-1).

The given initial settings can be changed.

Press the button (5-2) to change listening the 2^{nd} harmonic (5-1) for listening the 3^{rd} harmonic (5-3) and vice versa.

Press the button (5-5) to change listening from a built-in loudspeaker (5-4) to headphones (5-6) and vice versa.

Press the button (5-8) to change the operation mode from pulse (5-7)(5-15) to continuous one (5-9) listening to a signal from AM demodulator output (5-18), then to continuous one (5-9) listening to a signal from FM demodulator (5-17) and then to a pulse mode again (5-7)(5-15) in a circle.

6.3. **Options //08s and //24s**. Turn the probing signal transmitter On pressing the button (5- 13). Herewith, if initial settings have not been changed, then the transmitter pulse mode (5-7) with linear response indication on the display (5-12) switches on. An operator can analyze probing signal transmitter power (3-6), response value of the 2nd (3-5) and the 3rd (3-4) harmonics at the display screen (3-1). The scale (3-7) is not used in the pulse operation mode. An operator can change probing signal transmitter power using the buttons (5-20) and (5-21). In the given mode audio information (clicks) of signal responses of the 2nd (5-1) and 3rd (5-3) harmonics is applied to the built-in loudspeaker (5-4) or to headphones (5-6). An operator can control a volume level using the buttons (5-16) or (5-19).

When the button (5-8) is pressed NLJD switches to the continuous operation mode indicator (5-9) listening a signal from AM demodulator (5-18) is On. An operator can analyze probing signal transmitter power (3-6), response value of the 2nd (3-5) and the 3rd (3-4) harmonics at the display screen (3-1). Besides, using the scale (5-7) an operator can make analysis of a level of the received 1st harmonic of the reflected probing signal which shows presence of the reflected materials (water, metals, etc.). The given signal must be checked at low value of the probing signal power. A level of the received signal is given by the scale flashing value relative to the average (zero level) scale value. A value of the signal phase (positive or negative) does not matter.

When the button (5-8) is pressed again NLJD returns in the continuous operation mode, the indicator (5-9) with listening to a signal from FM demodulator (5-17) switches On. An operator can analyze probing signal transmitter power (3-6), response value of the 2nd (3-5) and the 3rd (3-4) harmonics at the display screen (3-1). Besides, using the scale (5-7) an operator can make analysis of a level of the received 1st harmonic of the reflected probing signal which shows presence of the reflected materials (water, metals, etc.). The given signal must be checked at low value of the probing signal power. A level of the received signal is given by the scale flashing value relative to the average (zero level) scale value. A value of the signal phase (positive or negative) does not matter.

When the button the (5-8) is pressed again NLJD returns to the pulse operation mode.

6.4. **Options //08s and //24s.** When the button (5-13) is pressed again and if the initial settings have not been changed NLJD remains in the pulse operation mode (5-7) but using the display screen (3-2) an operator can make analysis of the probing signal transmitter power (3-6) and responses spectra of the 2nd (3-9) and 3rd (3-8) harmonics. Listening modes are equal to those givenin the previous section.

When the button (5-8) is pressed NLJD switches to the continuous operation mode the indicator (5-9) with listening a signal from AM demodulator (5-18) is On. An operator can analyze probing signal transmitter power (3-6), and responses spectra of the 2nd (3-9), 3rd (3-8) and 1st harmonics at the display screen (3-3). Listening modes are equal to those given in the previous section.

When the button (5-13) is pressed again, the probing signal transmitter of NLJD switches off. Herewith, a noise level in the receiving channels of the 2nd harmonic response is analyzed automatically and the corresponding frequency of the probing signal by noise minimum is selected at the next switching on (pressing the button (5-13).

6.5. **Options //24 and //36m.** Turn NLJD On using a slide-type switch (5-11) placed at the handle-control panel (hereinafter the first figure refers to Figure number, and the second one – position in Figure). Herewith, indicators (5-4) lights up at the control panel shortly showing a charging level of Li-Ion battery, and 3 indicators (5-1), (5-4), (5-7) light up continuously showing NLJD is powered On. The given indicators show that when the button (5-13) to turn on the transmitter probing signal is pressed NLJD switches to the pulse mode (5-7) with automatic power control and listening to a specific 2nd harmonic response (5-1) to the built-in speaker (5-4).

One yellow LED should be lightning on the antenna unit (a circle scale of the probing signal power indicator) (2-1). Its initial position corresponds to the maximum power of the probing signal. The probing signal transmitter is off (it is turned on after pressing the button (5-13) only). The 2nd and 3rd harmonics indicators should not light (flashing of the first LEDs of two first scales (2-2) and (2-3) is permitted).

The given initial settings can be changed.

Press the button (5-2) to change listening the 2nd harmonic (5-1) for listening the 3rd harmonic (5-3) and vice versa.

Press the button (5-5) to change listening from a built-in loudspeaker (5-4) to headphones (5- 6) and vice versa.
Press the button (5-8) to change operation mode from pulse (5-7)(5-15) to continuous one (5-9) (CW) listening to a signal from AM demodulator output (5-18), then to continuous one (5-9) listening to a signal from FM demodulator (5-17) and then to a pulse mode again (5-7)(5-15) in a circle.
Press the power control button (5-21) to set initial power of the probing signal different from maximum, the corresponding LED on the scale (2-1) shows a power level.

6.6. **Options //24 and //36m.** Turn the probing signal transmitter On pressing the button (5- 13). Herewith, if initial settings have not been changed, then the transmitter pulse mode (5-7) with automatic power control (5-7) switches on. An operator can analyze probing signal transmitter power (2-1), response value of the 2nd (3-5) and the 3rd (3-4) harmonics. Power of the signal radiated changes depending on the signal level at the 2nd harmonic receiver output. In the given mode audio information (clicks) of signal responses of the 2nd (5-1) and 3rd (5-3) harmonics is applied to the built-in loudspeaker (5-4) or to headphones (5-6).
Press the button (5-2) to make automatic power control of the probing signal depending on the signal level at the 3rd harmonic receiver output (5-3).
An operator can control volume level using buttons (5-16) or (5-19).
An operator can change the transmitter power of the probing signal in the manual mode using buttons (5-20) and (5-21).
When the button (5-8) is pressed NLJD switches to the continuous operation mode indicator (5-9) listening a signal from AM demodulator (5-18) is On.
When the button (5-8) is pressed again NLJD returns to the pulse operation mode.
When the button (5-13) is pressed again, the probing signal transmitter of NLJD switches off. Herewith, a noise level in the receiving channels of the 2nd harmonic response is analyzed automatically and the corresponding frequency of the probing signal by noise minimum is selected at the next switching on (pressing the button (5-13).

6.7. **(Transmitter head //08)** Turn NLJD On using a slide-type switch (5-11) placed at the handle-control panel (hereinafter the first figure refers to Figure number, and the second one – position in Figure). Herewith, 4 indicators (5-1), (5-4), (5-7) and (5-15) light up at the control panel showing NLJD is powered On. These indicators show that when a button to switch the probing signal transmitter (5-13) is pressed NLJD switches to the pulse mode (5-7) listening to the built-in loudspeaker (5-4) of the specific response (5-15) by the 2nd harmonic (5-1).
The given initial settings can be changed.
Press the button (5-2) to change listening the 2nd harmonic (5-1) for listening the 3rd harmonic (5-3) and vice versa.
Press the button (5-5) to change listening from a built-in loudspeaker (5-4) to headphones (5-6) and vice versa.
Press the button (5-8) to change operation mode from pulse (5-7)(5-15) to continuous one (5-9) listening to a signal from AM demodulator output (5-18), then to continuous one (5-9) listening to a signal from FM demodulator (5-17) and then to a pulse mode again (5-7)(5-15) in a circle.

6.8. **(Transmitter head //08)** Turn the probing signal transmitter On pressing button (5-13). Herewith, if initial settings have not been changed, then a transmitter pulse mode (5-7) with responses indication at LEDs (2) switches on. An operator can analyze probing signal transmitter power on the scale (2-1), response value of the 2nd harmonic on the scale (2-2) and response value of the 3rd harmonic on the scale (2-3). An operator can change probing signal transmitter power using buttons (5-20) and (5-21). In the given mode audio information (clicks) of signal responses of the 2nd (5-1) and 3rd (5-3) harmonics is applied to the built-in loudspeaker (5-4) or to headphones (5-6). An operator can control volume level using buttons (5-16) or (5-19).
When the button (5-8) is pressed NLJD switches to the continuous operation mode, the indicator (5-9) listening a signal from AM demodulator (5-18) is On. An operator can analyze probing signal transmitter power on the scale (2-1), response value of the 2nd harmonic on the scale (2- 2) and response value of the 3rd harmonic on the scale (2-3).
When the button (5-8) is pressed again NLJD returns in the continuous operation mode, indicator (5-9), but listening to a signal from FM demodulator (5-17) switches On. An operator can analyze probing signal transmitter power on the scale (2-1), response value of the 2nd harmonic on the scale (2-2) and response value of the 3rd harmonic on the scale (2-3).

When the button (5-8) is pressed again NLJD returns to the pulse operation mode.

When the button (5-13) is pressed again, the probing signal transmitter of NLJD switches off. Herewith, noise level in the receiving channels of the 2^{nd} harmonic response is analyzed automatically and the corresponding frequency of the probing signal by noise minimum is selected at the next switching on (pressing the button (5-13).

6.9. 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.

6.10. Simultaneous flashing of all indicators on the control panel (or color change from green to red of the indicator at the display (3-10) indicates that the battery is discharged. In this case turn off the power, untwist a cover at the edge of the handle, remove a battery, place it into the container and charge using the charger.

6.11. If it is necessary to listen to the response signal from the headphones put a plug of the headphones into the socket (4-7) at the control panel.

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 strictly forbidden.

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 2^{nd} and 3^{rd} harmonics levels is made both by number of LEDs lightning on the corresponding indicator scale (readings of linear scale or increased level of the response spectrum density at the display) 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 2^{nd} harmonic indicator LEDs (readings of linear scale or increased level of the response spectrum density at the display). While rapping at the suspected place of a p-n transition, readings of LEDs (readings of linear scale or increased level of the response spectrum density at the display) do not change.

7.6. When a natural p-n transition is found, one shall observe stable lightning of the 3^{rd} harmonic (mainly) indicator LEDs (readings of linear scale or increased level of the response spectrum density at the display). While rapping at the examined surface intensively, readings of indicators by the 3^{rd} harmonic (readings of linear scale or increased level of the response spectrum density at the display) 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.

8. Warranty

3.1. Warranty period for «LORNET-STAR» is 12 months upon supply to the customer.
3.2. Life time is 6 years.
3.3. Warranty does not cover power elements.