

Katran-Lux

Non-linear junction detector



USER MANUAL

Nonlinear junction detector “Katran-Lux” is intended for search and detection of electronic devices installed in building structures, pieces of furniture and interior, both in transmission and switched-off mode.

“Katran-Lux” ensures detection of devices containing semiconductor elements and preliminary assessment of the detected object based on the levels of reradiated 2nd and 3rd harmonics. The maximal response from artificial semiconductor elements (transistors, diodes, microchips) is noticed on the 2nd harmonic of the probing signal. When radiating oxide films of natural origin maximum response time is a the 3rd harmonic of the probing signal.

The detector Katran-Lux allows analyzing responses of the illuminated objects on both 2nd and 3rd harmonics of the probing signal which ensures reliable identification of electronic devices and natural oxide semiconductors. The levels of 2nd and 3rd harmonics signals are indicated simultaneously on the locator’s LED display. Algorithm of frequency tuning used in “Katran-LUX” chooses frequency of the probing signal automatically in such point that noise level is minimum in the receiving channel of its 2nd harmonic.

There are two types of signals emitted:

- Continuous wave of carrier frequency (CW);
- Pulse modulation of carrier with pulse ratio 100(Pulse).

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

Mode of automatic control of output power simplifies actions of an operator.

“Katran-LUX” can display signal levels of the 2nd and the 3rd harmonics at LED panel simultaneously. Besides, level of the 2nd or the 3rd harmonics can be estimated in turn aurally by click repetition rate, reproducing through earphones.

Presence of the detector of an envelope curve of UHF signal re-emitted enables to tap active microphones and to use acoustic-binding for easy search.

Distinctive features:

- adjustable wide range transmission power and possibility to work near radio electronic devices;
- an automatic output power adjustment makes operator’s work much easier;
- use of digital signal processing allows to optimize signals processing algorithms and reach maximal sensitivity;

- use of 3 types of ranging signal modulation (pulse type carrier frequency impulse modulation, continuous transmission of carrier frequency CW and continuous transmission of carrier frequency with 1 kHz signal frequency modulation (CW + FM))

allows combining long detection range with reliable identification of detected devices;

- level of the 2nd and 3rd harmonics may be assessed in turns aurally by frequency of clicks translated through an internal speaker or attachable headphones.

- presence of a reradiated SHF signal envelope detector allows listening to active electronic devices containing an acoustic transducer.

- possibility to work both with a rechargeable battery or 220 V AC power supply.

Types of probing signal:

continuous transmission of carrier frequency

pulse modulation of carrier frequency

continuous transmission of carrier frequency with 1 kHz frequency modulation (CW + FM)

Probing signal frequency 800 MHz

Analyzed harmonics 2nd and 3rd

Output transmission power:

- in pulse mode

- in continuous transmission mode

- in CW + FM mode

not less than 15 W

not less than 1 W

not less than 1 W

Dynamic output adjustment range 20 dB, 11 levels

Sensitivity of radio receivers not worse than -110 dBm

Time of continuous work with one battery at the max. output power:

- in pulse carrier frequency mode

- in continuous carrier frequency transmission mode (CW)

at least 5 hours

at least 2 hours

Weight of fully equipped device not more than 1.7 kg

Total length of the device in working/folded condition 125 cm

Total length of the device in folded condition 55 cm

Structure of the Device, Design and Accessories

The device consists of the units and accessories listed in the Table:

Name	Quantity
A receiving-transmitting antenna unit telescopic arm with a control panel and battery	1
A mains charger for battery	1
Detector bag	1

The device has:

- 1- LED indicator;
- 2- Transceiver antenna unit combined with an indicator;
- 3- Telescopic arm;
- 4- Control panel with a power section and a battery (fixed underneath).

Operation Order

Remove the detector from the package, and the battery from a 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 for 30 minutes.

To start operation set the battery and turn «Katran-Lux» 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 on the probing signal transmitter pressing PWR button. This will switch on the transmitter pulse mode and the automatic mode of signal power control. The power of a radiated signal will change depending on a signal level at the 2nd harmonic receiver input. In this mode sound information of the 2nd harmonic response is applied to the loudspeaker. When switching on mode **3-RD** by pressing LSTN on the control unit, 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.

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.

6.4. 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 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 batteries are to be kept in an isolated case when not used.

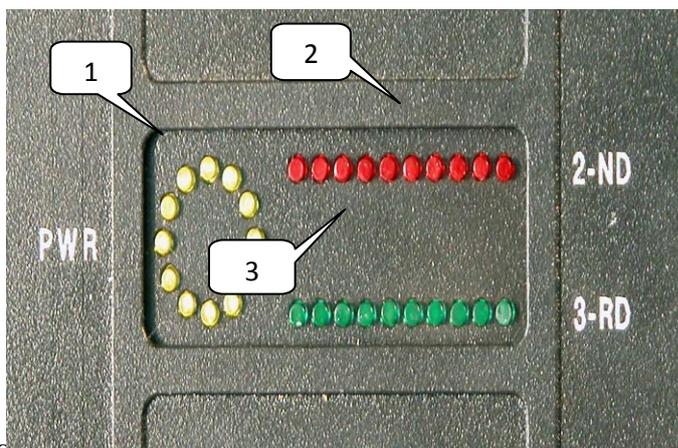
Purpose of the Detector Basic Units

The transceiver antenna unit with built-in 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 the detector 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 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 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. 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 of the 2nd (2) and 3rd (3) harmonics levels .



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

The control panel is used to control operation of the detector. It consists of a case combined with a battery and fixed on the arm. Control board,

buttons for operation modes control and display LEDs are placed in the package. 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. Control panel is shown in the following buttons refer to «AUDIO» group:

LEDs and **LSTN** button for switching of acoustic indication to the output of the 2nd or 3rd harmonics.

LEDs and **OUT** button for switching acoustic output to earphones or a built-in loudspeaker.

LEDs and **RF** button for switching between types of the radiated signal (CW – continuous, PULSE – pulsed).

The following buttons are referred to «POWER RF» group:

LEDs and **PWR** button to switch on/off the probing signal transmitter. When the instrument is switched on the automatic mode of output power control (AUTO) is set by default. To switch over to a 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.

LED and a button for receiving unit attenuator control.

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.

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.

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

Turn on the probing signal transmitter pressing PWR button. This will switch on the transmitter pulse mode and the automatic mode of signal power control. The power of a radiated signal will change depending on a signal level at the 2nd harmonic receiver input. In this 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, 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.

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.

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 and turning earphones 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 batteries are to be kept in an isolated case when not used.

Search Recommendation

If possible remove electronic devices from the room examined. If it is impossible, examination should be done at a decreased radiated power. Set maximum radiated power level and one of the operation modes of the receiver. In the CW mode it is recommended to use manual operation mode “Man” only. Place the antenna unit parallel to the surface examined at the distance not exceeding 10cm. 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). Analysis of the received 2nd and 3rd harmonics levels is made by number of LEDs lighting on the corresponding indicator scale. Remove the antenna unit from the surface examined or decrease output power and repeat measurements stated in 7.5. of the present manual. For a more accurate location as well as for protection of receiving devices from overload it is possible to decrease the signal level using attenuators. When an artificial p-n transition is found you will normally see stable lighting of the 2nd harmonic indicator LEDs. While rapping at the suspected place of a p-n transition, readings of LEDs do not change. When a natural p-n transition is found, you will observe 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.

Warranty

Warranty period for «Katran-LUX» is 12 months upon supply to the customer.

Life time of the device is 6 years.

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. Warranty does not cover power elements.