NON-LINEAR JUNCTION DETECTOR

“NR-CHP”

USER’S MANUAL

2018

CONTENTS

This Manual is intended
for explanation
"NR-CHP" Non-linear Junction Detector
design & principle of operation
as well as directions for its use.

For proper equipment use,
study this Manual in depth.

The Device has an open UHF radiator of electromagnetic energy.

In active mode it represents a source of active interference that could cause certain malfunction of radio-electronic equipment located in close proximity

It is the responsibility of the User to comply with the corresponding Radio Communication Regulations of the country where 'NR-CHP' NLJD is being used

1. APPLICATION

NR-CHP Non-linear Junction Detector (fig. 1) is intended for searching concealed electronic devices that contain semi-conductor components.

This Detector can be successfully utilized for suspect person inspection at a certain check point.

NR-CHP can detect typical target in every operational mode: active, stand-by or even switched-off.

2. FUNCTION

NR-CHP represents a portable tool that consists of antenna system, transmitter and two receivers adjusted for double and triple frequency of transmitter's probing signal. Both transmitter and receivers are placed in a Main unit body.

Main unit is fabricated as mono-block in a compact plastic body with an easy-to-use handle and control panel on the back side of the body.

The UHF probing signal is converted into a poly-harmonic one on the radiated nonlinear elements (semi-conductive items or corroded metal-oxide-metal junction) and retransmitted, better say – 'scattered' into ambient space.

Retransmitted 2^{nd} & 3^{rd} harmonics of the probing signal are received and processed simultaneously by receivers.

The received signals levels are reproduced in an audio form and its volume is proportional to the received signal level while its tone corresponds to an appropriate harmonic.

If necessary the received signals level can be reduced by **ATT** buttons (see Main unit control panel below) and monitored by corresponding LED indication.

3. NR-CHP COMPLETE SET (table 1)

Fig. 1 **NR-CHP** complete set.
1- Main unit, 2- imitator (test-unit), 3- charger, 4- rechargeable cells, 5- AC power adapter, 6- car power adapter, 7- carry bag

Table 1

1	**NR-CHP** Main unit	1
2	Target imitator (test unit)	1
3	Soshine SC-S1 battery charger	1
4	Soshine 18650 rechargeable cells	4*
5	AC power adapter	1
6	Car power adapter	
7	Carry bag	11
	Operation manual (not shown)	1

* - 2 sets with 2 cells in each

NOTE: rechargeable cells & battery charger can be replaced by any equivalent version.

3. MAIN TECHNICAL PARAMETERS

Target detection range - SIM card - Mobile phone	 not less 0.10 m not less 0.15 m
Receiver input signal attenuation	2 steps 10dB each (0 dB, -10 dB, -20 dB)
Received signal indication	Audio
Operational condition: Operating temperature Low limiting temperature High limiting temperature Limiting relative humidity	 -5°C … +40°C minus 20°C +50°C 80% (under +25°C)
Power supply	2 x 'Soshine' 18650 Li-ion rechargeable cells 3.7V
Continuous operation time with one set of fully charged cells	 not less 3h*
Weight Device in a ready for operation state Complete set in standard packing	 1.0±0.1kg 2.0±0.3kg

* - with 2800mAh cells

5. DESIGN

5.1 MAIN UNIT

NR-CHP Main unit represents a handy mono-block comfortable enough to be held by an operator (fig.3).

The Main unit is equipped with a control panel (3) and a power supply chamber (4).

Fig. 2 **NR-CHP Main unit.** 1- antenna cap, 2- Main unit handle, 3- control unit panel, 4- battery compartment cover.

5.2 NR-CHP back side with Control unit panel

Fig. 3 **NR-CHP** Back side**.**
1- 'On-Of button', 2- 'On' confirmation LED,
2- 3- (-10dB) &(-20 dB) attenuation confirmation LEDs,
4- attenuator adjustment button,
3- 5- battery compartment, 6- battery compartment lock

Control unit consists of membrane keyboard with two nonlocking buttons and 3 indication LEDs (fig.3)

Button ⏻ (1) is intended for Detector switching On & Off ,
LED (pos. 2) is used for Detector active mode confirmation.
Button **ATT** is intended for received signal attenuation value.
Two red LEDs (pos. 3) are used for -10 &-20 dB attenuation level confirmation.

Fig. 4 **NR-CHP** Battery installation
1- Main unit, 2- battery compartment,
3- rechargeable cells 4- cell holder

ACCESSORIES

POWER SUPPLY

Two Soshine 18650 rechargeable sells (fig.5) with 3.7V nominal voltage and 2800mAh capacity are used for Detector power supply.

Fig. 5 Soshine 18650 cells

The battery compartment for two Soshine 18650 rechargeable cells is located on the back side of Detector housing.

For battery charging **Soshine SC-S1 max Charger** (supplied) is used.

CHARGER

Soshine SC-S1 max Charger (fig. 11) is intended for rechargeable cells charging. The battery charging is performed in an automatic mode and does not need any operator's assistance.

Fig. 6 **NR-CHP** standard Charger complete set.
1 – **Soshine SC-S1 max** charger unit
2 – **Soshine** DC 12V car adapter
3 – **Soshine** AC power adapter

NOTE:

Soshine *AC adapter* (fig. 6, pos. 3) *allows to charge the battery from the Mains 100 – 240 V, 50/60 Hz.*

Soshine *DC 12V car adapter* (fig.6, pos. 2) *is intended for battery charging from the motocar 12V DC net.*

IMITATOR

Target **Imitator** (standard test unit) is intended for NR-CHP detector workability control

Imitator represents high-frequency semi-conductor diode (2D521A referring to the Russian classification) in a ∅14 x 165 mm solid plastic body.

Fig. 7 NR-CHP Imitator (test unit)

MARKING

A nameplate with NR-CHP abbreviation and Detector serial number are located on the transceiver side plate.

One screw slot at the backside of the Main unit and the antenna cap shell screw are also sealed.

Fig. 8 NR-CHP marking

PACKING

Complete set of NR-CHP is packed in a dedicated shockproof carry bag (fig.9).

The bag is made of a durable synthetic fabric and is equipped with rigid frame and soft inserts.

Handy grips and a shoulder strap make its transportation easy and comfortable.

Fig.9 NR-CHP Carry bag

NR-CHP OPERATION

OPERATION CONDITION AND RESTRICTIONS

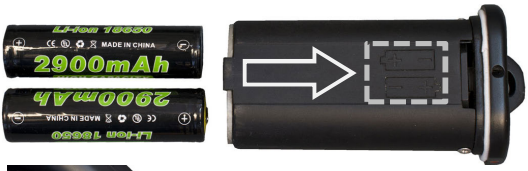
After long-term exposure to a low temperature keep the device packed in a standard packing at least 2 hours for evening up its temperature with the environment.

NOTE: Operating NR-CHP keep corresponding safety measures.

Safety precautions for the open RF emitters:

- Avoid prolonged presence of personnel in a Main lobe of NR-CHP antenna' diagram.

NOTE: Probing signal power density at the distance of 1 meter along the maximum of NR-CHP antenna directional radiation pattern does not exceed Russian State Standard 12.1.006-84 (Russian State Sanitary Norm) for UHF-equipment serviceman under continuous 8-hours operation.



GETTING STARTED

Take NR-CHP components out of standard packing.

Open battery compartrment at the back side of the Main unit.

Insert two fresh rechargeable cells (fig.10) into the cell holder keeping cells polarity specified on the holder side wall (see an arrow). Install it into the battery compartment.

Close the battery compartment cover and lock it.

Fig. 10 Rechargeable cells installation

1. Push (‘On”) button to switch on Detector (fig.11).

The following mode is set on default confirmed by corresponding LEDs:

– transmitter is on,
– receivers are on,
– input signals attenuation is at -10 dB

Fig. 11 Detector is switched-on with -10 dB input signal attenuation

2. Use ATT button to adjust maximal receiver sensitivity (fig.12).

3. Aim antenna at various directions and evaluate noise background in that particular point.

Choose the direction without any noise reaction for Detector workability test.

Fig. 12 Detector in a maximal sensitivity mode

NR-CHP WORKABILITY TEST

Place test-unit (imitator) at a chosen direction 0.5…0.7 m from antenna cap.

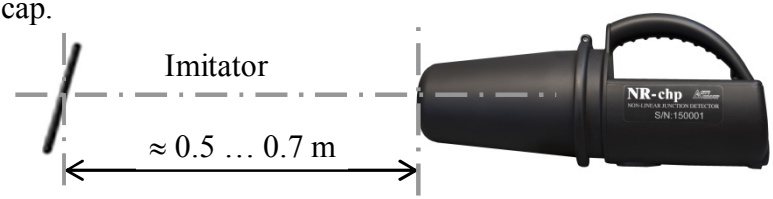


Fig. 13 NR-CHP workability test by means of standard imitator

At that a tonal signal should be heard.

Detector is ready for operation

SEARCHING OPERATION

NR-CHP Detector represents a high sensitive radio-electronic device. Getting started remove from the your pockets and outfit any items that contains semi-conductive components.

Carry out searching operation with maximal receiver sensitivity.

Use ATT button to activate this mode (see fig. 10 for reference).

The receivers sensitivity is determined by real noise environment situation right on spot, for instance, by extraneous emission activity and/or non-lineal junctions that cannot be removed from the area under control.

USEFUL HINT:
If necessary, depending on the noise/ interference situation adjust an adequate received signal attenuation by means of ATT-button.
For instance, -20dB (see fig.14)

Fig. 14

By the end of operation – switch off Detector.

Remove battery from the body and pack complete set in a Carry bag (fig.9).

EMERGENCY ACTIONS

- In case of the equipment malfunction that cannot be corrected by the operator, Detector operation should be stopped.
- If Detector was exposed to an external mechanic, electromagnetic or climatic impact and temporarily lost its workability, then before restoring the operation it is required to carry out its visual checks and a corresponding functional test referring this Manual.

OPERATION OF THE FAULT DETECTOR IS NOT ALLOWED.

10. BATTERY CHARGING (fig. 15).

Insert 2 or 4 cells (pos.3) into **Soshine Charger** chamber (if necessary slide 'minus' spring contact)
Pay special attention to cells polarity referring indication on the charger chamber
Couple AC power adapter or DC 12V car adapter to the socket on a side wall of the **Charger** (pos. 2).
Connect **AC power adapter** to the Mains (100-240V, 50/60 Hz) or **Car adapter** to a corresponding cigarette lighter socket.
After switching on the power the **Charger** will check every charging channel operability and initiate the charging mode.

Fig. 15 Soshine SC-S1 max Charger
with 4 cells ready for charging.
1 – LED charging channel indication
2 – Adapter connection socket
3 – **Soshine 18650** 2800mAh Li-Ion rechargeable

Charging mode LED indication (see table 5)

Charger LED indication (Fig. 16, pos.1) Table 5

Charging process status	LED light mode
Charger workability self -test	4 x LED light red then switch over to green
Defective or cells of a wrong type are installed (for instance Ni-MH, Ni-Cd and etc.)	Alter green to red back and forth
Charging mode start	Red
80%-90% charge is obtained	Blinking green
Fully charged	Green
Cell's wrong polarity	Dead

After battery charging completion unplug AC adapter from the Mains and then from the **Charger**.

NOTE:
Charging time for Soshine 18650 2800mAh Li-Ion rechargeable cells with Soshine SC-S1 max charger is as follows:

4 hours - for 2 cells, 8 hours - for 4 cells

The battery (cells) can be unplugged from the **Charger** during any charging stage without any failure to the battery or the Charger itself.

Charger operation precautionary measures

- Do not try to charge primary cells!
  That can initiate an explosion and provoke the fire.
  Acceptable elements should have an inscription “Rechargeable”.

- Do not block vent holes on the bottom of the charger housing. For instance, don’t place it on a soft, fleecy surface (carpet, blanket, seat covering and etc.).

- Charger is intended for indoor use only. Protect the device from moisture and perspiration water. Do not switch on the charger and/or power adapters with the obvious presence of moisture inside the device.

- Do not try to disassemble or modify the device. Do not use it as a surrogate power source for a certain gadget. The device terminals are intended for charging appropriate cells only.

- Charger is an electronic device with high frequency circuits and violent operating current. The wrong operation could cause an electrical shock.

- Do not leave the charger and/or AC power adapter coupled to the Mains unattended for a long time. In spite of several protection circuits used in the charger circuit there is certain probability of abnormal mode that will cause the fire.

11. MAINTENANCE

ATTENTION! IT IS FORBIDDEN TO DISASSEMBLE DETECTOR!

GENERAL INSTRUCTIONS

The NR-CHP Maintenance should be carried out by the personnel who studied the Operation Manual and have practical experience of NLJD usage.

To keep NLJD in fault-free and ready-to-use condition the following Maintenance are provided:

- **Check inspection** – performed at the detector acceptance procedure, preparation for transportation, storage as well as at periodic testing of serviceability, removal from storage and after transportation;
- **Daily Maintenance** – performed after each Detector usage, transportation or placing in storage;
- **Scheduled Maintenance** – performed once a year during long-term storage.

MAINTENANCE ORDER

Check inspection:

- take **NR-CHP** components, accessories and supporting documentation from the carry bag;
- check **NR-CHP** set packaging referring the device packing list;
- verify the seals integrity;
- check **NR-CHP** components exterior;
- verify labels, signs & marking condition on the device component housings;
- carry out the device workability test;
- remove the batteries;
- pack **NR-CHP** components into the carry bag.

Daily Maintenance

- use clean rag to remove dirt and dust from external surfaces of the device components;
- use brush and soup water to clean the carry bag;
- dry the carry bag;
- correct minor paint coating defects (scratches and chipping) of the device components;
- charge the batteries;
- perform the device workability test;
- remove the batteries;
- pack **NR-CHP** components into the carry bag.

Scheduled Maintenance

- charge the batteries.

ROUTINE REPAIR

The defective device repair, adjustment and setting-up should be carried out **ONLY** by authorized personal at the Manufacturer's factory.

12. SHIPPING AND STORAGE

NR-CHP can be shipped in a standard packing in a passenger cabin by any kind of transport.
Prevent Device in standard packing from shock and vibration.
Store packed device under the temperature from +5 up to +40°C and relative humidity no more than 80 % under +25°C

NOTE: THE BATTERIES SHOULD BE STORED IN A CHARGED STATE ONLY.

13. CERTIFICATE OF ACCEPTANCE

Non-linear Junction Detector NR-CHP serial No _____
is in conformity with the Main technical parameters
and is accepted for use.

Seller _____

Date _____

14. WARRANTY

NR-CHP warranty period is 12 months from the date of purchase.

Manufacturer guarantees normal functioning of the device on the assumption of the following all requirements of this Manual by the User and in case of malfunction within the Warranty period Manufacturer will repair the device free of charge.

Intended service life of the product before discarding is 8 years including the storage period at the warehouse up to two years.

CUSTOMER COMPLAINTS ARE NOT ACCEPTED AND WARRANTY MAINTENANCE DO NOT COVER THE FOLLOWING CASES:

1. Mechanical damage of the device's units or parts.

2. Traces of independent unauthorized repair and/or warranty sealing damage.

3. The device's Works number mismatches to that mentioned in a Certificate of Acceptance

NOTES:

1. Warranty period does not cover batteries and the Charger.

2: Post-warranty service is accomplished under separate order.

FOR NOTES