FS Future Series

eXp 4000

Version 2.1

User's Manual

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Introduction

1.1 Preface

Dear customer,

all of the engineers, sales, training and support staff at OKM Ortungstechnik GmbH would like to thank you for your purchase of the eXp 4000.

The eXp 4000 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 eXp 4000 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 eXp 4000 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 eXp 4000. 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 eXp 4000 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 eXp 4000 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 eXp 4000 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 eXp 4000 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

Install/Uninstall USB drivers on Windows

In this chapter you will learn how to install the USB drivers, that are necessary to transfer data from the machine to your computer software. Please make sure to read the proper section appropriate to your Windows operating system.

2.1 Windows XP

The instructions in this section are only valid for Windows XP.

2.1.1 Install USB drivers on Windows XP

The installation of the USB drivers in Windows XP is relatively simple. After you have connected the device with your computer, switch it on and the message from figure 2.1 appears on your screen.

Illustration 2.1: Install USB drivers: Windows XP, Step 1

If your Windows XP has Service Pack 2 installed, you will see the dialog from figure 2.2 if Windows Update has to search for drivers up to date. Mark entry *"No, not this time"* and click on *Next*.

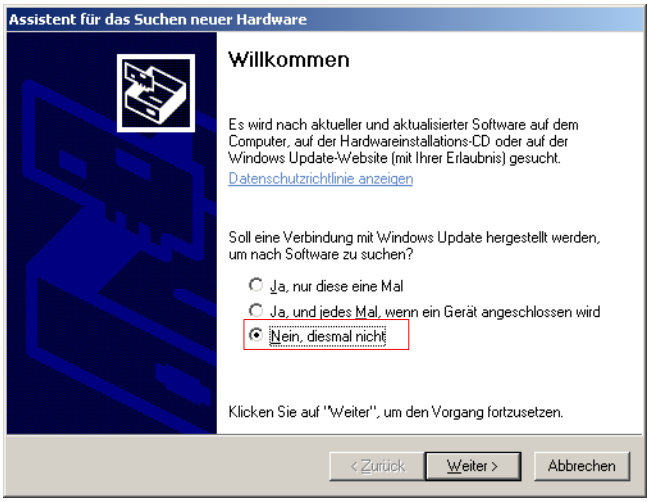


Illustration 2.2: Install USB drivers: Windows XP, Step 2

In other versions of Windows this window should not appear.

In the following dialog window like figure 2.3 select the entry *"Install software from a list ..."* and click *Next.*

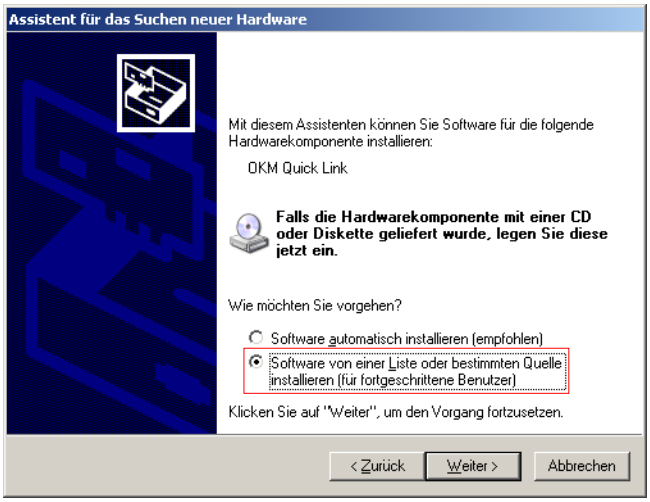


Illustration 2.3: Install USB drivers: Windows XP, Step 3

In the next dialog window from figure 2.4 mark the entry No search, select driver individually and click on Next.

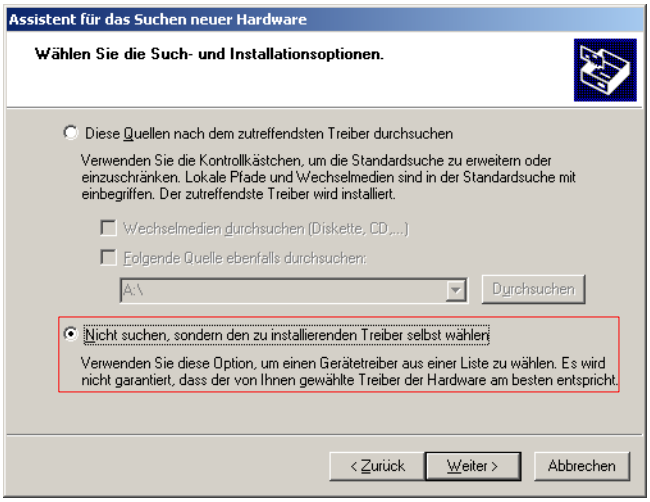


Illustration 2.4: Install USB drivers: Windows XP, Step 4

Another window will open, represented in figure 2.5, where you have to select the driver file. Therefore click on Data carrier. ... Immediately another window appears where you click on the button Search ... Then select the file **`OKM_LE.INF`**, which you can find in the directory **`\drivers\usb_cable`** of your software CD. Afterwards you have to click on Open, OK and Next, to start the installation of the files.

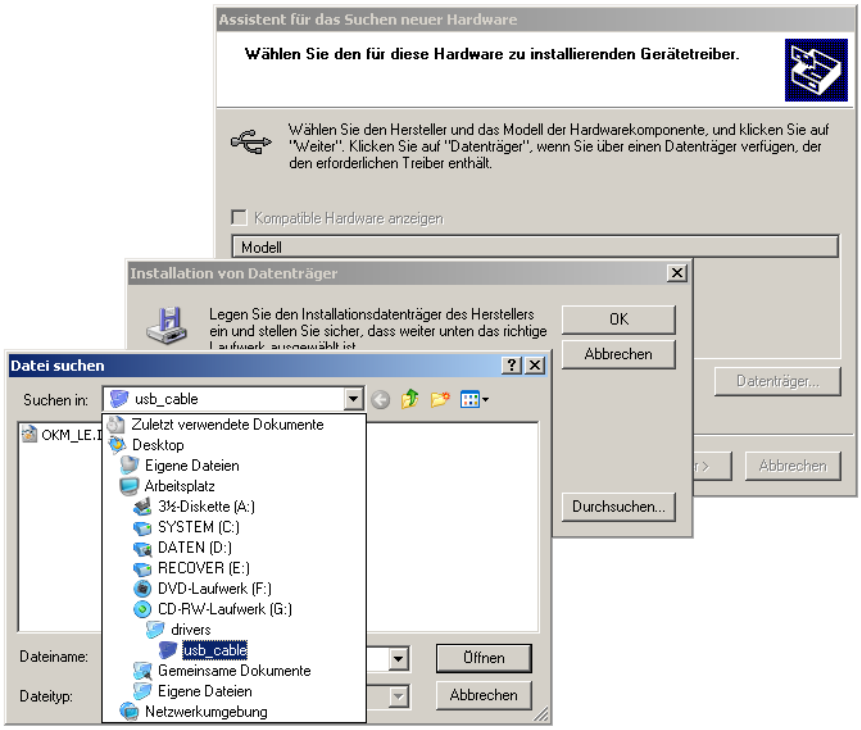


Illustration 2.5: Install USB drivers: Windows XP, Step 5

After successful installation of the driver a message like in figure 2.6 will appear on your computer screen. Now the drivers of your device are installed and you can transfer data to your PC.

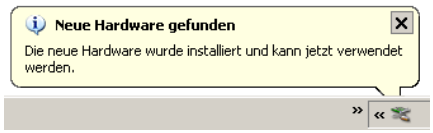


Illustration 2.6: Install USB drivers: Windows XP, Step 6

2.1.2 Uninstall USB drivers on Windows XP

If you need to delete the USB drivers from your operating system because of a wrong installation, please open the device manager of Windows XP. Therefore please click on Start > control panel, like represented in figure 2.7.

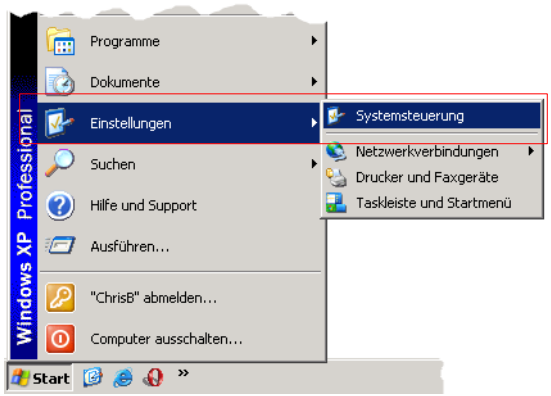


Illustration 2.7: Uninstall USB drivers: Windows XP, Step 1

After that a dialog like in figure 2.8 appears. There you can find the entry system and click twice on it.

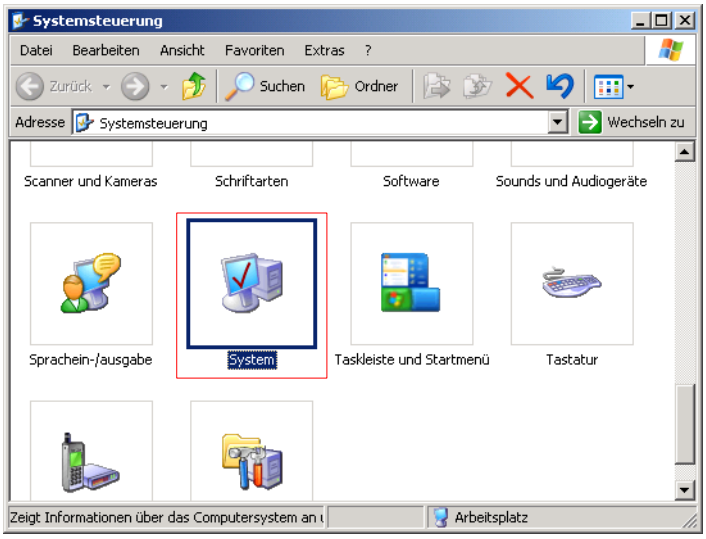


Illustration 2.8: Uninstall USB drivers: Windows XP, Step 2

The dialog from figure 2.9 appears on your screen. Click on the tab hardware and after that the button device manager.

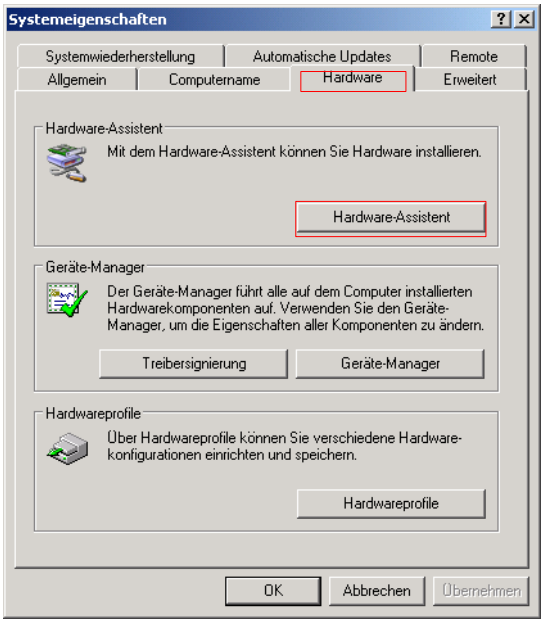


Illustration 2.9: Uninstall USB drivers: Windows XP, Step 3

A list of devices like in figure 2.10 will be represented. There you can find the entry USBController. By clicking the plus symbol next of this entry, all available USB devices will be shown.

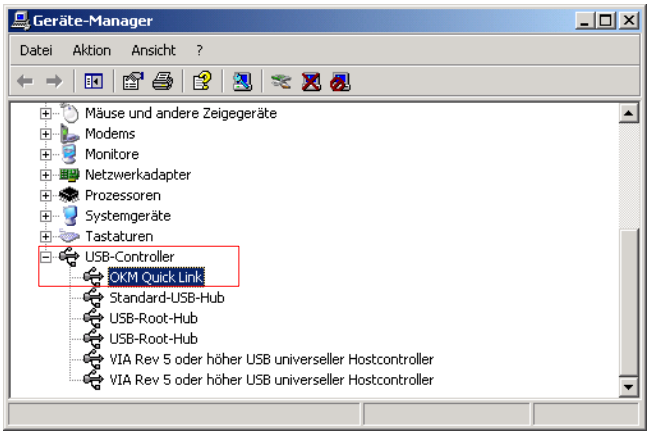


Illustration 2.10: Uninstall USB drivers: Windows XP, Step 4

Mark the device which you like to delete, which means "eXp 4000. Additionally the device may be listed as “OKM Quick Link”. Then click on the button. Alternatively you can select the entry Uninstall in the menu Action.

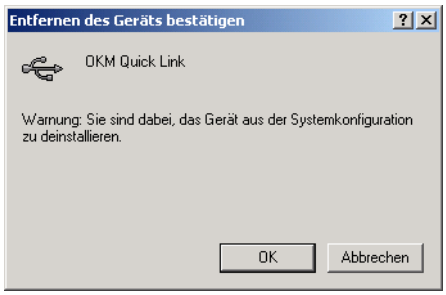


Illustration 2.11: Uninstall USB drivers: Windows XP, Step 5

The dialog from figure 2.11 appears. Click there on the button OK. Now all drivers will be deleted from your computer. If needed you can now install the USB driver again correctly.

2.2 Windows Vista

The instructions in this section are only valid for the Windows Vista operating system.

2.2.1 Install USB drivers on Windows Vista

The installation of the USB drivers in Windows Vista is relatively simple. After you have connected the device with your computer, switch it on and the message from figure 2.12 appears on your screen. Click on **Locate and install driver software (recommended)**.

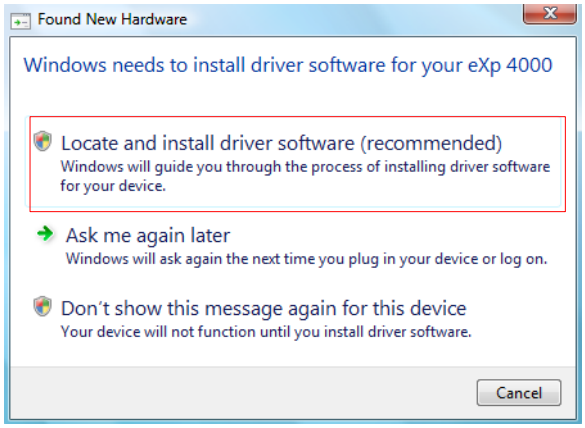


Illustration 2.12: Install USB drivers: Windows Vista, Step 1

At the next window, shown in figure 2.13, click on **Don't search online**.

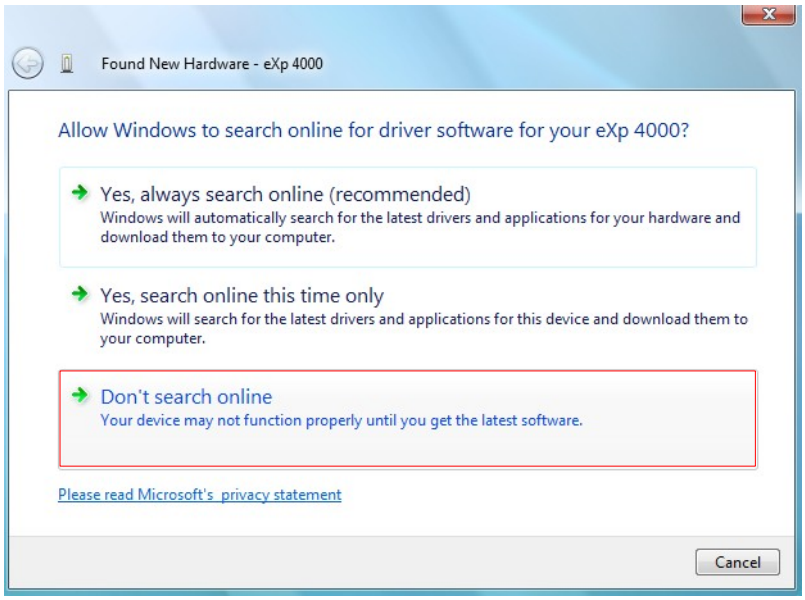


Illustration 2.13: Install USB drivers: Windows Vista, Step 2

When the window from figure 2.14 is visible, insert the software CD with the USB drivers into your CD drive and click on the **Next** button. Windows will now search for the correct USB drivers automatically.

Illustration 2.14: Install USB drivers: Windows Vista, Step 3

When the installation has finished the completion screen from figure 2.15 is displayed. Press **Close** to close this window.

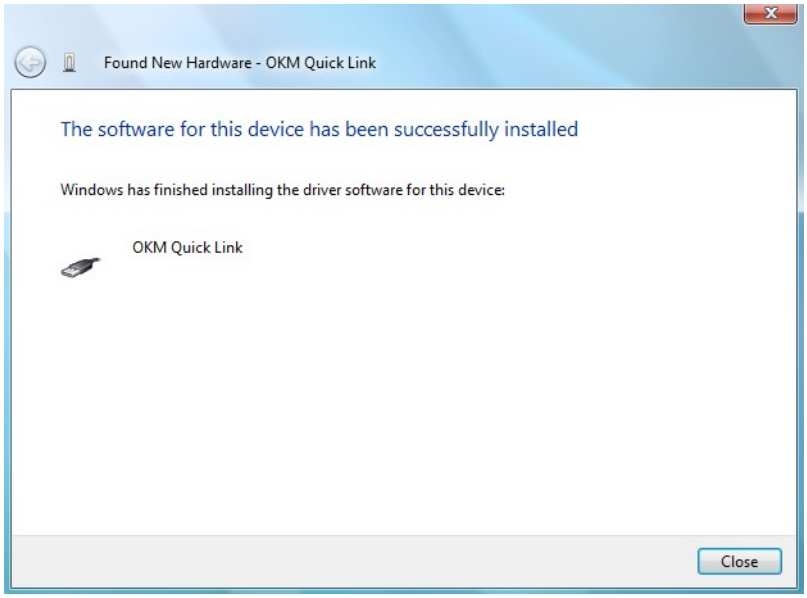


Illustration 2.15: Install USB drivers: Windows Vista, Step 4

Now you have completed the installation of the USB drivers in Windows Vista, which will be confirmed by presenting the message from figure 2.16.

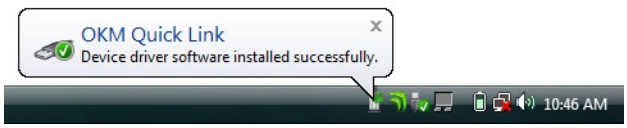


Illustration 2.16: Install USB drivers: Windows Vista, Step 5

2.2.2 Update USB drivers on Windows Vista

If you need to update the USB drivers on your operating system or the initial installation failed, please open up the Device Manager of Windows Vista. Therefore press the Windows start button and click on **Control Panel**.

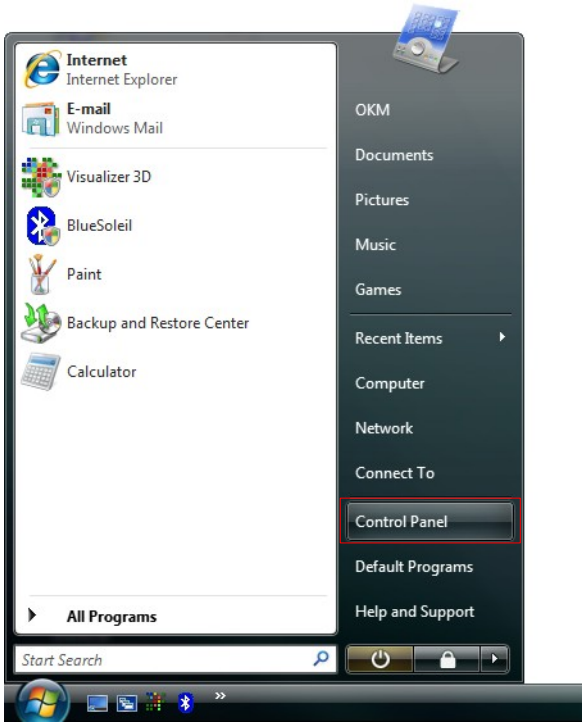


Illustration 2.17: Update USB drivers on Windows Vista, Step 1

At the next screen, shown in figure 2.18, select **View hardware and devices** which can be found on the bottom of the left sidebar.

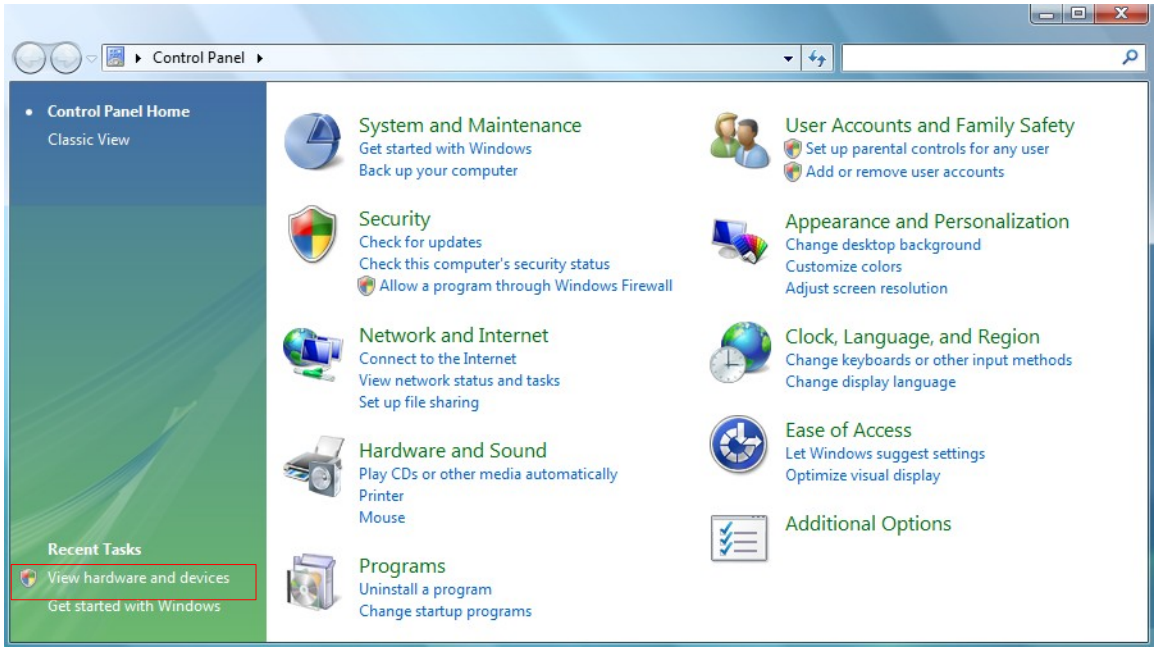


Illustration 2.18: Update USB drivers on Windows Vista, Step 2

In the Device Manager (see figure 2.27) there will be a device under *Other devices* with a yellow warning symbol to indicate a problem i.e. no driver installed. If the drivers has been installed already it will show up under *Universal Serial Port Controllers*. The text next to this device will depend on the device attached. In this example the device was an eXp 4000 device. Right click on the device (eXp 4000 in this example) to bring up a menu as shown below.

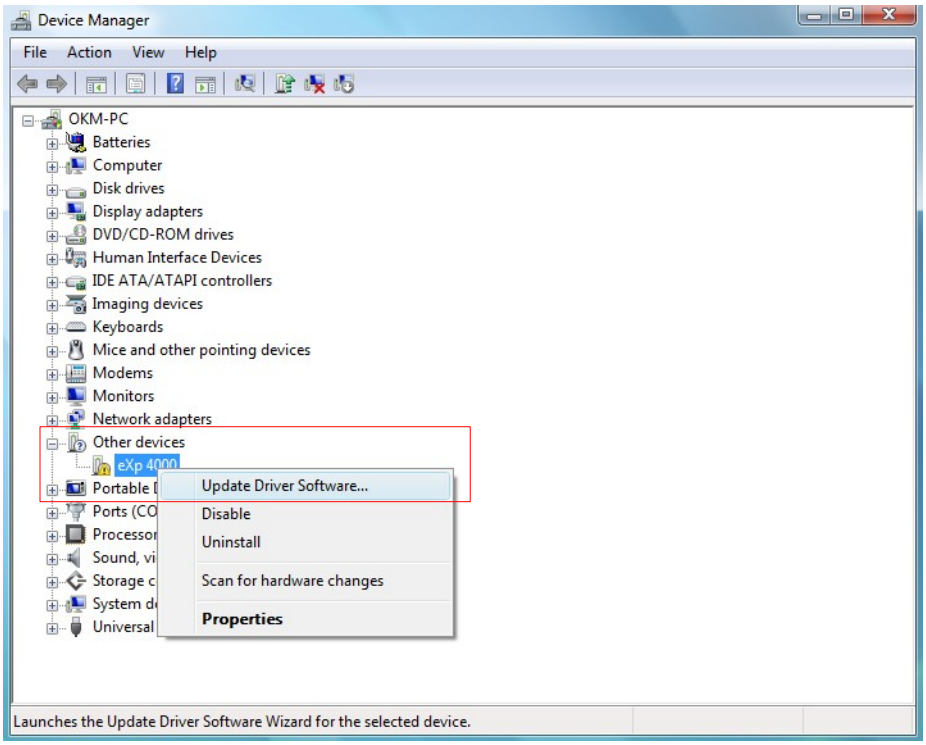


Illustration 2.19: Update USB drivers on Windows Vista, Step 3

From the displayed menu select **Update Driver Software...** which then displays the option for an automatic or manual search. Select the second option to browse manually.

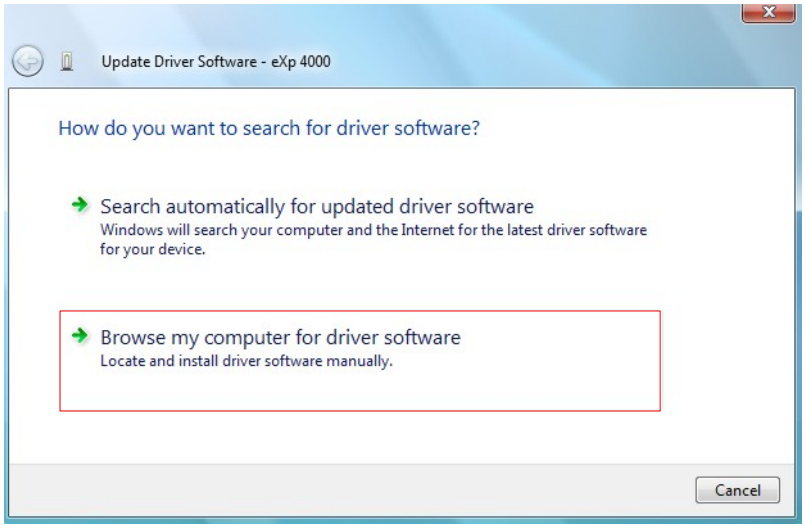


Illustration 2.20: Update USB drivers on Windows Vista, Step 4

In the address box put the exact location where the drivers have been saved to. Usally this may be your software CD or a folder on the PC if you downloaded the drivers from our website. It is not necessarily the exact same location as shown in the screenshot of figure 2.28.

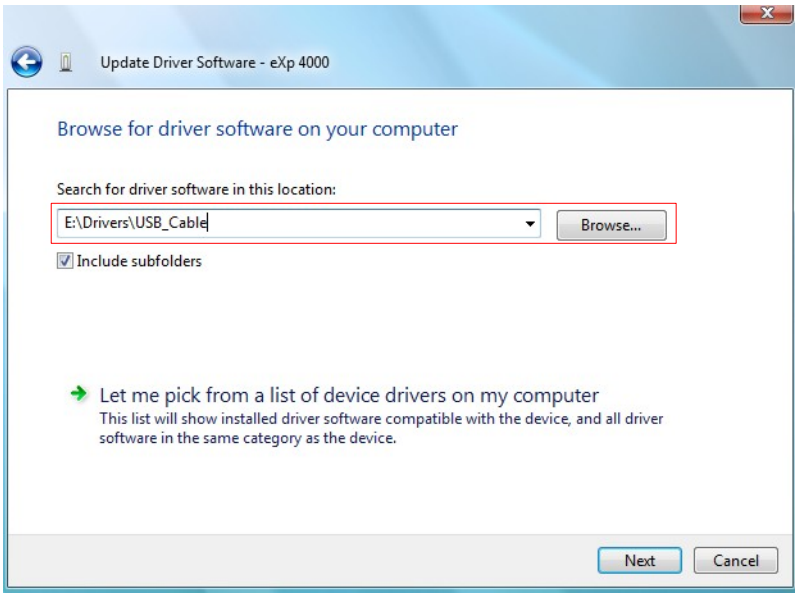


Illustration 2.21: Update USB drivers on Windows Vista, Step 5

After entering the drivers location select **Next** to start the installation.

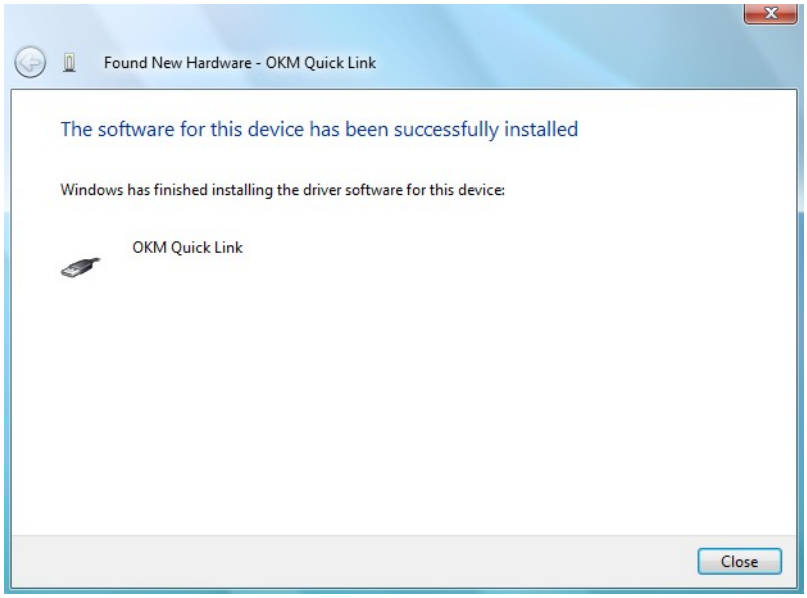


Illustration 2.22: Update USB drivers on Windows Vista, Step 6

When the installation has finished the completion screen from figure 2.17 is displayed. Press **Close** to close this window and go back to the Device Manager.

The Device Manager will now show a device under *Universal Serial Bus Controllers* indicated in the screenshot below as *OKM Quick Link*.

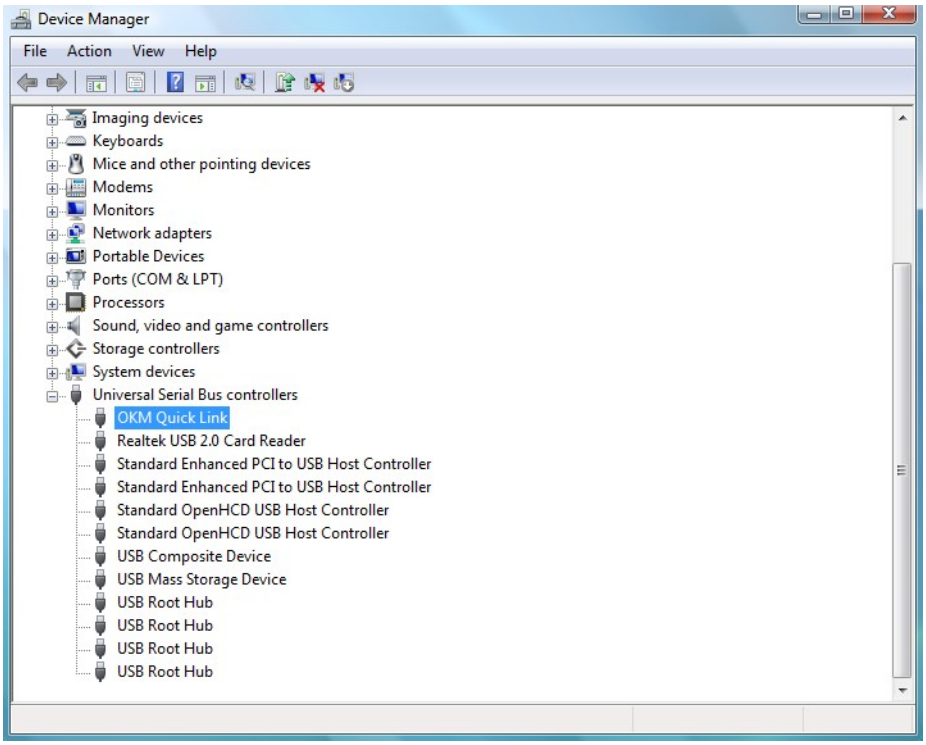


Illustration 2.23: Update USB drivers on Windows Vista, Step 7

The USB drivers are correctly updated/installed now and you can close the Device Manager window.

2.2.3 Uninstall USB drivers on Windows Vista

If you need to delete the USB drivers from your Windows Vista operating system, please open up the Device Manager as described in the previous subsection.

Installed devices can be removed using the Device Manager by simply right-clicking on the mouse and selecting **Uninstall**. This will delete the associated registry entries for that device only.

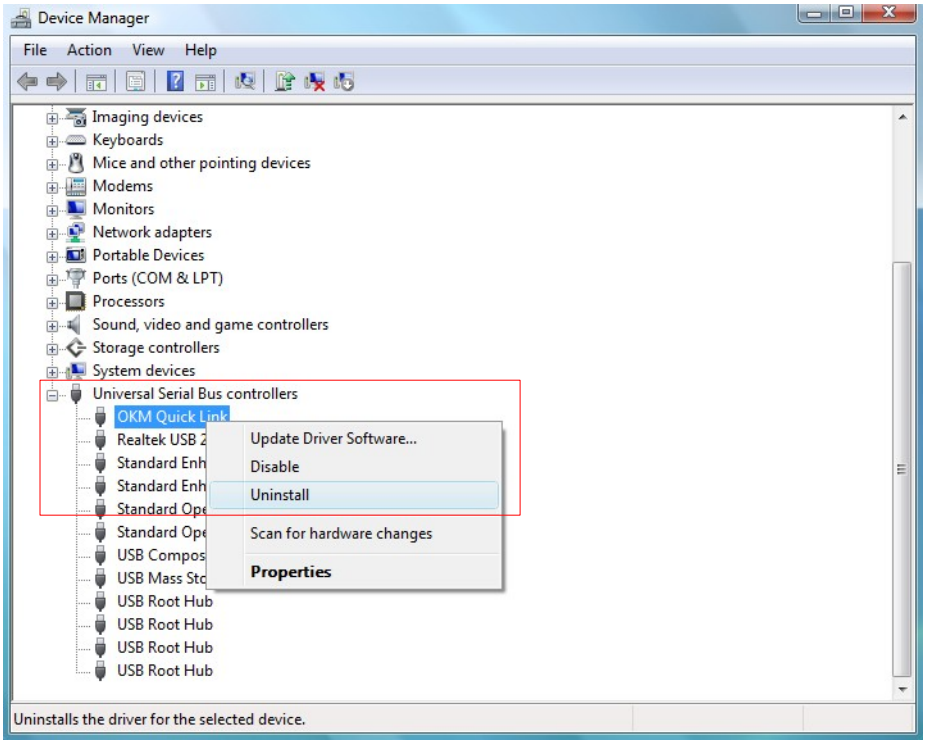


Illustration 2.24: Uninstall USB drivers on Windows Vista, Step 1

Windows Vista provides an automatic method to delete driver files via check box *"Delete the driver software for this device"* on the uninstall dialog box. Just mark the check box and click **OK** to remove the installed USB drivers of your device.

Illustration 2.25: Uninstall USB drivers on Windows Vista, Step 2

2.3 Windows 7

The instructions in this section are only valid for the Windows 7 operating system.

2.3.1 Install USB drivers on Windows 7

The installation of the USB drivers on Windows 7 is a little bit different as known from previous Windows versions. Connect the device to a spare USB port on your PC and make sure everything is switched on. Windows 7 is now trying to install the latest USB drivers and displays the message from figure 2.19.

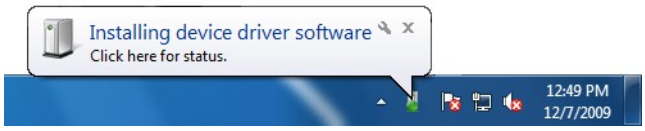


Illustration 2.26: Install USB drivers on Windows 7 - Step 1

Shortly after this Windows 7 will bring up a new message as shown in figure 2.20 to inform you about the fact that it could not install any drivers for your device successfully.

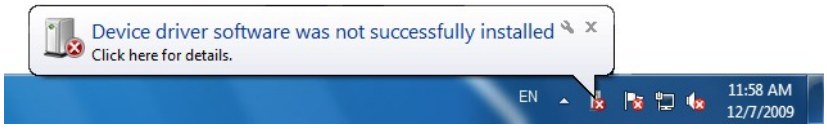


Illustration 2.27: Install USB drivers on Windows 7 - Step 2

Press the Windows 7 start button to bring up the start menu and select **Control Panel** as shown in figure 2.26.

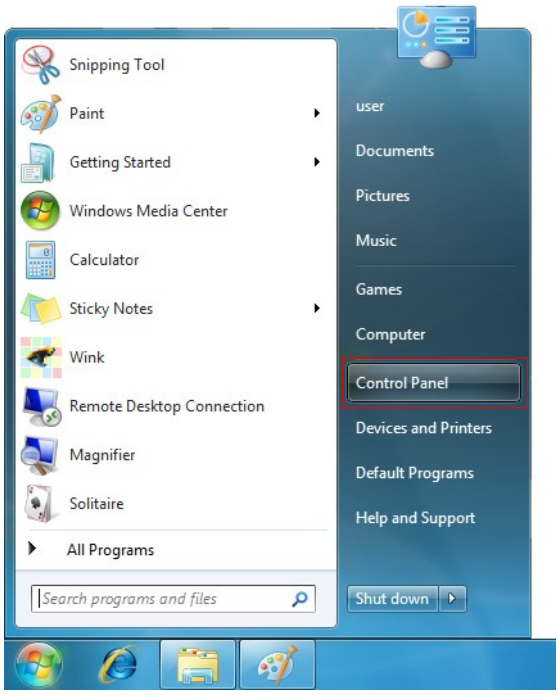


Illustration 2.28: Install USB drivers on Windows 7 - Step 3

This will open up the control panel window as shown in figure 2.29. From the control panel window you have to select **Hardware and Sound**.

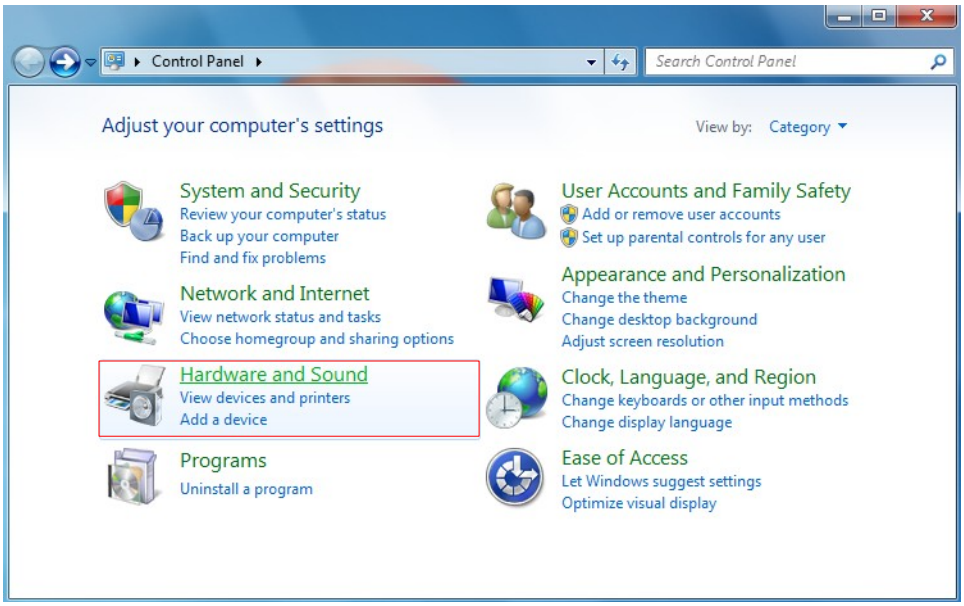


Illustration 2.29: Install USB drivers on Windows 7 - Step 4

At the next screen, shown in figure 2.30, select **Device Manager** which can be found under *Devices and Printers*.

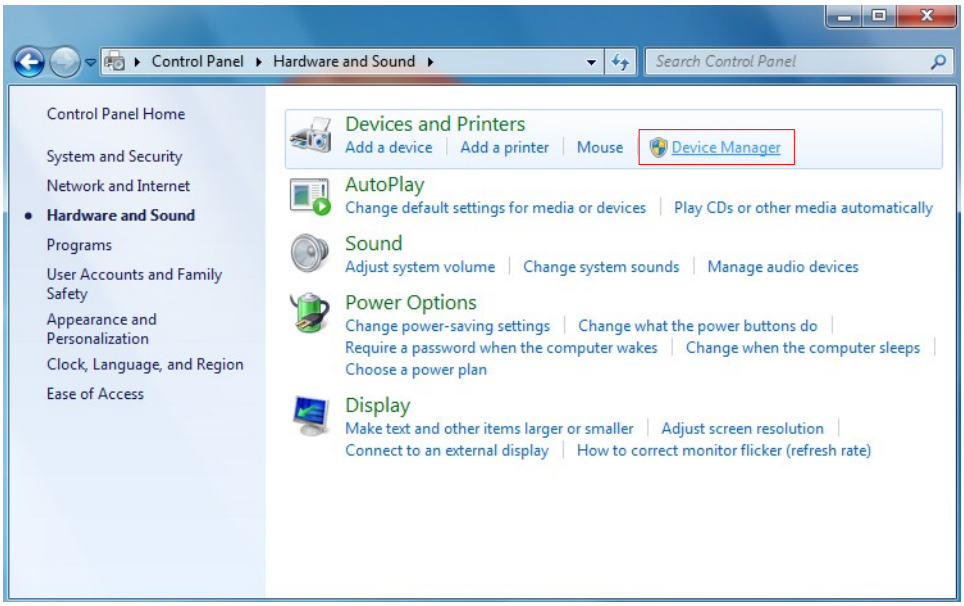


Illustration 2.30: Install USB drivers on Windows 7 - Step 5

In the Device Manager (see figure 2.27) there will be a device under *Other devices* with a yellow warning symbol to indicate a problem i.e. no driver installed. The text next to this device will depend on the device attached. In this example the device was an eXp 4000 device. Right click on the other device (eXp 4000 in this example) to bring up a menu as shown below.

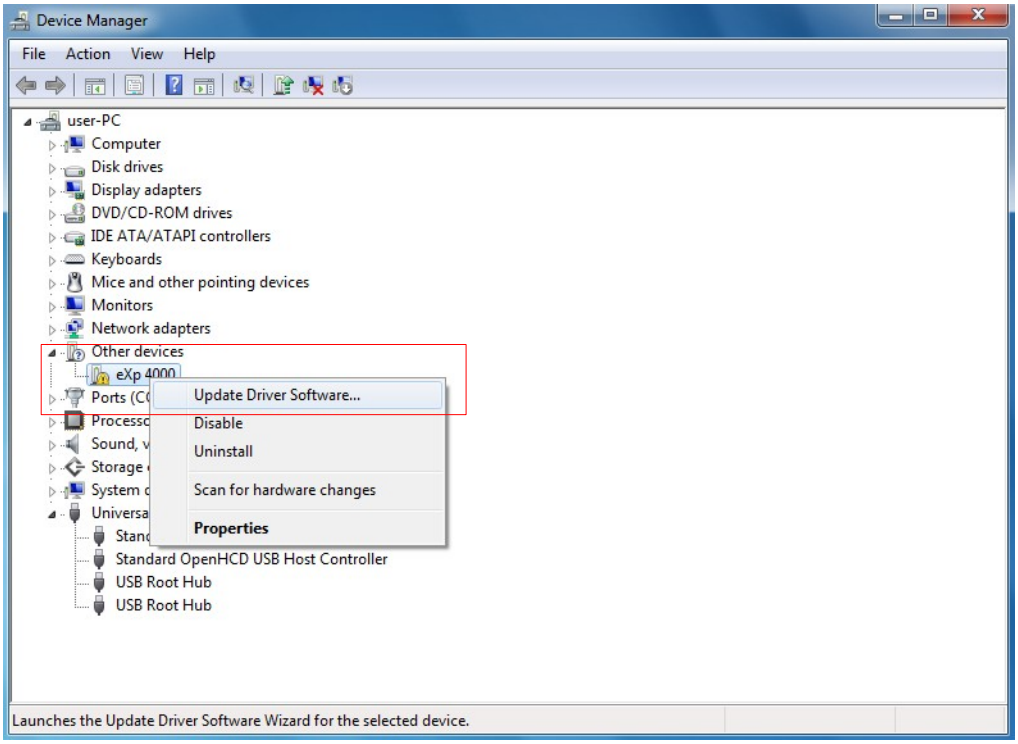


Illustration 2.31: Install USB drivers on Windows 7 - Step 6

From the displayed menu select **Update Driver Software...** which then displays the option for an automatic or manual search. Select the second option to browse manually.

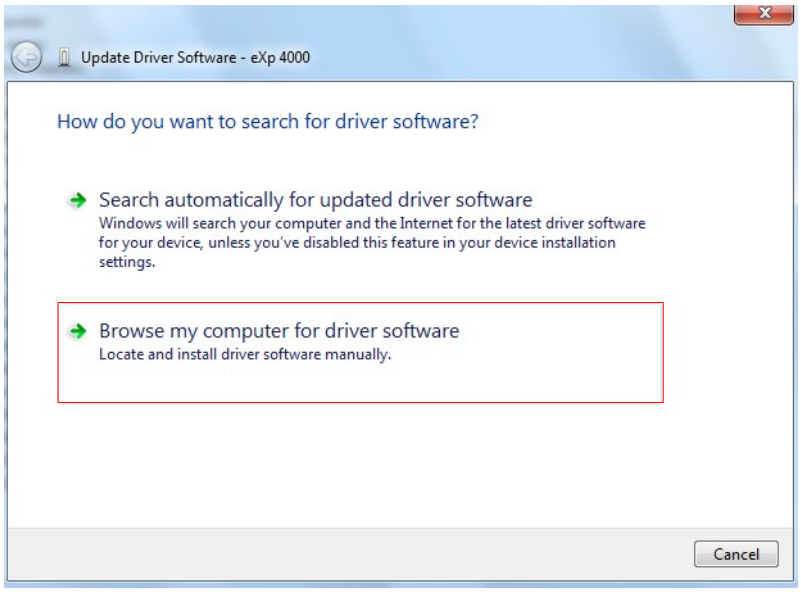


Illustration 2.32: Install USB drivers on Windows 7 - Step 7

In the address box put the exact location where the drivers have been saved to. Usally this may be your software CD or a folder on the PC if you downloaded the drivers from our website. It is not necessarily the exact same location as shown in the screenshot of figure 2.31.

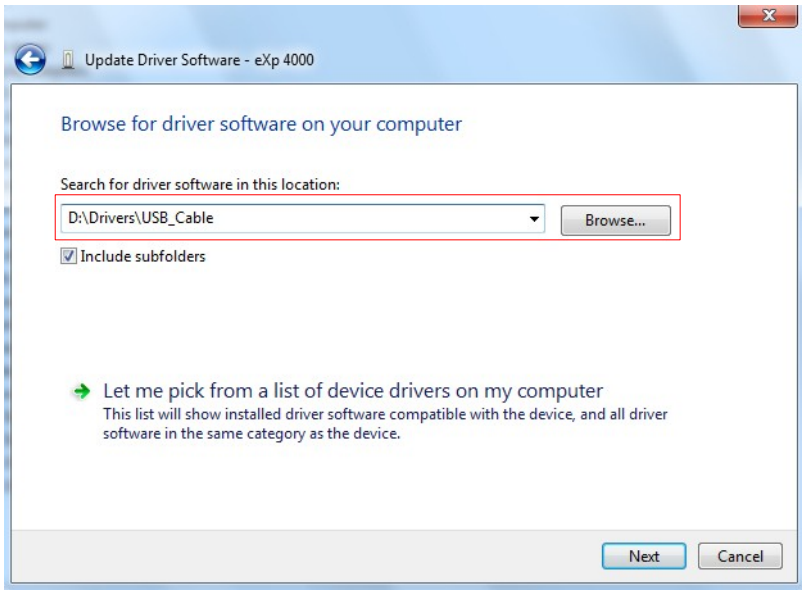


Illustration 2.33: Install USB drivers on Windows 7 - Step 8

After entering the drivers location select **Next** to start the installation.

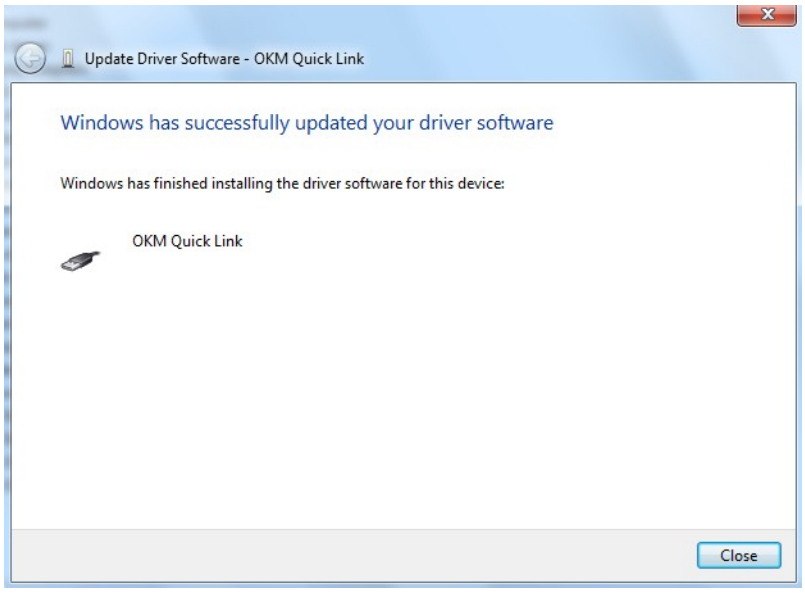


Illustration 2.34: Install USB drivers on Windows 7 - Step 9

When the installation has finished the completion screen from figure 2.32 is displayed. Press **Close** to close this window and go back to the Device Manager.

The Device Manager will now show a device under *Universal Serial Bus Controllers* indicated in the screenshot below as *OKM Quick Link*.

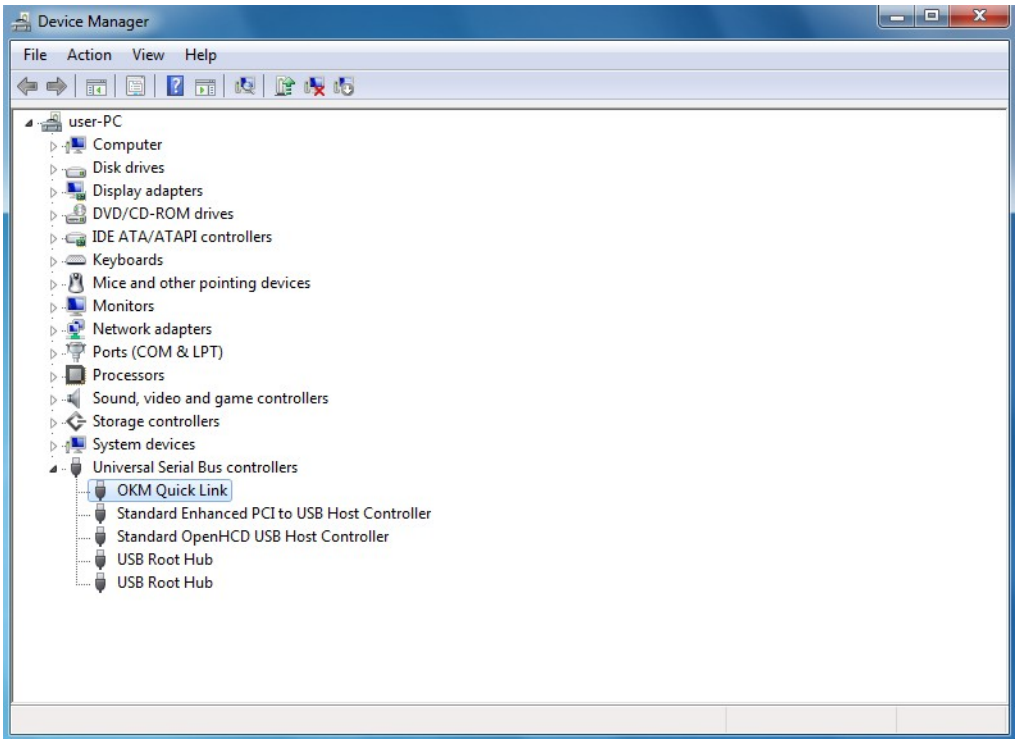


Illustration 2.35: Install USB drivers on Windows 7 - Step 10

The USB drivers are correctly installed now and you can close the Device Manager window.

2.3.2 Uninstall USB drivers on Windows 7

If you need to delete the USB drivers from your Windows 7 operating system, please open up the Device Manager as described in the previous subsection.

Installed devices can be removed using the Device Manager by simply right-clicking on the mouse and selecting **Uninstall**. This will delete the associated registry entries for that device only.

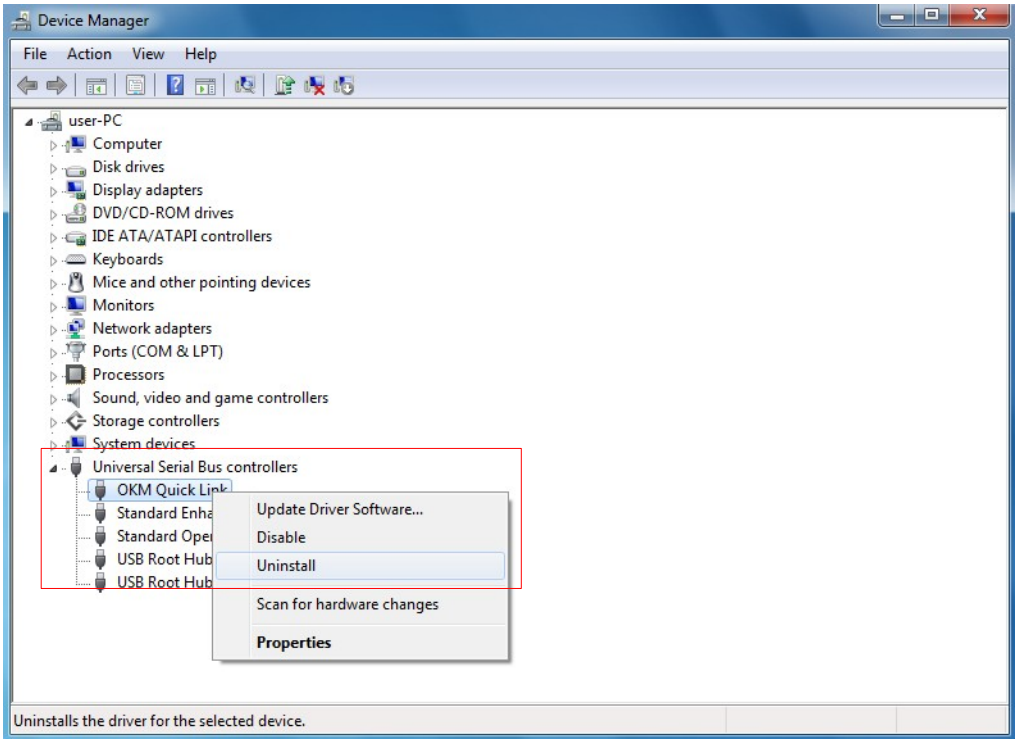


Illustration 2.36: Uninstall USB drivers on Windows 7 - Step 1

Windows 7 provides an automatic method to delete driver files via check box *"Delete the driver software for this device"* on the uninstall dialog box. Just mark the check box and click **OK** to remove the installed USB drivers of your device.

Illustration 2.37: Uninstall USB drivers on Windows 7 - Step 2

Chapter 3

Technical Specifications

The following technical indications are medial values. During operation small variations are quite possible.

3.1 Control Unit

Dimensions (H x W x D) ..... 430 x 150 x 260 mm
Weight ..... about 3 kg
Voltage ..... 9.6 - 14.4 VDC, 22 W maximal
Safety Class IP40
Operating Time (full charged Power Pack, 25 °C) ..... about 3 hours
Operating Temperature ..... 0 °C – 40 °C
Display ..... 300 mcd Background lighting, 6.4" Diagonale, 640 x 480 Pixel TFT, Color
Computer ..... 800 MHz Processor, INTEL i586- compatible
Working Memory (RAM) ..... 256 MB
Data Memory ..... 256 MB
Feedback ..... accustic, visual
Storage temperature ..... -20 °C – 60 °C
Air humidity ..... 5 % – 75 %
Waterproof ..... No
Sensor technology TCFX-01-A

3.2 Data Transmission

Technology ..... USB
Maximal Data Transmission Rate ..... 19200 Baud

3.3 Computer, Minimum Requirements

The computer is not part of the scope of delivery. The indicated values should help you for a correct selection of a suitable computer for analysis of your measured results.

Processor ..... minimum 1.5 GHz
CD-ROM Drive ..... minimum 4x
Port (Data Transmission) ..... USB
Free Memory ..... minimum 50 MB
Working Memory (RAM) ..... minimum 256 MB
Graphic Card ..... minimum 128 MB, OpenGL-compatible
Operating System ..... Windows XP, Windows Vista, Windows 7

Chapter 4

Scope of Delivery

In the following section you can find all standard equipment. The scope of delivery can be different in some circumstances because of some optional accessories which should not be included in the basic equipment.

	Basic	Gold Edition	Professional
Control unit incl. carrying strap	1	1	1
Headphones	1	1	1
Telescopic rod assembly for GPR antenna	1	1	1
Power Pack with charger and travel adapter	1	2	1
GPR antenna 25 cm	1	1	1
Joystick	1	1	1
User's manual	1	1	1
Carrying case	1	1	2
3D Software (Visualizer 3D)	1	1	1
USB cable	1	1	1
Super sensor	-	1	1
Antenna for metal discrimination (DDV system)	-	1	1
GPR antenna 50 cm	-	-	1
GPR antenna 75 cm	-	-	1
GPR antenna 100 cm	-	-	1
Antenna for tunnel detection	-	-	1
FS-Thermoscan	-	-	1

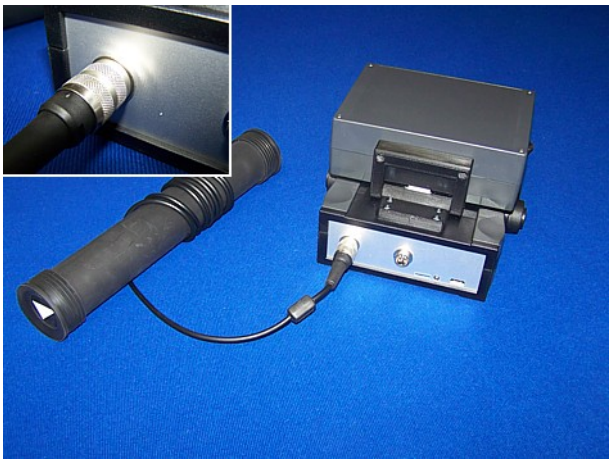
Table 1: Scope of delivery

Chapter 5

Assembly

This section explains how to assemble the eXp 4000 and to prepare the unit for operation.

Before you can use the device eXp 4000 for a field measurement you should do some preparations. Please make notes to the following steps.



Step 1

Connect the probe which you would like to use to the control unit. Regardless of which probe you are using, you will always use the same plug for each probe.

You can only use one probe at a time for one measurement.

Illustration 5.1: Connection of probe

Step 2

Now you can connect the Power Pack to the control unit. After powering on the Power Pack you can put it in your pocket.

Now you should power on the device by using the Power On/Off button.

Illustration 5.2: Connection of Power Pack

Step 3

The headphones are necessary to hear the acoustic output of the device.

But you are also able to scan the field without connecting the headphones.

Illustration 5.3: Connection of headphones

Illustration 5.4: Connection of joystick

Step 4

If you are going to be conducting a scan in "Manual" mode, plug in the joystick to the control unit.

Chapter 6

Control Elements

In this section you will learn more about the fundamental use of all control elements for the eXp 4000 measuring instrument. All connections, inputs and outputs are explained in detail.

Illustration 6.1: Control unit with power supply and probe

Via the display you can see the navigation menu and all recorded scans.

The horizontal antennas like the 25 cm GPR probe have to be connected via the T-mount to the Telescopic rod assembly. Vertical probes like the Super Sensor can simply be held in your hand.

6.1 Control Unit

The control unit is the processing center of the eXp 4000. Via the control unit, various functions can be selected, all measured values can be recorded and stored.

6.1.1 Front View

Figure 6.2 shows the front side of the control unit with its control elements.

Illustration 6.2: Control unit, front view

The Power switch is used to power on the device. Prior to operating your unit, connect the external Power Pack and turn it on.

The Start button is used to start a scan. When in "Manual" mode, it is also a secondary trigger to record a measurement.

The joystick Connector is used to connect the joystick to the device. The joystick fullfils the same functions as the Start button, but is more comfortable and can facilitate the measurement procedure.

With the keys 🡻 and 🡹 you can select the operating mode. To confirm your selection you have to press the **OK** button.

6.1.2 Rear View

Figure 6.3 shows the rear view of the control unit and its connections.

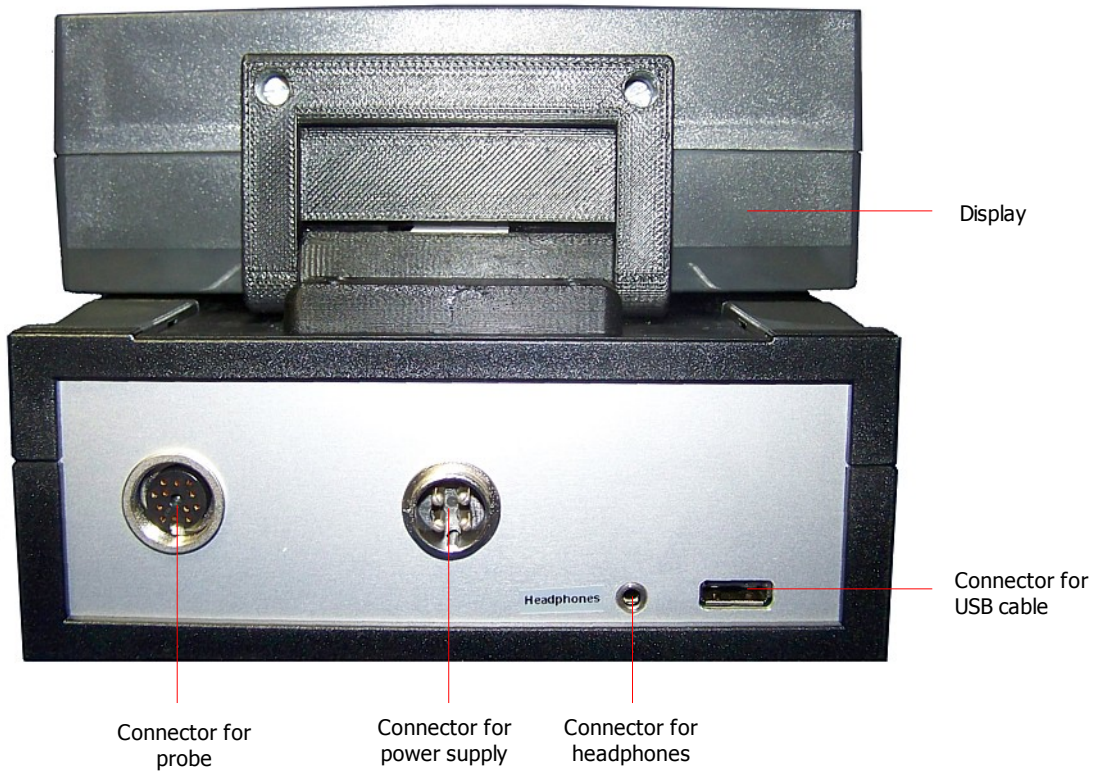


Illustration 6.3: Control unit, rear view

The connector for the power supply is used to connect the battery. There the external power supply has to be plugged in.

On the probe connector the different probes as well as the DDV system can be connected.

The connector for the headphones is used to plug in the delivered headphones enabling the user to hear an audio output.

Via the connector for the USB cable the device can be connected to a computer via the USB cable. This is necessary to transfer data from the device to a computer.

Chapter 7

Operating Modes

In this section you will learn more about the different operating modes of the eXp 4000. Every function is explained in its proper subsection.

Selecting the correct operating mode depends primarily on the desired output. So for example there are some functions which have to be used for an initial first measurement in an unknown area to get a general overview, whereas others are more suitable for a more detailed search and analysis with a special processing software program.

The eXp 4000 has the following operating modes:

- **Magnetometer**
  Search an area with the integrated magnetometer.
- **Ground Scan**
  Measurement with graphical evaluation, whereby measured data can be stored in the internal memory of the device for later review.
- **Metal Detector**
  Activate optional DDV system to discriminate between metals.
- **Discrimination**
  Examination of detected objects regarding their characteristics on iron contents.
- **Empty Memory**
  Delete all data stored in the internal memory.
- **Exit**
  Power off the device and shut down the integrated PC module.

If you are connecting the optional FS-Thermoscan to the eXp 4000, there will be two more operating modes available. Without FS-Thermoscan those functions are inactive and not visible.

- **Thermograph**
  This operating mode is used to view and analyze differences in temperature measured with FS-Thermoscan.
- **Thermo Scan**
  In Thermo Scan you can create graphical infra red images to visualize the distribution of temperatures of a field.

Both operating modes will be visible in the main menu as soon as the optional device FS-Thermoscan is connected to the eXp 4000. These options are useful for seeking cavities.

Via the touchpad on the front of your device you can select and confirm your desired operating mode.

7.1 Magnetometer

By selecting the Magnetometer mode from the main menu, you can scan the sub-surface for ferromagnetic targets and areas of the soil with a high iron content. Also, you may view the oscilloscope output on the monitor to be able to identify ferromagnetic materials in the ground.

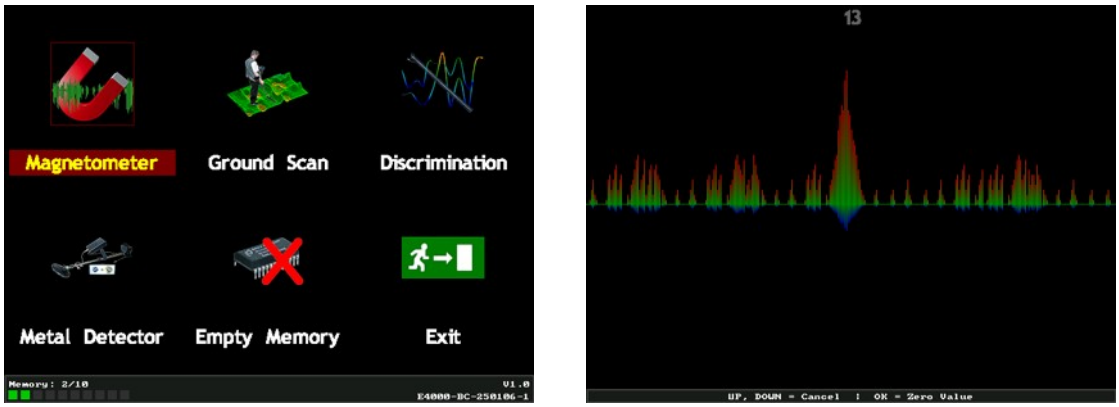


Illustration 7.1: Magnetometer: Main Menu, Representation of Values

The Magnetomer mode can be used with all the antennas except the DDV system. As soon as you confirm the operating mode "Magnetometer", the integrated magnetometer will be adjusted to the current ground value of the place where it is situated at that moment. During the initialization process the message "*Ground Balance, Please Wait*" appears on the display. Only after this message disappears can you start your search.

When powering on the unit above a neutral soil, all metallic signatures will be shown in upward spikes. If by mistake, you start the unit above a metal target, all like metals will not be recognized.

To re-balance the Magnetometer, press the **OK** button, while staying on a neutral place. To exit the Magnetometer mode, press the 🡻 or 🡹 to return to the main menu.

When you use this mode, you can actually move quite quickly to clear a field of easily identified metallic objects. Most of the time when your target may be of a newer nature or is located in an area where there is a lot of modern construction, this is the first choice to identify potentially “Hot” targets. A hot target can be debris like cans, nails, screws, old automobile parts, etc... These should be cleared first. The magnetometer measures usually only near to the surface for quick hunts.

7.2 Ground Scan

This operating mode allows you to do a measurement with graphical representation whereby all measured values will be stored in the internal memory of the device. Also you have the possibility to recall and see previous stored graphics. This mode can be used with all antennas except the DDV system.

The Ground Scan mode is your primary function. This is the mode where you are going to find the targets and locate areas of disturbed soils. When something is buried, then whoever buried it had to dig a hole. Look for the disturbance in the soil first. If a hole was created at 4½ feet (1.5m) deep, after a couple of seasons the hole will appear to be over 6 ft (2m) in diameter at the surface. Start with a scan that has an impulse approximately every 1½ to 2 feet (40cm – 60cm) forward and to the sides. Don't go too fine on the first scans until you have a possible anomaly. Look for the holes! Usually without a hole you could be looking at mineralization.

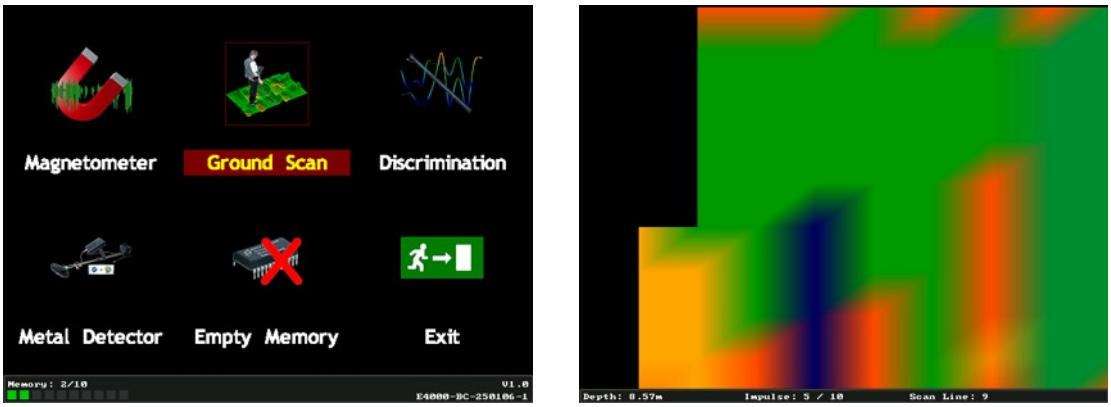


Illustration 7.2: Ground Scan

In the first submenu which is shown in figure 7.3, you can choose between the following alternatives:

- **New Scan**
  Set up and record a new graphic.
- **Browse Scans**
  See or delete stored graphics.
- **Back To Main Menu**
  Finish *Ground Scan* and go back to the main menu.

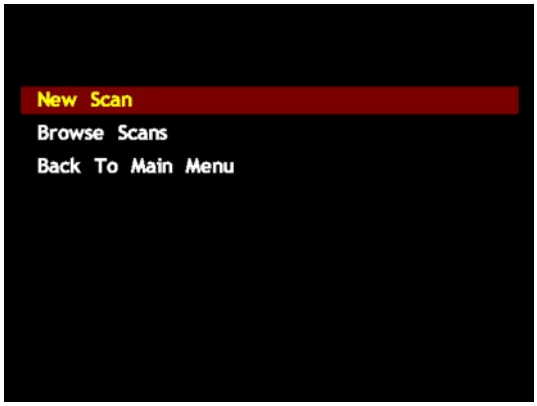


Illustration 7.3: Ground Scan – Submenu

7.2.1 New Scan

After activating this operating mode you have the possibility to adjust certain settings. There are different parameters which influence the measurement. In figure 7.4 you can see the corresponding submenu.

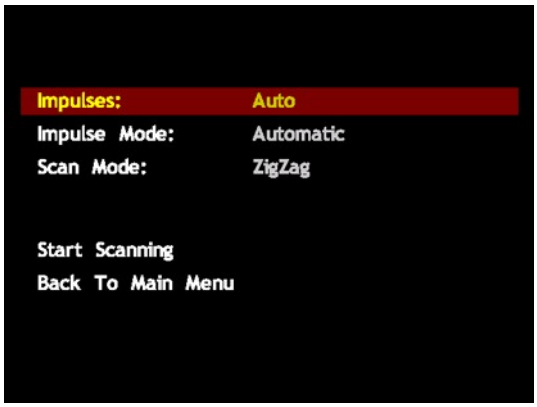


Illustration 7.4: Ground Scan – Parameter

You can modify the following parameters (the underlined values correspond to the setting made by the factory):

- **Impulse Mode (Automatic, Manual)**
  If you are working in the Manual mode the measured values will only be recorded when using the joystick or by pushing on the start button. If you select the Automatic mode, the measured values will be recorded represented on the display continuously.
- **Impulses (Auto, 10, 20, ..., 50)**
  Number of measured values per search line. If you select "Auto" the number of impulses can be adapted to the current length of your search line. During the first line the device will read values regulary without stopping. When you want to finish your first line you have to press the **OK** key, to stop the measuring process of the current line. The device will store the number of impulses and use it for all further scan lines on the same scan. By selecting the value 10, 20, ... or 50 you can preset the number of impulses you need in one measured line.

- **Scan Mode (Parallel, Zig-Zag)**
  Scan Mode defines the method of scanning an area. In the Parallel mode measurement starts always from the starting line, whereas in the Zig-Zag mode measurements starts at the end of

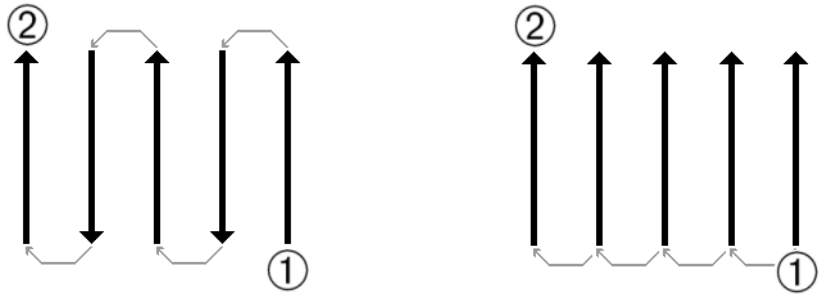


Illustration 7.5: Zig-Zag or Parallel

the line which was scanned before, like represented in figure 7.5. In the last scanning method (Zig-Zag) you have to take care not to change the orientation of the antenna, which means if the white arrow on the side of the probe shows to north direction for example it has to show to north direction in every measured line.

Select the parameter, which you want to change with the keys 🡻 and 🡹, until it is highlighted in red color. Now press the **OK** key. The marking will change, so that only the current value is highlighted in red color. Now you can change the value of the selected parameter by using the keys 🡻 and 🡹. To finish this process you have to press the **OK** key again.

Go to your start position and adjust all necessary parameters to your needs. Then you have to select option *Start Scanning*, to start the measurement. The message from figure 7.6 will appear and ask you if you are ready to start your first scan line now.

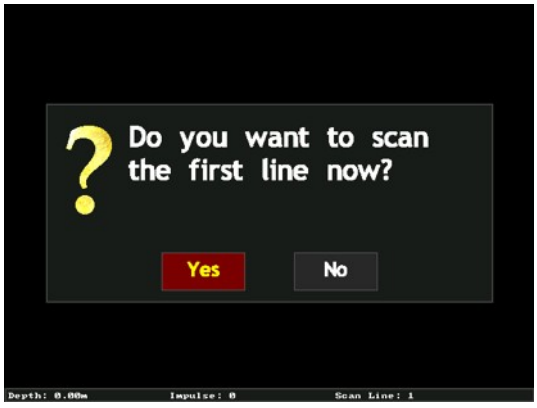


Illustration 7.6: Start first scan line?

While using the keys 🡻 and 🡹 select option "Yes", if you want to start the measurement. Confirm your selection by pressing the **OK** key. As soon as you press the **OK** button, begin walking immediately for the eXp 4000 is now recording data. As soon as your first scan line is finished a new message will appear, where you have to select "Yes" if you want to scan another measured line.

Repeat this procedure until your complete area is scanned. Step by step a graphical representation similiar to figure 7.7 will appear.

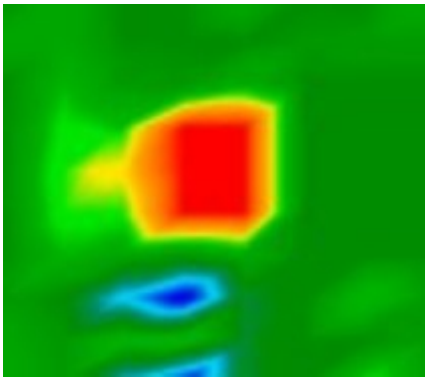


Illustration 7.7: Graphical Representation of a Measurement in Operating Mode Ground Scan

The graphic where a target is present should primarily be a green color for the background, which represents normal ground. In this green area red and blue objects can be placed. Metallic objects are normally represented in red and cavities, water reserves and earth interferences in blue colors. Areas where ground mineralization is present is often shown in red also.

7.2.2 Browse Scans

After selecting the "Browse Scans" function with the **OK** key, you will see a list of the stored scans, as represented in figure 7.8. Select the measurement which you like to see with the keys 🡻 and 🡹. For the

Illustration 7.8: Select Stored Measurement

selected measurement the following options represented in figure 7.9 are provided.

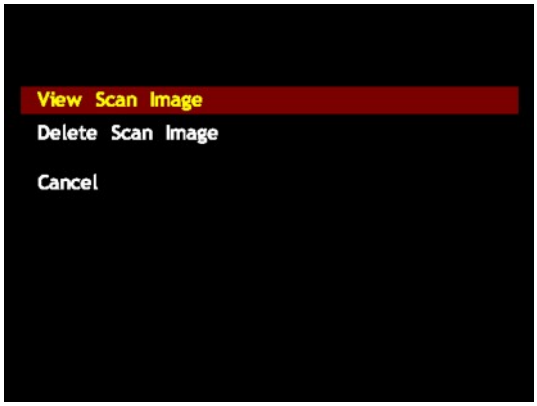


Illustration 7.9: Submenu: Browse Scans

- **View Scan Image**
  The selected measurement will be displayed once again. Press any key to go back to the selection menu.
- **Delete Scan Image**
  The current selected measurement will be deleted, if you confirm the following message with "Yes". Following you will go back to the menu Ground Scan.
- **Back To Ground Scan Menu**
  You go back to menu Ground Scan.

7.3 Metal Detector

To use this operating mode you have to connect the optional DDV system first. This detector is specialized to find small objects (e.g. coins) which are located near to the surface.

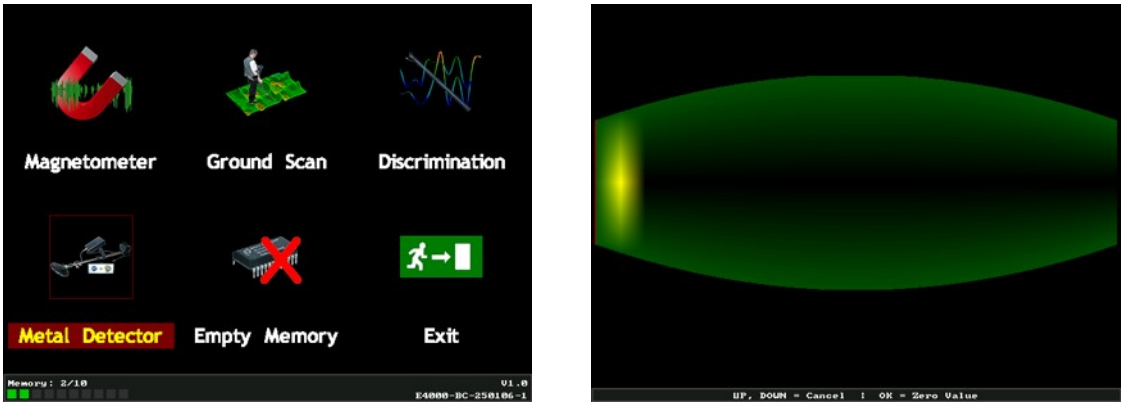


Illustration 7.10: Metal Detector

Also with this detector you have the possibility to discriminate between different metals. So for example you can find out if an object is gold, silver or iron.

Further information about the correct usage of the detector and the principle of discrimination you can find in section "Optional Equipment / DDV system" of this users manual!

7.4 Discrimination

This operating mode is used to identify metals and cavities. Therefore it is necessary to connect the optional available Supersensor. If you don't have the optional Super Sensor, contemplate very seriously on acquiring one. This is an extremely powerful function and can assist you in verifying real targets. There are three basic modes in which you will use this function. Discrimination of course, tunnel recognition, and then also when on the water from a boat. For water operations, please contact one of our trainers at the factory to receive a more detailed operation. In this section we will only cover Discrimination and Tunnel Recognition.

In this mode there is no given manner fixed or a scan direction. You can walk as you want to determine the soil. This operating mode is most effective if you have already detected possible objects and now want to know more details about them.

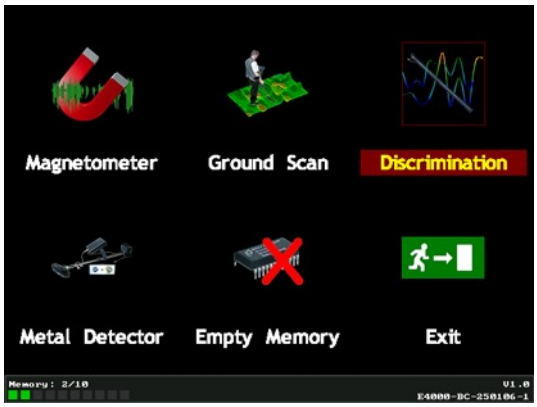
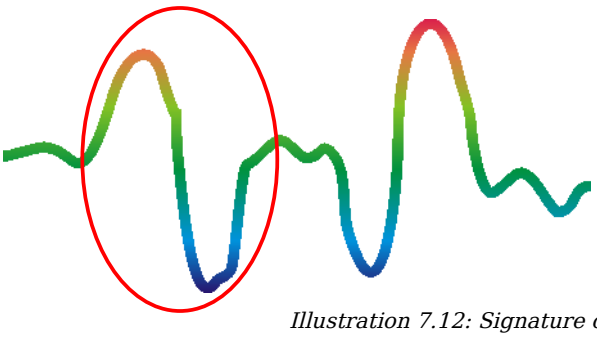


Illustration 7.11: Discrimination

The Supersensor should point vertical towards the ground. It should not be turned or pivoted.

Now you can slowly move the Supersensor 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. There are 3 different signatures, from which you can recognize a specific characteristic of any target.



Ferromagnetic metals

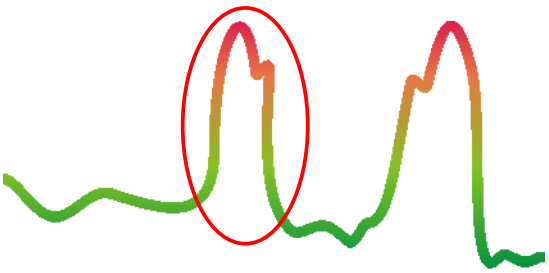
Ferromagnetic targets have a positive-negative-signature.

Illustration 7.12: Signature of a ferromagnetic metal target

The figure 7.12 shows a typical signature of a ferromagnetic metal like 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 Supersensor. If you keep moving the probe from one side to another, these 2 signatures will change continuously.

Take care to move the Supersensor slowly and at the same height above the ground and above a detected object to get a clear signature.

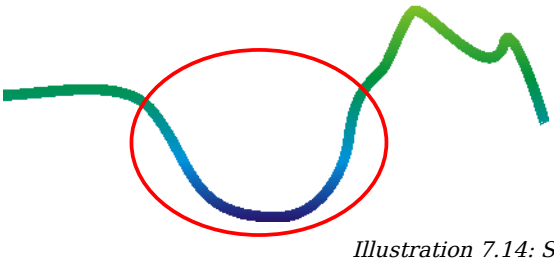


Non-ferromagnetic metals

Non-ferrous targets have a pure positive signature.

Illustration 7.13: Signature of a non-ferromagnetic metal target

The figure 7.13 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.

Illustration 7.14: Signature of a non-metallic target

The last of the typical signatures is represented in figure 7.14. 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).

7.5 Empty Memory

The *Empty Memory* mode is used to delete all data which is stored in the internal memory of the device. If you confirm this option you will be asked again if you really want to delete all data. If you confirm now by pressing Yes all data will be deleted and cannot be rebuilt or transferred to a computer.

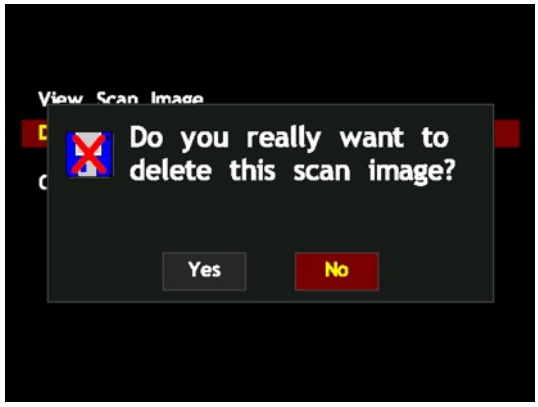


Illustration 7.15: Empty Memory

7.6 Exit

You have to select the *Exit* mode, to finish the operation with this unit and to power it off. As soon as you confirmed this selection the integrated pc module will shut down and the device will power off itself.

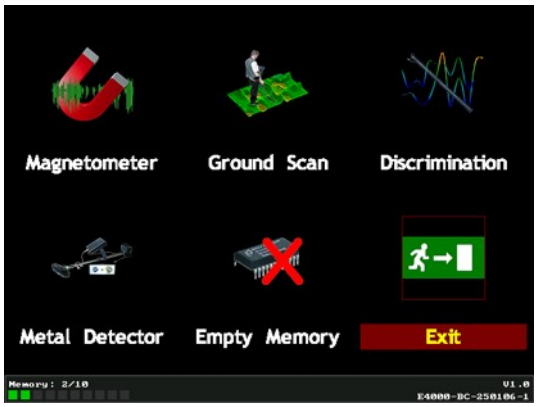


Illustration 7.16: Exit

Please wait until the device has powered itself off. After the device is off, you can power off the external power supply.

7.7 Thermograph

This operating mode is only visible and usable if the optional device FS-Thermoscan is connected.

Detailed information about this functionality is available in the user's manual of FS-Thermoscan!

7.8 Thermo Scan

This operating mode is only visible and usable if the optional device FS-Thermoscan is connected.

Detailed information about this functionality is available in the user's manual of FS-Thermoscan!

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.

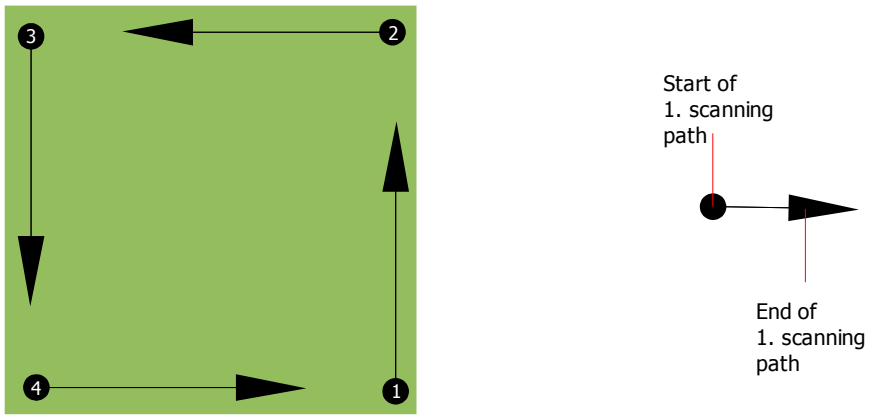


Figure 8.1: Starting position of a scan area

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 eXp 4000:

- **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.

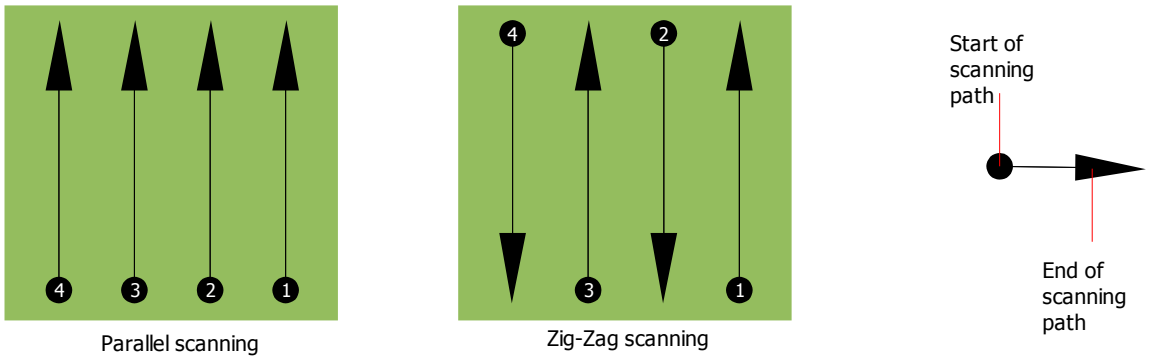


Figure 8.2: Scan modes to measure an area

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.

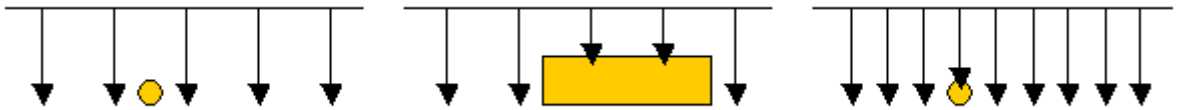


Figure 8.3: Effects of changing the number of impulses and their distance

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.

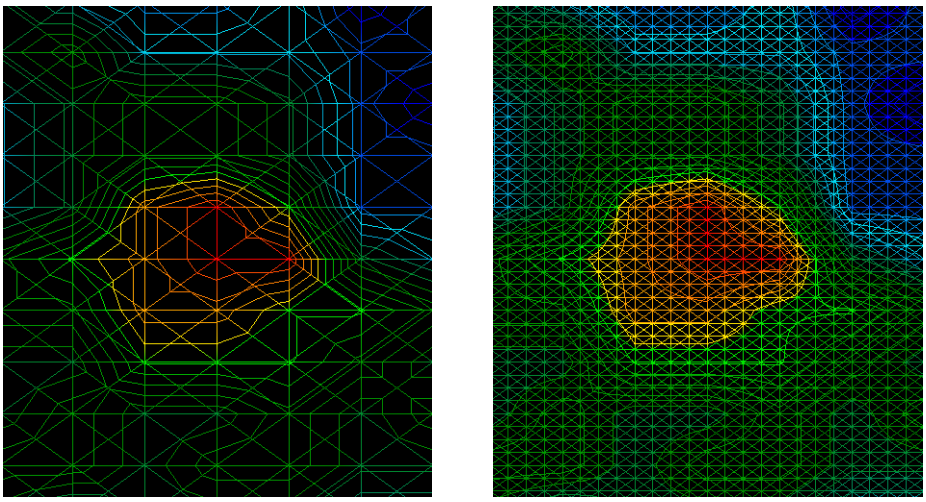


Figure 8.4: Comparison of low and high number of impulses

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.

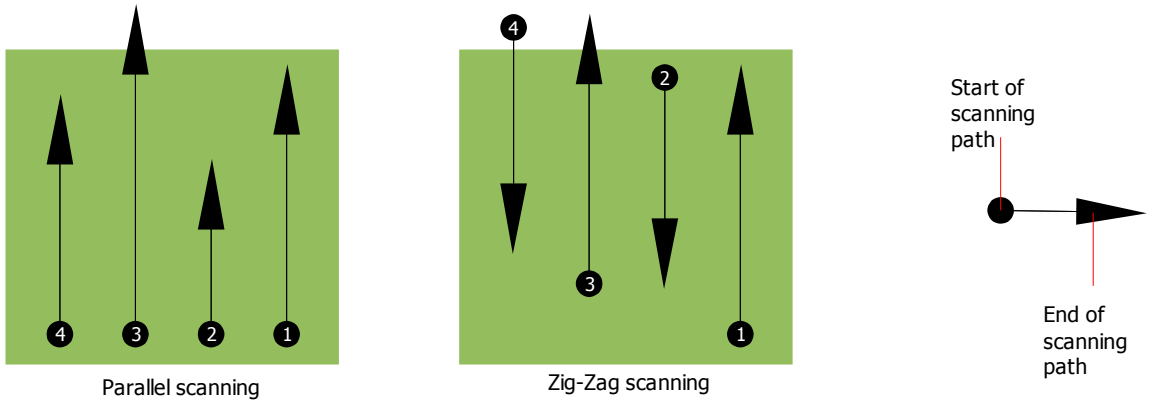


Figure 8.5: Different walking speeds during scanning

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 eXp 4000 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.

Chapter 9

Optional Equipment

Here you can find additional information on accessories that can compliment the basic unit. Keep in mind that the mentioned accessories are not included in the normal scope of delivery.

9.1 Super Sensor

The Super Sensor is a hig hresolution antenna, which is specially adjusted to detect metals. Yet it is also possible to recognize larger voids with this antenna. A particular characteristic is to distinguish ferrous metals from nonferrous metals. This discrimination is possible in the operating mode Discrimination. Compared to the standard Horizontal GPR-antennas the Super Sensor can find much smaller and deeper situated metal objects.

9.1.1 Usage

The Super Sensor can be used in the following operating modes:

- Magnetometer
- Ground Scan
- Discrimination

To use the Super Sensor with the device, you just have to connect it to the main unit. Therefore you have to plug in the connector of the antenna in the appropriate input of the device. Hold the antenna always vertical to the ground in your hand, whereby the cable should come out at the upper end of the antenna. The figure 9.1 shows how the Super Sensor has to be hold in a correct way.

Illustration 9.1: Position of Super Sensor

The Super Sensor should not be swinged nor moved up and down during the measurement. The more even you hold the antenna the better will be your measured graphical results. The distance between the ground and lower part of the antenna should be about 10 cm, but can be enlarged depending on the terrain conditions.

The orientation of the antenna should not be changed during the complete measurement!

9.2 DDV system

With the DDV system (Disc Detector Visualization System) a powerful metal detector is on your disposal, which not only supports your underground research with a visual representation but also offers you various filter possibilities.

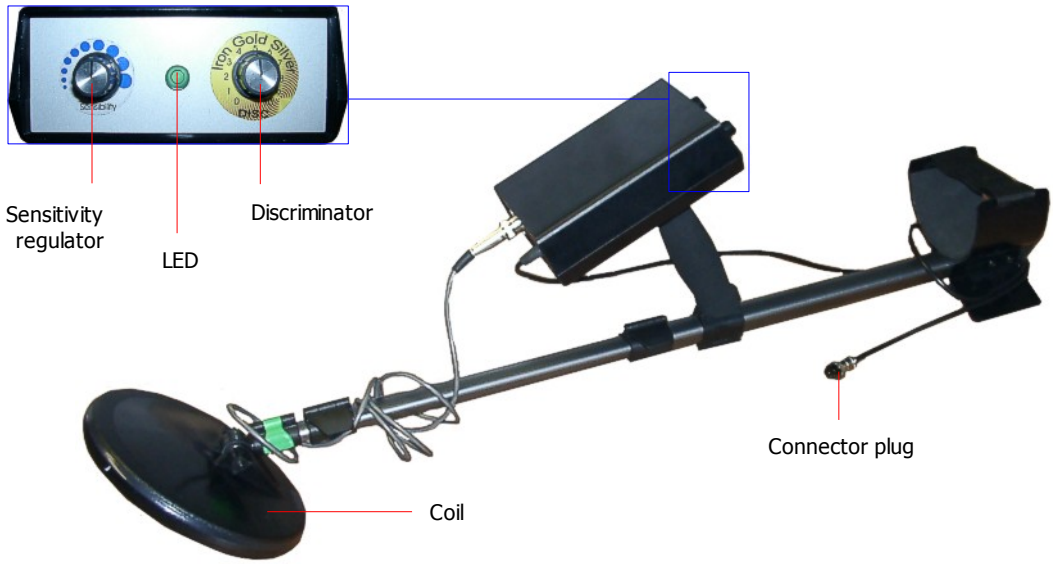


Illustration 9.2: Control Elements of the Detector

To use the DDV system just plug in the connector plug into the control unit of your eXp 4000. Then select the operating mode "Metal Detector" in the main menu.

Attention: As soon as you confirm this option the ground balance will start. Detailed information you can find in section 9.2.3 on page 70!

Now you have to pivot the detector coil continiously right above the ground, trying to keep the same distance to the soil. Adopt the rhythm of the graphical representation on the screen. As soon as you pass above a metallic object a yellow colored trace will appear in your graphic and you can hear an acoustical sound through the headphones.

9.2.1 Calibration

The manual calibration is only possible for product version *V1.1* and following. In case of need all former product versions have to be calibrated from the manufacturer. The version of your device you can read inside the main menu.

Before using the metal detector for the first time the DDV system has to be adjusted on the eXp 4000. If you purchased the DDV system together with the main unit the metal detector has already been

calibrated in the optimal way. Anyway you have the possibility at any time to recalibrate the DDV system. Therefore you have to activate at first the operating mode "Metal Detector".

Place the DDV system on the ground like shown in figure 9.3. Take care that no metal is situated near to the coil! Press the key **OK**, to start the calibration.

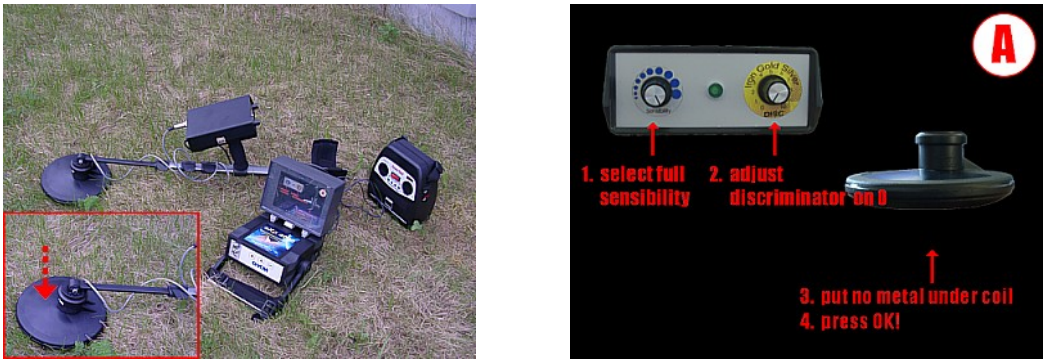


Illustration 9.3: Calibration of the DDV system, step 1

In the first step of calibration you have to turn the sensitivity regulator completely to the right side and so adjust it on full power. The discriminator has to be adjusted on the value 0. Take care that no metal is located near to the coil! Now press the key **OK**, to start the calibration. Wait until this process is finished.

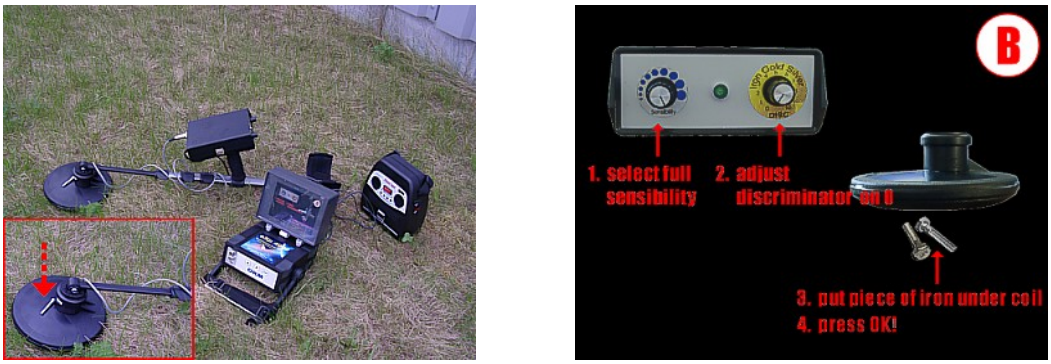


Illustration 9.4: Calibration of the DDV system, step 2

In the second step of calibration you have to leave the sensitivity regulator in the same position and place a piece of iron (e.g. screw or nail) under the detectors coil. Alternative choice is to place the metal directly on the top of the coil, like you can see in figure 9.2. Now press again the key **OK** and wait until this process is also finished.

After finishing the calibration a visual signal (yellow light) should be visible on the screen. If the headphones are connected you will also hear an acoustical signal. The DDV system is now calibrated to work correctly on-site.

9.2.2 Adjust the discriminator

The discriminator serves to filter certain materials. So it is possible to ”exclude“ for example worthless iron and steel objects. Or people who are hunting for treasures and gold are able to exclude other materials with the help of this discriminator.

Illustration 9.5: Adjustment of discrimination

In figure 9.5 the regulator to adjust the discrimination is represented. This regulator can filter certain materials. Table 2 explains the adjustment in the case of normal ground conditions[1].

Adjustment	Indicated materials
0	All metallic objects
3	Iron, gold, bronze, silver, aluminium
5	Gold, bronze, silver, aluminium
7	Silver, aluminium
10	Aluminium

Table 2: Standard adjustment of the discrimination

When you adjust the regulator for discrimination on gold, the detector reacts besides gold also on bronze, silver and aluminium. To find out if there is really gold in the ground you have to follow the following instructions:

1. Switch the discriminator on gold and start your soil examinations until you reach a place where the detector reacts positive, which means you can hear an accustical sound signal.
2. Now switch the discriminator on silver and examine this place again. Following there will be two possibilities:

   - The detector reacts positive! The material under the ground is not gold, but could be silver or aluminium.
   - The detector does not react! There is probably golden material in the ground but also bronze is possible.

Please consider that you always should do the ground balance, which is explained in this following section.

1 The indications from table 2 concern the use in normal type of soil. In extreme conditions (mineralisation, salt deposits, ...) they can variate from this normal value.

9.2.3 Ground Balance

A correct soil reconcilation (Ground Balance) is absolutely necessary that the adjusted discrimination can work properly. If the soil reconciliation is not done correctly the operation of the device and the integrated discriminator cannot work properly.

In the following section you can find a list of all necessary working procedures to do a correct soil reconciliation:

1. Power on the eXp 4000 and connect the DDV system.
2. Adjust the discriminator on the material you like, see previous section.
3. Put the device with coil approx. 10 cm above the ground.
4. Select the operating mode "Metal Detector" and confirm it.

If you hear an acoustic signal from the DDV system after these indications, then the ground balance is not finished correctly. Repeat these steps until there is no acoustic signal from the metal detector.

The following causes can prevent a correct soil reconciliation:

- You are staying above a metalic object.
- You confirm the operating mode "Metal Detector" without holding the coil directly above the ground.
- During the confirmation of the operating mode "Metal Detector" you are holding the coil to high and then minimize the distance to the ground.
- You are turning the discriminator during ground balance.

Only if you are doing a correct soil reconciliation the functionality of discrimination can be guaranteed!

Chapter 10

Error Messages

In this chapter you will find possible error messages which can appear during the work with the device.

In case you are scanning very large areas in the operating mode "Ground Scan" the stored files will also be very large, which could fill up the internal memory completely. As soon as the free memory cell is less than 20% the message shown in figure 10.1 will appear.

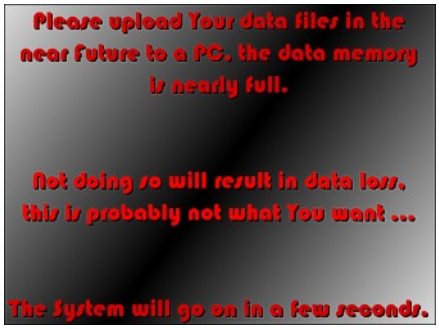


Illustration 10.1: Only a small amount of memory available

If there is no more free memory available you will see a message like in figure 10.2. You can free memory space by transfering all stored data via software to your computer or by selecting the option "Empty Memory" to delete all stored data without having transferred them to your computer.

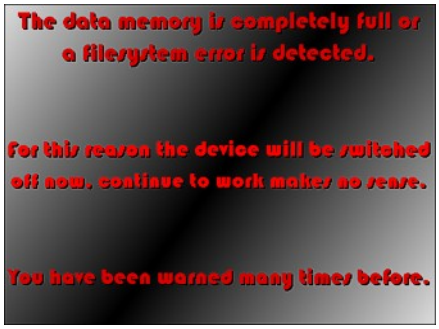


Illustration 10.2: No free memory available

If message 10.3 appears the device cannot control the operating voltage. This also means it cannot warn you in case of a low status of the battery. Also the automatic shutdown of the device may be affected. It is adviced to let the device check from the manufacturer to avoid further damages.

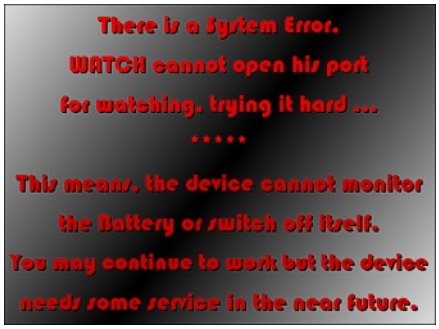


Illustration 10.3: Internal Hardware Error

Message 10.4 appears if the battery is low because of a long operating time with the device and not enough voltage is available. You should power off the device and charge the external power supply as soon as possible. If you continue operating with the device it could be possible that data gets lost.

Illustration 10.4: The external power supply has to be charged

Because there is a PC module integrated in the device you have to shutdown it like a normal computer. Therefore you have to use option "Exit" from the main menu. The message like in figure 10.5 remind you to wait until the device powered off by itself.

Illustration 10.5: Shutting down the system

If the device itself is not able to power off, a message like in figure 10.6 is shown. In this case you simply power off your external power supply.

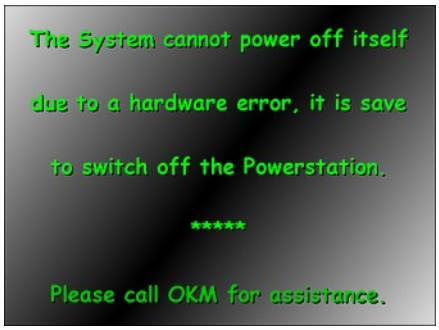


Illustration 10.6: Shutting down the system is not possible