

## **DN-II Radar Life Detector Instruction**

## **Operation**



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## Introduction

Dog Nose (DN) Radar Life Detector is a high-tech life-saving equipment integrated micro-power ultra-wideband radar technology and biomedical engineering technology. It improved the quality and efficiency of the rescue task which applied to the earthquake, landslides, accidents and other emergency.

It analyzes the Time-domain Doppler Effect generated by radar echo when human motion to ascertain the existence of life and its specific location. It adopted vital signs extraction techniques of Ultra-wideband radar and non-contact feature to penetrate non-metallic media (clothes, walls, ruins, floor, and other coverings, etc.) without any electrodes or sensors to contact with beings. It detectesthe vital signs (breathing, heart rate, body movement) in the far distance and measures the distance from the location buried the body accurately.

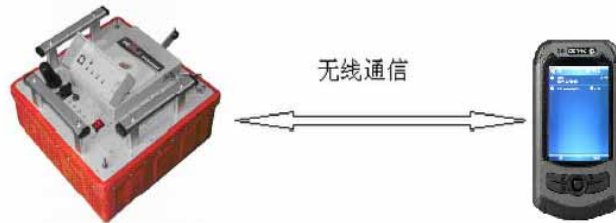
DN-II radar life detector overcomes the existing inherent technical flaws on othersss such as audio, optical, infrared life detector.It can detect the specific location of trapped persons as soon as possible, and is not affected by the ambient temperature hot objects , sound disturbances, and the geographical conditions and the trapped state (injuries, coma, etc.).Especially under the cuccumstance of strong noise of disaster field, it could help to analyze and ascertain the survivors quickly and efficiently. It is important to reduce the blindness, workload of rescue, and improve rescue efficiency.

DN-II radar life detector is the Key scientific research projects of 2009 of Administration Ministry of Public Security, and is made by Hunan Fire Services Department and Hunan Novasky Electronic Technology. It is the first life detecting equipment made by China. Now we have ourown Technology and IP of the life detector, its function can be comparable with foreign related products. Combine to reality, we did some unique designs, and the product's solid structure, easy to operate and fully functional. The DN-II radar life detactor have been identified through the national scientific and technological achievements and the fire detection certification.

DN-II radar life detector consists of radar host and PDA. Radar host transmits and receives electromagnetic wave and

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detects echo signal. PDA control the operation of User terminal monitoring software. As Interaction Platform of operator and radar equipment, User terminal monitoring software receives the target message detected by the radar for operator Real-time observing. In the meantime, it delivers control command and status information to radar host, and operator could implement real-time monitorin of wireless swithing of radar mode and its working status. shown in figure 1.



*Figure 1 hardware of DN-II radar life detector*

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## Life detecting

### 1. Parameter setup

#### a. Preparation:

Put the battery fully charged into the slot behind the life detector, and then close the battery cover. Make sure PDA is fully charged, and setup the right date and time.

b. Open the radar host, press power button, the blue power light is on. About 60 seconds later, the red light is on. It shows the radar host has finished self-checks and is ready.

Turn on the PDA, if the “Wi-Fi” shows “关闭”, please turn on the wireless monitor, and click “菜单” → “Wi-Fi 设置”, connect the Wi-Fi to novasky\*\*\* net. \*\*\* stands for the No. of DN-III or DN-II radar life detector. Press “完成” button and back to main interface. Figure 2 shows the interface after setting the wireless network successfully.



Figure 2 the interface of wireless network setting successfully

c. Click start of PDA, and then click the icon of the DN-II or DN-III, start the user terminal control software of radar life detector. Now, there's a status bar with a small red moving square, as in figure 3. When you click the option button of “连接到,” radar host and PDA start connecting. When the status bar turns to green, it

means the connection is ready, as figure 4. after the connection, the green light on the radar host is on. Then the blue , red, and green light are all on.



Figure 3 main interface



Figure 4 connection diagram

d. Before detecting, parameter should be setup according to the real detecting environment. Click “参数设置” on the main interface, shows the interface of parameter setup, likr figure 5.



Figure 5 parameter setting interface

- ✧ Mode detecting: one-dimensional ranging, two-dimensional imaging, two options
- ✧ Range of detector: 1,2,..... , 9,10,15,20,25,30 ( unit: meter)
- ✧ Level of sensitivity: high, low, 2 levels. High level is the default.

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- ✧ Media Compensation: air, phasing, ruins, 3 medium. When detected under different environment, related detecting media should be selected to provide the compensation to improve the accuracy.
  - ✧ After setuping the parameter, click the button of “设定” , back to main interface.

## **2. One-dimensional distance detecting mode**

After selecting one dimension distance detecting, it'll show the interface of parameter setting, as figure 6. click button “确定” , then operating interface turns out, as figure 7. Distance scale of detecting moving objective is on the left side of blank areas, and a elapsed time clock is on the bottom-right of the screen. In the upper right corner of the screen appears the name of the current data file. Red circle stands for breathing signal, and black square satands for moving signal. As the red circle and the black square increase, the certainty of detection of the target increases.

Software interface on the title bar displays the status of the two batteries (the narrower rectangle connected to the power indication of PDA, the wider rectangular connected to the power indication of radar host).

Only PDA and radar host connected successfully, the power indicator of host radar will be lighted. Blue means the battery level, red means the expired level, green means on external power.

Click the button “停止” or “OK” , and stop the detecting target. Meantime, the detecting data is stored in the memory of radar host and PDA.



Figure 6 interface of setting parameter

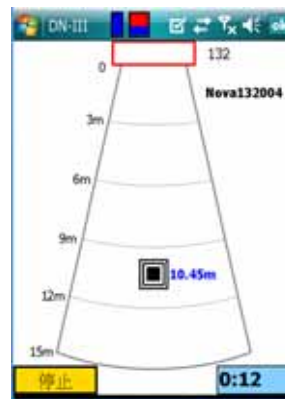


Figure 7 operating interface

### 3. Two-dimensional image detecting mode

If there is target under the one-dimension distance detecting mode, you could select the two-dimensional image detecting mode to location objects. Two-dimensional image detecting mode can only detect the straight and the departure distance between radar host and target, which lead to the Cartesian coordinates of target direction to radar axis. Measurement steps are as follows:

- Click “运行”, enter the interface of parameters setting, select “二维成像” as detecting mode.
- Click “确定” to display the two-dimensional imaging interface, and it is similar with the one-dimensional distance interface, as figure 8. Start the first detection. When the respiratory signal of target exceeds a certain threshold, the upper red square turns to green, and display a curve with center at the square, and the distance and the respiratory frequency showed on the bottom of the interface, as figure 9.
- Move radar host, click “移动步长” on the bottom-left, enter the distance traveled of radar host, click OK. Corresponding to the actual traveled distance, as figure 10. then the button of imaging

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appears. Click “成像” , start the second detection, as figure 11.

d. When the respiratory signal of second detection exceeds a certain threshold, as figure 12, the upper right red square turns green, and draw a curve with center at the square. The first curve and second curve intersect at one point, and get the offset distance between target and radar host, as figure 13.

e. Steps above finished an imaging operation. Click the button of moving steps and start the re-imaging operation. Then complete the same steps as above.

f. Stop: click “停止” or “OK” and return to the main menu.



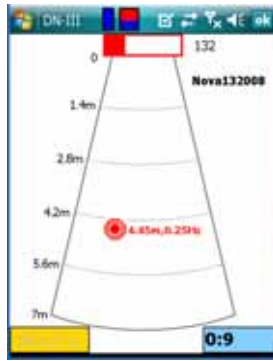


Figure 8 Two-dimensional imaging interface —first detection

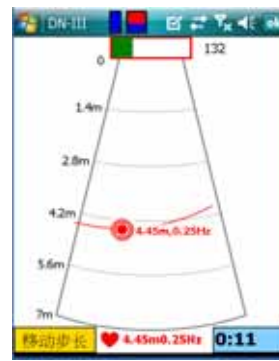


Figure 9 Two-dimensional imaging interface—finish first detection

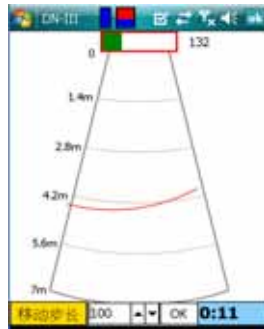


Figure 10 setting interface of moving steps

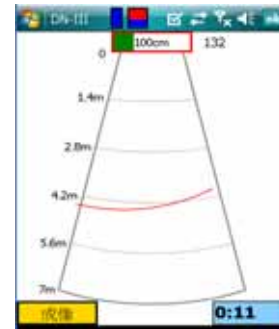


Figure 11 Two-dimensional imaging interface—the second detection

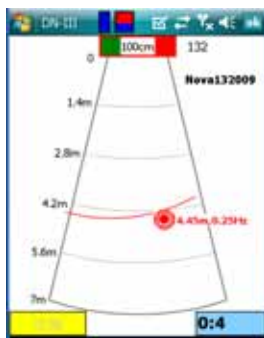


Figure 12 Two-dimensional imaging interface—during the second detection

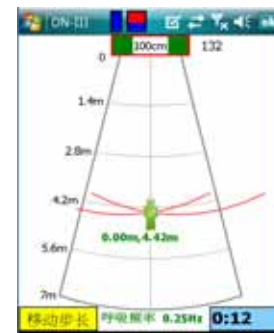


Figure 13 Two-dimensional imaging interface

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## Target replay

Click on the main menu under "target playback" menu, pop-up file selection window, with hand-held terminals "up / down" navigation key to select the document, press the "confirm" key to play the file, or from the screen, click on the appropriate file, click "Playback" button to play the file

Click “目标回放”button under main menu, show file selection window, select file through “上/下” navigation key on the PDA. Click “确认” to play files, or click relating file on the screen and click “回放” button to play it. As figure 14.



Figure 14 List files of target replay

The interface of target replay is similar to operating interface. After replaying, click “OK”to the file selecting window, and select another file needed or re-click “OK”to return to main menu.

## Expert mode

Click “专家模式”, or select “专家模式”through the “上/下”navikey in the main menu, then click “确认”and enter the interface of expert mode. As figure 15.

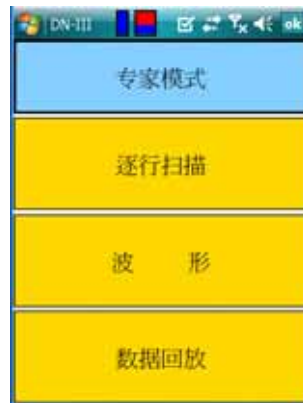


Figure 15 interface of expert mode

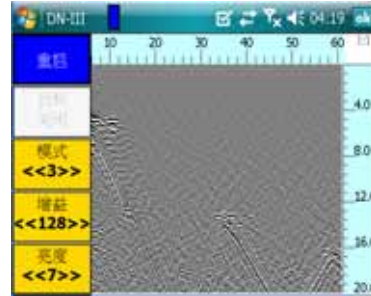


Figure 16 interface of line by line scanning

- a. Line by line scanning: observe the radar real-time data. Screen rotated 90 degrees to show data clearly. As figure 16.
- b. There is the distance scale of radar echo signal in the right side of display area.
- c. Options for users is on the left of the display area.
  - ✧ Restart: end this search cycle and start the next search process.
  - ✧ Mode : There are 5 Mode to select. mode 3 is recommended.
  - ✧ Gain-dBi: The adjustment range is 1 ~ 256. It depends on the loss of electromagnetic wave against to the material under the detecting circumstance.
  - ✧ Then compensate the loss. Generally the compensation is not higher than 64.
  - ✧ Brightness: the increase/decrease of brightness of the background.

d. Data replay: replay the old radar data. Like the usual replay mode, selecting window turns out; select the file needed to replay by the same method.

Only download the data collected by the host through the scanning mode to PD it can replay. Detailed steps refer to download file, Appendix B.

Similar to line by line scanning mode, restart, mode and Gain-dBi are options and the other option controls the speed between 1 (lowest) to 5 (fastest).

Data collected in normal mode could replay in expert mode. Turn on “目标打开/关闭”, then display the round or square icon on the radar data. There is no relating replay file when data collected in expert mode. So the button of “目标打开/关闭” is grey, prohibited for use.

- ✧ Waveform: waveform interface shows radar waveform, as figure 17.
- ✧ Click “OK” to expert mode interface.
- ✧ Click “OK” to main menu.

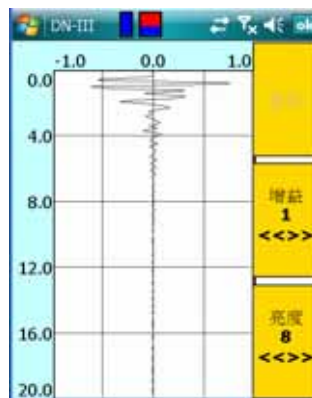


Figure 17 wave form interface

## Shutdown radar host

In case of a failure occurs to radar host, quitting operating system of radar host first, then Soft poweroff.

a. Shutdown operating system of radar host: click “雷达关机”on the main interface of the PDA, showed messagebox “请确认雷达是否关机！”, as figure 18. click “否” to cancel the operation, and click “是”to shutdown the radar host. There is 30 seconds countdown balloon of “否”for shutdown. Until it reminds shutdown radar safely, and only the blue light of the radar host is on, it could be shutdown safely, as figure 19.



Figure 18 Shut Down dialog fo radar host

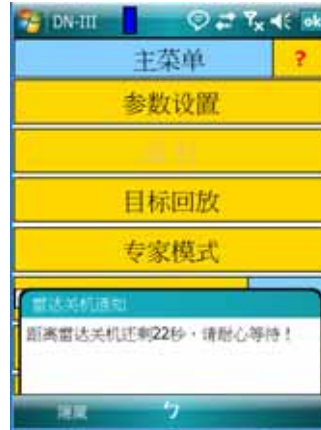


Figure 19 countdown interface of shutting down radar host

b. Shutdown PDA: Press the power button on the bottom of the PDA, turn off it. Shut off the PDA power should operate in the Windows Mobile interface; it can't be shutdown when it is still operating. Press power button for 3 senconds and system sounds a tone off, the PDA is shutdown.

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## Appendix A Directions for battery

Check the power level of host. There is window to display the battery level near the handle, as figure 20. Different number of cells representing different battery status:



Figure 20 battery

- ✧ 5 cells——100%
- ✧ 4 cells——80%
- ✧ 3 cells——60%
- ✧ 2 cells——40%
- ✧ 1 cell——no more than 20%

Re-charge when one cell power left only before using.

Recharge PDA: put the plug into the bottom of the PDA, and then put the charger into outlet. There're kinds of connectors for option. Charging time is 2 to 3 hours usually. During the charging the third yellow light on the upper left is on, the light turns green when finished.

Recharging radar host:

Put the battery into the charger slot and slot alignment carefully. The charging time is not beyond 4 hours. The left green light is flashing during the charging process. If the right red light flashed means battery needs to be calibrated. Inserte the battery in the cradle

Calibrate according to the middle of the calibration key. The blue light flashing menas doing calibration, blue light stopping flashing

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means calibration finished.

Battery status icon: PDA showed the battery level of itself and the radar host when the system is running.

The narrow rectangular on top left stands for battery level of PDA, the wider rectangular stands for that of radar host.

- ✧ The icon is all blue means fully charged
- ✧ Most of the icon is red means the power is going to run out
- ✧ Green means using external power currently.



*Figure 21 battery level indicating bar*

**Appendix B Data and software maintenance**

When the data and software need to maintain, click the “维护” button to maintaining interface, or select “维护”button through “上/下”navikey and click “确认”button, as figure 22,then click the “是”button to enter maintaining mode, as figure 23.



Figure 22 enter maintaining interface      Figure 23 maintaining operation

**1. Deleting data**

There’s numerous data files stored in the radar host and PDA after longtime running. The files in the memory in the radar host and PDA need deleting when the storage capacity is not enough.

- a. Deleting files in the radar host: first, make sure the connection is established between radar host and PDA. Click “删除数据”in the “维护”menu, then select “雷达主机”as the “请选择删除数据对象!”dialog box appears to enter the data deleting interface of radar host. Right now figure 24 shows the storage files of radar host.
- b. Select the files need to delete or click “全选”, select all files.
- c. Click “删除”, select “是”when dialog box appears, and delete the specified files. PDA returns to maintaining menu automatically after deleting. If select “否”, then the delete operation is abandoned, as figure 25.





Figure 24 storage interface



Figure 25 storage cleaning interface

d. Deleting files in the PDA: click “维护” and select the “删除数据” option, then select “手持终端” when “请选择删除数据对象!” dialog box appears to enter the data cleaning interface of PDA. Right now the files list shows the storage files of PDA.

- ✧ Select files need deleting or click “全选” button, select all files.
- ✧ Click “删除” button, select “是” option, deleting specified files. PDA return to maintaining menu automatically after deleting. If select “否”, then the delete operation is abandoned.

## 2. Downloading files

All data is stored in the radar host. it need to be downloaded from radar host if the data have to deliver to PDA. Operations are as follows:

- a. Click “维护” menu and select “是” when the dialog appears, then enter the maintaining interface.
- b. Select “下载数据” option.
- c. Enter downloading interface, as figure 26. select the files need to download or select “全选” button, select downloading all files.

d. Select “下载”, and the progress bar in the bottom of the interface shows the files downloading speed currently. When all the selected files are downloaded, a dialog box “文件下载完毕!” will appear, as figure 27. ckech it and return to previous menu screen.



Figure 26 data downloading interface

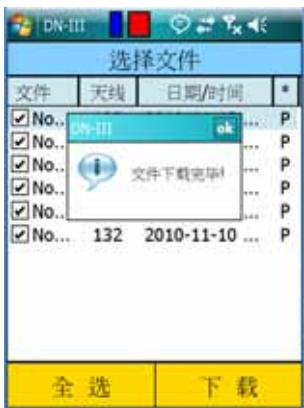


Figure 27 data loaded

3. Data remote uploading

To detect target accurately expertise is needed under the complex circumstance in the field. Experts analyze according to field data remotely could make result more accurate and improve the field saving efficiency.

DN possessed expert analysis system with remote support capabilities and established Remote Professional Support Center. It provides the most complete data analyzing function by cloud computing platform. Remote experts’ analysis needs uploading detecting data to remote cloud computing platform with experts support. There are two methods.

Method 1： entered with software

Click “维护”menu select “是” and enter the maintaining interface. Select “上传数据”option, enter “上传数据导航”. There’re several methods of uploading data to remote cloud computing platform

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with experts support directly or indirectly. (1) Transmitting data to networked computers with ActiveSync software through USB data access. (2) Log in [www.sinoradar.com](http://www.sinoradar.com), click remote cloud computing platform and transmit data. (3) Make use of the 3G function of the PDA, transmit data to the email: [service@novasky.cn](mailto:service@novasky.cn). In the meantime dial the free hotline: 400-7058-600 to the Expert Hotline Q & A.

Method 2: enter by operating system

Quit the software of the PDA. Select “开始” → “资源管理器”, enter MyDocuments>DogNose>Download menu. Select relating data files and transmit data to remote cloud computing platform directly or indirectly. (1) Transmitting data to networked computers with ActiveSync software through USB data access. (2) Log in [www.sinoradar.com](http://www.sinoradar.com), click remote cloud computing platform and transmit data. (3) Make use of the 3G function of the PDA, transmit data to the email: [service@novasky.cn](mailto:service@novasky.cn). In the meantime dial the free hotline: 400-7058-600 to the Expert Hotline Q & A.

#### **4. Software upgrading**

When the system needs upgrading, the software can be upgraded to radar host through software upgrading, avoiding open host radar. Steps as follows:

- ✧ Download or copy the software need to upgrade to folder MyDocuments\Dognose\FIREWARE
- ✧ Enter the maintaining interface and click “软件升级” button.
- ✧ Select the right newer file, click “升级”; after uploading the file, the software upgrades automatically.

## Appendix C maintaining hardware

Turn off radar host and restart it again when radar searched for a long time or PDA can't connect or connect in error. If the same mistake appears again, quit the life detector and restart again.

1 GB storage capacity could store over 50 hours detecting data. If the storage is full the system will be paused. System recovers when user deletes data manually. Deleting data regularly could avoid the system problem.

Because we don't know the particular time of the emergency, we should learn how to operate the life detector and charge it regularly. we should check the battery of the radar host and PDA when emergency come. Low power may lead to wrong data or can't function properly.

When you meet the difficulties, please describe the symptom and contact technical staff of our company.

If you need to change the parameter of radar host, click “维护”button and enter the maintaining interface, or select “维护”by “上/下”navikey and click “确认”, as figure 28. select “是”enter maintaining mode when dialog appears, as figure 29.



Figure 28 enter maintaining interface      Figure 29 maintaining operation

Select “雷达主机”through “上/下” navikey or click “雷达主机”directly. Click the number you want to change and you can change the serial number of radar host. Modify the 2<sup>nd</sup> and 3<sup>rd</sup>

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number with the same way. Then press “OK”button and back to main menu interface.you’ll see the serial numbers of radar host have been changed through the main interface of PDA.

Warning: The operation above is prohibited if no exceptional circumstances appear. Or it may cause radar host and PDA disable.

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#### **Appendix D daily service**

In order to make sure the life detector works safely, users should do daily service. The method is as follows:

If there's a long period of storage of the radar host and PDA, Batteries should be taken out.

Clean the surface of radar host and PDA with clean cloth and put them into the special equipment box after completed use.

The special equipment box with radar host and PDA should be put in ventilated, dry environment.

If the battery is not used for a long time, it should be recharged when recharging.

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## **FCC STATEMENT**

1. This device complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
  - (2) This device must accept any interference received, including interference that may cause undesired operation.
2. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

### **FCC ID: ZIXDN-XXX**

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.



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