EAGLE
NR900EK3M

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EAGLE NR900EK3M

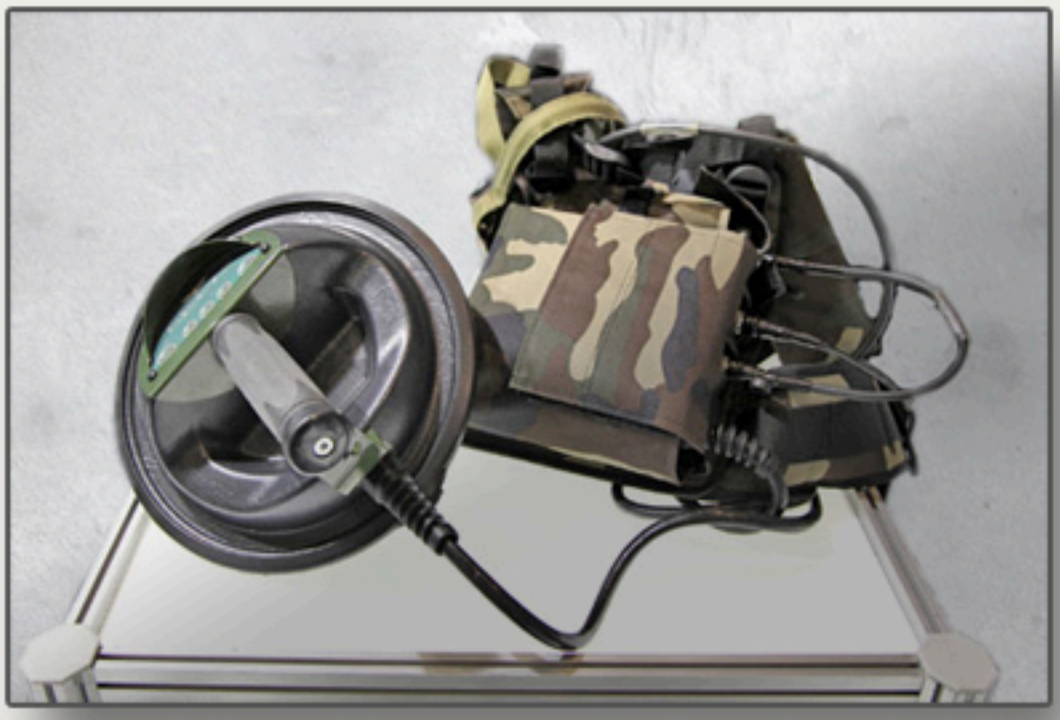
GENERAL NOTES

The Device has an open UHF radiator of electromagnetic energy.
It is strictly prohibited to direct the Device antenna system towards any human from the distance less than 2 m.

The Device in active mode is a source of active interference that could cause certain malfunctionof a radio-electronic equipment located in close proximity.

This Manual is intended for explanation 'EAGLE NR900EK3M' Non-linear Junction Detector design & principle of operation as well as directions for its use.
For proper equipment use, study this Manual in depth.

It is the responsibility of the User to comply with the corresponding Radio Communication Regulations of the country where 'EAGLE NR900EK3M' NLJD is being used.



EOD EQUIPMENT

EAGLE NR900EK3M

APPLICATION

The '**EAGLE NR900EK3M**' non-linear junction detector (here and after - Detector) is designed to locate and confirm the presence of IED (improvised explosive devices) that contains semi-conductor components regardless their operational mode: "stand-by", "on" or even switched off.

Detector can reveal targets located on the ground surface or slightly buried in the ground or snow as well as concealed in building structures and various facilities.

Detector makes it possible to reveal IED with tightening device or push-switch that contains joint metallic parts.

Detector represents a portable device served by a single operator.

Detector is intended for outdoor operation under a wide range of environmental conditions. It maintains its normal operating ability within -30°C…+50°C temperature range.

Operator is alerted about the presence of the target by both audible (via headphones) and visual (LED bar-graph display) alarm. A sound alarm for low battery indication is also provided.

The **Detector** can be used up to 4 hours with one fully charged battery (spare battery is supplied).

Detector is intended to be operated from a standing position.
That allows operator to investigate the area below or in front of him. The detection distance depends on the type of a target and its orientation, as well as soil and weather conditions and electromagnetic environment in a searching area.

Detector contains no any hazardous substances.

NOTE: All information contained in this manual is subject to change without notice.

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MAIN TECHNICAL PARAMETERS

Detection range

Standard imitator (test unit) placed 1meter above the ground
level under minimum probing signal output should be not less than 1.5 m

Operating supply voltage: 7.5 V

Power supply: Power pack with built-in 7.5 V 5.4 Ah Li-Ion rechargeable battery (2s1p VL 34570 PM).

Operational condition:
Operational temperature: -30° C to +50° C with standard Power pack
Max relative humidity: 95% under +35° C

Charger operation condition:
Operational temperature: +5° C to +40° C with standard Power pack
Max relative humidity: 95% under +25°C

Weight (complete set in standard packing): not more -13 kg

Continuous operation time: Two standard Power packs - not less than 8 hours

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COMPLETE SET

Fig.1 NR900EK3M set

The main components of Detector set are as follows:

1. Antenna head with control panel
2. Electronics unit
3. Headphones
4. Target imitator
5. Power pack (2 pcs)
6. Power cable (2 pcs)
7. Charger
8. Charger AC-cable
9. Charger DC-cable
10. Operator backpack
11. Power pack pouch
12. Charger pouch
13. Carry bag
14. Antenna cap

DESIGN ELECTRONIC UNIT

The main part of the Detector (fig. 2) consists of Electronic unit (1) that is permanently coupled with Antenna module (2) by means of flexible UHF & control cables in a protective hose (3).

The headphone connector (4) and a socket for power supply (5) are located at the front side of the unit.

When the headphones and the power supply unit are not connected, sockets are protected with rubber caps.

Electronic unit contains transmitter module, 2 receivers and a PC board that provide all necessary connections for sub-assemblies, units and modules of Detector.

Fig. 2 Electronic unit with Antenna module

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ANTENNA MODULE

Antenna module (fig. 2) consists of transmitting and receiving antennas embedded in a plastic case, control panel (6) and a handle (7).

Main lobes of antennas radiation pattern are oriented along their geometrical axis.

Both antennas have a common protective dome cover.

For better dome protection a special cap made of strong fabric can be used (supplied).

In active mode operator takes Antenna head into his hand.

CONTROL PANEL

Control panel (figure 3 in next page) is placed on the back of Antenna module and incorporates all necessary controls and indicators:

1)  - ON/OFF switch button
2) **-10, -20, -30** sensitivity control: input attenuator
3) **MAX** - output power control: max/in switch over
4) 2-nd harmonic level indicator: 16 red LED bar-graph display
5) 3-rd harmonic level indicator: 16 green LED bar-graph display
6) Control buttons LED confirmation

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CONTROL PANEL

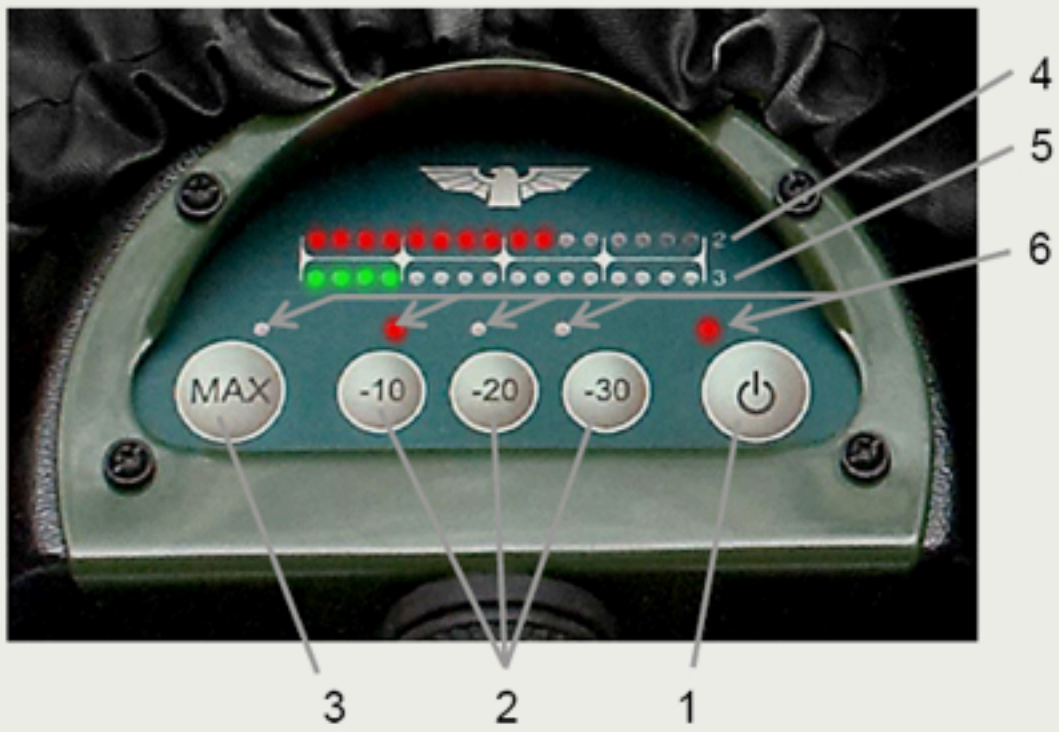

Fig. 3 Control panel

Both signal level bar-graph displays are divided to 4 equal sections with 4 LEDs in each.

Every LED corresponds to 2.5 dB, thus every section matches to 10 dB of a probing signal level harmonic (2-nd or 3-rd).

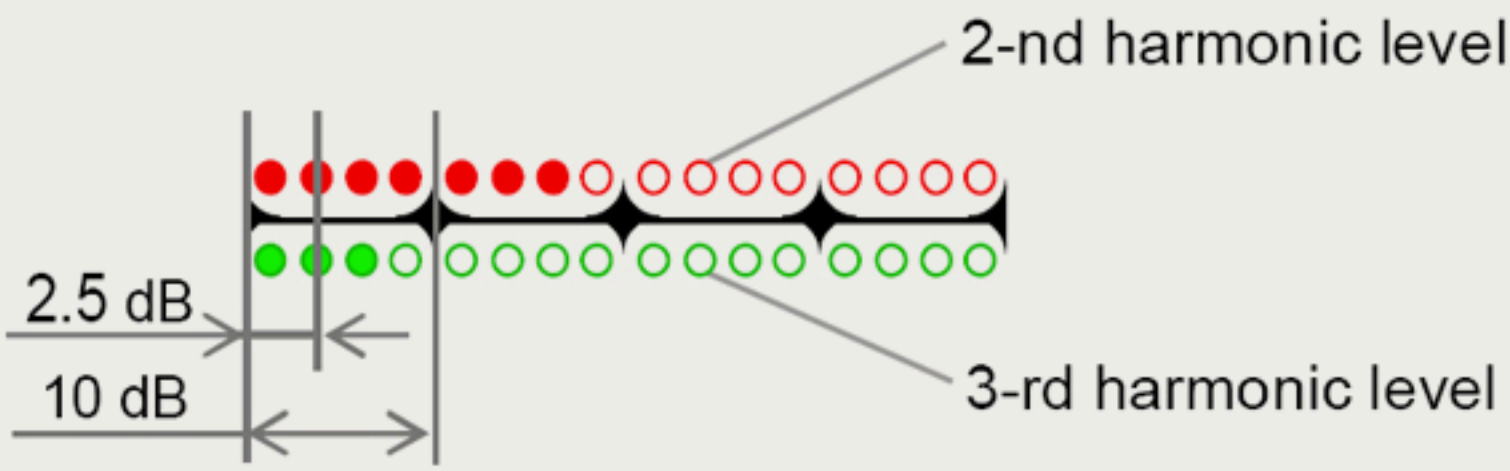

Fig.4 2nd & 3rd LED bar-graph display

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POWER PACK

Power pack has a built-in 7.5 V 5.4 Ah Li-Ion rechargeable battery (2s1p VL 34570 PM) that is permanently placed in a strong metal casing and should not be removed from it.

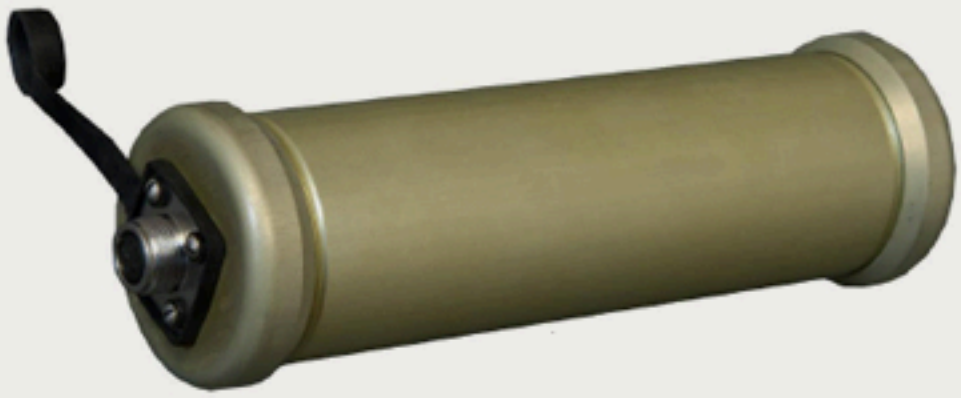

Fig. 5 Power pack

The front panel of the unit contains a female socket (1) marked ⊣⊢ for cable connection with the Electronic unit by means of Power cable (fig.6).
When the cable is disconnected, the socket must be covered with the rubber cap.

Fig. 6 Power cable

TARGET IMITATOR

Target imitator (test unit) is intended for the Detector workability control (fig.8).
It represents a plastic body with a built-in silicon HF-diode.

Fig. 8 Target imitator (test unit)

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HEADPHONES

Detector is supplied with dedicated headphones specially designed to be worn under a helmet (fig.9).

The headphones are connected to a corresponding socket of the Electronic unit by a cable with a plug.

Fig. 9 Headphones

CHARGER

Charger (fig.10) is intended for charging the battery of rechargeable cells of the Detector.

Front panel of the Charger contains:

1) Socket for connection with the Electronic unit;
2) 'ON/OFF' LED indicator with 'СЕТЬ' engraving ('СЕТЬ' (rus) = 'MAINS')
3) 'MODE' LED indicator (3) with 'РЕЖИМ' engraving ('РЕЖИМ' (rus) = 'MODE')
4 - Beep tone buzzer for 'end-of-charging' mode confirmation
5 - Socket on a back panel for power supply source connection (by means of a corresponding cable)
6 - AC-cable for coupling to the mains AC 90 ...242 V, 50/60 Hz
7 - DC-cable with 'crocodile' terminals for connection to DC 11 ...30 V source.

NOTE: Red terminal = 'plus'; black = 'minus'
Detector's Electronic unit, Power packs and Charger have splash-proof configuration with rubber gaskets and protective caps.

Fig. 10 Charger with cables

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OPERATOR BACKPACK

Fig.11 NR900EK3M in a backpack ready for operation

A dedicated backpack (fig.11) is used for placing Detector components on operator body at the time of practical operation.

MARKING

The Detector serial number is on the nameplate of Electronic unit near connector sockets.
Power pack serial number is located on the nameplate of the casing.
Charger serial number is located on the nameplate of the casing.

SEALING

Electronic unit, Power pack and Charger: works sealing are in hollows for a fastening screws of the units bodies.

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PRINCIPLE OF OPERATION

The Detector represents a pulse non-linear junction detector.
Its principal functional elements are as follows (see block diagram below):

- Antenna system (transmitting & receiving antennas)
- Probing signal transmitter,
- 2nd harmonic receiver,
- 3rd harmonic receiver
- Signal processor,
- Control board and display,
- Headphones

Transmitting antenna emits UHF pulse probing signal generated by transmitter.

When this signal encounters any non-linear junction like industrial semi-conductor or natural oxidized metal-to-metal contact, it is converted to its second and third harmonic.

These harmonic components are reradiated - better say “scattered” - to ambient space and are picked up by receiving antenna of the Detector.

After passing through 2nd and 3rd harmonic receiver circuits that signals are processed and presented in both visual and audible forms via two bar-graph LED display and headphones (supplied).

Detector has two output levels of a probing signal and three sensitivity levels of the receivers adjusted by means of control board.

Operational mode parameters and received signals levels are indicated by LED display.

The battery discharge is indicated by typical audio signal in the headphones and blinking ON/OFF switch LED

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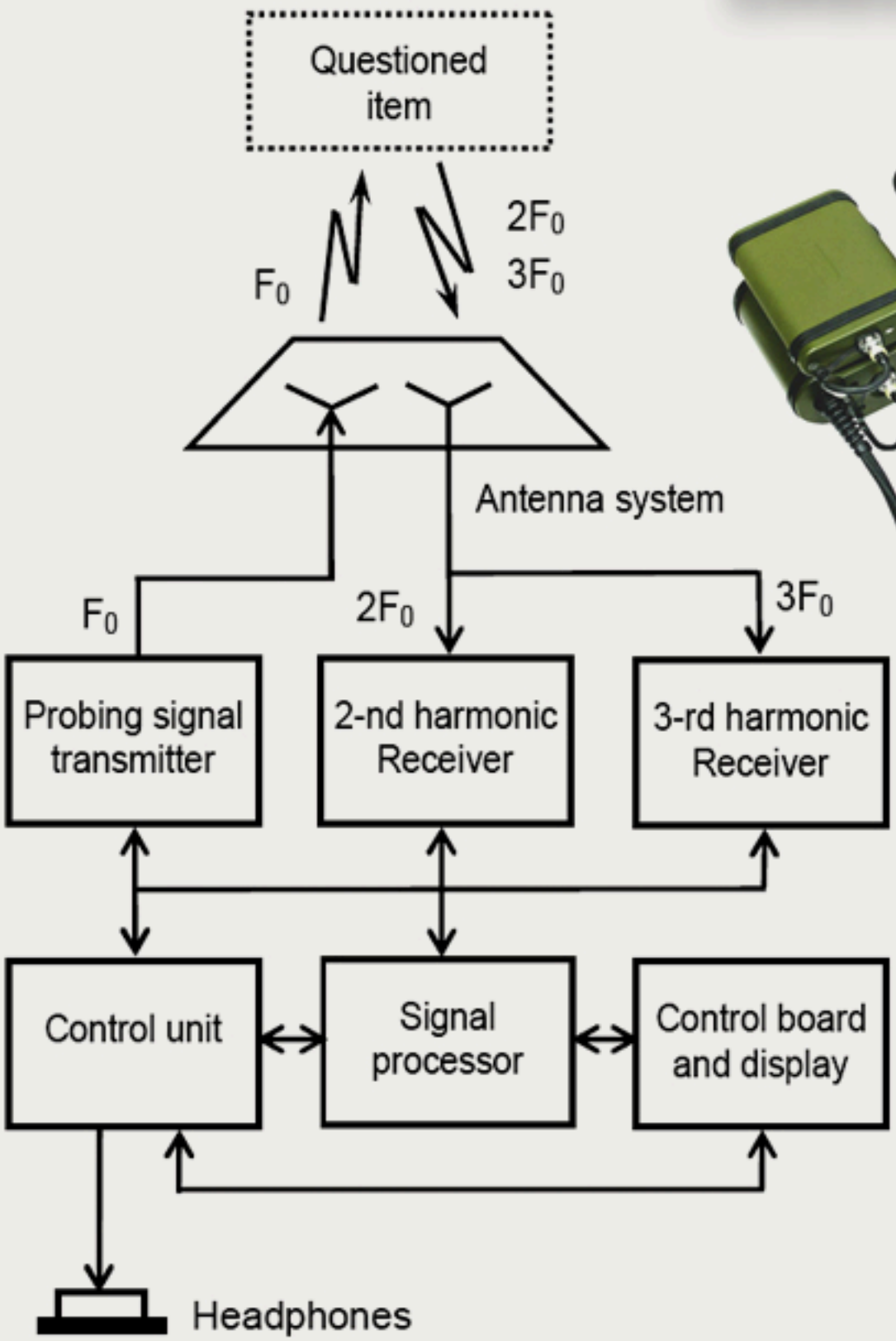

NOTE: Detector will switch off automatically after 20-30c unless Power pack with rechargeable battery will be replaces for a fresh one.

Detector workability is checked by means of target imitator (test unit).

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CAUTION

Electromagnetic interference (EMI) from existing power lines or outside radio transmitters may affect NLJD operation under certain conditions.
If EMI is obvious - adjust sensitivity and output power to reduce this influence.
If this cannot be done, stop NLJD use.

UNPACKING AND ASSEMBLY

1. Open Carry bag and take Detector and its accessories from it.

2. Carry out visual inspection of Electronic unit with Antenna head, their cables and connectors for possible damage and contamination as well as Operator backpack for breaks and tears.

3. Charge batteries of Power packs if necessary.

4. Connect Power pack and headphones to corresponding sockets of Electronic unit.

5. Place Electronic unit and Power pack in corresponding pockets of the backpack. Place spare Power pack just nearby so that in case of first battery discharge the power cable can be easily transferred to a fresh one.
NOTE: The same can be done with the pouch of primary cellscontainer.

6. Fix all components tightening the harness.

7. Put on backpack with Detector and adjust its belts and straps for operator convenience. Fasten locks and clips.

8. Put on headphones and take Antenna unit.

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ADJUSTMENT AND SETTINGS

1. Getting started, select an area free from false alarm sources: any electronic devices and metallic constructions with corroded contacts.

2. Press and hold ON/OFF button  to switch-on Detector. Red LED will light in confirmation. Initial setting will be activated automatically:
- Output power – minimal value
- Sensitivity – minus 10 dB (red LED -10 must light)

3. Press -10 button to set maximum sensitivity - red LED near the button will dye.

4. Press MAX button to set maximum output - red LED near the button will light in confirmation.
NOTE: Few LEDs of both bar-graph displays may blink randomly accompanied by sporadic audio reply in headphones.

5. Holding Antenna head at the level of your chest aim it to various directions and select one that produces the lowest response signal.

6. Check Detector operability with Test piece in a free air. Place Test piece in front of Antenna head at a distance of 0.5 - 0.7 m.
2-nd harmonic level indicator should display at least 6 red points together with distinct mid-level audio signal.

7. Make sure that approaching Test piece to Antenna head or moving it off provides a corresponding signal level alteration.
Moving Test piece aside from Antenna head will cause the total signal fall-out.

8. ON/OFF button  to switch off Detector.

Detector is ready for operation.

SEARCHING

CAUTION
Start searching operation from position not less than 20 meters from the area to be inspected. Keep antenna head at least one meter from the article or surface under control.

1. Switch on Detector

2. Adjust the maximum receiver's sensitivity mode (-10, -20 and -30 LEDs should be dead).

3. Direct Antenna head to the questioned area starting from the close proximity. Check the ambience scanning it from left to right step-by-step expanding the zone of inspection tilting-up Antenna head.

4. In case of the signal appearance locate its direction judging by the 2nd & 3rd harmonic bar-graph indication. If necessary decrease the receiver sensitivity pushing -10, -20, or -30 buttons.

5. If no interference were observed set MAX output mode confirmed by corresponding red LED on display and maximum receiver's sensitivity: -10, -20 and -30 LEDs are dark.

6. Start moving to the questioned area at a speed of 4-5 km/h holding Antenna head in a right or left hand at the level of your chest.

7. Inspect the area of interest by scanning Antenna head as if it is illuminated with an electric torch.

NOTE: When Detector is set to MAX output power, some red & green LEDs may blink irregularly.

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SEARCHING

8. When a target is found and Detector receives an increasing reflected signal indicated by bar-graph display – stop your forward movement.

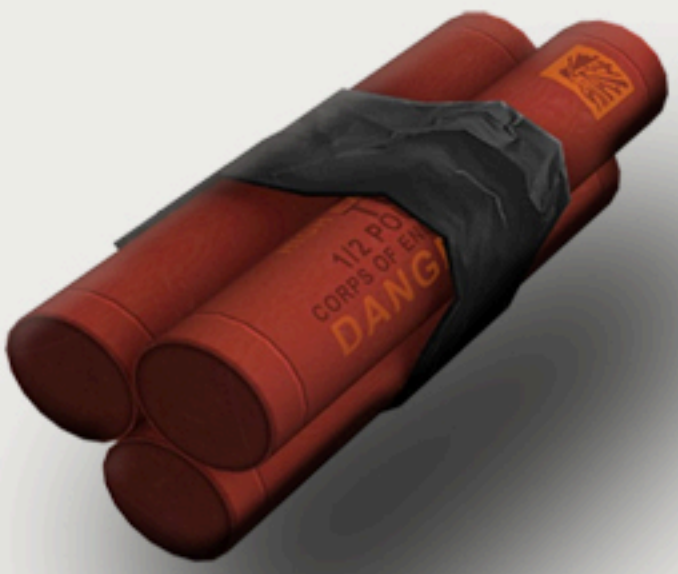
9. Switch-over Detector to its minimal output - push MAX button (a corresponding LED should die).

10. Referring to an input signal level (judging by LEDs and audio in headphones) aim Antenna head to the target and locate it.
Maximum signal level corresponds to a real direction to the target.

11. Perform small movements around the target until it will be located more precisely.

WARNING

To avoid accidental triggering of a target, reduce output power immediately after receiving a steady signal at a level of 20-30 dB (8-12 LEDs).
Locate the target only at a Minimum Output Power.
If necessary - use input signal attenuator (press -10, -20 or -30 buttons)
Never bring Antenna head closer than 1m to the target revealed!



NOTE:

Analyzing the data pay attention to 2-nd to 3-rd harmonic signal level ratio:
If the 2-nd harmonic level is 10dB higher than the 3-rd one (red LED quantity is greater-than 'greens' by 4 lights) – for sure the target encloses industrial semiconductor components and corresponds to electronic device.

If green scale (3-rd harmonic) is 10 dB greater than red one – the target, with the high probability, contains metal-to-metal contacts.

Every LED indication is accompanied by a corresponding audio signal in the headphones.

When the search operation is over, switch off Detector, take off operator backpack and put the device into the carry bag.

USEFUL HINTS:

When the battery run down (below 5.8 V) a warning audio signal will be heard in the headphones.

In this case:
- Switch Detector
- Disconnect flat battery
- Couple the fresh one
- Switch on Detector
- Continue searching.

Otherwise, Detector will turn off automatically within 20-30 seconds after the warning signal.

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PACKING

By the end of practical operation do the following:

1. Ensure that Detector is switched off.
2. Take off the backpack.
3. Disconnect the power cable from the Electronic unit and thepower pack.
4. Unplug headphones from the Electronic unit.
5. Pull Detector's units out of the backpack.
6. Check their condition, wipe them with rag if necessary.
7. Cover all sockets with rubber caps.
8. Put Detector's units in to the backpack
9. Check Antenna module.
10. Put Detector's components in to the carry bag and fasten it.

BATTERY CHARGE

CAUTION

The battery charging is carried out in an automatic mode.
Use only dedicated Charger supplied with the set.
The usage of non-recommended chargers could result in a battery degradation.
The battery charging should be done solely under ambient positive temperature

The charging time is not more than 5.5 h and depends on the battery discharge level.

1. Connect the Charger to the power source:
   - Use AC cable for connection to the mains 90 …224 V 50- 60Hz;
   - Use DC cable for connection to DC 11…30 V source: 'Red' crocodile to '+' (positive) terminal, 'Black' crocodile to '-' (negative) terminal.

2. LED 'СЕТЬ'= 'MAINS' will light in confirmation (while LED 'MODE' ='РЕЖИМ' is dead) - the device is do connected to the power source.

3. Connect the Power Pack to the Charger. Within 10 s LED 'MODE' ='РЕЖИМ' will light red. By the end ofcharging the LED turns to green, beep tone buzzer is activated and the charging itself is terminated.

NOTE 1:

If after 5.5 h the LED 'MODE' = 'РЕЖИМ' starts blinking with red accompanied by the beep (at that the audio tone is higher than it happens by the end of normal charging) this indicates that the battery is out-of-order and not charged.

NOTE 2:

If within 20 s after connecting the Charger to the Power pack and a power source the LED 'MODE' = 'РЕЖИМ' is dead this indicates that the battery is out-of-order or of a wrong type.

4. By the end of charging disconnect Charger from the power source and the Power pack from the Charger.

CARE AND MAINTENANCE AFTER USE

1. Clean the equipment with a wet rag and let it dry.
2. Check the equipment for possible damage.
3. Charge the batteries if necessary.
4. Check Detector workability
5. Check the presence of every component and pack them in the carry bag.
6. Report any faults and deficiencies.

TROUBLESHOOTING GUIDE

Malfunction description, its obvious display and add-on indications	Possible cause	Fault removal
After switching on manipulations Detector is in 'OFF' mode	Battery is flat	Replace Power pack for a fresh one
Switch-on LED indicator is dead	Power cable failure	Change the cable for a spare one (supplied)

If all attempts to recover Detector failed – call the device supplier for repair.

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TRANSPORTATION

1. Detector can be transported in a cabin of any transport vehicle with the exception of unpressurized cabins and compartments under the ambient temperature from minus 40° C up to +60° C without restriction on transportation range and shipment number

2. Detector in standard packing can be stacked on any platform in no more than two layers being fixed to prevent shift aside or up.

3. While being transported on open trucks, Detector should be provided with a weatherproof cover.

STORAGE

For a long storage check Detector workability, charge rechargeable batteries, pull primary cells out of their container.

Detector should be stored in its carry bag under following conditions:

1. in covered environmentally controlled warehouses under the temperature from plus 5ºC to plus 15ºC and relative humidity not more than 40% (under plus 15ºC) – up to 5 years (without replacing the batteries);

2. in warehouses that are not environmentally controlled under the temperature from minus 30ºC to plus 50ºC and relative humidity not more than 95% (under plus 35ºC) – up to 3 months;

3. under the temperature from minus 40ºC to plus 60ºC – up to one week.

NOTE: Avoid any traces of acid & alkali vapor or other aggressive substances in the warehouse premises.

NR-900EK3M (EAGLE) designed for Detection of mines and explosive device with electronic fuses (activation system) concealed on the ground surface, slightly in the ground (snow), under the road pavement and within various facilities.

DETECTS:

- communicational transmitters & receivers as well as alarm and remote control system facilities;
- electronic and electromechanical timers;
- acoustic, magnetic, optoelectronic sensors and midget TV cameras;
- built-in metal-ware as well as hidden machinery and appliances;
- domestic electronic units and alpine skiing in snow traps.

APPLICATION:

- roads, terrain and objects inspection for mines, improvised explosive devices (IED) and other explosive appliances with electronic components
- searching for hidden caches with weapons, ammunition, explosive devices & communication facilities
- questioned items investigation, searching for subversive and terrorist devices and arrangements

ADVANTAGES:

- extended detection range
- electronic facilities localization in any operational mode: active, 'stand-by' or even switched off installed behind walls, fences, etc.
- equipment design allows its usage in tactical airborne missions
- efficient use in search/reconnaissance missions
- high searching rate
- safe to handle, user-friendly design
- extended continuous operational time without battery replacement
- long-term operation facility in field conditions

TECHNICAL INFORMATION

Probing signal:	Pulse
Receiver:	2-channel (2nd and 3rdharmonic)
Output power (average / peak):	0.15W / 200W
Visual / Audio Indication:	LED-display / Headphones
Power supply:	Ni-Cad battery, 6V/7Ah
Start-up time:	Not more than 5min
Continuous operation time with one fresh battery (under normal environmental condition):	Not less than 8 hours
Operation temperature range:	-30ºC…+50ºC
Weight (ready for operation/in standard packing):	5.1kg/12.0kg

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