FS Future Series

3D Ground Navigator

Version: 2

User's Manual

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Introduction

1.1 Preface

Dear customer,

all of the engineers, sales, training and support staff at OKM GmbH would like to thank you for your purchase of the 3D Ground Navigator.

The 3D Ground Navigator detector works on the principle of Electro-Magnetic Signature Reading (EMSR). Besides the detection of metallic objects this device is also capable of detecting natural features of the earth like formations of strata, cavities, voids, faults, ground water and other non-metallic objects. Then of course this equipment is best suited at detecting sepulchers, treasure, buried utilities, tanks and the like.

The 3D Ground Navigator is able to locate, document and analyze buried objects within various structures and vessels non-intrusively without having to excavate the area. Using EMSR is particularly useful in areas where detection is a must and excavation is not possible. The facile and flexible handling of the 3D Ground Navigator can easily and quickly give reproducible results.

With our team of specialists we guarantee that our products are under recurrent control. Our specialists try to implement new developments in terms of further quality improvements for you.

By purchasing or using one of our products, we cannot guarantee that during the course of your research that you will be successful and have a find. The recognition of hidden and buried objects depends on a huge number of factors. As you well may know there are different soil types all over the world with different levels of natural attenuation. Variable soil properties can and will hamper and alter ultimate scan measurements. Areas where there is an extreme amount of ground water, varying clays, sands and wet soils making scanning more difficult and may reduce the maximum depth capabilities of any and all detection equipment, regardless of make or model.

For more information regarding where this equipment has been used and operated, please visit our web site. Our equipment is constantly being tested and when improvements or upgrades are available, we will list them also on our web site.

It is necessary for our company to protect our developments and all of the information learned during the “Research and Development” phases in creating our technology. We strive to stay within the given framework of legislation, patents and trademark registration.

Please take your time to read this User Manual and familiarize yourself with the operation, functionality and how to utilize the 3D Ground Navigator. We also offer training for your equipment in our factory and on-site. We strive to maintain worldwide dealer network for assistance and support. Please visit our web site for more information.

1.2 Important Notes

Prior to using the 3D Ground Navigator and its accessories, please read these operating instructions carefully. These instructions give information on how to use the detector and potential sources where precautions should be taken.

The 3D Ground Navigator and its accessories serve for the analysis, documentation and detection of sub-surface anomalies and ground disturbances. The recorded data of the ground structure will be transmitted to a PC to give a visual representation using our proprietary software program. Any additional notes to the software should be observed. Please read the user manual of the software!

1.2.1 General Notes

Being an electronic device, the 3D Ground Navigator has to be treated with caution and treated with care as with any electronic device. Any failure to observe the safety precautions given or any use for purposes other than the ones it is designed for may result in damage or destruction of the processing unit and/or its accessories or connected components.

The device has a built in anti-tampering module which will destroy the unit if it is improperly opened. There are no end user serviceable parts on the inside of the unit.

1.2.2 Possible Health Hazards

If used properly this device normally does not pose any health hazards. According to current scientific knowledge, the high-frequency signals are not harmful to the human body on account of their low power.

1.2.3 Surrounding Area

When moving this unit from a cold place to a warmer place, watch out for condensation. Do not immediately operate the unit until any possible condensation could have evaporated. The unit is not weather proof and water or condensation can destroy the unit.

Avoid strong magnetic fields, which may occur in places where there are large electric motors or unshielded loudspeakers. Try to avoid using this equipment within 50 meters (150 ft) of this type of equipment.

Metallic objects on the ground such as cans, tin, nails, screws or debris can influence your scan data and present negative results regarding your scan data. Also it is a good habit to remove any metallic objects off of your person like cellular telephones, keys, jewelry, etc... Do not wear steel toe boots.

1.2.4 Voltage

The power supply should not be outside the indicated range of values. Use only approved chargers, batteries and rechargeable batteries which are included in the scope of delivery.

Never use the 115/230 Volt mains supply.

1.2.5 Data safety

Data errors can occur if:

- the range of the sender module has been exceeded,
- the power supply of the device or the batteries are too low,
- the cables are too long,
- the unit is operating to close to devices which sends out disturbances or
- atmospheric conditions (electrical storms, lightning, etc...).

1.3 Maintenance and Services

In this section you will learn how to maintain your measuring instrument with all included accessories to keep it in good condition a long time and to get good measuring results.

The following list indicates what you absolutely should avoid:

- penetrating water
- strong dirt and dust deposits
- hard impacts
- strong magnetic fields
- high and long lasting heat effect

To clean your device please use a dry soft rag. To avoid any damage you should transport the device and accessories always in the appropriate carrying cases.

Prior to using your 3D Ground Navigator please be sure that all batteries and accumulators are fully charged. Also allow the batteries to completely discharge before recharging them, regardless if you are working with the external battery or with internal accumulators. This way your batteries will have a long and durable life.

To charge the external and internal batteries, use only the approved chargers which are part of our scope of delivery.

1.4 Danger of Explosion during Excavation

Unfortunately, the last two world wars also made the ground in many places of the world a potentially explosive scrap heap. A host of those lethal relics are still buried in the ground. Do not start digging and hacking for an object wildly when you receive a signal of a piece of metal from your device. Firstly, you might indeed cause irreparable damage to a truly rare find, and secondly, there is a chance that the object reacts in an insulted way and strikes back.

Note the color of the ground close to the surface. A red or reddish color of the ground is an indicator of rust traces. As regards the finds themselves, you should definitely pay attention to their shape. Curved

or round objects should be a sign of alarm, especially if buttons, rings or little pegs can be identified or felt. The same applies to recognizable ammunition or bullets and shells. Leave that stuff where it is, do not touch anything and, most importantly, do not take any of it home with you. The killing machines of war made use of diabolical inventions such as rocker fuses, acid fuses and ball fuses. Those components have been rusting away in the course of time, and the slightest movement may cause parts of them to break and be triggered. Even seemingly harmless objects such as cartridges or large ammunition are anything but that. Explosives may have become crystalline over time, that is, sugar-like crystals have formed.

Moving such an object may cause those crystals to produce friction, leading to an explosion. If you come across such relics, mark the place and do not fail to report the find to the police. Such objects always pose a danger to the life of hikers, walkers, farmers, children and animals.

Chapter 2

Technical specifications

The following technical indications are medial values. During operation small variations are quite possible. Technical changes due to development are possible!

2.1 Control unit

Dimensions (H x W x D) ..... 180 x 230 x 120 mm
Weight ..... approx. 1.2 kg
Protection Class IP40
Operating time (internal battery) ..... approx. 24 hours
Charging time (internal battery) ..... approx. 3 hours
Input (charger socket) ..... 19 VDC / 0.6 A (max. 24 VDC / 0.5 A)
Operating time (optional Power Pack) ..... approx. 48 hours
Input (optional Power Pack) ..... 12.5 VDC / 0.9 A (max. 24 VDC / 0.5 A)
Processor / Main CPU ..... Cortex M3, 32 MHz
Processor / Slave CPU ..... Cortex M0, 24 MHz
Display ..... 3.5” Resistive touch, 480 x 320 Pixel
Display CPU ..... Cortex M3, 32 MHz, 128 KB RAM
Data memory ..... 4 GB
Sample rate ..... 1024 values / second
Measurement resolution ..... 16 bit
Operating temperature ..... -10 – 60 °C
Storage temperature ..... -20 – 70 °C
Audio ..... Internal speaker / Bluetooth
Air humidity ..... 5 % – 75 %
Waterproof ..... No

2.2 Wireless data transfer

Technology ..... Bluetooth
Frequency range ..... 2.4 – 2.4835 GHz
Maximum transfer rate ..... 1 Mbps
Receiving sensitivity ..... -85 dBm
Maximum range ..... about 10 m

2.3 Super Sensor

Length ..... 850 mm
Diameter, Shaft / LED Orbit ..... 50 mm / 65 mm
Weight ..... 0.85 kg
Sensor technology SCMI-15-D

2.4 Computer, minimum requirements

The indicated technical parameters should help you to choose of a suitable computer to analyze your measured scan data.

CD-ROM drive (internal or external) ..... min. 4x
Interface (data transmission) ..... USB
Free disk space ..... min. 50 MB
Working memory (RAM) ..... min. 256 MB
Graphic card ..... min. 128 MB, OpenGL-compatible
Operating system ..... Windows 7, Windows 8, Windows 10

Chapter 3

Scope of delivery

In the following section you can find all standard equipment and optional parts of 3D Ground Navigator. The scope of delivery can be different in some circumstances because of some optional accessories which are not included in the basic equipment.

Description	Quantity
Control unit with carrying strap	1
Bluetooth headphones	1
Super Sensor with LED orbit	1
Software "Visualizer 3D"	1
Charger for control unit	1
Bluetooth dongle	1
Carrying case	1
User's manual	1
Carrying tube for Super Sensor	1
Power Pack	optional

Table 1: Scope of delivery

Chapter 4

Data transfer via bluetooth

In this section you will learn how to install the bluetooth software on your computer. This software is necessary to transfer all measured data from your 3D Ground Navigator to the computer.

4.1 Installation of bluetooth software

In the first section of this chapter it will be explained how to install the bluetooth software. Please note that the represented figures do not necessarily correspond to the current version of your operating system or the version of usb installation.

4.1.1 Install software and driver

The bluetooth software is situated on the software CD which is included in the scope of delivery. Place the CD inside the CD Rom drive of your computer and wait until a window like shown in figure 4.1 appears.

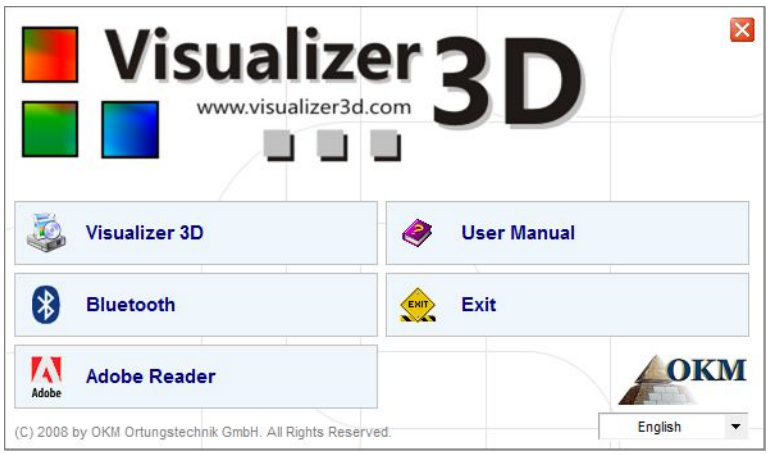
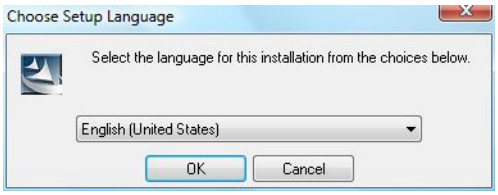


Figure 4.1: Start screen when inserting in the software CD

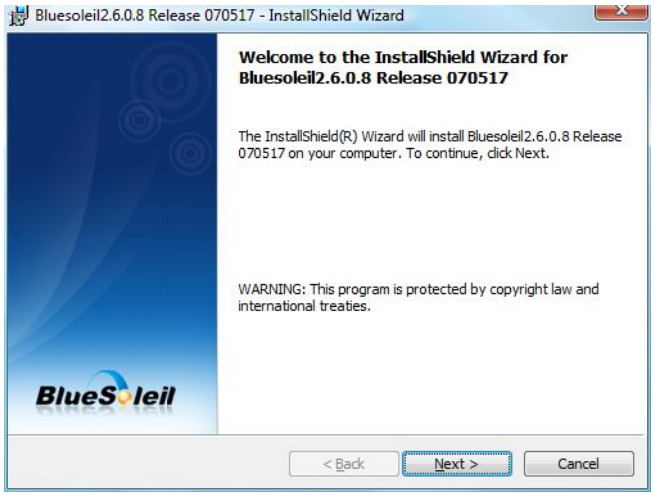
Click on the entry *Bluetooth*, to start the installation of the bluetooth software and follow the instructions on the screen of your computer, like it is explained in the following steps.



Step 1

Select the language and click on the button "OK".

Figure 4.2: Installation of bluetooth software, step 1



Step 2

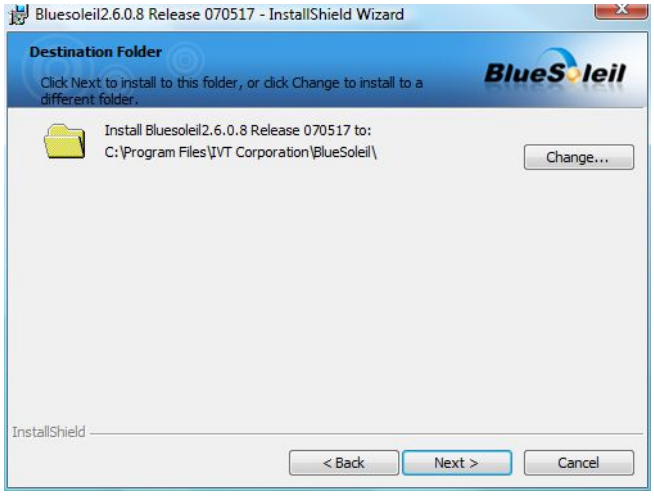
Click on "Next >".

Figure 4.3: Installation of bluetooth software, step 2

Step 3

Mark the entry "*I accept the terms in the license agreement*" and after that click on "Next >".

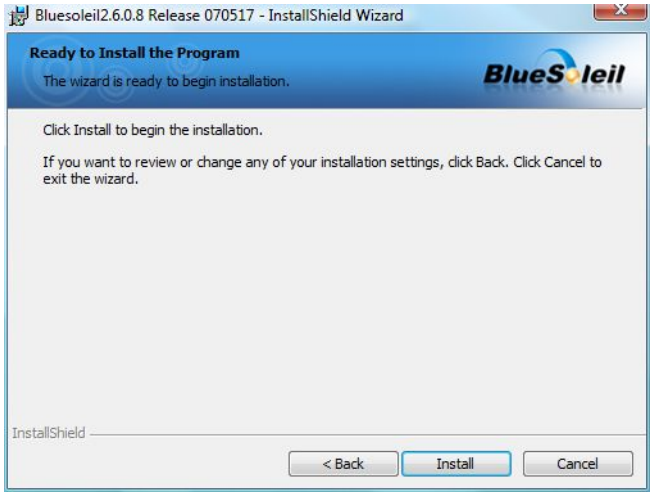
Figure 4.4: Installation of bluetooth software, step 3



Step 4

Click on "Next >".

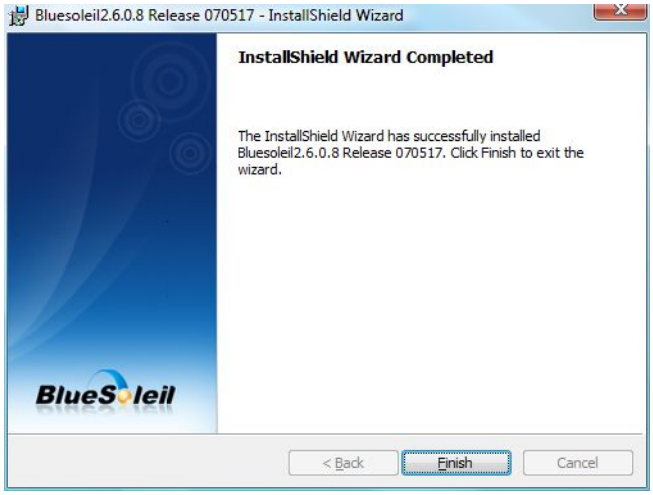
Figure 4.5: Installation of bluetooth software, step 4



Step 5

Click on "Install".

Figure 4.6: Installation of bluetooth software, step 5



Step 6

Click on "Finish".

Figure 4.7: Installation of bluetooth software, step 6

Restart your computer after finishing the installation, to agree to the changes on your system!

4.1.2 Configurate bluetooth dongle

After restarting your computer the bluetooth software should open automatically. Check if you can find the bluetooth icon (grey/white) on the down right side of the task bar.

If you do not find this symbol there, you should start the bluetooth software manually. In this case just click on the bluetooth symbol, which has been created on your desktop during the installation.

Step 7

Double click on the new created bluetooth symbol on your desktop to open a window like here on the right side.

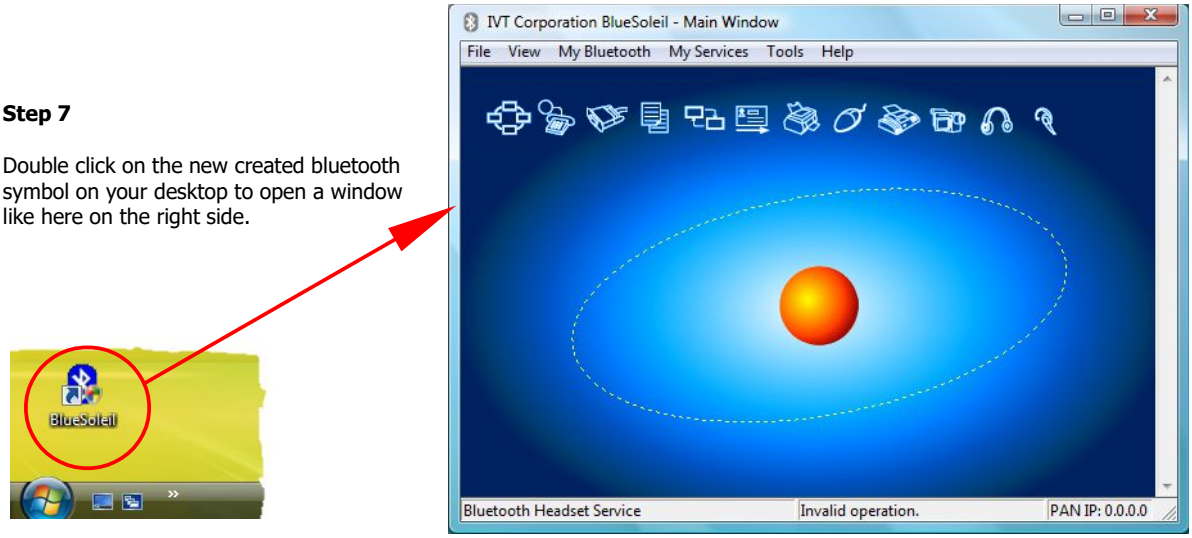
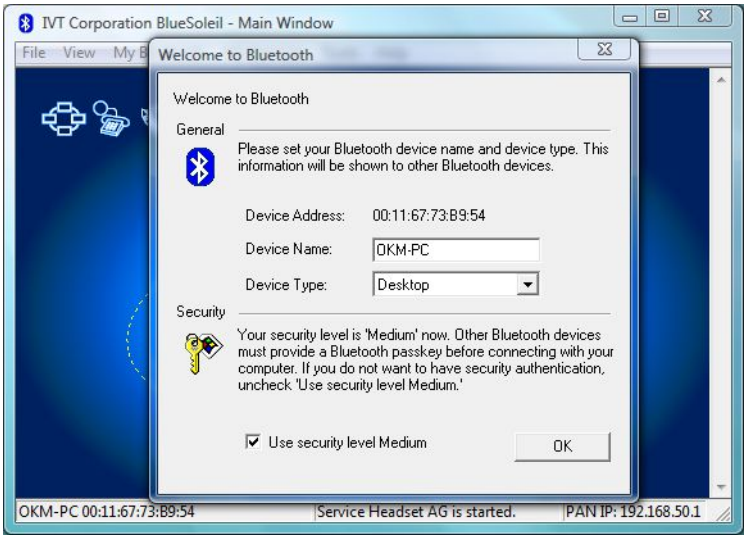


Figure 4.8: Installation of bluetooth software, step 7

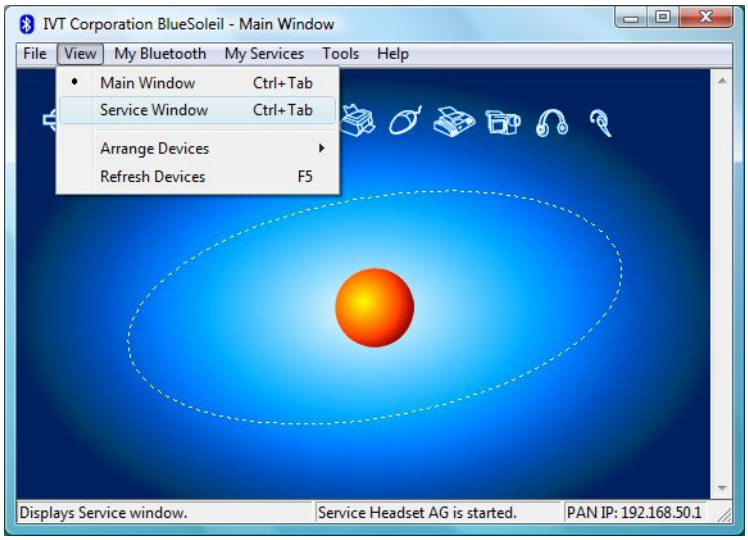


Step 8

Plug in the bluetooth dongle in a free USB connection of your computer. When the dialog from the left figure appears click on "OK".

Figure 4.9: Installation of bluetooth software, step 8

Now the bluetooth drivers will be installed on your computer. This can take several minutes, depending on your computer. Please wait until all drivers are installed successfully and then continue with step 9.



Step 9

Click in the menu on "View → Service window", to see the installed services.

Figure 4.10: Installation of bluetooth software, step 9

Step 10

Behind the entry "Serial Port A" you can find the assigned COM port, which you should select during the data transfer in the software Visualizer 3D.

In our example here it is COM6.

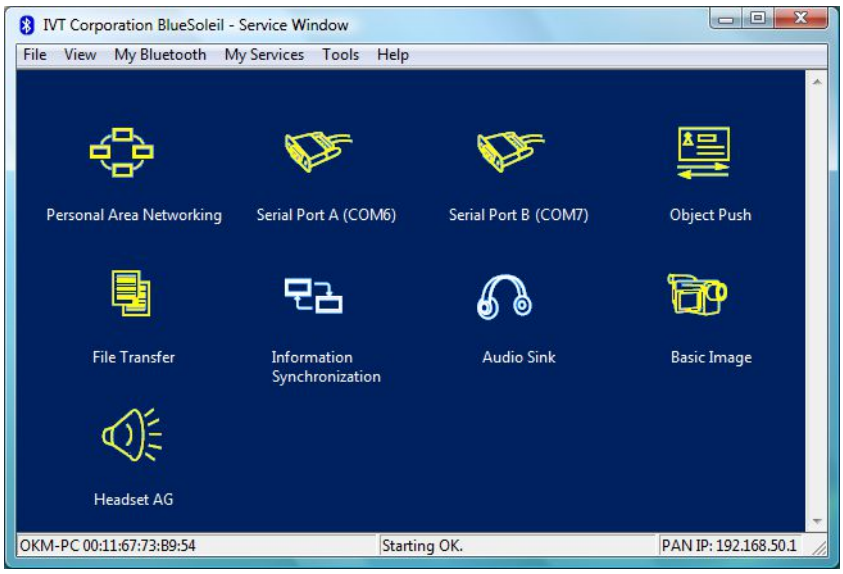
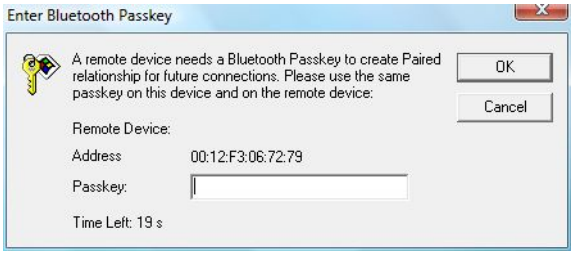


Figure 4.11: Installation of bluetooth software, step 10

4.1.3 Setup connection

When you connect the device via bluetooth for the first time, to transfer data the computer, you should enter the bluetooth passkey. The passkey is **OKM** (take care to write in capital letters!).



Step 11

When connecting the device to computer the first time you should enter the bluetooth passkey.

Enter **OKM** in capital letters and click on "OK".

Figure 4.12: Installation of bluetooth software, step 11

Step 12

When the bluetooth connection is established successfully the bluetooth symbol in the task bar will be visible in green.

Only after the bluetooth connection is successfully established, you can transfer data from your measuring instrument to the computer.

> The measuring instrument should establish the bluetooth connection always by itself. It is not possible to search for the device via the bluetooth software. You only can use the bluetooth dongle delivered with the device!

4.2 Uninstall bluetooth software

In this section it is explained how to delete the bluetooth software from your computer.

Therefor click on the entry **`Start -> All Programs -> IVT BlueSoleil -> Uninstall BlueSoleil`** and follow the instruction on the screen of your computer. After uninstalling your bluetooth drivers you should reboot your computer.

Chapter 5

Control elements

In this section you will learn more about the fundamental use of all control elements for this measuring instrument. All connections, inputs and outputs are explained in detail.

5.1 Breakdown of the Ground Navigator

The key components to the 3D Ground Navigator are shown below.

Figure 5.1: 3D Ground Navigator with control unit and Super Sensor

The **Control Unit** is the operating center and processing unit of the whole detector system. You will select your appropriate operating mode and adjust all settings to scan your area.

The **Super Sensor** measures the environment and transfers all data to the control unit for further processing. The Super Sensor comes with a LED orbit to visualize detected objects.

If the control unit is connected with **Wireless Headphones** it will turn off the internal speaker.

For much longer operating times an optional **Power Pack** can be utilized with the detector.

5.2 Control unit

The next subsections explain all control elements of the Control Unit. Thus you become familiar with the buttons, sockets and the like.

5.2.1 Top/Front View

Figure 5.1 shows all control elements of the top and front panel of the Control Unit.

Figure 5.2: Control elements of the top and front panel

Display / Touchscreen: The display of the device shows all operating modes, messages and measuring states. Close to the display (on the front panel) there are 3 menu buttons to operate the device. The **OK** button is mostly used to activate the selected operating mode. In some circumstances this button is allocated with another function which will be explained at the appropriate section within this manual. By using the arrow buttons ← and → you can switch between the operating modes in the main menu and select the options in submenus. With these arrow buttons you can finish the measurement of an operating mode and get back into the main menu.

Power on/off button: With the power on/off button you can switch on or off the device. When the device is powered off and you press the power on/off button the device will be switched on and the LED of the power on/off button will shine green. To power off the device, you should keep pressing the power on/off button until the device powers off and the integrated LED lamp turns out.

Start button: Primarily the start button is used to start a measurement and to release every single impulse in the manual impulse mode. There is an alternative start button built-in into the Super Sensor.

5.2.2 Bottom View

Figure 5.3 shows all control elements on the bottom side of the Control Unit.

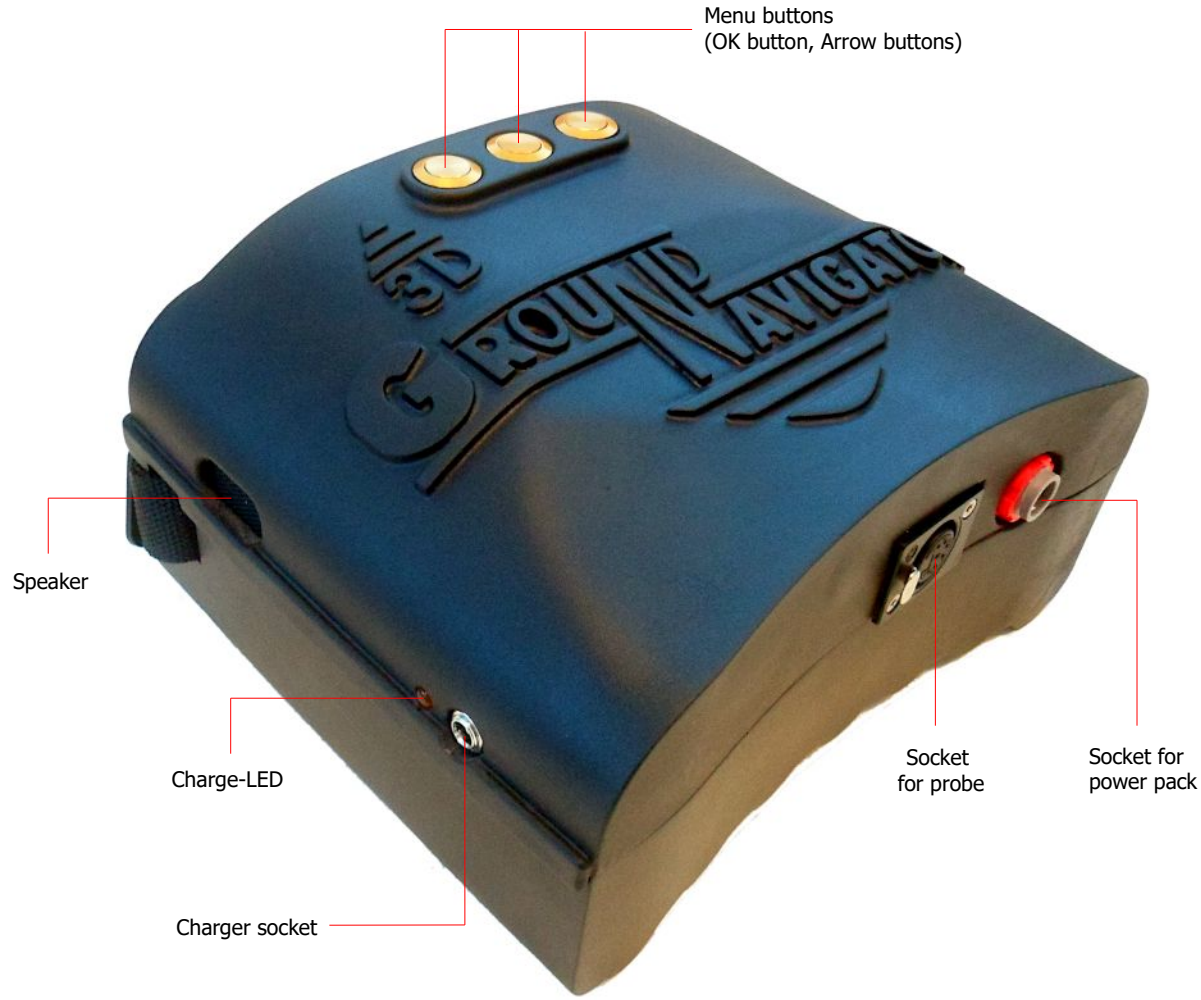


Figure 5.3: Control elements on the bottom panel

Charger socket: The charger socket is used to recharge the internal battery. While charging the battery, the **Charge-LED** is shining “orange”. See section 5.2.4 “Charging the internal battery” on page 32 for more details about charging the control unit!

Socket for power pack: Additional to the internal battery, it is possible to connect OKM's optional Power Pack. By using this Power Pack you can extend your operating time by another 48 hours.

Socket for probe: At this socket you should connect the Super Sensor. Without probe there is no measurement possible.

5.2.3 Touchscreen

After powering on the 3D Ground Navigator metal detector, a splash screen is shown while the system is booting up. When finished the main menu appears where you have to choose the desired operating mode with the buttons ← and → or by simply clicking the arrows on the touchscreen itself. If the desired option is visible you have to confirm it by pushing **OK** or by touching the display button directly. In figure 5.4 you can see the structure and touch areas of the screen.

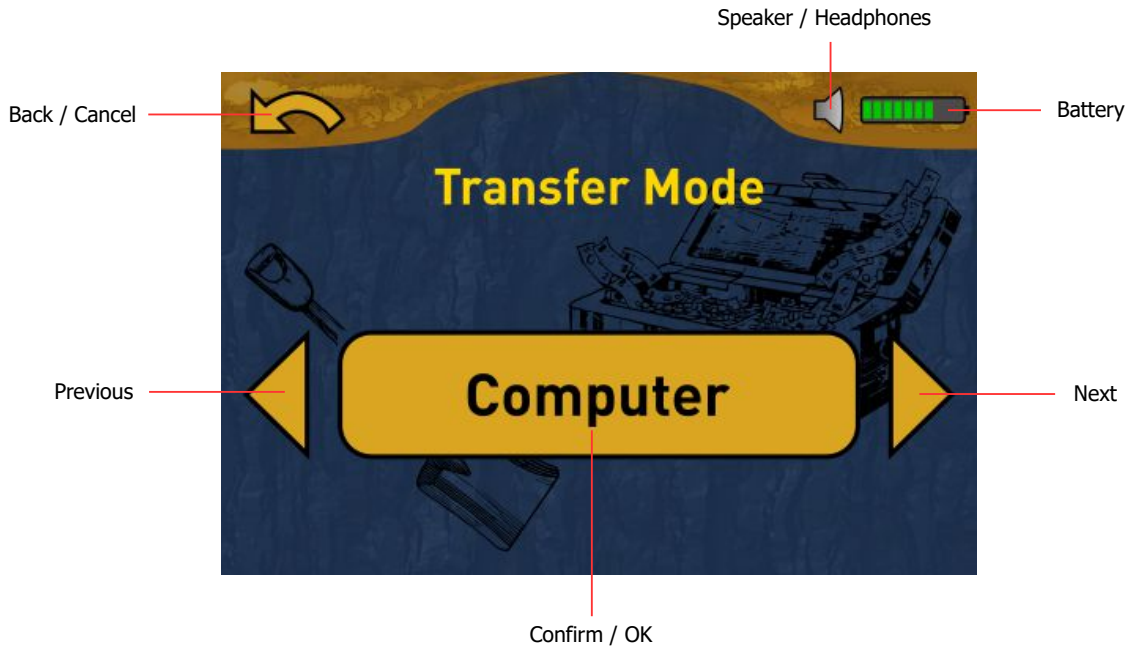


Figure 5.4: Touch areas of the display

Previous: When this area is touched with your finger, the previous option is shown. If you reach the first of all available options it will automatically jump to the last option. The same effect can be achieved by using the ← button.

Next: When this area is touched with your finger, the next possible option is shown. If you reach the last of all available options it will automatically jump back to the first option. The same effect can be achieved by using the → button.

Confirm / OK: When this area is touched with your finger, the current option will be confirmed. The same effect can be achieved by using the **OK** button.

Back / Cancel: The back icon or the cancel icon are used to leave an active operating mode like Magnetometer, Pin Pointer or Ground Scan or to get back to the previous screen, e.g. to leave a submenu.

Headphones: By default the internal speakers are used for any sound output. The headphones icon indicates that a Bluetooth headphone has been successfully connected with the 3D Ground Navigator.

More information on how to connect Bluetooth headphones is available in section 7.5.1 "Headphones" on page 54!

Battery: The battery icon indicates the current charge state of the internal battery. If the charge is too low ( ), you have to recharge it by using the appropriate charger.

5.2.4 Charging the internal battery

Switch off the detector, connect the original charger to the charge socket of the 3D Ground Navigator and plug the charger into a power socket. Now the Charge-LED will shine orange until the battery has been charged completely. After the battery is fully charged, the Charge-LED turns off.

> Only use original OKM chargers for recharging the internal battery!
> Otherwise the battery may be damaged or explode.

5.3 Super Sensor with LED orbit

The Super Sensor is equipped with a light sphere called "LED orbit", that can indicate the measured values visually during the scanning process.

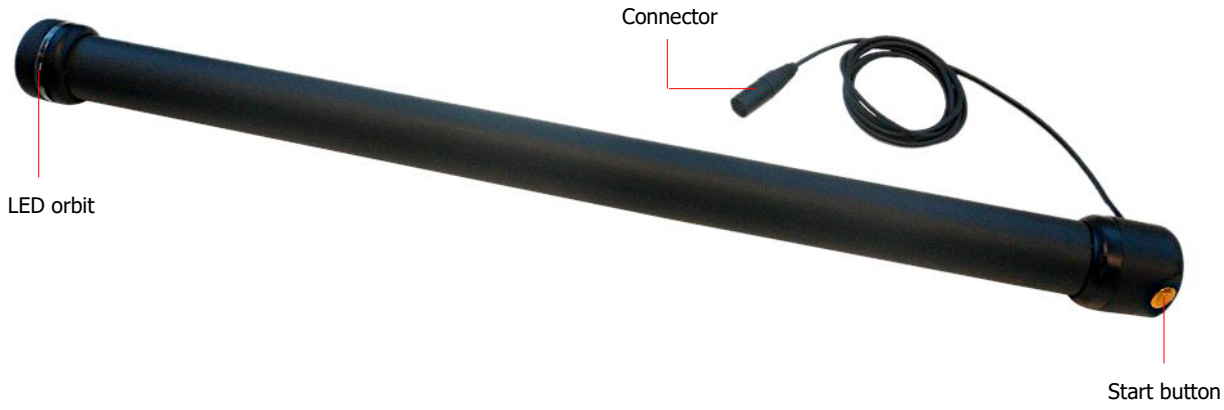


Figure 5.5: Super Sensor with LED orbit

Start button: This button has exactly the same functionality like the start button of the control unit. You may use it to start a measurement and to release every single impulse in the manual impulse mode.

Connector: The connector is used to connect the Super Sensor with the probe socket of the control unit.

5.4 Bluetooth Headphones

The 3D Ground Navigator can be operated with any Bluetooth headphone available on the market. Your detector already comes with Bluetooth headphones similar to figure 5.6.

Figure 5.6: Bluetooth headphones with accessories

To use the headphones with your metal detector, please follow these simple steps:

1. Select “Settings” from your main menu
2. Now select “Headphones”
3. Power on your Bluetooth headphones and push the pairing button

The 3D Ground Navigator tries connecting for 60 seconds. If the Bluetooth connection between headphones and device can be established successfully, the speaker icon switches to a headphones icon. Otherwise you should try again.

See also section 7.5.1 “Headphones” on page 54 for more detailed information regarding connecting the Bluetooth headphones.

Chapter 6

Assembly

In this section is explained how to assemble the device and how to prepare a measurement.

Before you can use 3D Ground Navigator for a field measurement you should do some preparations. Please pay attention to the following steps!

6.1 Charging the control unit

Switch off the device, connect the original charger with the charge socket of the detector and plug it in into a power socket as shown in figure 6.1.

Figure 6.1: Charging the internal battery of the control unit

Now the Charge-LED will shine orange until the battery has been charged completely. After the battery is fully charged, the Charge-LED turns off.

Only use original OKM chargers for recharging the internal battery!
Otherwise the battery may be damaged or explode.

6.2 Preparing the Control Unit

The Super Sensor is used to measure the underground values and should be connected to the socket on the bottom of the unit. Avoid hard impact or other damages. Plug in the connector of the Super Sensor until it locks into place (press the small release lock to detach the probe from the socket).

Figure 6.2: Connecting the Super Sensor

To supply the device with additional power, you can also connect the optional Power Pack. Plug in the connector of the Power Pack into the designated socket and turn it to left or right until it locks into place (when you pull on the connector, it will be detached from the socket).

Figure 6.3: Connecting the Power Pack (optional)

Now switch on the Power Pack. The LED indicator will shine green. Please refer to the user's manual of the Power Pack for further information concerning its use!

After connecting and switching on the Power Pack you can simply put it in any of your pockets.

Figure 6.4: Pocket the optional Power Pack (optional)

Now you should power on the device with the power on/off button and you are ready to perform your measurements.

Figure 6.5: Power on your control unit and get ready to scan

Chapter 7

Operating modes

In this section you will learn more about operating the device. Every operating mode will be explained in a proper subsection.

After powering on the 3D Ground Navigator metal detector, a splash screen as shown in figure 7.1 appears on screen while the system boots up.

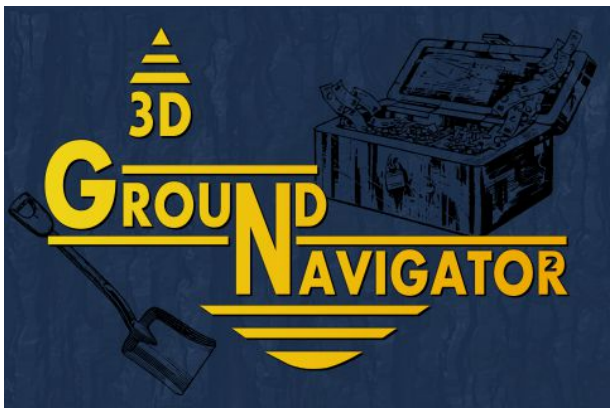


Figure 7.1: Splash screen during boot-up

When finished the main menu appears where you have to choose the desired operating mode.

The main menu offers the following operating modes and functions:

- **Ground Scan**
  Conduct a graphical 3d measurement for detailed analysis on a computer.
- **Pin Pointer**
  Transfer live data to Visualizer 3D software to pinpoint potential targets.
- **Magnetometer**
  Process an acoustical magnetic field measurement to detect ferrous metals.
- **Transfer to PC**
  Transfer stored measurements to Visualizer 3D software.
- **Settings**
  Adjust general settings like Bluetooth address, headphones connection etc.

The choice of the operating mode depends on the planned mission. Normally you should use several operating modes one after another to explore an area. In that way you can obtain as much information as possible from the underground of the scanned area.

7.1 Ground Scan

The operating mode "Ground Scan" allows a graphical measurement of any area for analysis on a computer.

General information about conducting a geophysical measurement can be read in chapter 8 “Field procedure” on page 57.

7.1.1 Prepare a Ground Scan

Before starting the actual measurement, you have to adjust three essential parameters. These settings are necessary to define the field size and how to step out the area to record measuring values. This and the next subsections will explain these parameters in more detail.

Step 1

Power on the device and select the operating mode "Ground Scan" from the main menu. If there is no probe connected the button is disabled.

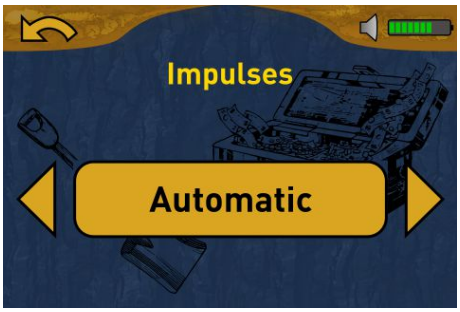
Step 2

If the Super Sensor is connected, please confirm the operating mode "Ground Scan" by pushing the **OK** button.

Step 3 - Impulse Mode

The impulse mode sets the way of how the single impulses (measure values) will be released by the metal detector. There are two impulse modes available:

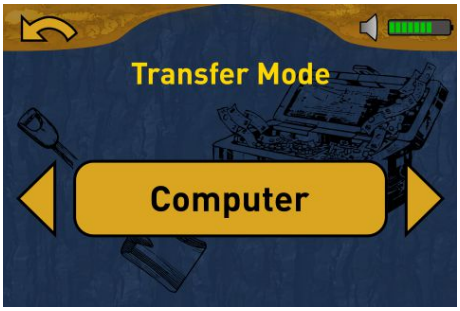
- **Automatic**
  Each measure value will be recorded automatically and continuously without any break.
- **Manual**
  One measure value will only be recorded after you have pressed the start button of the control unit or Super Sensor.



Step 4 - Impulses

Now you set the number of impulses (measure points), which will be recorded for each single scanning path. The following choices can be made:

- **Automatic**
  The number of total measure points of one scanning path will be defined during the measurement. If you reach the end of the first scanning path while in automatic impulse mode you have to press the **OK** button (or alternatively the start button) to save the required number of measure points. In manual impulse mode you must press the **OK** button, because the start button is used to release the impulses. This number of measure points will than be used automatically for all following scanning paths. Beginning from the second scanning path the device will stop by itself, when the defined number of measure points has been sent out.
  If you select "Automatic" you are not able to do a direct transfer to a computer. You can only store the measured values in the internal memory of the device, because the exact length of field is not yet selected.
- **10, 20, ..., 200**
  Each scanning path consists of the selected number of measure points. At the end of each scanning path the device stops by itself, as soon as the number of measure points has been recorded.



Step 5 - Transfer Mode

In the final step you have to define the type of data transfer. The transfer mode configures where to send and store your data. You may select one of the following transfer modes:

- **Memory**
  The measured data will be stored in the internal memory of the device. After finishing the measurement you should transfer the data to a PC by using the operating mode "Transfer to PC". The internal memory of the 3D Ground Navigator can only store one measurement at a time.
- **Computer**
  The measured data will be transferred right away to a

connected computer. Therefor a Bluetooth connection will be established before starting the measurement. The option "Computer" is not available if the number of impulses has been set to "Automatic".

Step 6

Depending on your selected Transfer Mode the on-going procedure is different. The following two subsections explain both ways in more detail:

- **Memory**
  Continue reading section 7.1.1.1 “Saving into memory” on page 43!
- **Computer**
  Continue reading section 7.1.1.2 “Transferring to computer” on page 43!

7.1.1.1 Saving into memory

If you have selected "Memory" as transfer mode, you can start measuring right away.

Step 7

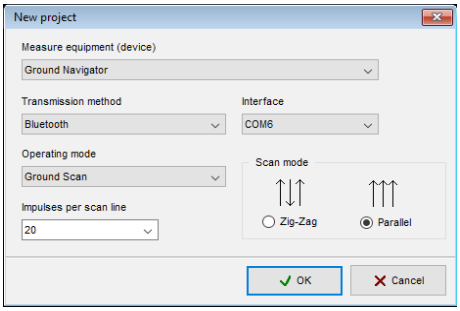
Go to the start position of your first scanning path, get ready and start your first scan line by pushing the start button.

Read section 7.1.2 "Conducting the measurement" on page 44 to learn more about conducting a complete ground scan.

If you are going to finalize this operating mode, simply push one of the arrow buttons ← or →.

7.1.1.2 Transferring to computer

If you selected "Computer" as transfer mode, you need to establish a wireless data connection with OKM's Visualizer 3D software on your PC. So plug in the Bluetooth dongle into a free USB port and start your Visualizer 3D software. Make sure the Bluetooth drivers has been installed according to chapter 4 "Data transfer via bluetooth" on page 19!



Step 7

Enter all settings according to your on-going measurement. Also adjust the Com-Port number according to your local Bluetooth installation and click the "OK" button of the Visualizer 3D dialog.

Step 8

The 3D Ground Navigator is trying to connect to your Bluetooth dongle that must be present at a free USB port on your computer.

Step 9

After the Bluetooth connection is established, go to the start position of your first scanning path and start your first scan line by pushing the start button.

Read section 7.1.2 "Conducting the measurement" on page 44 to learn more about conducting a complete ground scan.

If you are going to finalize this operating mode, simply push one of the arrow buttons ← or →.

Step 10

After canceling the Ground Scan screen, the device also exits the wireless data connection before returning back to the main menu.

7.1.2 Conducting the measurement

After all parameters has been adjusted the device is ready to start the first scanning path. Beginning from this moment the display will indicate the current number of scanning paths and the current number of measured impulses per scanning path.

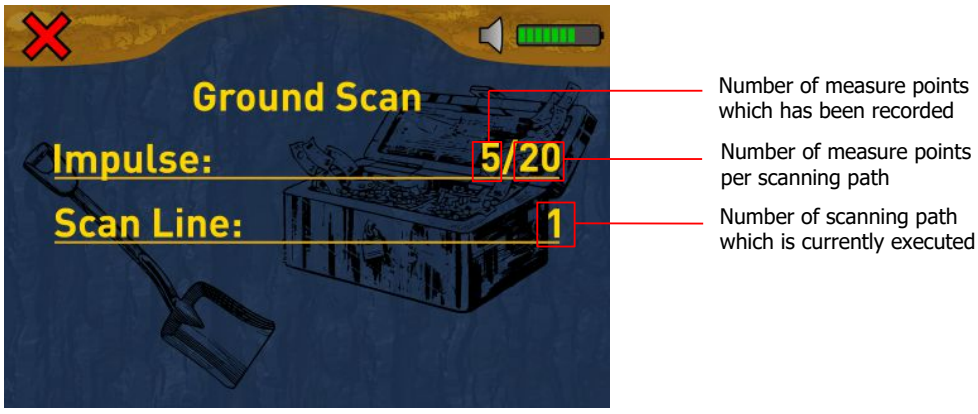


Figure 7.2: Display representation in operating mode "Ground Scan"

Figure 7.2 shows the display which indicates that the first scanning path has begun and 5 impulses have been measured up to now. In total there will be 20 measure points per scanning path. The device is waiting for the user to press the start button to begin recording the measurement.

After setting all parameters you can start recording measure values. So go to your start position of the first scanning path and press the start button.

a) If you have selected the impulse mode "Automatic" just keep going slowly until you reach the end of the first scanning path. When you already have defined the number of impulses, the device will stop automatically at the end of the line, otherwise – if selected “Automatic” - you should press the **OK** button now. Then you go to the start position of the next scanning path and press the start button again. The device will stop automatically by itself at the end of the scanning path.

Figure 7.3: "Zig-Zag" scanning (left) and "Parallel" scanning (right)

b) If you have selected the impulse mode "Manual" you should press the start button to start your measurement. You must release each single measure impulse manually one by one with the start button. The impulses will not be sent out automatically. Now you should do a little step forward and press the start button again, to measure the second measure point. The device stops and you should again walk a little step forward and press the start button once more. Now continue in this way until you have reached the end of the first scanning path. If you already have defined the number of impulses per line, the device will automatically signalize the end of the scanning path, otherwise you should press the **OK** button when you like to finish the first line. Now go to the start position of your next scanning path and push the start button again. Go another step forward and repeat the measurement in the same way like you recorded the first scanning path. The device will now signalize automatically the end of the next scanning path.

Continue to measure all further scanning paths until you have recorded the complete measure area. To finish the operating mode "Ground Scan" and return back to the main menu you simply push one of the arrow buttons ← or →.

Information about the scanning procedure in general you will read in chapter 8 “Field procedure” on page 57 of this user's manual.

7.2 Pin Pointer

As the name "Pin Pointer" already indicates, it allows you to pinpoint potential targets more precisely. Furthermore you have the possibility to distinguish between ferromagnetic and non-ferromagnetic metals.

Normally this operating mode is used after you have executed a complete measurement in operating mode "Ground Scan". It is mainly used to analyze detected objects in more detail. Due to the analysis of the measurement results in "Ground Scan" you can determine the position of a located object to know at which place of the measuring area you should research in detail with the Super Sensor.

7.2.1 Preparing a Pin Pointer scan

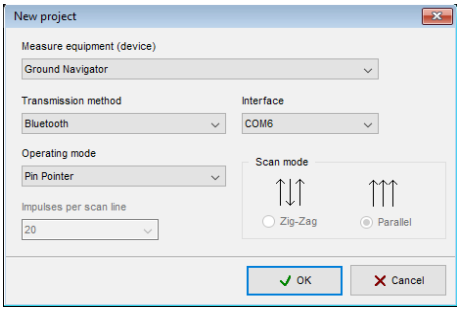
In this operating mode all measured data will be sent directly to a computer. Therefor a wireless data connection to the Visualizer 3D software must be established first.

Step 1

Power on the device and select operating mode "Pin Pointer" from the main menu. If there is no Super Sensor connected the button is disabled.

Step 2

If the Super Sensor is connected, please confirm the operating mode "Pin Pointer" with the **OK** button.



Step 3

Enter all settings according to your on-going measurement. Also adjust the Com-Port number according to your local Bluetooth installation and click the "OK" button of the Visualizer 3D dialog.

Step 4

The 3D Ground Navigator is trying to connect to your Bluetooth dongle that must be present at a free USB port on your computer.

Step 5

After the Bluetooth connection has been established, the detector is ready to measure. Now push the start button of the detector to start recording.

Step 6

The display now shows the active Pin Pointer screen. You can repeat the ground balance at any time by pushing the start button.

If you are going to cancel this operating mode, simply push one of the arrow buttons ← or →.

Step 7

After canceling the Pin Pointer screen, the device also exits the wireless data connection before returning back to the main menu.

7.2.2 Conducting a Pin Pointer scan

After the data transfer to the computer has been established according to step 5, you are ready to start your measurement. Figure 7.4 shows how to hold the Super Sensor during the measurement correctly.

Figure 7.4: Position of the Super Sensor during a measurement

Push the start button to start scanning the underground. You should slowly move the Super Sensor from one side to another above the possible object. Please try to capture the complete object, which means you should measure beyond the edges of the object. Repeat this measurement a few times to get a clear signature of the object.

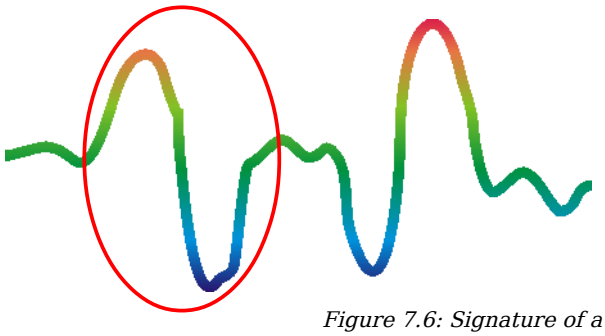
During this procedure the Super Sensor should point vertical towards the ground. It should not be turned or pivoted.

Figure 7.5: Pinpointing with Super Sensor

You may push the start button from time to time to repeat ground balancing the metal detector. To quit the operating mode "Pin Pointer" and return back into the main menu you just have to push one of the arrow buttons ← or →.

7.2.3 Analyzing a Pin Pointer scan

While scanning in Pin Pointer mode you might see one or more different signatures, from which you can recognize a specific characteristic of any target.



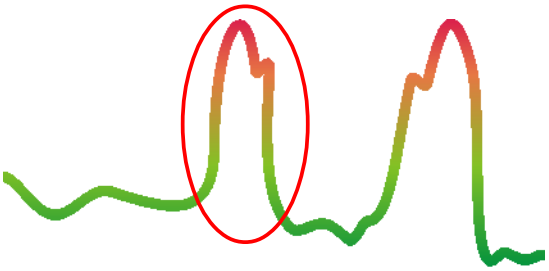
Ferromagnetic metals

Ferromagnetic targets have a positive-negative-signature.

Figure 7.6: Signature of a ferromagnetic metal target

The figure 7.6 shows a typical signature of a ferromagnetic metal like e.g. iron. The signature includes a positive (red) and a negative (blue) amplitude. When looking closely you can see even 2 ferromagnetic signatures. The first signature starts with a positive amplitude and the second signature starts with a negative amplitude. The order is not important, it depends on the direction of movement of the Super Sensor. If you keep moving the probe from one side to another, these 2 signatures will change continuously.

Take care to move the Super Sensor slowly and equal above the ground and above a detected object to get a clear signature.

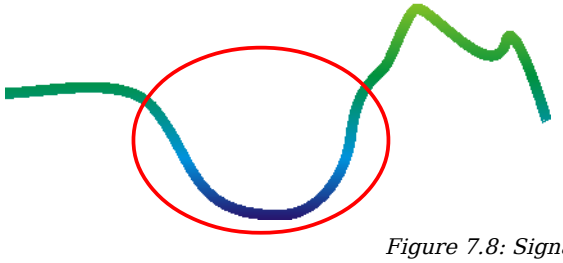


Non-ferromagnetic metals

Non-ferrous targets have a pure positive signature.

Figure 7.7: Signature of a non-ferromagnetic metal target

The figure 7.7 represents a signature of a non-ferrous target. You can recognize that there is only a positive amplitude (red). Additionally to the main amplitude there is another small peak, which is typically for precious metals. Also here the order of amplitude and the small peak is not important and depends on the scan direction.



Non-metallic targets

All non-metallic items have a pure negative signature.

Figure 7.8: Signature of a non-metallic target

The last of the typical signatures is represented in figure 7.8. It is the signature of all non-metallic targets and structures. These can be voids, tunnels or buried plastic pipes or boxes. You can recognize that there is only a negative amplitude (blue).

7.3 Magnetometer

In operating mode "Magnetometer" you can research the area in regard to ferromagnetic[1] metals. Primarily this function is an acoustical mode, it only generates a very rough graphical representation on the display to visualize the highs and lows.

Please note that it can also react on metallic trash or contamination laying on the surface or near to the surface.

7.3.1 Preparing a Magnetometer scan

There is not much to prepare to conduct a scan in Magnetometer mode. Simply follow these steps:

Step 1

Power on the device and select the operating mode "Magnetometer" from the main menu. If there is no probe connected the button is disabled.

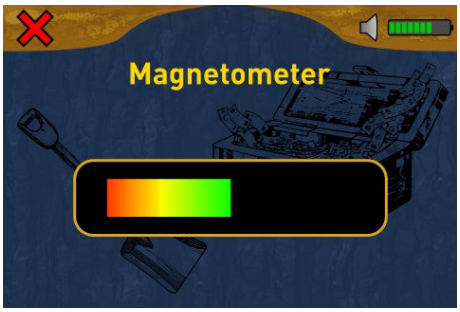
Step 2

If a proper probe is connected, please confirm the operating mode "Magnetometer" with the **OK** button.

Step 3

Now push the start button of the detector to start measuring.

1 Ferromagnetic metals are for example iron, cobalt and nickel. Also other metals or objects, which include traces of such metals can be detected.



Step 4

The display now shows the active Magnetometer screen. You can repeat the ground balance at any time by pushing the start button.

If you are going to cancel this operating mode, simply push one of the arrow buttons ← or →.

7.3.2 Conducting a Magnetometer scan

Right after activating the “Magnetometer” mode, no sound should come from the device. If you can hear any sound output, you should repeat the ground balance. Make sure you hold the Super Sensor straight downwards to the ground, as you would do during the scanning process, and run the ground balance by pushing the start button. With that the sound output should be silent.

Figure 7.9: Probe should always point downwards and should not be turned

Now you can move slowly forward, backwards and sidewards, but should avoid turning the probe. The probe should always point vertical to the ground and should not be turned around its own axis.

Figure 7.10: Pivoting or turning the probe falisifies the measurement

As soon as an acoustical signal sounds, the device has detected a potential metal target right under the position of the probe. In this way it is possible to find small metals near the surface like nails, screws, wires, seals and similar targets.

You should use the operating mode "Magnetometer" to remove such disturbing metal pieces from the area that you like to scan. The less metals are laying near to the surface, the better will be your result in the operating mode "Ground Scan". You can also find larger metal targets which are located deeper underground. A general norm is: The larger the target, the deeper it can be detected underground!

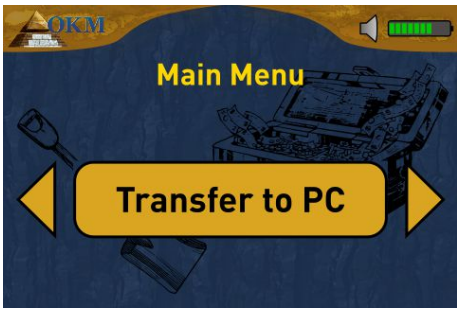
Also you can use the operating mode "Magnetometer" as a useful pin pointer during the excavations. If you already have dug out a large hole and do not remember where exactly the detected object was situated, you can simply use the Magnetometer mode to relocate fast and efficient the target position.

After using this operating mode for a while you should process a new ground balance by pushing the start button. To finish the operating mode "Magnetometer" and return back into the main menu you simply push one of the arrow buttons ← or →.

7.4 Transfer to PC

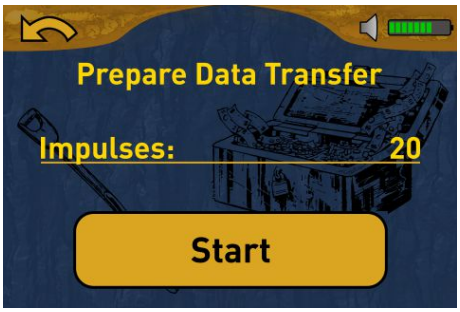
By using the operating mode "Transfer to PC", you can transfer measured data from the internal memory of the 3D Ground Navigator to the Visualizer 3D software.

Plug in the Bluetooth dongle into the computer and start your Visualizer 3D software. Then follow these steps to transfer scan data from your 3D Ground Navigator to the PC software.



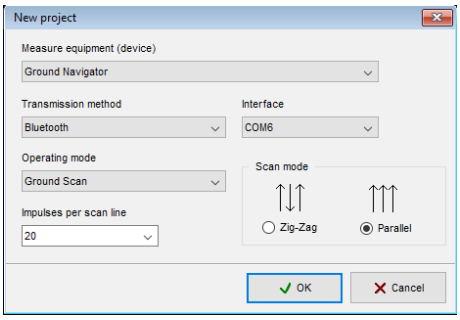
Step 1

Power on the device and select operating mode "Transfer to PC" from the main menu. Push the **OK** button to open the prepare screen.



Step 2

This screen informs you about the settings that you have to adopt into the Visualizer 3D dialog. It tells you how many impulses per scanning path were recorded.



Step 3

Enter all settings according to your saved measurement. Also adjust the Com-Port number according to your local Bluetooth installation and click the "OK" button.

Step 4

The device is connecting with the PC and tries to establish a valid Bluetooth connection.

Step 5

Now the device transfers all data from internal memory to your computer. Simultaneously you should see incoming measure values in Visualizer 3D.

Step 6

After all data has been transferred, the Bluetooth connection gets disconnected and you will get back to the main menu.

7.5 Settings

In this section you will learn how to adjust different settings of your 3D Ground Navigator metal detector. Please be careful while changing these settings.

7.5.1 Headphones

This option allows you to connect Bluetooth headphones with your 3D Ground Navigator. After activating this option with the **OK** button, you need to power on your headphones and push the headphones' pairing button. The actual pairing process can be different from headphone to headphone.

Figure 7.11: Pairing Bluetooth headphones

The program will wait 60 seconds to connect to the headphones. If it is successful the speaker icon will change to a headphones icon.

7.5.2 Information

This option displays information concerning the device's serial number and firmware version.

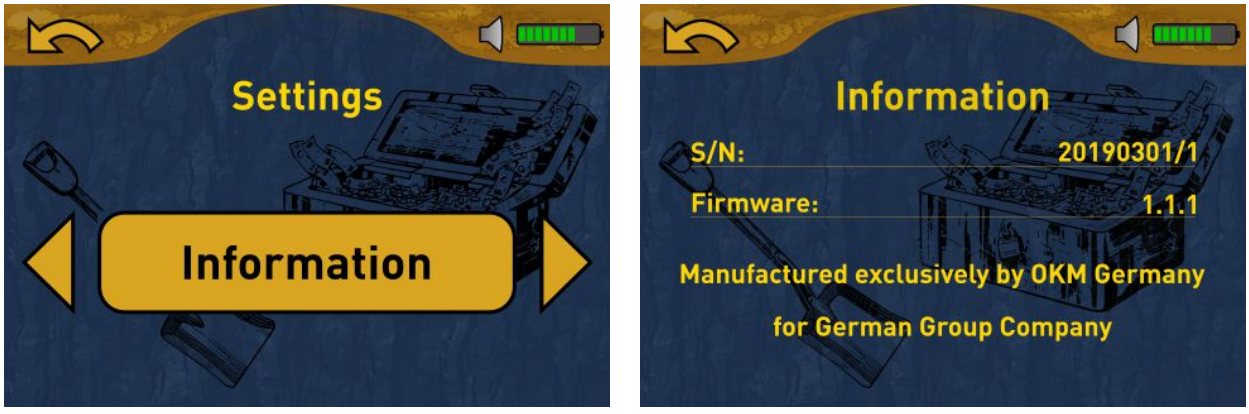


Figure 7.12: Information screen

Those information may be useful if you are contacting your distributor for additional support requests.

7.5.3 Bluetooth

By default this value is already correctly set in the factory and must not be changed. This is the place where you can change the Bluetooth address in case you purchased a new Bluetooth dongle.

> Any unprofessional changes to this value may result in a corrupted data transfer.

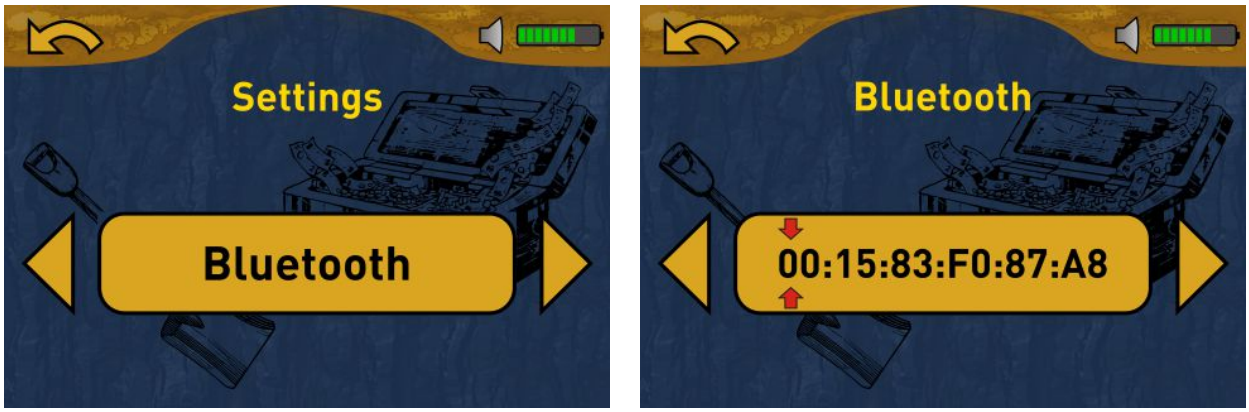


Figure 7.13: Changing Bluetooth address

Use arrow buttons ← or → to select a specific digit and then change its value with the **OK** button. If all digits has been adjusted correctly, select the “Back” option and push the **OK** button to confirm the change. You will return back to the settings menu.

7.5.4 Factory Reset

This option will reset all configurations back to factory defaults. For safeness purposes an additional question pops up to avoid accidental factory resets.

> Running the factory reset will clear all personal configuration changes. If you individually changed the Bluetooth address also this setting will be cleared.

Figure 7.14: Reset to factory defaults

Use arrow buttons ← or → to select the “Yes” option and push the **OK** button to start the factory reset. If you do not want to reset your device select the “No” option instead.

7.5.5 Back

This option is used to return back to the main menu, especially when using the hardware buttons only.

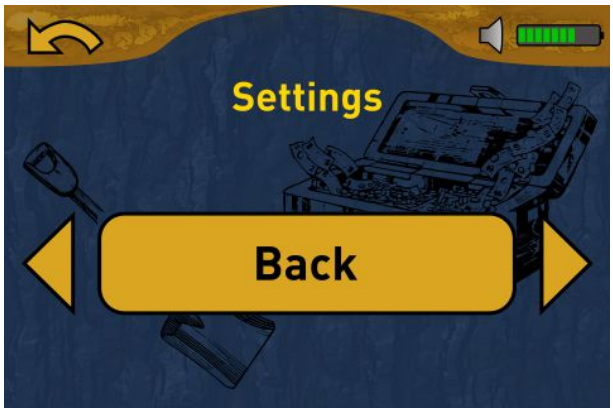


Figure 7.15: Back screen

If you are using the touchscreen capabilities you simply touch the  icon instead. This icon will always indicate to go back to the previous screen.

Chapter 8

Field procedure

This chapter gives practical instructions about the general procedure of scanning an area. The different scanning methods and procedures will be explained in detail.

8.1 General scanning procedure

In general every scan always starts on the bottom right corner of your scan area. Starting from this point, you should walk scan path by scan path, whereby every following path is situated on the left side of its previous path. During walking these lines, the measurement values will be recorded and depending on the selected operating mode either transferred directly to a computer or saved into the memory of the device.

The device stops at the end of each finished scan line, so that the user can find the starting position of the next line. In this way, all paths will be recorded and the area will be measured.

Figure 8.1 shows all 4 possible starting positions and the corresponding first scanning path. Depending on the composition of your terrain you can determine the optimal starting point for your measurement by yourself.

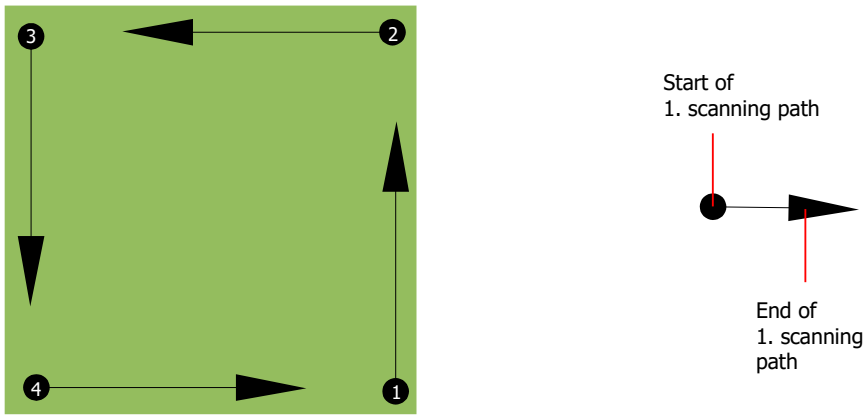


Figure 8.1: Starting position of a scan area

The scanning paths may be referred as "Zig-Zag" or "Parallel" traverses. Also the number of impulses (measure points), which are recorded during one scanning path can be adjusted individually depending on the size of your scan area (length of scanning path).

8.1.1 Scan Mode

There are two general techniques to surveying an area with the 3D Ground Navigator:

- **Zig-Zag**
  The starting position of two scanning paths next to each other is on the opposite side of the measured area. You will record data on your scanning path and on the return path as well.
- **Parallel**
  The starting position of two scanning paths is always on the same side of the measured area. You will only record data in one way and in one direction, while you should return and walk back to the starting position of the next scanning path without recording data.

Figure 8.2 represents both techniques schematically.

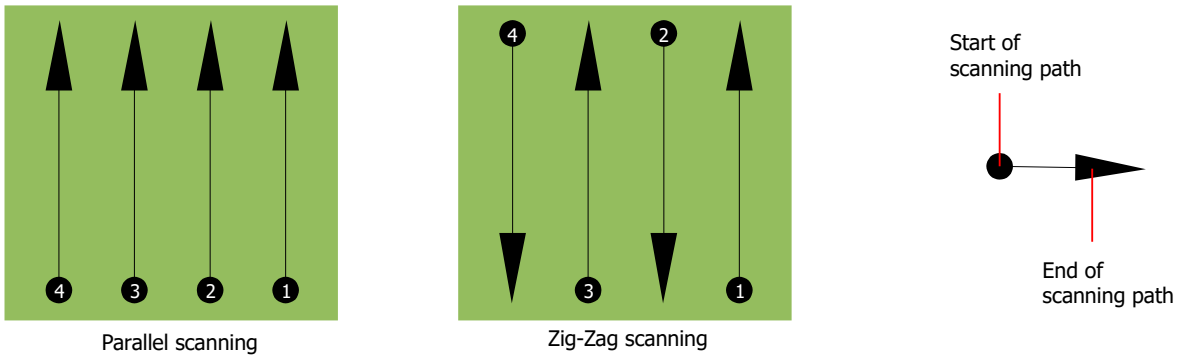


Figure 8.2: Scan modes to measure an area

Doing the scan in "Parallel" mode you will start on the bottom right corner of your scan area (point ❶) to walk and record a scan path towards the upper right corner of the area. After recording the first line, you should walk back to the starting point and move to the left of the first scan line to start the scan path 2 (point ❷), to start there the second scanning path. In this way all other paths will be scanned, until you have reached the left side of your measure area.

Doing the scan in "Zig-Zag" mode you will start also from the bottom right side of your measure area (point ❶) to walk and record a scanning path towards the right upper corner of the measure area. Different from the parallel measurement, you should continue recording data while walking back the second scanning path. So you go to the starting point of the second scanning path (point ❷) and scan in the opposite direction. In this way, all other paths will be scanned in the scan mode "Zig-Zag" until you have reached the left side of your measure area.

The distance between the scanning paths should be consistent during one measurement but can vary from measure area to measure area. If you mostly look for smaller targets than you should also select a smaller distance between the lines. A standard rule is: The smaller the distance between the paths, the more accurate your scans will be. When you are conducting your first scans the lines should not be to close together to locate possible targets.

8.1.2 Regulation of the number of impulses per scanning path

It is possible to select the number of impulses before starting the measurement or selecting the automatic mode ("Auto") to adjust the number of measure points after finishing the first scanning path.

When the number of measure points has been configured, the device will stop automatically when this number has been reached and waits for the start of the new scanning path.

In the automatic mode you should stop the measurement of the first scanning path by yourself, by pressing the appropriate button, as soon as you have reached the end of the first scanning path. This effective amount of measure points will be used for all further scanning paths of this measurement. Starting from the second scanning path, the device now stops automatically after the assumed number of impulses has been reached.

Keep in mind the number of impulses which you have recorded per scanning path. This amount should be entered later in the software program, when transferring the data to a PC, to receive all measured data correctly from your measuring instrument!

There is no special rule for selecting the right number of impulses. But there are different aspects which should be considered. These are some considerations

- the length of your measured area and
- the size of the objects you are searching for.

A preferable distance between two impulses is about 15 cm to 30 cm. The smaller the distance between two impulses is, the more exactly the graphical representation will be. If you are looking for small objects you have to select a smaller distance, for big objects you can increase the distance between the impulses.

Figure 8.3 shows the effects of the distance and the number of impulses per scanning path for some objects.

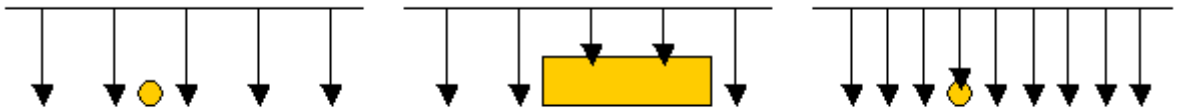


Figure 8.3: Effects of changing the number of impulses and their distance

Figure 8.4 shows the difference between very few impulses (left side) and much more impulses (right side) on the same length of scanning path. Therefor the second record (right side) shows much more details and also smaller objects can be seen.

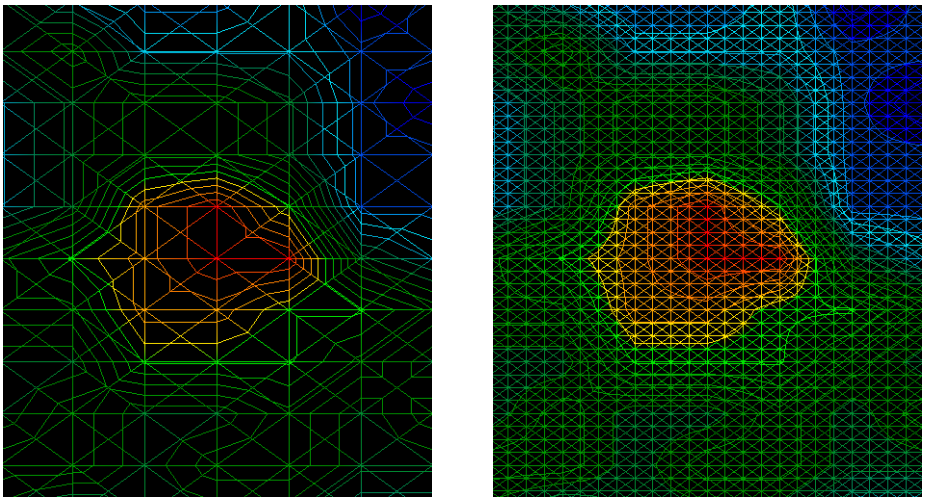


Figure 8.4: Comparison of low and high number of impulses

Do not hesitate to record more measurements with different numbers of impulses. For example you can scan a large area before doing a second detailed precision measurement. Especially if searching for

bigger objects you can proceed like this. With this manner you can measure a larger area very quickly and afterward you make new scans localizing the suspect targets.

When conducting a scan it is important to not only make note of how many impulses are being used but to get a clear picture of what you are scanning, it is very important to watch your speed. Every scan line should be measured at the same speed as the previous line.

Figure 8.5 shows what can happen, if you walk at different speeds during your scan.

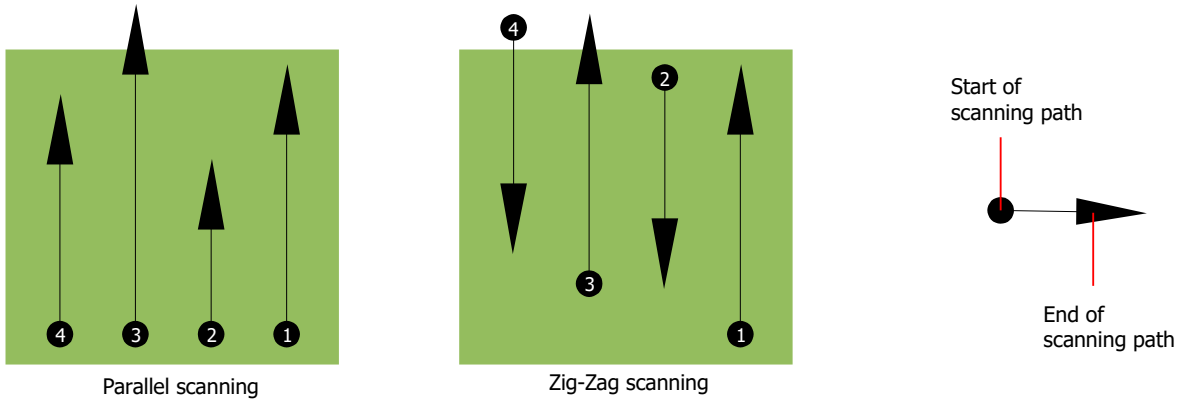


Figure 8.5: Different walking speeds during scanning

Using a different walking speed in the scanning paths, will cause displacements in the scanning path. As a matter of fact, a target can get cut into several smaller items or completely lost because it was missed. Later when the data is downloaded for further analysis, speed errors can make a target completely unidentifiable and may be discarded.

In general, the following rule is valid: Keep scans at practical sizes where you can see the beginning and stop lines and can comfortably traverse an area to keep your speed and the distances reasonable.

8.2 Special advices for field procedure

There are some aspects which you should take note of when conducting scans. In principle, a scan is only as good as the path that was taken. Making errors while scanning will show up in the final graphical representation also as an error. This will cause frustration and lost time.

Before you start with a measurement in the field, you should think of what you are looking for and if the selected area is suitable. Measuring without a plan usually will produce unacceptable results. Please consider the following advice:

- What are you looking for (graves, tunnel, buried objects, ...)? This question has direct effects on how a scan is conducted. If you are looking for larger targets, the distance between the single measure points and scanning paths can be larger, as if you are looking for small targets.
- Inform yourself about the area, where you are searching. Does it make sense to detect here? Are there historical references which confirms your speculation? What type of soil is on this area? Are there good conditions for data recording? Is it allowed to search at this place (e.g. private property)?

- Your first measurement in an unknown area has to be large enough to get representative values. All further control measurements should be adjusted individually.
- What is the form of the object you search? If you are looking for an angular metal box, the identified object in your graphic should have a form according to this.
- To get better values concerning depth measurements, the object has to be in the center of the graphic, which means it has to be framed by normal reference values (normal ground). If the object is on the side of the graphic and not totally visible an estimated depth measurement is not possible and also measurement of size and form are limited. In this case, repeat the scan and change the position of your scan area, to receive an optimal position of the anomaly inside of the graphic.
- There should not be more than one object in a scan. This will influence the depth measurement. It is useful to scan partial areas over such targets.
- You should do at least two controlled scans to be more sure about your results. This is also important to recognize areas of mineralization.
- Most important rule when dealing with mineralization. **REAL TARGETS DON'T MOVE!** If your target moves then it is most likely mineralization.

8.2.1 Orientation of probe

During one measurement the probe should have always the same distance to the ground. Generally we recommend a height of about 5 – 15 cm from the surface of the ground if possible.

In the event that you are going to go over stones, wood or high grass that is higher, start your scan with the sensor higher right from the beginning. In circumstances like these, then perhaps you will need to start the scan with the probe at a height of 2 feet (50 cm) and keep it at that level for the entire scan. It is important to maintain the height, this will eradicate many errors. As a rule, do not change the height during a scan for it may create unnecessary errors.

Another important aspect is the physical orientation of the probe. During the "Parallel" scan mode the orientation of the probe does not change because you are always measuring in the same direction. Even in the "Zig-Zag" scan mode the orientation of the probe must not be changed. That means you are not allowed to turn yourself with the device and the probe at the end of the scanning path. Instead you should walk backwards and continue scanning. Otherwise your obtained graphic includes red or blue stripes. These stripes throughout a scan are commonly referred to as “Rotational Errors”.

8.2.2 Parallel or Zig-Zag?

For skilled users of the 3D Ground Navigator both scan modes are suitable. According to experience the best graphics has been received in the "Parallel" mode, because you are starting at the same point and traveling in the same direction. It is also easier to control your walking speed.

Especially in uneven territories like mountain sides, acclivities or other inclined layers the parallel mode is preferred. When it comes to speed, the experienced user will very often use the Zig-Zag mode for the initial scan to determine if there are anomalies in the area worth further research.

8.2.3 Manual or automatic impulse mode?

Large even or passable surfaces are commonly measured in the automatic mode. The manual impulse mode is mostly used for difficult uneven terrain, areas where there is quite a bit of growth and if the measurement result needs to be very accurate.

In terrains with difficult access like mountain cliffs and sides, slippery surfaces or overgrown areas, it is wise to use the manual impulse mode. Because each impulse will be released manually, you have enough time to position the probe in the correct way and record the measured value. In this way, you can also measure accurately previously marked dots of a predefined grid.

8.2.4 Tips from the trainers themselves

When conducting scans, there are some extremely important items that need to be noted. First of all it is crucial that you relax. When you are tense, you are putting too much pressure on yourself to do the scan correctly; often resulting in errors.

- Newly buried targets are difficult to see. Many users receive the equipment and the first thing they do is go out and bury an object. When an object goes into the ground it changes the natural signature of the soil and creates some kind of noise. Usually the buried object has a weaker signature than the unnatural noise and therefor is not detectable. So taken scan images will not show the buried item but visualize the noisy area in blue colors. After the item has been seasoned, meaning it has been in the ground for a complete cycle of seasons (usually a year), the noise gets reduced and the signature of the buried object becomes visible again.
- Train on known targets. In the training course at the factory we have several objects that have been buried for years, just like real targets in the field. These targets can be quickly and easily identified because they are not natural to the soil. Other targets that you can use in your own area are buried utilities. Pipes, tanks, electrical, sewers, graveyards, etc... Most of these items can be found in every community, town or city. This is where you need to begin your training if you are going to self-train.
- Get professional training. When you take advantage of receiving the training, either from the factory or a qualified dealer, you will understand not only the use and operation of the OKM detector but also the software so much easier and be able to identify targets as well as errors.
- Do not rely on just one scan measurement. So many users go out into the field and they make a measurement and see a target. Instead of repeating the scan and reproducing it several times, they go out and get a shovel and dig. On very rare occasion will the first scan be perfect. Even the trainers do multiple scans to ensure that they are not looking at areas of mineralization or an error.

- Soil Mineralization – Oh! Very frustrating! We will all experience it. When you are in an area that is known to have pockets of mineralization, be prepared to conduct more scans than normal.
    - Clay is probably the number one foe. Depending on the iron content of the clay will determine how strong the attenuation will be. A quick rule of iron content is how dark it is, it can vary from a light gray up to a dark orange. The darker the more iron it will have in it.
    - Sand is usually very clear and easy to hunt in. There are two factors of sand that need to be noted. Sand where the ground water is very shallow, meaning that the ground water is usually just a couple of meters from the surface or desert sand where it is very arid. In desert sand, the targets can be situated 3x deeper than indicated.
    - Farmland is another area to take note of. In modern farms, so many nutrients and fertilizers are introduced creating an unnatural area of mineralization.
    - Rocky mountainous areas. Areas with many mountains are also riddled with patches of mineralization. Mountainous areas are created from faults in the earth and this is probably the biggest area for natural treasures as well as mineralization.