Scan Explorer 12000 Pro

Professional detector

Scan Explorer 12000 Pro

User's Guide

Introduction

Thank you for your purchase of the Underground Surveyor Apparatus (USA). Before operating the unit, please read this manual thoroughly and retain manual for future reference.

With the *Scan Explorer 12000 Pro*, you will be able to locate anomalies, buried objects and faults. The *Scan Explorer 12000 Pro* works on the principle of detecting electromagnetic field changes that are emitted from the Earth.

With the *Scan Explorer 12000 Pro*, there is no need to transmit a signal into the earth, because of the existing signals that are already present in the earth. The Device has very sensitive broadband receivers, enabling it to receive electromagnetic and magnetic signals. When there is an item buried in the ground, a FERF (Free Electron Radiation Field) is created enabling the receiving antennas in the *Scan Explorer 12000 Pro* to identify its presence. When a hole is dug, it creates a scar on the Earth's surface; this scar is visible to the *Scan Explorer 12000Pro*. Like any other detector ever built, it is looking for the difference, which enables the operator to locate anomalies.

The software that was created exclusively for the USA is designed to highlight items in the ground, anomalies, disturbances, etc… You can see subsurface objects in *Real-Time* with the *Visualizer 3-D Software*. Also, a feature that assists in detecting a target area is *Auto Ground Balancing*. *Auto Ground Balancing* defines the compensation for the varying amount of minerals in the soil by sensing the mineralization and automatically adjusting the ground balance to achieve the best performance, thus producing a more "clearly defined target area". One of the main items to note is to do a large enough scan allowing you to see the background. When scanning in only one small area, determining the difference between the target and the background can be somewhat difficult. Another note to remember is to isolate suspected targets so that there is only one target per scan. This way you will be able to determine the approximate size of the object. As advancements in the software are available you may purchase upgrades, critical updates will be available free of charge. Please contact your sales representative for more information.

Existing Potential Method

When using specifically designed sensors the earth's self-potential of direct currents can be measured. The sensors become very useful when using a single forward motion just above, without contacting, the earth. With this rather simple technique, the geophysicist can trace zones of mineralization, having a strong signal, or tunnels having a weak signal. By receiving a combination of AC/DC and frequency to map potentials, we can map fields of interest. These rapid changing signals are amplified and analyzed by the software. The *Scan Explorer 12000 Pro* allows for the rapid collection and interpretation of large quantities of data, making it a cost effective technique. EM equipment measures the background of the emitted signals from the earth; it then detects any differences that are present. Differences can be caused by anything in the subsurface that has disturbed the earth (like a void, metal objects, fault, tunnels, etc…). Other available geophysical techniques that are sensitive to the presence of both ferrous and non-ferrous metal objects include metal detectors, pulse induction, resistivity, ground penetrating radar, etc…

What EM Measures

EM measures the apparent electromagnetic field of the ground, including effects of the soil, bedrock fractures, contaminants, metal objects, and ground water. Variations in the electromagnetic field may indicate changes in composition, layer thickness, or moisture content. The presence of buried metal such as drums, and/or other objects create a large variation. *Scan Explorer 12000 Pro* is specifically designed to detect subsurface anomalies by receiving varying signals from the ground.

Magnetic Surveying

Magnetic surveying is ideal for both reconnaissance and focused surveys. It is expedient and cost effective, covers more ground in less time, and requires a minimum of field support. The portability of the instruments makes magnetic surveying well suited to sites with topographic variations.

What Magnetic Measures

Magnetic surveys measure the earth's magnetic field very accurately. Buried ferrous materials, and in some cases, changes in bedrock lithology, produce disturbances in the local magnetic field that can be readily detected by magnetic surveys. *Scan Explorer 12000 Pro* instrument is one such device that takes measurements in order to find anomalies that lie beneath the surface. Instruments like the "Discriminator", uses "Pulse Induction" to measure conductivity and in combination with a Magnetometer to discriminate ferrous and to see non-ferrous objects.

Principles of Magnetics

The earth's geomagnetic field has three principal components: the main field itself, an external field and local perturbations superimposed on the main field. Caused by processes in the interior of the earth, the main field has a large magnitude which varies slowly over time. At present, the earth's field amplitude (T) ranges from a low of about 25,000 nanoTesla (formerly gamma) (nT) near the geomagnetic equator to almost 70,000nT at the geomagnetic poles. The field inclination is horizontal at the equator and vertical at the poles. The external field originates outside the earth's crust and is associated mainly with electric currents in the ionized layers of the outer atmosphere because of interaction with the solar winds. Traveling along magnetic flux lines solar winds are ionized plasma or hot-charged particles, which transmit energy by wave motion. Local variation in the rock and mineral assemblage of the near-surface crust produce local perturbations that are the anomalies of exploration interest.

The earth's magnetic field (a vector field having both amplitude and direction) is described by an intensity (total field intensity, T), an inclination (I) and a declination (D), Figure 1.1. For Specific applications, horizontal and vertical field components can be derived from T, D. and I

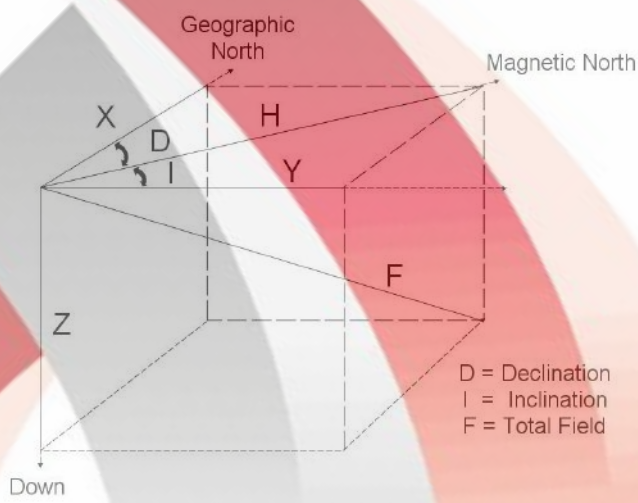


Figure 1.1

Rock units in the crust acquire a magnetization in the direction of the earth's field, which is referred to as induced magnetization or magnetic polarization. The resulting induced field of a typical finite source body is dipolar: that is, it contains positive and negative elements. In the middle-to-high magnetic latitudes of the Northern Hemisphere, the dipolar nature of an induced anomaly is typified by a positive (high) and related, but subdued, negative (low) on its north side.

Anomalies of interest range in amplitude from a few nanoTeslas (nT) for deep basement or sedimentary anomalies to 1,000's of nT for near-surface mafic rocks or iron formation to 10,000'snT for magnetite iron ore deposits.

Several time-variant or temporal variations occur in the geomagnetic ambient field. A long period, or secular change, occurs slowly over many decades or centuries and modifies inclination, declination and intensity. Such a change can be observed as a change in the magnetic declination as noted on old maps when compared to today's version. A complete reversal of the total field direction, occurring over tens-to-hundreds of thousands of years, is a more dramatic effect of the secular change.

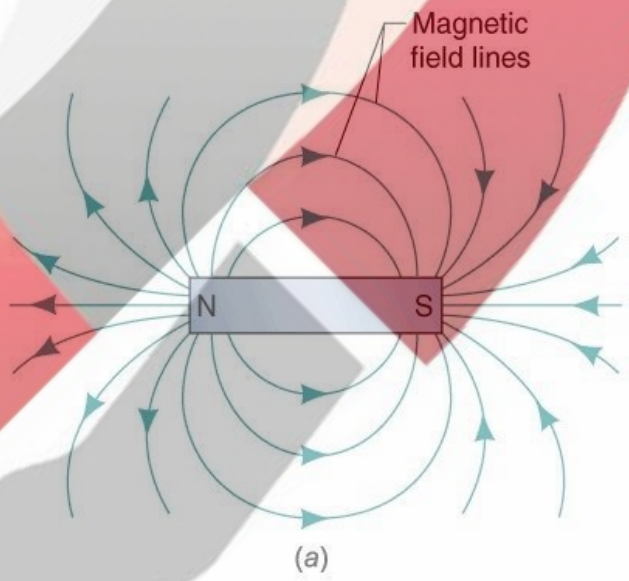
More important to prospecting are the diurnal variations. A diurnal variation of 10 – 100+ nT occurs regularly on a daily basis, (Breiner, 1973). This diurnal is also related to solar winds, the small effects of which vary with the level of the ionosphere and intensity of solar winds. Micro pulsations of 0.001 to 10s nT are random effects lasting from 0.02 to tens of minutes. Magnetic storms also produce a short period random "noise" which may vary up to many 100s nT over periods of a few

minutes to hours. Storm effects are unpredictable but are related to and follow solar flaring, commencing abruptly and decreasing slowly over hours or days.

The purpose of the use of lasers, detector objects buried whatever it is in the first step must be the foreground scientific though little about disclosing the methods we have to use the available tools to get the best result.

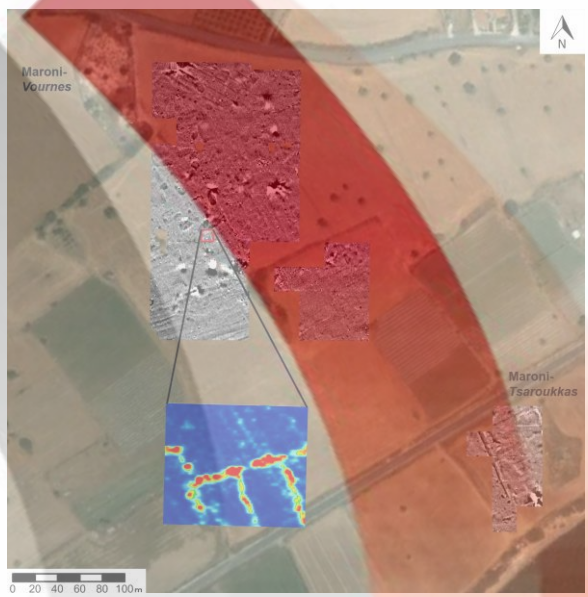
Magnetometry

All of us are surrounded by a magnetic field. Magnetic field by electric current is available in a lot of electrical equipment/electronic perimeter we arise. Tv, computer, power transmission lines, etc. All of the resources to create the magnetic field. The Earth has a magnetic field, which of course also its size is relatively small.



(a)

All of us probably know that magnets produce a magnetic field, the Earth has a magnetic field, electrical current within a magnetic field produced by the wire. But never knew that the magnetic field produced by the heart and brain of humans as well. The thing that makes the difference created by the field magnets and a square created by the heart and brain, is a huge field.



The attributes of the object buried keeps up with the use of a tool for accurate magnetic field goal without the need to dig out the soil layer below to get enough information.

The method of Geophysical Exploration technique that oldest magnetometry; principles and even and construed and interpreted many similarities with gravimetry. But normally this method is more complex and more irregular magnetic field changes as well as the acceleration of gravity than Earth and local. in this method of measurement of the Earth's magnetic field or its gradient changes. Because some materials such as magnetite in the magnetic field of the Earth, the magnetic high anomalies. Mineralization of iron, copper, nickel and asbestos because of magnetic bearing with accompaniment, with the discovery of the magnetic polls easily. Even some of the geophysical exploration, Don, this method to explore the pelasery gold due to accompany it with Black Sands containing high amounts of magnetite, is recommended. The basis of the theory of this method is actually the magnetic permeability response of metals and gems has plunged to the Earth's magnetic field, magnetic materials. Historically the first-time Gilbert (1600) the physician for Queen Elizabeth's first book in the Earth's magnetic field, the concept of magnets with determining its direction at each point of the Earth's surface. In about the year 1640 in order to explore the iron ...

Ambient reflection spectroscopy

Perhaps wondering how ancient civilizations are able to find gold and silver have been? One of the responses to this question is that of the Inca people People-South American Indians were on the night of the glowing aura of Badr, green-blue colour on the places that contain precious metals prices were expensive, intrusive view. Long after the Indian tribes and Spanish attackers also sixteen century ad of this technique to find the treasures of gold and silver benefit. Nowadays also use this technique is common and many people are claiming to be able to see a halo of treasure buried. If you are able to see with naked eyes the Halo are not mentioned, you can use special cameras. Halo infrared radiation in the treasure principle that appears to be emitted from all the metals are buried. Its part of the infrared radiation electromagnetic radiation. Electromagnetic radiation is a form of radiant energy waves that are two waves of electrical and magnetic fields that have taken shape is always perpendicular to the direction of propagation and interaction, and to publish the material environment requires. Electromagnetic radiation in the wavelength (frequency acquainted) are divided into several range. Understanding content for friends who are familiar with physics is simpler.

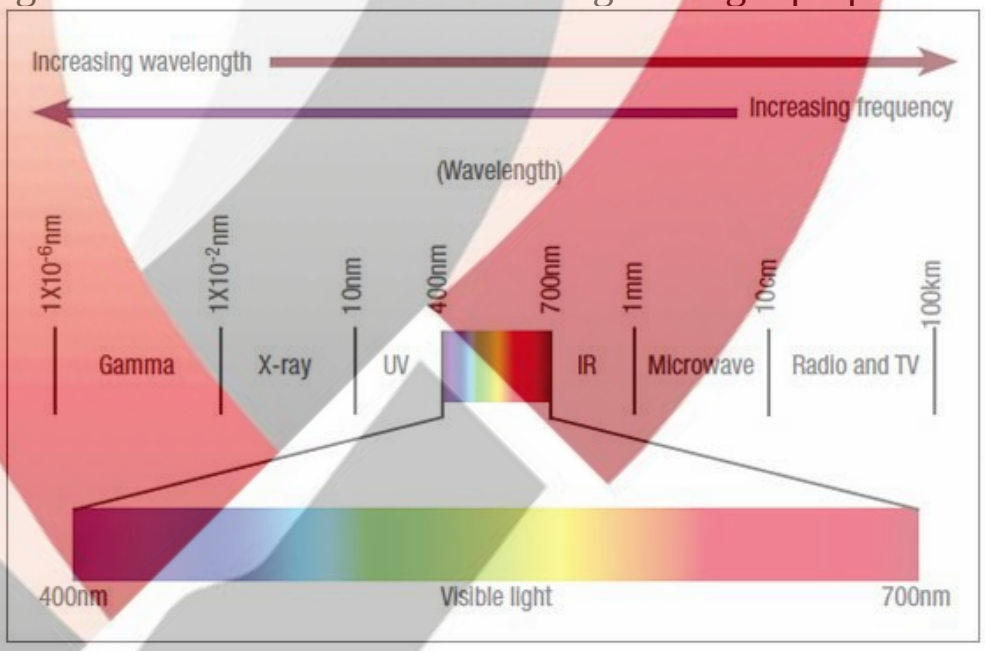
A few points need to be mentioned.

1. that the wavelength and frequency with each other than they are with increasing wavelength images, frequency is reduced and vice versa with increasing frequencies wavelength is reduced.
2. The range of electromagnetic waves by increasing frequency (and wavelength decreases acquainted) are as follows: short long radio waves, radio waves, ripples (microwave ovens), infrared waves (red down) visible light waves, engulfed in purple, x-ray and gamma ray.
3. With the increase in the frequency of wave energy also increased the energy of gamma rays as an example of the energy beams coming more purple.
4. each of the above range of electromagnetic radiation are also in turn have tinier divisions are for example x-ray according to the frequency of radiation it twofold SXR software and hard x-ray divided HXR or meta-purple waves also swept away the purple waves twofold FUV and NUV stend near ultraviolet waves. Infrared

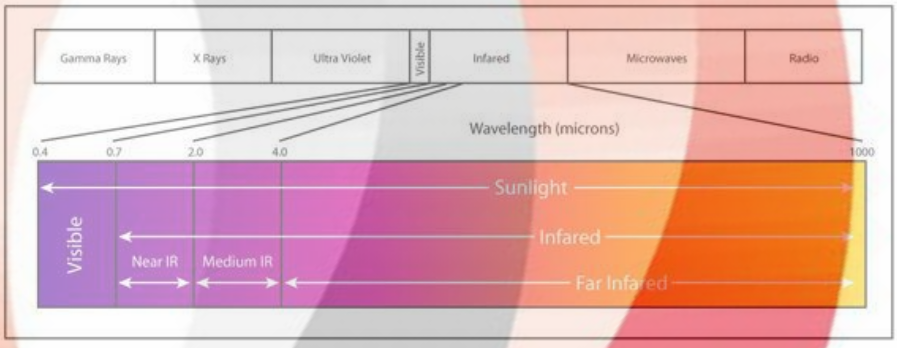
waves also are signaling to the near infrared, NIR infrared short-wave infrared medium wave SIR MIR long wave infrared and far infrared FIR HIR are divided into.

5. Unit of measurement of frequency standard system consists of a Hz cycle of a Hertz wave full over the second one. The navigation unit is also wavelength nm 1 nm = 10-9 m, but the conventional unit is the other name of the Angstrom is Å. An Angstrom is a tenth of a nanometre (1) Å = ۰٫۱nm = 10-10 m.

Infrared beams to which they referred, in terms of the wavelength of the visible red light beams, the adjacent band and over the range 700 nm wave-the ۱mm ' but it is what we generally Visual systems in conventional optics, we work with it and the range of the length of the wave is the 700nm-1400nm near infrared range IE Near Infra Red = NIR The human eye is naturally able to see a range of red light with a wavelength of 380 nm to 750 nm wavelength to light purple.



The range of light that for archaeological and geological observations being used mostly the top 750 nm wavelength is the wavelength to see this without the use of a special tool is not possible.



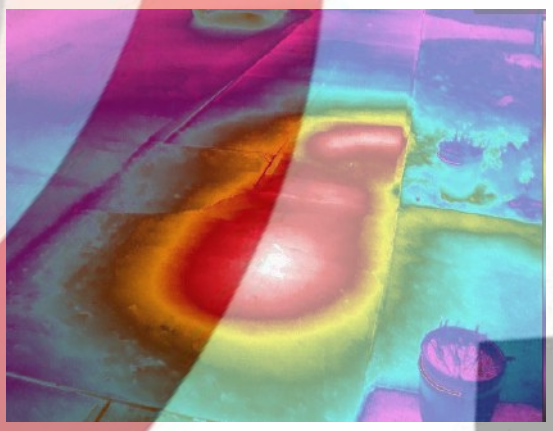
One of these common tools with the use of special filters, camera technique is the use of the camera to view the invisible halo of buried treasure is not a new phenomenon and has a synchronous with the rise of the first generation of camera polaroeid" Lewis matasia American period come from the browser a SX-70 cameras polaroeid SLR treasur to see Halo treasure and use large and dramatic success was also achieved. This is a camera that is a type of single-camera optic is a reflection by the company polaroeid in the year 1972 ad production and supply, and up to the present century also used more or less. Videos of this type of camera also for joint of ten cartridges and exclusive Film production with the name Zero Time. With the advancement of technology and the supply of modern digital cameras, this camera has become obsolete and outdated, and even its video production as well as from 2005, has been to stop and find a healthy film and use it for your camera from the challenges of Ferraro.

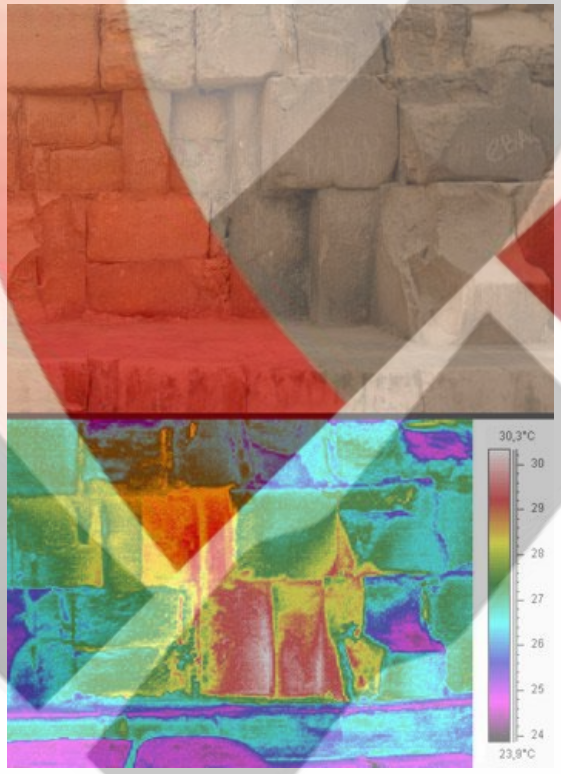
Of course, using a digital camera and the infrared filter can be partly achieved this important but ultimately work with the camera and taken pictures of the suspect analysis of something very professional and a problem that requires practice and repetition to get reliable results.

Therefore, the vacancy is a tool that, like magnetometry and operational procedures. Using the above sensitive sensors scan the precise parts of the sectional can be reviewed at the discretion of the user, the feeling gets. Another of either exceed the device in the same field that uses the absorption of waves is a reflection of the deep Earth that reflects the power of the Sun, the waves, can be filled with the image of the desired section and contact the relevant software at the discretion of the operator.

Temperature measurement

Measurement of the ambient temperature to obtain the desired level of information under one of the procedures that are customary and non-customary in some industries. one of these is the non-contact gauge heat tools that have application in different industries. as well as thermal cameras is another of this tool is that below are a few examples of images that are taken by this camera model is available.





As shown in the pictures above you can see the areas of the image to the color red is, in fact, the temperature of the warmer areas of the points around which are blue well. This means that the changes behind the Red areas that the temperature increase in the parts of the book red image. of course, such temperature changes some stages, perhaps less than 1 ° c,

which is no use of instrumentation make sense of these minor changes are not possible.
Other features of the device changes to the thermal cross section is about exploring with ultra sensitivity the limit of 100 ° c and thermal imaging with appropriate software to analyse each sample relative to the available rahater.

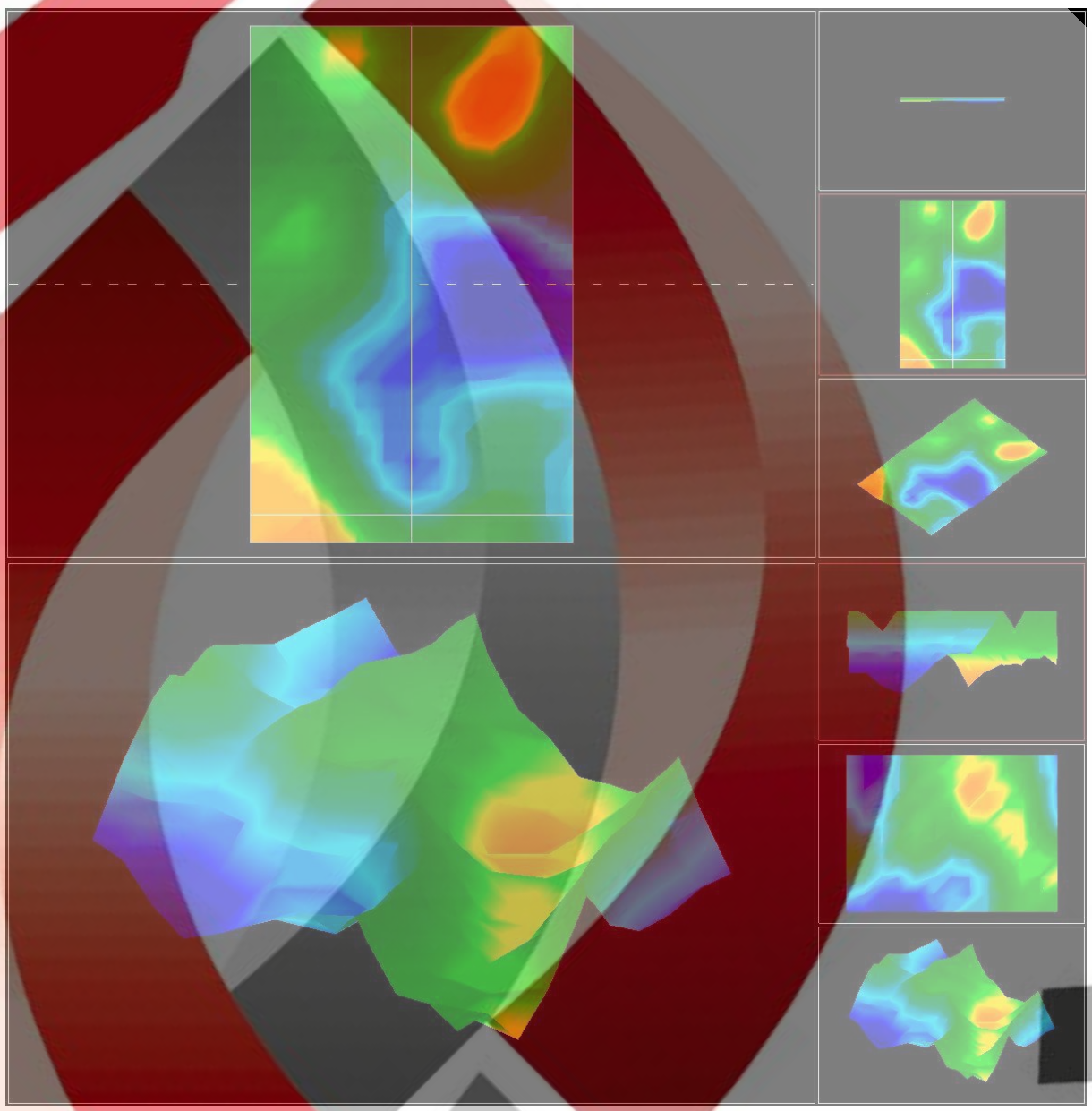
General and important tips

Select the device that you have the complete package in the face of professional operational procedures. Therefore, please first read the detailed manuals to operational problems in the past.

It is normal that in the early days of use of the machine to get the desired results not because of skill and proficiency in each device need to practice and repeat. According to this that this device is a sensitive electronic instruments, so pay attention and caution while working with essential it. any use and transport without caution or severe jolts and sudden impact, can be serious damage to the hardware devices Enter.
Be careful if you need to repair or replace warranty for use of internal batteries. Be sure to go through the dealers. If you open the appropriate and inappropriate protective device or circuit, the sensor section and an active manipulation and ruining the entire hardware.
When you move the device from a cold environment to a warm environment or vice versa have carefully before turning on the device and connect the sensor with thermal conditions of stay up to manttezr the environment to reach balance.
Also, before you proceed to operational note to closer-including electrical voltage doesn't do this and if you need electrical or electrical generators with Tower distance less than 50 meters.

The mechanism and function

These devices communicate via the advanced multi super sensitive sensor with software like video visualizer 3D information in the following form of the target area at the discretion of the user.



With the analysis and editing of the images can be easily without the need for software tools for drilling, initial impressions of magnetometry and thermal and magnetic maps plot and infrared scans, used.
Another benefit of this device is very easy to use and transport user compared to similar models available that continues to pay General and against the minor.

Physical specifications

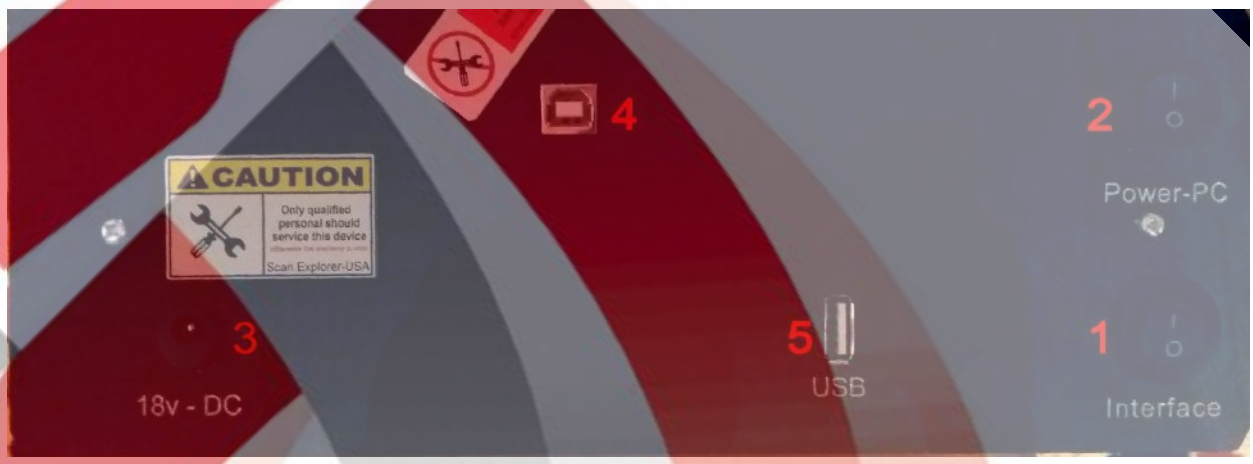
With regard to the form of the following section 6 is composed of:

1. main chassis battery, the circuit board and corresponds to the decomposition of the signals are located
2. super multi sensors
3. special operational safety belts
4. charger for the device

The details of the Executive Panel (Control Panel)

According to the image number 4 and 5 are the key connection profile and. The following control.

1. Character display for communication and control between the menus and different parts of the machine
2. The key corresponding to the selected items and the Executive menus
3. Control key for menu (top)
4. Control key for the menu (at the bottom)
5. Optical sensor placement Status Viewer
6. The relevant key to start the scan data
7. The key to the sensor calibration
8. Harvest-related key scan data
9. Headphone Jack
10. Wireless connection sensor status
11. LED related to the status, save scan
12. Power ON / OFF PC
13. LCD of PC



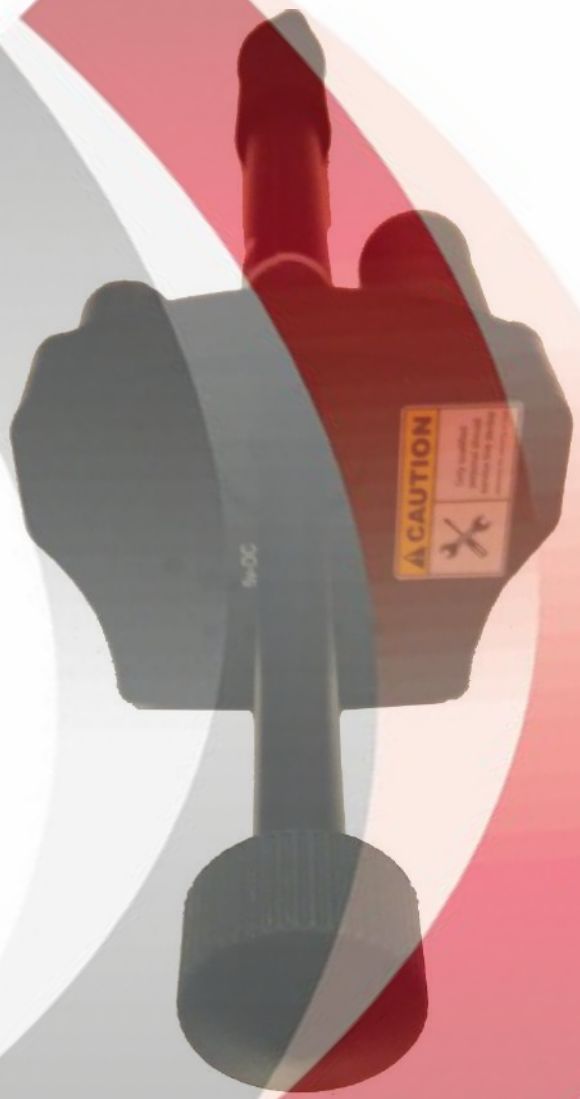
1. The switch corresponding to the circuit feeding the bottom circuit mode which are ready to work with the
2. Pc Power Swith
3. Input jack to connect the charging cable of the device
4. USB cable connection related
5. USB for use any portabale flash memory or mouse or keyboard

Prepare against

This section describes how to prepare the machine for use to stick the user device according to carry belt first. the figure below is ready, and the lower part of the upper straps to the back and from the top of the shoulder to the chest to hang up holder in front of the chest locks.

Then the holder of the device to hook the strap holder attach the tablet device in place as sliding. connector corresponds to multi sensor in place of the rear panel and tighten the plug screw it.
Rotary telescopic handle lock open sensor and bench to the necessary size and contrast with tight turns. Thus the device is operational when ready went on to explain it to stick.

Handle height adjustment feature is capable of multi sensor as well as with the following form you can anchor the Earth with sensors tailored to the type of scan and adjust the scan area.



For example, when using the manual scan mode in the device in some areas of the Earth's surface is not perfectly smooth and some plant or scan lines there are bumps that can create the correct placement of the sensor can be easily enlarged bench with ejecting and adjust the bottom of multi sensors for the abutment retaining a fixed distance sensor with the Earth.

How to use the Devic?

Main menu

After you turn on the device by using the following form, similar to the dorsal Panel after a few seconds the main menu view on the selection

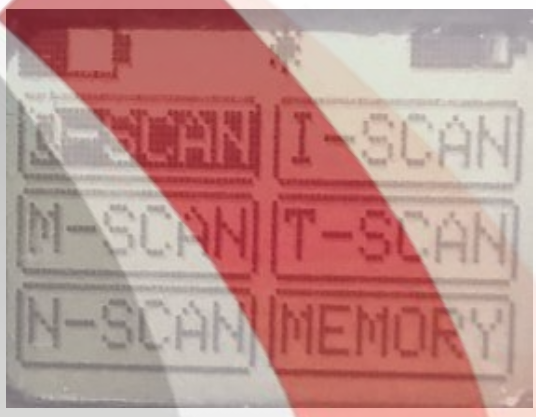
markers at the beginning. item 7 that if light is off page selection key handling in a day where there is enough light by turning off the backlight battery consumption reduced regresses.

1. Quick scan for automatic scanning audio + magnetometry
2. Scanning with magnetic disturbances to the soil magnetometry of high
3. Scans for natural soils with magnetometry magnetic low-turbulence
4. Automatic scan (infrared) + audio + manual
5. Automatic thermal scanning + audio + manual
6. Save scan settings
7. The control status of the lcd light
8. Battery status bar
9. Sensor battery status bar

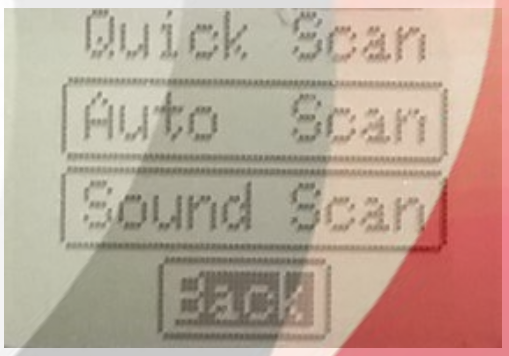
Magnetometry Scan

This device of the three-main menu for the desired area of magnetometry harvest.
The following is a full description of the menus to stick.

Q-SCAN

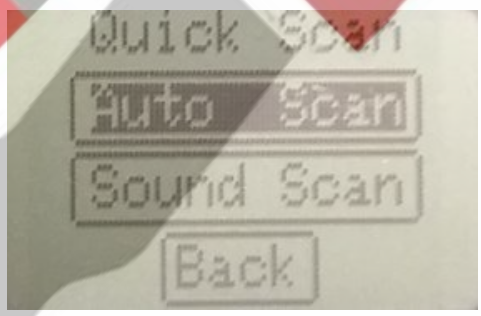


The first option from the menu corresponding to the quick scan (Quick Scan) that with the arrival of this option to the page such as the following figure opens.

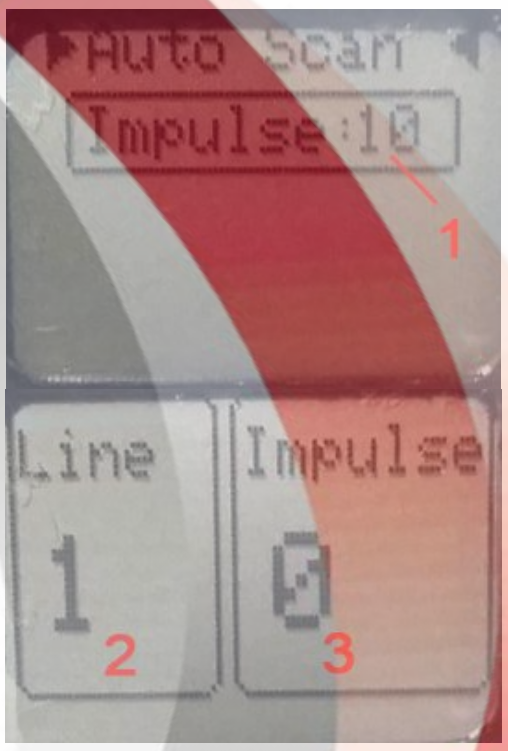


As shown in figure above you can see this menu is composed of three choices with open Back to the main menu option handling, description of the upper two options below, say:

Auto Scan



Use this option when you use that requires quick scan of a book scan every region. this book online automatic harvesting and compared with the manual scan picked up the water quickly but carefully harvested in this way than to manually scan less. selecting this option opens a screen like the following figure:

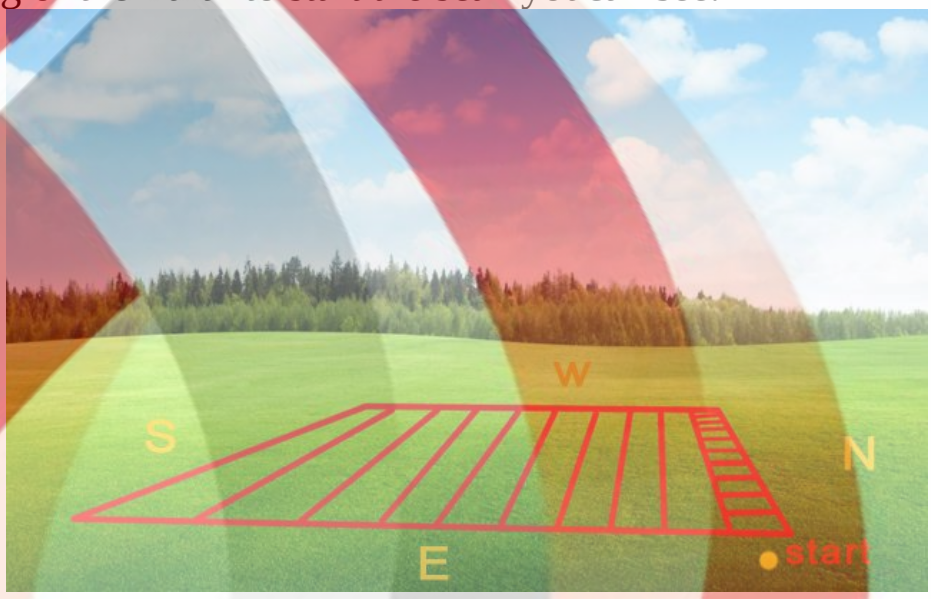


1. This option shows the number of steps for each line that you can control with the arrow keys up and down to select the desired value.
2. The line number where the scan that is being picked up.
3. The house number of the scan that shows gets picked.

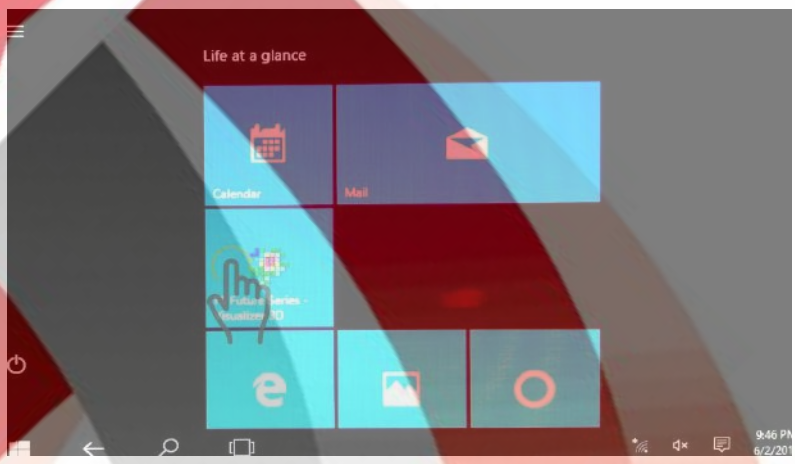
Automatic scan picking

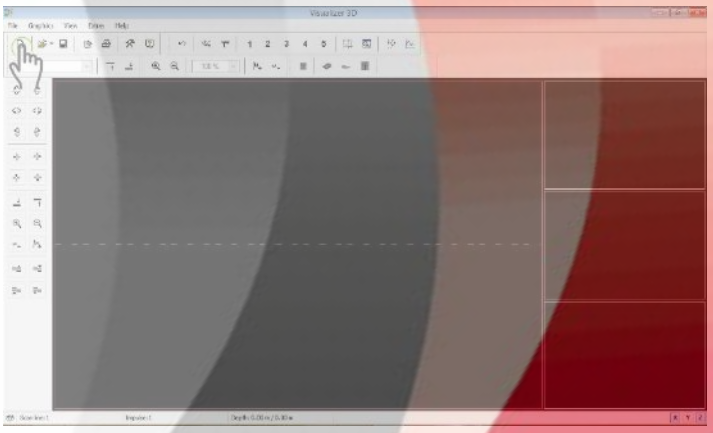
According to the description above for automatic scan picked up a following manner we act magnetometry:
First, we're going to scan the ground to form a square or rectangle on the right is better in terms of surface effects. ground clearing, such as small bushes or small stones and scrap metal or metal cans like oxide and. No matter how smooth the surface image to be harvested just as close to reality ... are using indicators inform any square or rectangle to specify the side of the same size, then the line is scan gain. for example, the length of the scan line 4 m in comment 5. Select pulse count should. carefully in mind that no matter how the number of pulses over a line, choose the permission to be more image. For example, the number of pulses in these 20. split the line scans on any home size, number of pulses the specified scanning gets that here with the Division 4 m 20 x 20 cm, which is the same as the size of a house get scan results. If the pulse 10 comments gave the size of each home 40 in 40 cm, which was less than the previous

image permission to. in the following figure is an example of the box packaging of the Earth to start the scan youcan see.

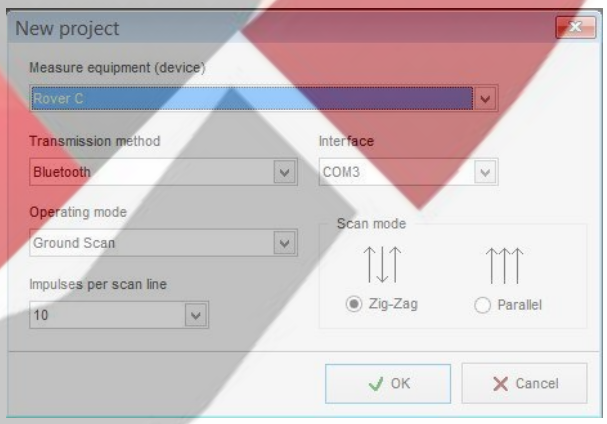


As shown in figure above you can see the four geographical directions on Earth. to withdraw a detailed scan automatic scan, it is better to scan lines in order from East to West, or on the contrary, consider that this is the reason for this if from North to South or from South to North, the automatic scan do get together due to the direction of the magnetic field lines with sensors track the movement of the Earth created the possibility of an error in the scanning pulse more final result gets. So it is advised before the scan will scan for automatic line with magnetometry, especially the scan lines from East to West or from West to East and the packaging box based on this implementation. Note scanning all that with software you picked the starting point according to the bottom-right corner of Figure 13 selected box. a example for automatic scanning of a harvest, according to the description above. First, the device is ready, and the starting point of the box will turn on the device you'll then enter the menu and quick scan automatic scan options, we have chosen the following form then follow the tablets run the software and select the NEW heading.





New project window opens:



In this window, the default settings should only be the amount of parallel zigzag scanning mode and the pulse or enter the number of the CCR pulse on every scan line you scan from impulses per drop-down menu, enter the line and kind of went back to a parallel or a zigzag. "then Ok." in this case should be LED on the top panel connections turn on the device front. is the number of pulses in the program Entered in the device menu as well. for example, if you select 10 numbers must be in the auto scan menu

with the arrow keys up or down on the pulse 10. then the book perpendicular to the sensor of the Earth and with a distance of approximately 10 cm from the ground and keep the 

key in starting point. to hear beep sound with means the device is ready to scan. carefully all along the path of the moving distance sensors the sensor of the Earth to be stationary and moving Additional parties or front and rear sensor is not the same as the weight of the cotton have to hang, consider that in all the length of the perpendicular motion relative to the Earth's surface.
In this case, to start the scan key once picked up the first line, with hitting the 

key scan should move to the first line so long to scan all. concurrent with the move picked up the sound of the pulse is to hear it seems to show the correct function of the device. for example, if the number you have chosen pulse 10 scan key scan line should kick off with hearing the sound of the beep is all palsha 10. at the end of the scan line is change beep sound and notice that the line scan all. After finishing the first line second line should scan start scan, you note that if option is zigzag in the software you select should be visualizer 3D after the first line of the sensor the size of a pulse to the left of the first redirect the same house the second line is scanned with the same scan line key handling a two-run line picked up and To check out all the scan lines continue, only this notice should move to the back, in fact, when you move from the end of the first scan line to the beginning of the second line should not have any Rotary.
If the parallel option, you have chosen in the window be visualizer 3D should be the first line after the completion of the second line to the first home scanning is the size of a home from the left of the first line of the first House to start withdrawals.
Note that the first line of the visualizer 3D software scans doesn’t show in the picture is actually the first line for the calibration of the image ... as well as the first line of each House or palsha a scan in the image does not display but the information it gets applied to the entire image on the pulse.

With the shuffle  button in the scan menu to open the automatic page.

How to move the Super sensor?

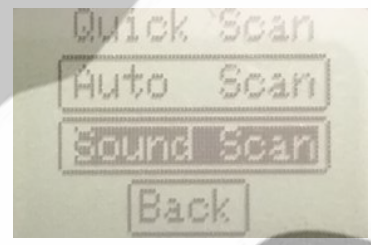
One of the most basic and the most important parts of the sensor, and how to get moving magnetometry in scan line is that unfortunately, this lack

of attention when sufficient operational important causes of the major errors in the final scan results. This is an important principle in the use of all available devices in automatic scanning mode that the above device is also of this rule is no exception with a simple example of the importance of this issue to stick:

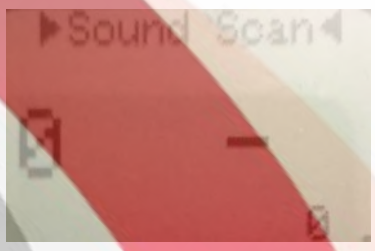
The sensor is a pencil metaphor that you laid it on the tip of the paper should line the quiet book. right onto your drawing paper so that the pencil is perfectly perpendicular to the paper you've kept with the smallest shake hands or become separated from the tip of the pencil and paper you will see that your lines are curved in some parts of the same operation or fracture. in analogy with moving the motion sensors in the sensor if the line is curved or fracture The result will be the same spot scanning error so always remember before any scanning, the desired pitch of any

obstacle that keeps your line during scan curved or fracture, clearing also remember when motion sensor perpendicular to the Earth's surface and the head of the sensor with a distance of 5 to 10 cm from the ground distance and the distance to the end of the scan line is preserved.

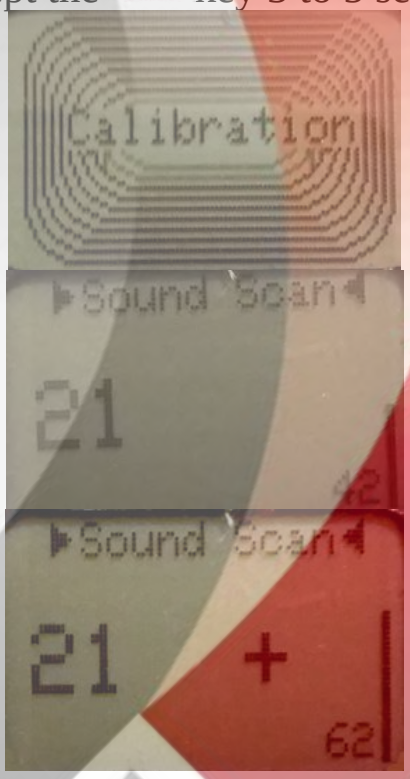
Sound Scan



With the arrival of the voice menu option opens the following:

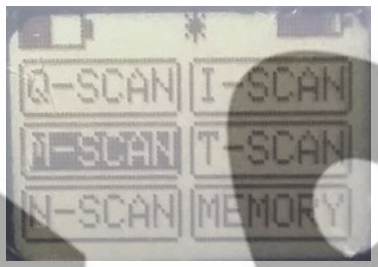


After logging in to this page multi sensor with distance perpendicular to the scanning area and kept the Cal key 3 to 5 seconds to ensure that:



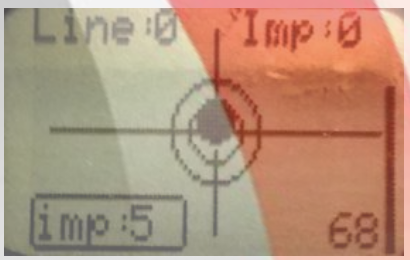
As shown in the pictures above you can see after hitting cal key you can use the arrow keys at the bottom left of the great number of obala set up so the sound of the voice on the eve of the right bar of the page. its respective number on the bottom with the bar sans powers. + or – symbol N and S pole markers below the bench sensor.

M-SCAN



The second option in the main menu, the scan to scan mineral lands with a high percentage of minerals. Additionally, the option of manually scanning:

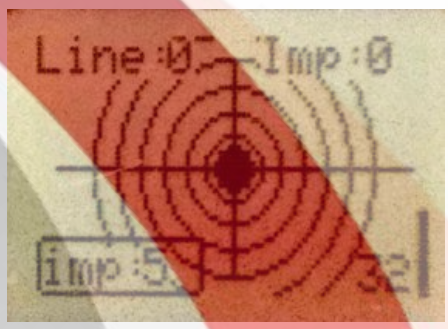
With the arrival of M-SCAN menu the following window opens:



The bar to the right of the picture with the corresponding number of the power of the magnetic field the following displays the sensor area.
Scan-line order Line and Imp and step scanning.
The chart in the middle of the image corresponding to the alignment line multi sensors. the significant point is that this device is in the manual scan is part of that same magnetometry operator with respect to the alignment on the page can easily chart by moving the sensor relative to the position sensor perpendicular to the Earth's surface.
The number in front of the imp is also related to the pulse number that enter during the scan line is considered.

Harvest manual scan

According to the explanations provided in the previous sections have been told to withdraw, manual scan should also be the location of the desired scan the box and wrapping.
For detailed classification can box cloth, ropes or tour that already have ready to use after the exact rating box. and specify the lines and houses a scanning devices ready.
At the starting point of the box (the bottom and right) stand and we turn on the device, the sensor perpendicular to the starting point and the start key can hear beep sound, isn't ready to harvest, you first scan the lower part of ADB multi sensor in the middle of the first home of Bill and sensor with minor movements to parties so we set up the following chart to figure out the alignment.



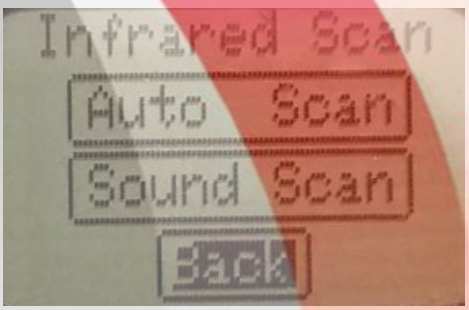
Also in this case the lights on the front panel align part relating to bright, at the same moment with the scan key handling harvested from first home often do, are second homes a scan perform the same operation and precision that does not align the sensor until the led does not turn on and the scan key justifies the action will not cause this is a must in all scanning houses how to get multi sensors of a State And angle, and the final image scanning results will be extraordinary because the smallest change the angle of the Earth's axis relative to the sensor can cause the error.
By taking the Line numbers and the numbers on the screen of the device you can Imp Scan that you get to the end.

N-SCAN

The option of manual scan scan related to super sensitive and is therefore should keep in mind to use areas where surface pollution and mineral, how to harvest the scans in this method is exactly the same as M-SCAN option, just after turning on the device and get on the starting point before the Start button to start the sensor should be aligned on the spot and kept the cal key press a few seconds the start button then clicked. And continue to do the scan picked up the steps.

Infrared scanning

The fourth option from the main menu corresponds to the infrared scan harvest. with this option, the following page opens:



Infrared scan of the menu, the automatic scan dobkhsh scan and is comprised of audio, audio in scan manual scan as well as withdrawal.

Automatic scan picking

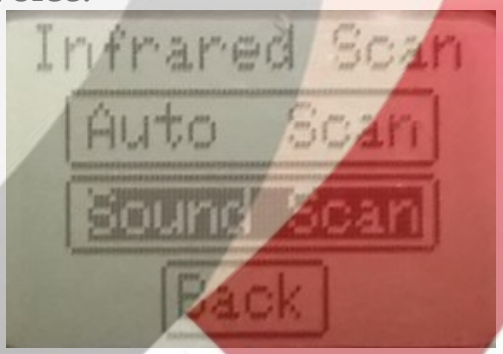
With the arrival of imported Auto Scan Options page to the following:

As you can see the information on this page is exactly the same as the automatic scan magnetometry, so the performance is the same as scanning magnetometry, consider an infrared scan to withdraw the environmental conditions have a significant role, therefore it is better to consider a few basic tips:
Although the first infrared temperature scanning for the best temperature is between 10-20 degrees, the second point is the angle relative to the Sun that get a better scan, select the check box so that the Sun is behind you, it's also the best infrared scanning for hours in the afternoon hours and at times near dusk.

To start automatic infra-red scan by taking the environmental conditions that were told, first place the desired packaging box and put right on the starting point, the software will run on the Tablet and the New option and the number of pulses and. We enter and talk to the Green Ok led is turned on, then the device on the device screen, enter the number of pulses, multi sensor with a bit of distance from the ground, and hold the cal key for a few seconds to ensure that, in the same mode key starters can hear beep sound with a heading, we are ready to scan key scan and the scan will start from the first line of withdrawal, and as scan parts description to check out.

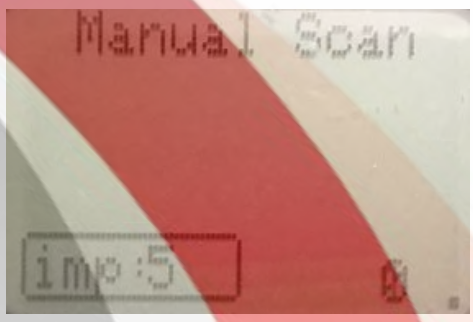
Manual scan and audio

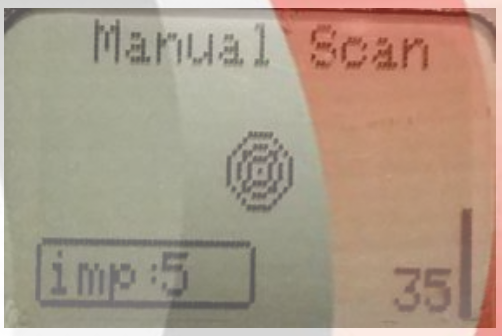
With automatic  key handling in scan page to get the following menu will open, and select the option to manually import scan page Scan Sound and infrared moving voice.



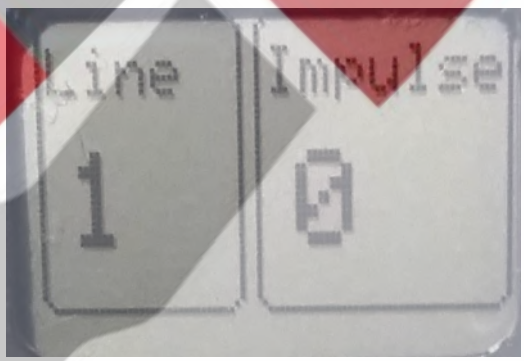
With the arrival of Sound options to Scan the following page opens:

In this case the sensor is in an area with less light and hold a few seconds the cal key. page had forms can be seen below:





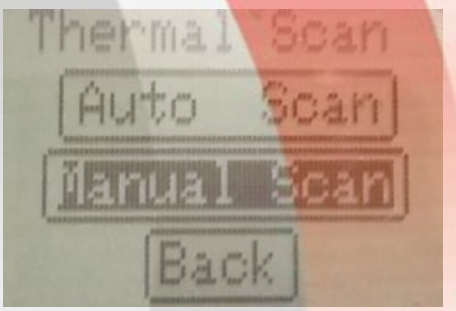
The middle circle to the right of the page and the bar changes the intensity of the infrared sensor that this environment has received and changes on the page to display the audio scan also is also concurrent with this action is performed that the operator can be due to changes in the intensity of the infrared audio notice have more curves.
To manually scan first impressions as the previous section in the description of the starting point of the box and the key to start and the key kept cal can talk to change page as follows:



As you can see with the shuffle key Start Line and two options will be added to the Impulse that page the number of scan lines and steps.
Are the same as the previous sensor description in the center of each House and the key Scan can do so. check out all the homes and lines.

Thermal scanning

As in the primary section said, these devices are able to heat detection sensitivity level up to hundredths of a degree Celsius. do this for image scanning with scanning software and audio. Select T-Scan in the main menu of the SACN, like thermal shape below will open:

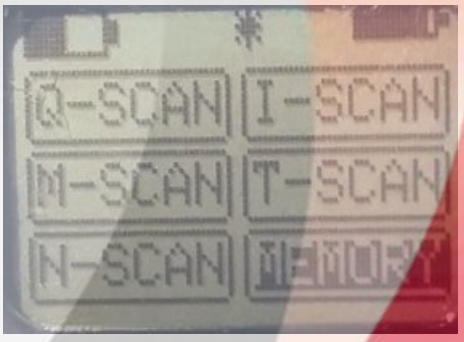


Auto Scan option to scan for automatic withdrawal is related to the thermal scan operations that are exactly the same as the previous automatic scans.
Manual Scan option to scan manual and related thermal is the audio by selecting this option the following page opens:

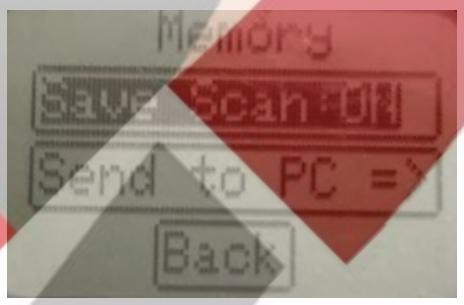
Variable circle bottom left corner indicates the severity of the following temperature sensors, temperature changes, as well as audio tones are also broadcast.
Handheld thermal scanning to withdraw at the starting point and the key to Start the scan according to the previous sorts do it often.

Save scan

In this machine because of the use of the tablets directly and comfortable compared to similar models need to save scan as much as possible do not have ... Because image mastering software when the direct scan scan is one of the conditions in principle, therefore, it is possible in some circumstances the need to save the scans in memory inside the device, the last option of the main menu to save the scan settings screen MEMORY-related data:



With the arrival of MEMORY options to the following goes:

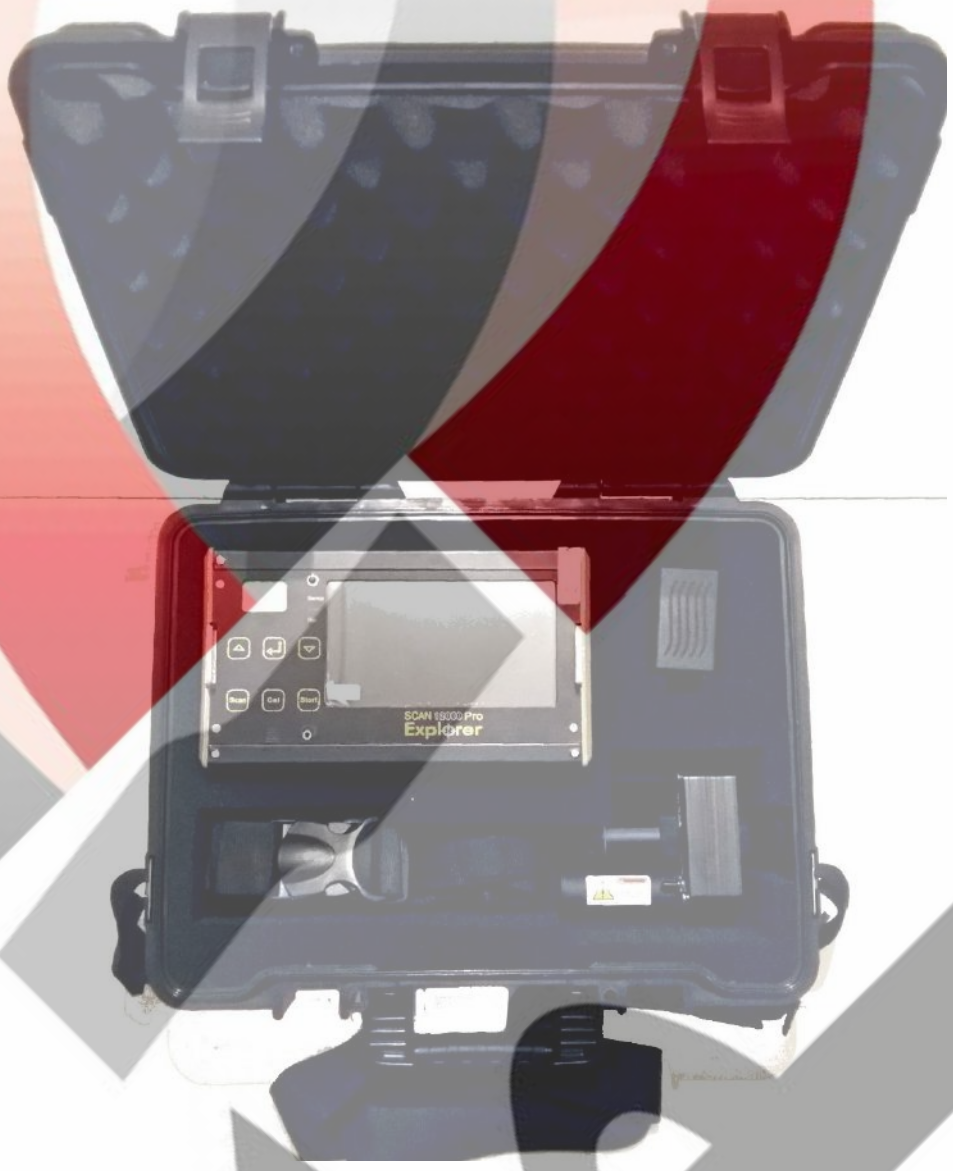


With the shuffle key on Save option ON OFF mode Scan conversion to and the corresponding led (Record) in the left corner of the front panel of the device is turned on, after this you can go back to the main menu and select any of the scan to continue your work, is in a State of active scan, such as the stunning manually or automatic memory storage device gets to do just after the completion of each scan in save mode before turning off the device Go to the main menu and then turn off the device. the new scan is saved on a previous scan.
After that, wherever you want, you can save the scan to a different tablet or lbtap to do this, first transferring the software to run the New option

and the pulse count same impulse which scans numbers saved and how to scan, save a zigzag or mats, and the Ok led front panel connections to clear MEMORY and go to menu then gets the option to Send PC = > until image information in View software.

Service and maintenance

For the carriage and handling of the device is better out of the box for the device. this box in addition to prevent possible blows to the front of the device as well as particles and moisture, so in order to avoid shortening the life of the device from this box.



Charging device

The internal battery has a voltage of 18-volt battery to a full charge, the device is better than a whole Time using their special cable of the appropriate Panel plug power chassis back to the charging lights while the dorsal Panel. bright red and when filling the battery stopped charging and automatically project the green light is turned on.
Each battery has a special lifetime depending on the user's consumption so if you gave in the device battery through contact with the relevant specialist proceeded to replace the battery in case you do any hardware problem or update the software through authorized specialist proceeded to publications.

3 Utilization and Structure

In figure 6 the complete screen representation of the software is shown. The following section describes all control elements and icons in detail.

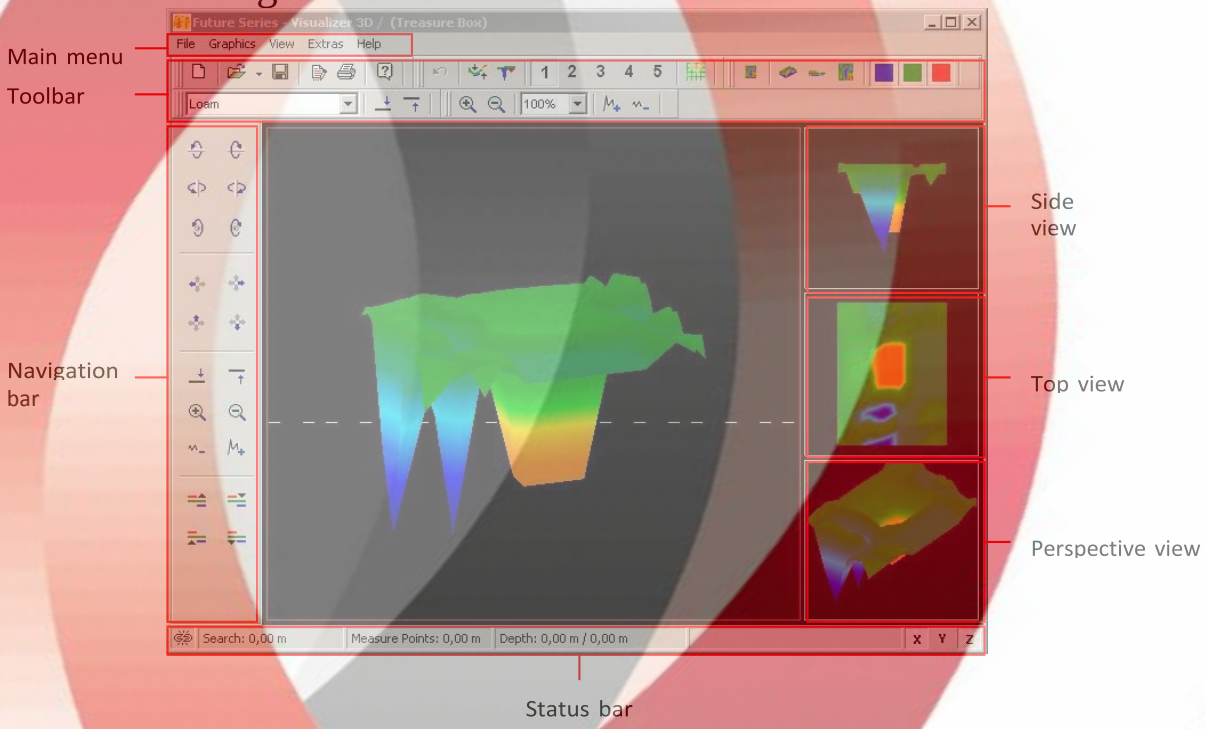


Figure 6: Software

3.1 Navigation Bar

In the Navigation Bar you can find different functions, to change the representation (position, rotation, size) of the graphic.

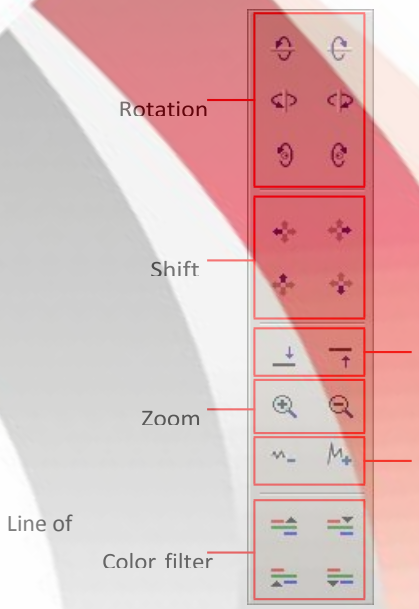


Figure 7: Operating Elements of the Navigation Bar

Rotation: These functions are used to rotate the graphic around the x-, y- or z-axis, to view the graphic from all sides. Through clicking on these functions several times you can rotate the graphic in the position you like. Another possibility to turn the graphic is to keep pressed the left mouse button and to move the mouse. The speed of this movement can be adjusted in *File* 7→ *Configuration* inside the main menu.

Shift: With these functions the graphic can be moved to the left, right, up or down. This is necessary if certain parts of the represented image are not visible. Another possibility is to keep pressed the right mouse button and to move the mouse. The speed of this movement can be adjusted in *File* 7→ *Configuration* inside the main menu.

Line of depth: With this function the line of depth in the graphic can be moved up or down. This option is necessary to determine the exact depth of located objects. Further information about depth measurement of objects you can find in section 4.1.5.2 on page 40.

Zoom: By using this button the graphic can be zoomed in or zoomed out. If your mouse possesses a turnable wheel you can also change the size of

your graphic therewith. The speed of this movement can be adjusted in *File 7→ Configuration* inside the main menu.

Difference in height: If the difference in height between the maximum and minimum value is too large you can make the graphic suitable to your screen. This function is useful in case the side view of your graphic is not completely visible in your computer screen. In case your graphic includes *black patches* "you should minimize the difference in height. Then all value outside
"
of the visible area will be indicated also.

Color Filter: With these functions either the red or the blue color level of the graphical representation can be moved up or down. So potential structures inside the graphic can be made better visible. Detailed information about the color filter you can find in section 4.1.4 on page

3.2 Status Bar

In the Status bar information about the program and about the current graphic are represented like for example position and depth about detected objects.

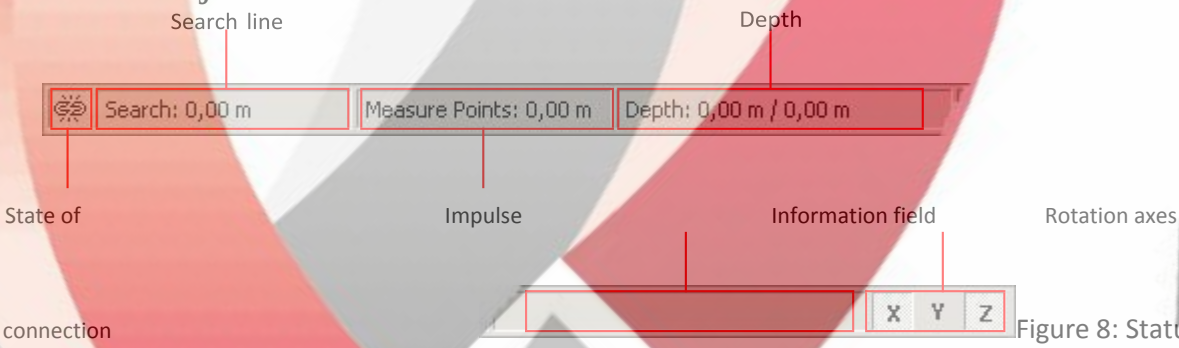


Figure 8: Status bar

State of connection: This field indicates if there is currently an active connection between computer and measuring instrument. There are the following possibilities:

= Connection inactive

= Connection active

Search line and Impulse: These fields indicate the position of the crosshairs inside the graphic. Detailed information about determination of the position you can find in section 4.1.5.1

Depth: Here you can read the depth of buried objects. To measure the depth the crosshairs or the line of depth should be placed directly over the object. The first value indicates the current depth of the line of depth and the second value indicates the depth of the measure point where the

crosshairs are placed. Further information about depth measurement you can find in section 4.1.5.2

Information field: This field indicates the function of the icon over which you move the arrow of your mouse.

Rotation axes: Here you can select around which axes the graphic should be rotated.

3.3 Toolbars

The toolbarsToolbar are a fast way to use the functions from the main menu. The small icons you can find also in the main menu next to the corresponding entry.

The following sections gives only a brief explanation about these functions. A detailed description you can find in section 3.4

3.3.1 Standard

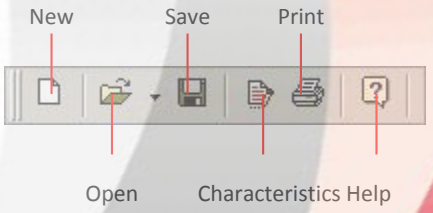


Figure 9: Toolbar Standard" "

New: Click here to scan a new area and to transfer data to your PC. Before you start the measurement you have to configure the data transmission. This function you can find inside the main menu under *File* 7→ *New*.

Open: Load a stored scan file from your hard disk to review or analyse again. A dialog will open itself where you can select the file. This function you can find inside the main menu under *File* 7→ *Open*.

Save: If you recorded a measurement or did some changes inside the graphic afterwards, like for example add some comments or information, you have to save the graphic again. This function you can find inside the main menu under *File* 7→ *Save*.

Characteristics: Click on this icon to enter detailed information about your measurement to remind later. Thereto belong for example length and width of your measured area and type of soil. This function you can find inside the main menu under *Graphics* 7→ *Characteristics*.

Print: If you want to print out the currently represented graphic click on this icon. This function you can find inside the main menu under *File* 7→ *Print*.

Help: This function is not yet implemented.

3.3.2 Graphics

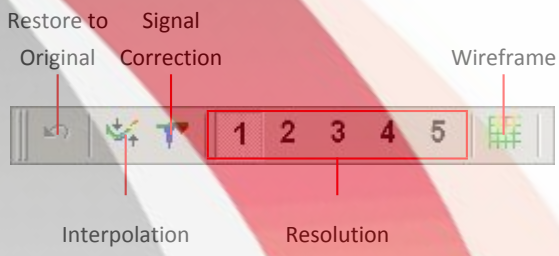


Figure 10: Toolbar Graphics“ ”

Restore to Original: With this icon you can cancel all changes which were made on the graphic. The graphic will be represented like a new opened file. This function you can find in the main menu under *Graphics* 7→ *Restore to Original*.

Interpolation: This function is used to do a mathematical computation of the graphic. New measured points between the measured lines and impulses will be calculated. This function you can find inside the main menu under *Graphics* 7→ *Interpolation*. Additional information about Interpolation you can find in section 4.1.3

Signal Correction: By using this function created error signals (e.g. caused by radio transmission) inside the graphic can be rectified. This function you can find inside the main menu under *Graphics* 7→ *Signal Correction*. Detailed information about Signal Correction you can find in section 4.1.2

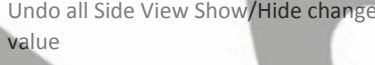
Resolution: With this icon the resolution of the graphic can be rarefied. Thereby new measure points are calculated mathematically. This function you can find inside the main menu under *View* 7→ *Resolution*.

Wireframe: The graphic will be represented in a wireframe, whereby all measure points and measured lines becomes visible. This function you can find inside the main menu under *View* 7→ *Wireframe*.

3.3.3 View

Undo all changes: Undo all changes of the graphic regarding rotation, moving and zoom of the graphic. This function you can find inside the main menu under *View* 7→ *Undo all changes.*

Perspective View: By using this function the graphic can be rotated into perspective view. This function you can find inside the main menu under *View* 7→ *Perspective View.*



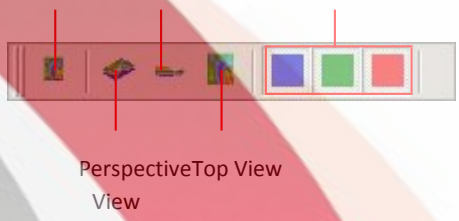


Figure 11: Toolbar View“ ”

Side View: The graphic will be represented in the side view. This function you can find inside the main menu under *View* 7→ *Side View*.
Top View: This icon shows the graphic from above. This function you can find inside the main menu under *View* 7→ *Top View*.
Show/Hide color value: These icons can be used to show or hide certain color values. When the button is pressed the corresponding color will be represented. This function is useful for example if an object is located inside a large cavity. From the side view the object will not be visible because the measured values are hidden from the cavity. In this case you can eliminate the blue color values to do a depth measurement (with line of depth) of the metallic object.

3.3.4 Depth measurement

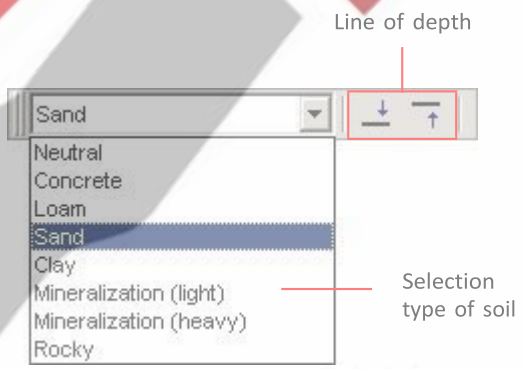


Figure 12: Toolbar Depth measurement “”

Selection type of soil: Here you can select the type of soil according to your measured area. The better the selected type of soil is adjusted to your

measured area; the exacter will be the determination of depth. The type of soil you can select also in the menu option *Graphics* 7→ *Characteristics*. The type of soil which you enter there will be stored with your graphic.

Line of depth: With these icons the line of depth can be moved up and down. This proceeding is important for the depth measurement with the line of depth. Detailed information about depth measurement you can find in section 4.1.5.2.

3.3.5 Scale

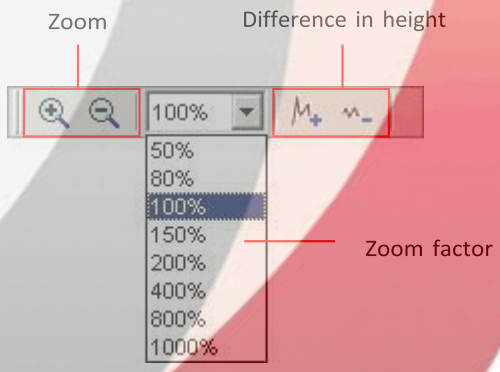


Figure 13: Toolbar Scale“ ”

Zoom: Here the graphic can be zoomed in or zoomed out. Alternatively you can use the turnable wheel on your mouse.

Zoom factor: From this list you can select the zoom factor of the graphic. The zoom factor will be adjusted immediately and the graphic will be adapted. This function you can find inside the main menu under *View* 7→ *Zoom*.

Difference in height: With these icons the difference in height of the graphic can be minimized or maximized. This is necessary when the graphic is larger than the visible area when it is rotated into side view.

3.4 Main Menu

Through the main menu you can access to all possible functions, which are put on disposal from the software program. In the following sections all options are explained in detail.

3.4.1 File

In the following subsections all functions of the menu option *File* are described in detail.

3.4.1.1 New

If you are working with *eXp 3000*, *eXp 5000* or *Localizer 3000* this function is not needed. Instead of this you have to use function *File* 7→ *Import*.

Click on *File* 7→ *New* if you want to transfer data from a device to your PC. A window like in figure 14 will open where some parameters has to be adjusted.

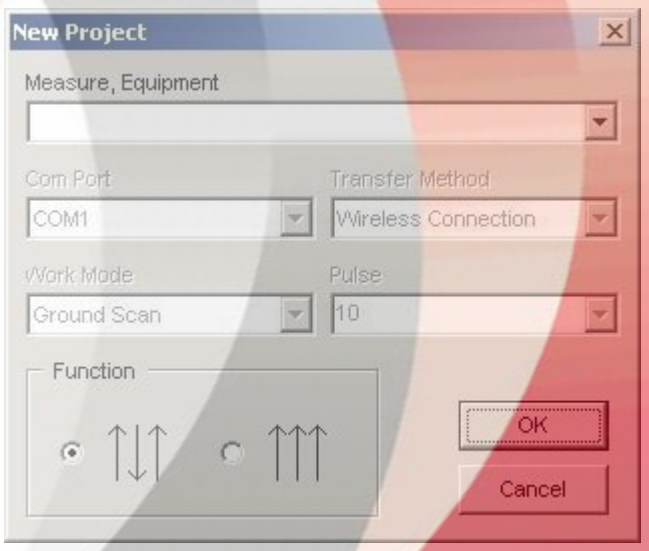


Figure 14: Dialog New“ ” • Measure, Equipment

Select here the device from where you want to transfer the measurement.

- **Com Port**

Select here the corresponding Com Port to which your cable or USB dongle[1] is connected.

- Transfer Method

Here you can enter the method of data transfer. The following possibilities are on disposal:

Wireless Connection: Enter this type of data transmission if you are working with a data receiver and antenna.

Cable Connection: You have to select this type of data transmission when your devices are connected directly to the computer with a serial data cable.

[1] Read in your device manual how to find out the corresponding Com Port when using a USB dongle.

Bluetooth: Choose this method of data transmission when you are working with a Bluetooth USB dongle.

• *Work Mode*

Enter in this section which working method you want to use to record or transfer data. Beware that this working mode should correspond with the selected operating mode of your device and that not all devices proceed all of these working modes.

Ground Scan: This function is standard function for every measuring instrument. It calculates a three dimensional image of the measured data. Detailed information about the analysis you can find in section 4.1

Discrimination: This function is available for all devices with Super Sensor. Detailed information about this function you can find in section 4.2

Live-Scan (Horizontal Probe): The measured data of a horizontal live probe are represented on the screen. Additional information about this operating mode you can find in section 4.3.1

Live-Scan (Vertical Probe): The measured data of a vertical live probe are represented on the screen. Additional information about this operating mode you can find in section 4.3.2

• *Pulse*

Here you have to enter the number of impulses per search line. Beware that this number has to be exactly the same like the one selected on the measuring instrument. If for example you used 20 impulses for the measurement with your device, you have to enter here also 20 impulses. If you are working with *Cavefinder B* you have to enter always 4.

• *Function*

There are two different possibilities to process the measured results:

Zig-Zag (↑↓↑): This scanning method is used with *GEMS*, *Cavefinder B*, *Grailfinder*, *Rover C*, *Rover C II*, *Rover Deluxe*, *Walkabout* and *Walkabout Deluxe*. Additionally, there is the possibility to use this manner also for *Future 2005* and *Future I-160*.

Parallel (↑↑↑): This scanning method is used with *GEMS*, *Future 2005* and *Future I-160*. Additionally, there is the possibility to use this manner also for *Grailfinder*, *Rover C*, *Rover C II*, *Rover Deluxe*, *Walkabout* and *Walkabout Deluxe*, but only in the manual mode.

After you entered all details about data transmission you can click on the button *OK*. The software is now ready to receive data from the measuring instrument.

3.4.1.2 Stop

This function is only visible if you used before the function *File* 7→ *New*. Click on *File* 7→ *Stop*, to stop the current connection to your device. Afterwards no other data can be received.

3.4.1.3 Open

To load a stored scan file from your hard disk, click on *File* 7→ *Open*. The dialog from figure 15 will open, where you can select the desired graphic.

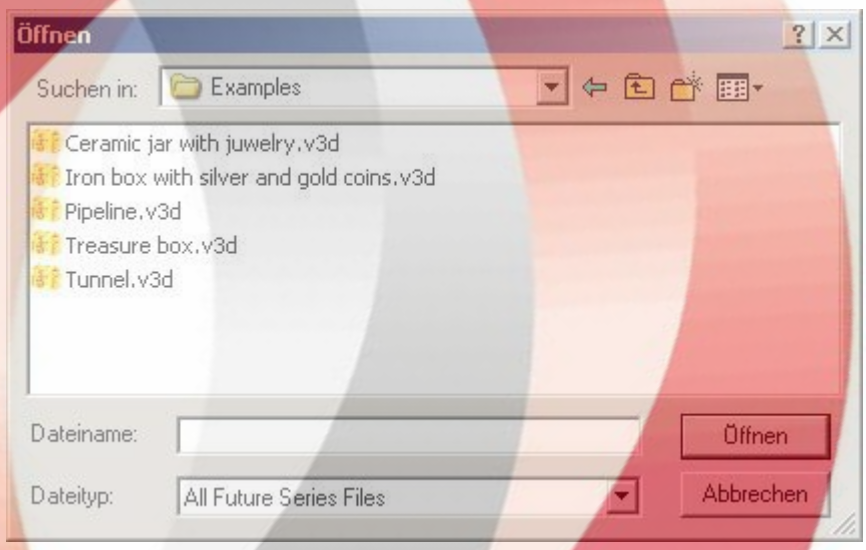


Figure 15: Dialog Open“”

After you selected the file click on the button *Open*. The graphic will be displayed.

3.4.1.4 Save

If you recorded a measurement or did some changes inside the graphic afterwards, like for example add some comments or information, you have to save the graphic again. This allows you to revert to all changed data every time.

If the current file is already stored on your hard disk, you can click on *File* 7→ *Save* to save again the file on the same name. If the current file is new recorded data, the function *File* 7→ *Save as* will be displayed automatically.

3.4.1.5 Save as

The function *File* 7→ *Save as* opens the dialog from figure 16, where you can rename the current graphic.

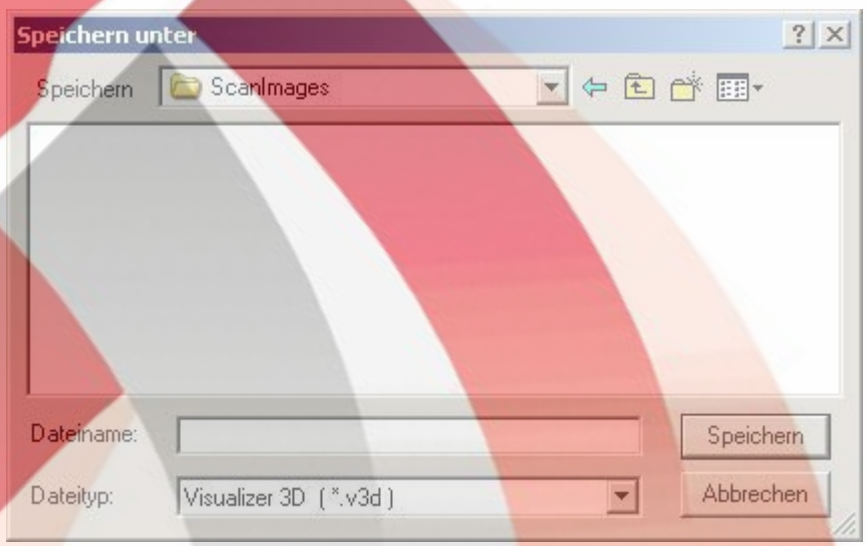


Figure 16: Dialog Save “”

After you selected the destination folder and file name click on the item *Save*. The graphic will be stored on your hard disk.

3.4.1.6 Import

With function *File* 7→ *Import* it is possible to transfer measured data from *eXp 3000*, *eXp 5000* or *Localizer 3000* to a computer. Therefore, click on the name of your device in the corresponding submenu. A dialog like represented in figure 17 will be displayed.

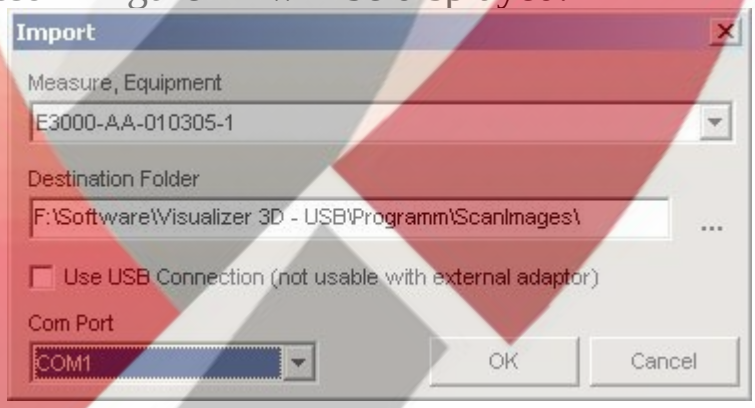


Figure 17: Dialog Import “”

Before transfering data from the measuring instrument to a computer you have to do some important adjustments.

- *Measure, Equipment*

In this field the exact serial number of your device has to be entered. Only if this number correspond with the serial number of your device a data transmission is possible.

- *Destination Folder*

Enter here the folder where the transferred data should be filed. If you click on the small item on the right side of the input field, a list will open, where you can select an already existing folder on your hard disk.

- *Use USB Connection*

Do only mark this entry when your measuring instrument has a USB Connection. If your device has a serial connection this field should *not* be marked, also if you connect it with an adapter cable to your USB connection of your computer.

- *Com Port*

This entry is only necessary for measuring instruments with serial Com Port. Select here the Com Port to which you connected the serial data cable.

Click on the button *OK* when you adjusted all parameters correctly. Now all data will be transferred from the device to your computer. Afterwards you have to use option *File* 7→ *Open* to open the transferred files.

3.4.1.7 Export as BMP

Click on *File* 7→ *Export as BMP* to save the image of the measured data as graphic file (Bitmap). A dialog will open, where you can enter a file name selected by yourself. After click it last some seconds until the window will open, because the graphic has to be prepared for export. During this proceeding an indication like *Graphic will be exported: 23%* is visible in the Information field of the Status bar.

After the image has been stored you can use it like a usual picture in different documents, emails or image processing applications.

3.4.1.8 Print

If you want to print out the graphic click on *File* 7→ *Print*. The dialog from figure 18 will open. After click it last some seconds until the window will open, because the graphic has to be prepared. During this proceeding an indication like *Preparing to Print: 38%* is visible in the Information field of the Status bar.

In the dialog you can adjust the following parameters:

- *Printer*

Here you can select the printer from where you want to print out the graphic. Additional options you can get by clicking the button *Preferences*.

- *Print Cover Page*

Mark this entry if you want to print a cover page with notes. The indications which you made in *Graphics* 7→ *Characteristics* will also be printed.

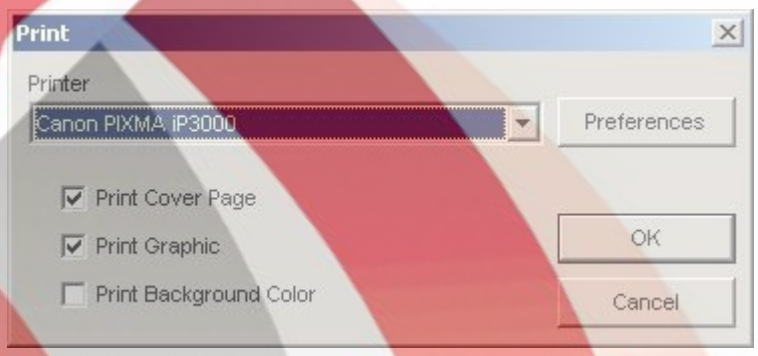


Figure 18: Dialog Print“ ” •

Print Graphic

If this option is marked with a tick, the current graphical representation of the screen will be printed. Deactivate this option for example if you only want to print the cover page with information. • **Print Background Color**

Mark this option if also the background color besides the colored representation should be printed. Beware that this printing needs more printing ink.

Click on the item *OK* if all parameters are adjusted correctly. Now the data will be send to the printer and the printout will start.

3.4.1.9 Preferences

By clicking on *File* 7→ *Preferences* you have the possibility to do certain program adjustments. A dialog like in figure 19 will open.

You can adjust the following parameters:

• *Language*

Select here the language in which the program should go. Currently the languages *English*, *German*, *French* and *Turkish* are on disposal.

• *Input Length*

Here you can adjust with which measures system you want to work. You can select between *Meter*, *Inches* and *Feet*. Depending on the adjustment the specification of length like width, length and depth are converted into the according format.

• **Date Format**

Here you select how the date should be indicated.

• **Time Format**

Select here how the time should be indicated.

• *Transformation Parameter*

Enter here the factors of the speed of your mouse movements. An indication of *2,0000* means that a Rotation, Movement or Scale is working with double speed. These indications depend on your used computer. Normally the standard indications are quite enough.

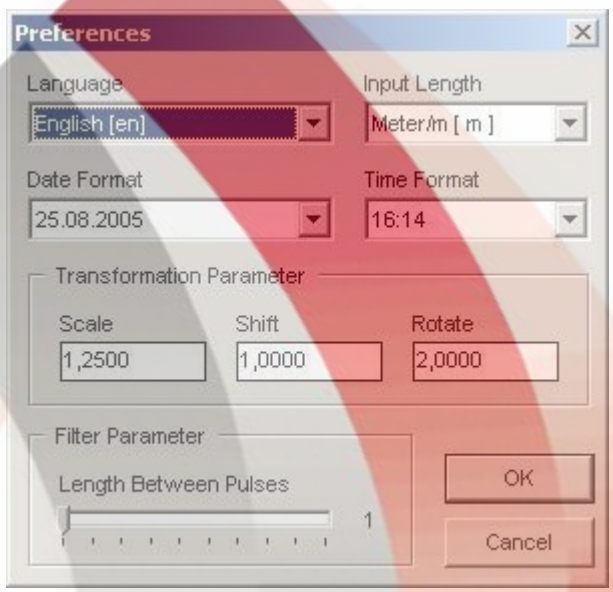


Figure 19: Dialog Preferences "" •

Filter Parameter

The filter parameter influence the fineness of the Color Filter, which you can change with the buttons in the navigation bar.

3.4.1.10 Exit

Click on *File* 7→ *Exit* to close the program. If the graphic is not yet saved or has been changed during this time the program will ask you if the data should be saved before exit the software program.

3.4.2 Graphics

The following section describes all functions of the menu *Graphics* in detail.

3.4.2.1 Restore to Original

With function *Graphics* 7→ *Restore to Original* you can cancel all changes which were made on the graphic, like for example Signal Correction or Interpolation.

3.4.2.2 Interpolation

Click on *Graphics* 7→ *Interpolation*, to do a mathematical computation of the graphic. A dialog like represented in figure 20 will open.

Before the interpolation will be done you have to adjust how often the interpolation should be used for the current graphic. Therefore, place the regulator on the desired position and click on the icon *OK*.

Detailed information about Interpolation you can find in section 4.1.3

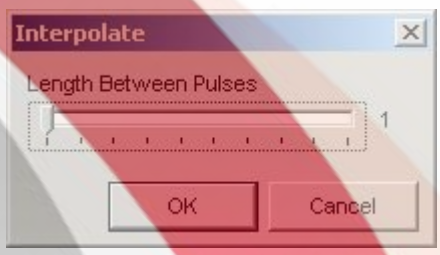


Figure 20: Dialog Interpolation“ ”

3.4.2.3 Signal Correction

The function under *Graphics 7→ Signal Correction* allows to eliminate all error signals which can be caused by data transmission via radio. After click on this function a dialog like in figure 21 appears on your screen.

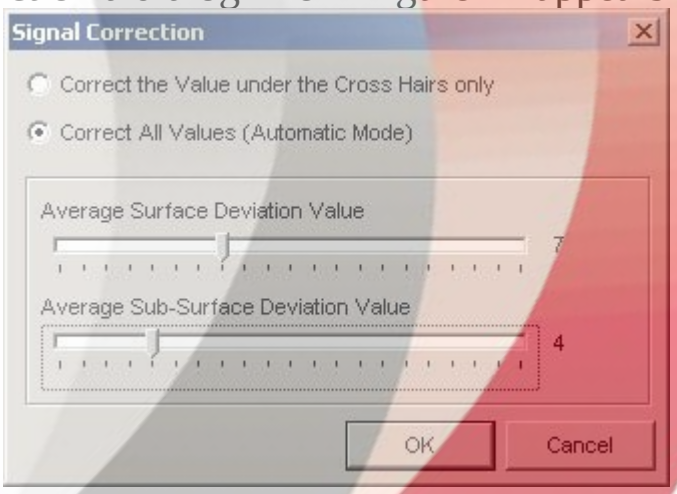


Figure 21: Dialog Signal Correction“ ”

You can select between two different types of signal correction: • **Correct the Value under the Cross Hairs only**

If this option is marked only the value under the cross hairs will be corrected. So you can avoid the unmeant correction of other values. • **Correct all Values (Automatic Mode)**

In this mode all measured values in the graphic will be checked and if necessary corrected.

The modification of the measured values results from the following parameters:

Average Surface Deviation Value

The measured value will only be corrected if its deviation to all other measured values inside the graphic is higher than the selected parameter value (standard value = 7).

Average Sub-Surface Deviation Value

The measured value will only be corrected if the deviation to all adjoining values is higher than the selected parameter value (standard value = 4).

Detailed information about Signal Correction you can find in section 4.1.2

3.4.2.4 Characteristics

Click on *Graphics* 7→ *Characteristics* to enter detailed information about your measurement project. A dialog like in figure 22 will open.

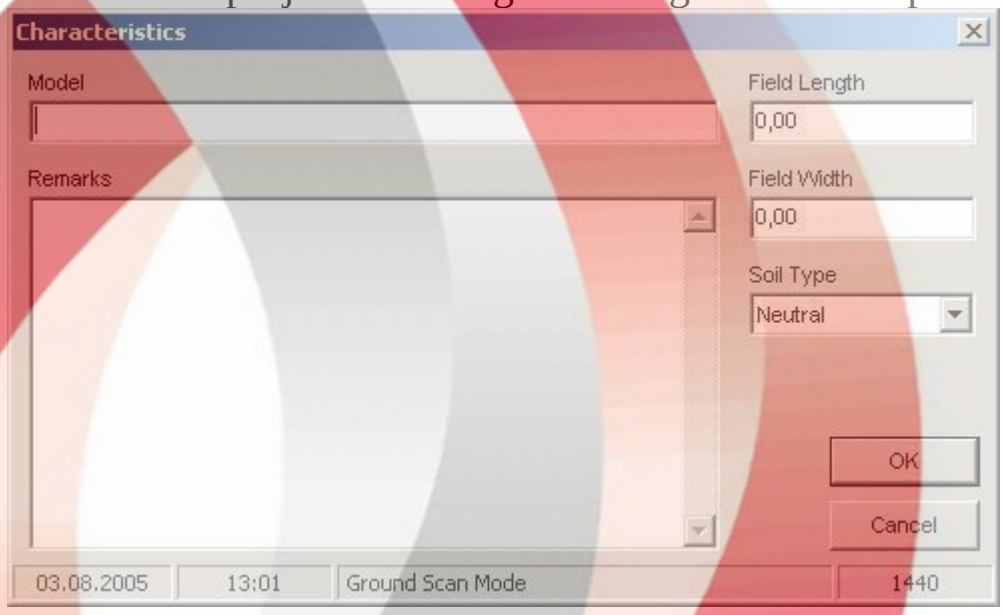


Figure 22: Dialog Characteristics“ ”

Essential information are not only length and width of your measured field but also the type of soil of the area where you did the measurement. Only with these values you can determine the correct position and depth of objects.

- **Model**

Enter here for example the name of your project or the place of your measurement.

- *Remarks*

In this field you can enter additional information like the distance between impulses, width of measured lines, walking direction and others.

- *Field Length*

Enter here the length of your measured area, also the length of your search line. The indication corresponds to the selected linear measure (meter, inches or feet).

- *Field Width*

Enter here the width of your measured area. The indication corresponds to the selected linear measure (meter, inches or feet).

- *Soil Type*

Select here the most corresponding type of soil of the area on which you did your measurement.

Click on the icon *OK* to take over the selected values and adapt the graphic. To save these data permanent you have to use option *File* 7→ *Save* or *File* 7→ *Save as*.

3.4.3 View

In the following subsections the functions of the menu *View* are explained in detail.

3.4.3.1 Undo 

The function *View* 7→ *Undo* cancel all rotations, movements or enlargements of the graphic.

3.4.3.2 Perspective 

Click on *View* 7→ *Perspective* to see the current graphic in perspective view. Alternatively you can double click on the graphic preview Perspective.

3.4.3.3 Side View

With a click on function *View* 7→ *Side View* the current graphic will be moved in side view. You can also click twice on the graphic preview Side View. In this view you can measure with the line of depth how depth objects are buried in the ground.

3.4.3.4 Top View 

If you click on function *View* 7→ *Top View* you can see the current graphic from above (bird's eye view). Alternatively you can click twice on the graphic preview Top View. In this view you can measure not only the position but also the depth of specific points.

3.4.3.5 Cross Hairs

Click on *View* 7→ *Cross Hairs* to fade in or out the white cross hairs, which are used to determine the position and depth.

3.4.3.6 Wireframe 

Click on *View* 7→ *Wireframe* to see the current graphic in a wireframe representation. Often small hidden details can become visible. Another click on this function shows the graphic again in the normal representation.

3.4.3.7 Quality

By clicking on *View* 7→ *Quality* you can select how many additional mathematical caculated points you want to add to the graphic. You can select between *Level 1 (Fast)*, *Level 2*, *Level 3*, *Level 4* and *Level 5 (Slow)*.

The more points will be calculated the more computing capacity is needed. Your computer needs more time for the representation of the graphic. Change your graphic into wireframe representation to see and analyse exactly the effects.

3.4.3.8 Zoom

If you click on function *View* 7→ *Zoom* you can select between the zoom factors *50%, 80%, 100%, 150%, 200%, 400%, 800%* and *1000%*. Click on any of these factors to see the graphic immediately in the corresponding zoomed level. Another possibility to scale is to use the turning wheel of your mouse.

3.4.4 Extras

In the following subsections the function of the menu *Extras* are explained in detail.

3.4.4.1 Split Screen

With function *Extras* 7→ *Split Screen* you can fade in or out the three different graphical previews *Side View*, *Top View* and *Perspective*. If these views are visible the function in the main menu is marked with a small tick.

3.4.4.2 Navigation Rulers

With function *Extras* 7→ *Navigation Rulers* you can fade in or out the navigation bar on the left side of your screen. If the navigation bar is visible the function in the main menu is marked with a small tick.

3.4.4.3 Fullscreen

When you click on function *Extras* 7→ *Fullscreen* you see only the graphic on your complete screen and if visible the three graphic previews. This mode is most suitable for the measurement with Live-Scan, which is possible with *Future 2005* and *Future I-160*.

3.4.5 Help

In the following subsections the functions of the menu *Help* are explained in detail.

3.4.5.1 Index 

This function is not yet implemented.

3.4.5.2 Homepage

With a click on *Help* 7→ *Homepage* you will get on the homepage of the manufacturer, where you can inform yourself about new products or offers. An active connection to internet is required.

3.4.5.3 Internet Update

To use function, *help* 7→ *Internet Update* an active connection to internet is required. When you click on this function the application will be closed and the program *WebUpdate* starts. Now you can download current updates from the internet.

Detailed information you can find in section 5 on page 46.

3.4.5.4 Information

Under *Help* 7→ *Information* a dialog opens where you ca find detailed information about your program version.

3.5 Key Functions

Most of the program functions can be activated by a simple keypress. In table 1 all available key combinations are shown.

Key	Function
F2	Show/Hide cross hairs
F3	Switch between full screen mode and wireframe
F5	Move blue color level down
F6	Move blue color level up
F7	Move red color level down
F8	Move red color level up
F9	Show characteristics of the project
F10	Open dialog preferences
F11	Fade in and fade out full screen mode
Page ↓	move line of depth down
Page ↑	move line of depth up
1	Graphic in resolution 1 (less CPU-intensive)
2	Graphic in resolution 2
3	Grafik in resolution 3
4	Grafik in resolution 4
5	Grafik in resolution 5 (more CPU-intensive)
Strg + P	Print graphic
Strg + I	Use interpolation
Strg + C	Use signal correction
Strg + R	Undo all changes
Strg + M	Fade in and fade out graphic preview *Side view*, *Top view* and *Perspective view*
Strg + F1	Perspective view
Strg + F2	Side view
Strg + F3	Top view
←, ↑, →, ↓	Move cross hairs

Table 1: Key Functions

4 Analysis and Evaluation of Measurements

Before measurement you have to know what kind of objects or cavities you are looking for and if the area you choose is suitable for this.

Measurement without a plan will not give you the results you would like. For this reason, please consider the following indications:
What are you looking for (graves, tunnels, buried objects, ...)? This question has its effects on your concrete manner to measure an area. If you are looking for big objects you can enlarge your distance between the measure points (impulses), for small objects use small distances.
Inform yourself about the area you select for measurement. Is it usefull to search at this place? Are there historical indications, which confirm your speculations? What type of soil is on this area? Are there good conditions? Is a correct data recording possible? • Your first measurement in an unknown area has to be large enough to get representative values (e.g. 20 impulses, 20 search lines).
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 exact values concerning the depth measurement, the object has to be in the centre 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 a correct depth measurement is not possible.
There should not be more than one object in a graphic. This will influence the exactness of depth measurement.
You should do at least two control scans to get sure about your results. So you also can recognize and isolate mineralized ground.

4.1 Ground Scan

With operating mode *Ground Scan* all recorded measured values are represented in a three dimensional graphic on the screen. All high-grade positive signals (e.g. metals) are shown in red color and all low-order negative values (e.g. cavities) are represented in blue color. The markedness of the red- and blue coloring depends among other things of the following factors:
Type of soil (e.g. loam, sand, stone, ...)
Contamination through other metallic objects
In the following subsections it is explained in which way the graphical representations can be edited and analysed.

4.1.1 Metal or Mineralization

On the beginning it is not always easy to find out the difference between metallic objects and mineralizations. Generally, metals are represented in

red color, but mineralized depositis in the ground can also include red color signals.

Here some important notes how to distinguish a real object from a mineralization:

- *Form*

If the object represented in your graphic has a special form (e.g. rectangle, circle, ...), you can conclude of a possible real found.

- *Color*

If there are many yellow and orange color values around the object, it will be probably a mineralisation.

- *Depth*

With a small depth of about 0,10m or 0,40m there is a high possibility that there is only a mineralisation of the ground.

- *Color Filter*

If position and form of the object are changing with the use of the color filter it is probably a mineralisation.

- *Control Scan*

If position, depth and form of the object stay nearly the same, also in further control scans you can conclude of a real object. Also if some graphics look similiar you always have to compare all indications.

Figure 23 shows a real object (left side) and a mineralized accumulation (right).

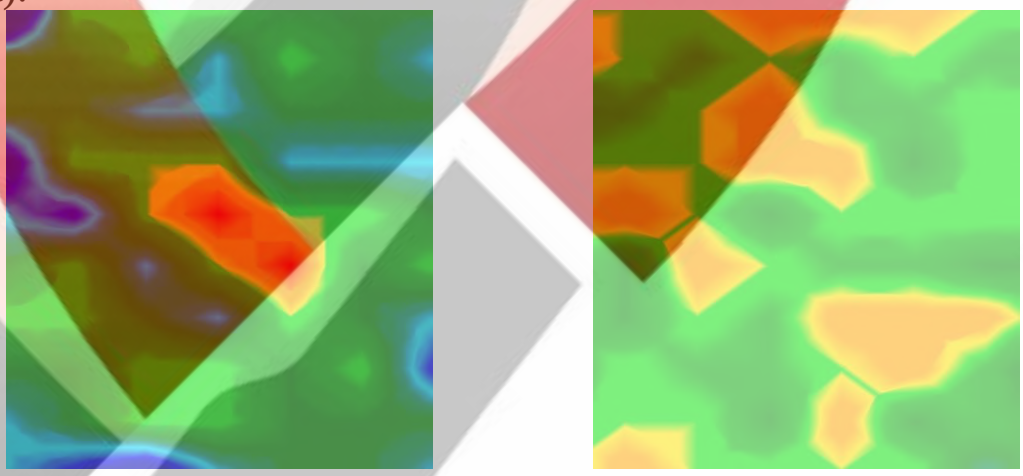


Figure 23: Comparison of object and mineral

4.1.2 Signal Correction

During the measurement there are different influences from the environment which can affect the graphical representation in a negative way. Especially other radio signals can impact negatively the measured values. This function is used to eliminate error signals from the graphical representation[2].

A click on *Graphics* 7→ *Signal Correction* shows the dialog Signal Correction "from figure 21

"

. There are two options possible: • **Correct the value under the cross hairs only** Manual mode, where only the marked value will be adapted.
• **Correct all values (Automatic Mode)**
Automatic mode, where all measured values will be adapted.
To use option Signal Correction, the follwoing parameters has to be adjusted:

- *Average Surface Deviation Value*

Here you assign how large the deviation of certain values to the average values of the complete measured field can be. The value *Zero* means no deviation.

- *Average Sub-Surface Deviation Value*

This value indicates how large the deviation of every measured point to the adjoining values can be. A value of *Zero* means no deviation.
The smaller the values of the parameters are; the more modulations will be made.

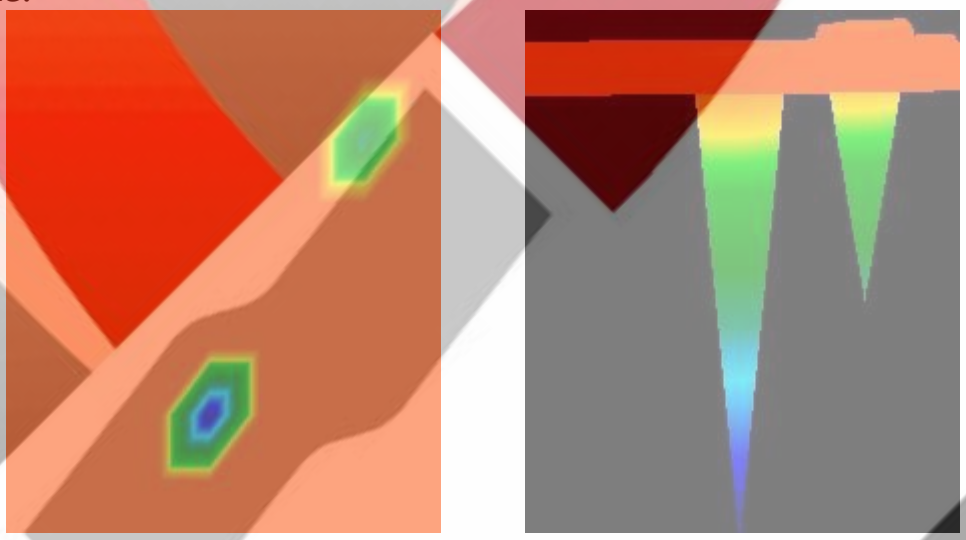


Figure 24: Graphic before signal correction

Figure 24 shows a graphic including two error signals. The side view shows clearly a high pointed deviation down. Often the complete graphic will be coloured in red if error signals are included. The error signals itself will be represented as large spikes in blue colour.

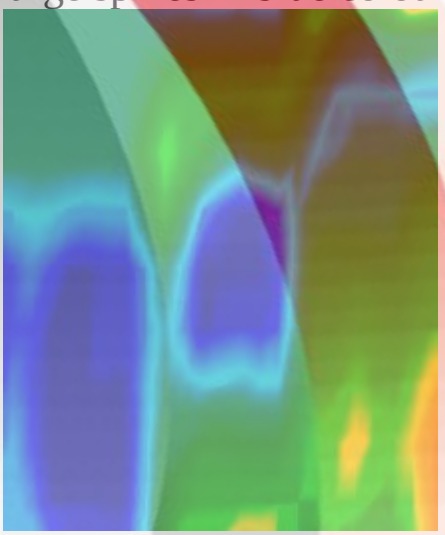


Figure 25: Graphic after signal correction

Figure 25 shows the same graphic like in figure 24, but after using the option Signal Correction. Now two blue parts become visible which were not visible before. They represent two places with excavations. Before the Signal Correction there was no indication visible.

4.1.3 Interpolation

With option interpolation you can improve the representation of your graphic. Also by using this option certain irregularities in the measurement will be eliminated. So it is possible to check possible objects regarding mineralization.

A click on *Graphics* 7→ *Interpolation* opens the dialog Interpolation“ from figure 20

”

. To begin place the regulator on number *1* and confirm your selection with a click on *OK*.

Figure 26 shows on the left side the graphic before interpolation and on the right side the same graphic after interpolation. You should repeat this procedure about 3 or 4 times. Alternatively, you can also adjust an interpolation value of *3* to do the interpolation only one time.

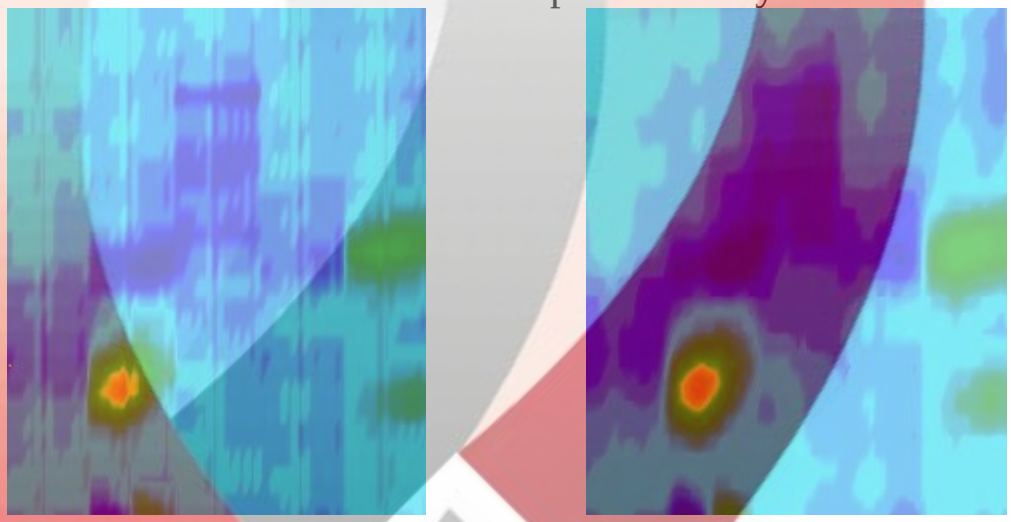


Figure 26: Graphic before and after interpolation

With the interpolation value you can adjust how often the interpolation procedure should be realized. So it is the same result when you do 3 times a interpolation with value *1* or just one interpolation with value *3*.

The interpolation is also very suitable to distinguish real objects from mineralizations. When there is a real metallic object inside the graphic it will also be visible after using interpolation several times and it will keep the same position, size and form. If already after one interpolation the signal disappears or split in more parts or change its position radical, than it is probably a mineralization of the ground.

If you repeat the interpolation process too often, also real objects will disappear from the graphic.

4.1.4 Color Filter

The representation of the graphic can be variated by moving the blue and red color level.
Therfore you can use either the buttons of the Color Filter from the Navigation Bar or the keys *F5*, *F6*, *F7* and *F8* of your computer keyboard. Figure 27 shows the original graphic (left side) and the changed graphic after moving the red color level.

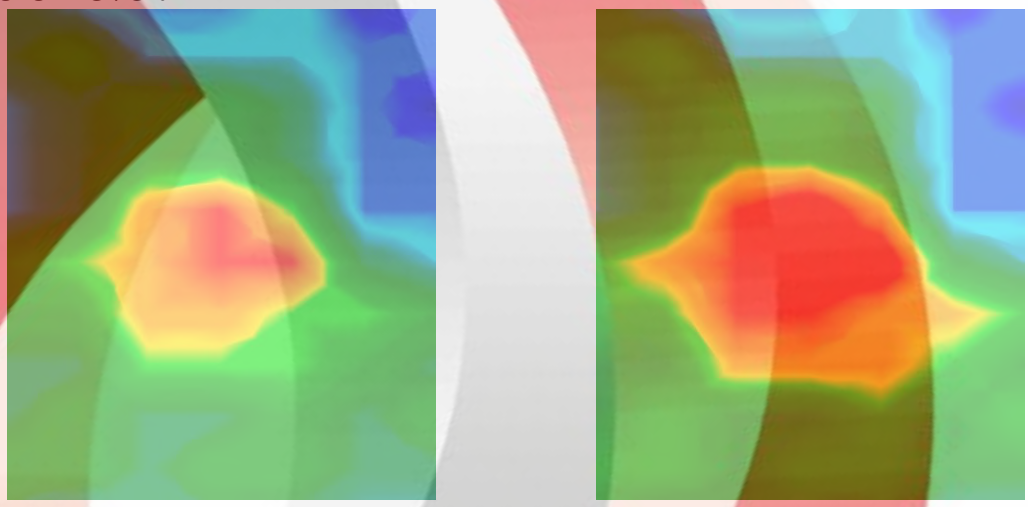


Figure 27: Usage of the color filter by moving the color levels

In figure 28 you can see two examples how the original graphic from figure 27 can be changed. On the left side the graphic after moving the blue color level is represented and on the right side the image after moving both color levels.

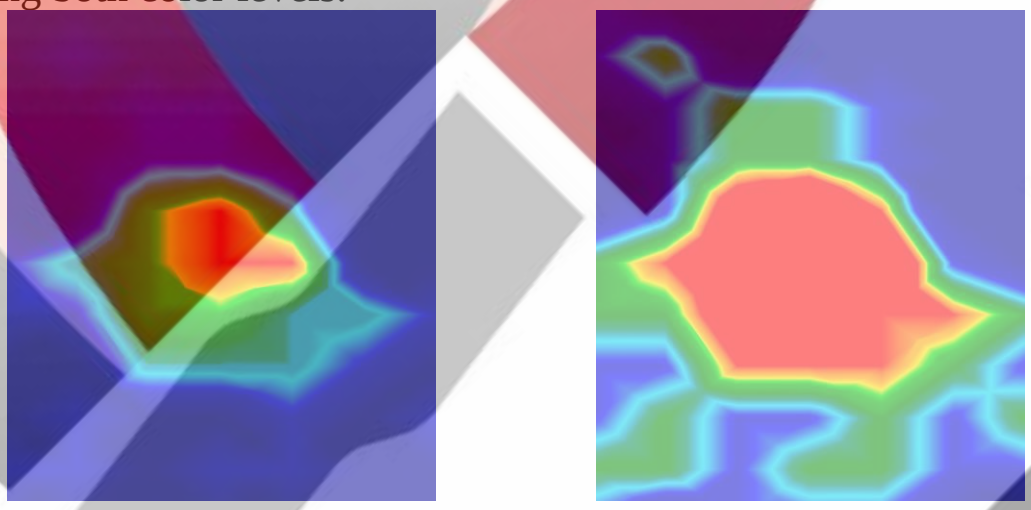


Figure 28: Usage of the color filter by moving the color levels

Normally the adjusted position of the color levels is selected optimal and do not has to be changed manually. But it can be useful to verify the graphic regarding to mineralization in the ground. If the detected signal

is changing strongly after only little moving of the color level, then the signal represents probably a mineral.

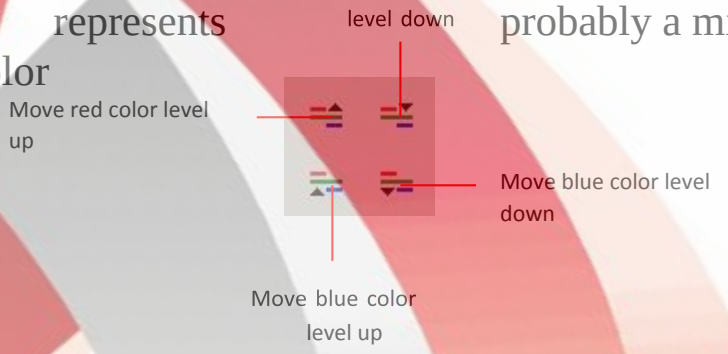


Figure 29: Operating Elements of the Graphic Control

In tabel 2 you can find again the key functions of the Color Filter, like already mentioned in tabel 1

Key	Function
F5	Move blue color level down (reduce blue color values)
F6	Move blue color level up (amplify blue color values)
F7	Move red color level down (amplify red color values)
F8	Move red color level up (reduce red color values)

Table 2: Key Functions of the Color Filter

4.1.5 Determination of Position and Depth

Only if you are sure to have found a real object you can begin to determine its position and depth. The next section explains how to proceed.

4.1.5.1 Determining the position

To locate the exact position of an object you have to enter the field length and width at first. Therefore click in the main menu on the entry *Graphics 7→ Characteristics*. A dialog window will open which is represented in figure 22. Enter here the corresponding values.
Place now the crosshairs with the arrow keys (←, →, ↑ and ↓) directly over the object, like shown in figure 30.

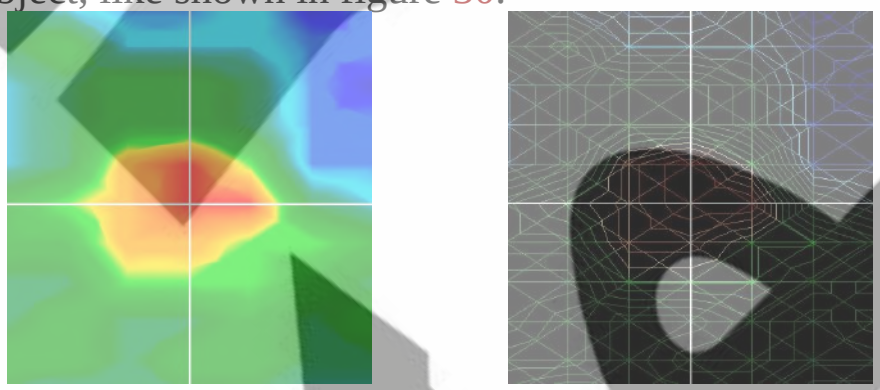


Figure 30: Determining the position of objects

Now you can read the relative distance between the object to your starting position in the arrays Search line and Impulse of the Status bar.
The represented position applies always to the measure point directly under the crosshairs, like represented in figure 30. You can move the crosshairs over any desired measure point inside your field with the arrow keys (cursor keys). During the representation of the the graphic with wireframe, which can be activated with *View* 7→ *Wireframe*, you can recognize easily every single measure point. This is visible in figure 30 on the right side.
If for example the indication shows *Search line: 3m* and *Impulse: 5m*, this means that you have to walk 3m to the left and 5m forward beginning from your starting point to stay directly over the object.
Now you may see that it is important to remember the exact location of your starting point. Note this information always in the information dialog which you can open anytime by pressing the key *F9*. Additionally, it is adviced to place a little marking on the ground where your starting point is situated.

4.1.5.2 Determining the depth

For the depth measurement a single object should be included inside the graphic. Also the object should be placed in the centre of the graphic if possible, it should be surrounded by normal reference values. Therewith optimal conditions for the precise determination of depth are given.
To determine the depth differences are quite possible. The deeper the object is located in the ground the higher can be the variance from the real depth. Normally depth differences of about 0,50m are possible. If there is a strong mineralization of the ground higher differences can arise.
Before determining the depth, you have to enter the type of soil which was present in your measured area. Therefore, select in the toolbar Depth measurement the corresonding type of soil from the list.
To determine finally the depth of objects there are two possibilities:
Depth measurement with line of depth
Depth measurement with crosshairs
Both possibilities are described in detail in the following subsections.

Depth measurement with line of depth

At first rotate the graphic into side view, like represented in figure 31. Alternative you can click twice on the side view window on the right side of your screen.

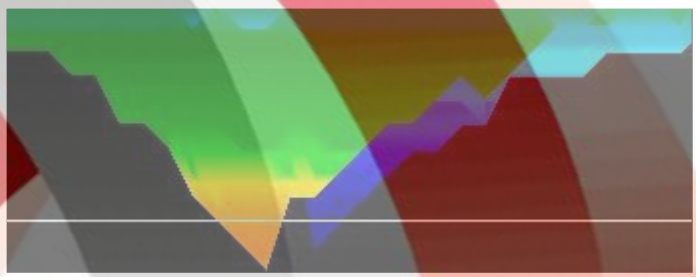


Figure 31: Depth measurement with line of depth

With the keys *Page* ↑ and *Page* ↓ of your computer keyboard you can move the line of depth to the ending point of your object. Now you can read the depth in segment Depth in the Status bar. Beware that two values are represented. You have to consider the first value. The second value is used for determination of depth with crosshairs.

Determination of depth with crosshairs

Rotate the graphic into top view, like shown in figure 32. Alternative you can also click twice on the view from above window on the right side of the screen.

Figure 32: Depth measurement with crosshairs

With the arrow keys of your computer keyboard you can move the crosshairs directly over the measure point whose depth you want to determine. Now you can read the depth in segment Depth in the Status bar. Beware that there are two values represented. You have to consider only the second value. The first value indicates the determination of depth with the line of depth.

4.2 Discrimination

The operating mode *Discrimination* can only be realized with the Super Sensor. With this specialized probe it is possible to discriminate between ferrous and non-ferrous metals.
The recorded measured data is represented in curves. From these curves you can conclude to characteristics about possible objects. Generally, there are three important forms representing non-ferrous metals, ferrous metals and cavities.

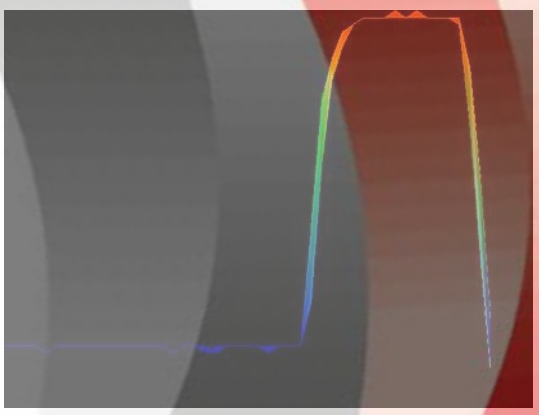


Figure 33: Curve Shape of Iron

In figure 33 it is represented, which curve shape results from ferrous metals. Typically, is the high deflection to the top followed by the same deflection down.

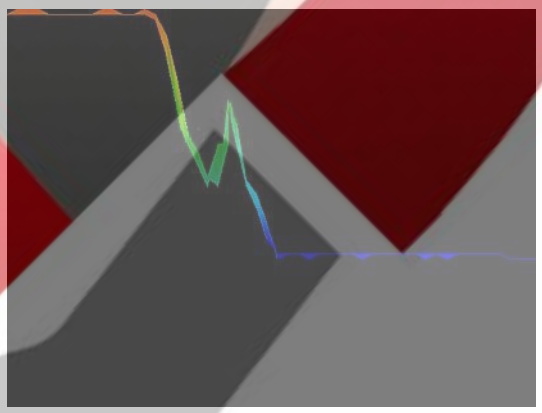


Figure 34: Curve Shape of Precious Metals

Figure 34 shows which principle curve shape is represented when passing over a precious metal. Typically, is the small additional deflection with the difference that there is no deflection down.

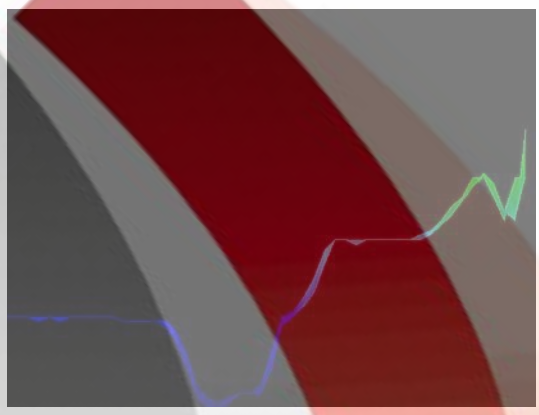


Figure 35: Curve Shape of Cavities

In figure 35 you can see the principle curve shape when passing over a cavity. Typically, is the high deflection down. But there is no equivalent deflection in the opposite direction.

4.3 Live-Scan

The operating mode *Live-Scan* is only possible with the devices *Future 2005* and *Future I-160*. The measured data are recorded continiously and send directly to the software. This way you will get a flowing "image, which represents the current situation under the connected probe. "

4.3.1 Horizontal Live-Scan

After connecting the horizontal antenna connect the device to your computer. Therefore select *Live-Scan (Horizontal Probe)* in the dialog from figure 14 on page 19. With impulses you select the amount of measurement series represented at the same time (recommended value = 10). The higher the value of the selected impulses the slower the image is flowing over the screen.
The latest measured data is always represented on the top of the screen. As soon as new data is present all values which were recorded before move down. In figure 36 the graphical representation is shown.

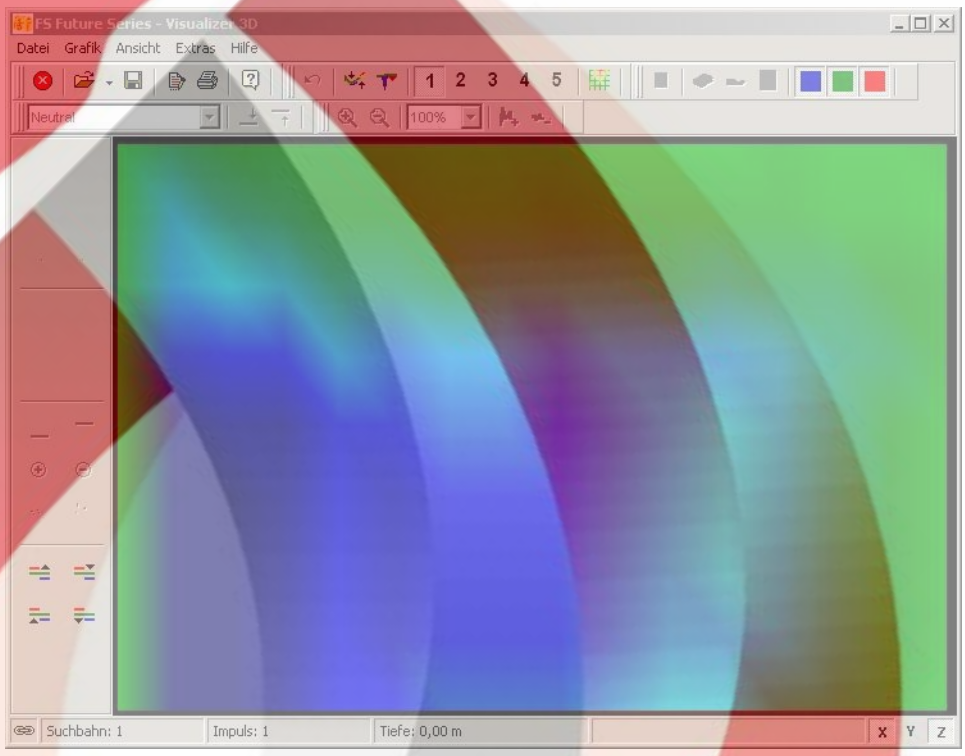


Figure 36: Horizontal Live-Scan

The measured values of the Live-Scan cannot be stored. You should decide during the measurement if there is an interesting discovery or not. In principle there are the same guidelines like in operating mode *Ground Scan*. Red color values represent metals and blue color values indicates cavities.

4.3.2 Vertical Live-Scan

Connect the vertical antenna and connect your device to the computer. Therefore select *Live-Scan (Vertical Probe)* in the dialog from figure 14 on page 19. With impulses you select the amount of measurement series represented at the same time (recommended value = 10). The higher the value of the selected impulses the slower the image is flowing over the screen.
The latest measured data is always represented on the left side of the screen. As soon as new data is present all values which were recorded before move to the right. In figure 37 the graphical representation is shown.

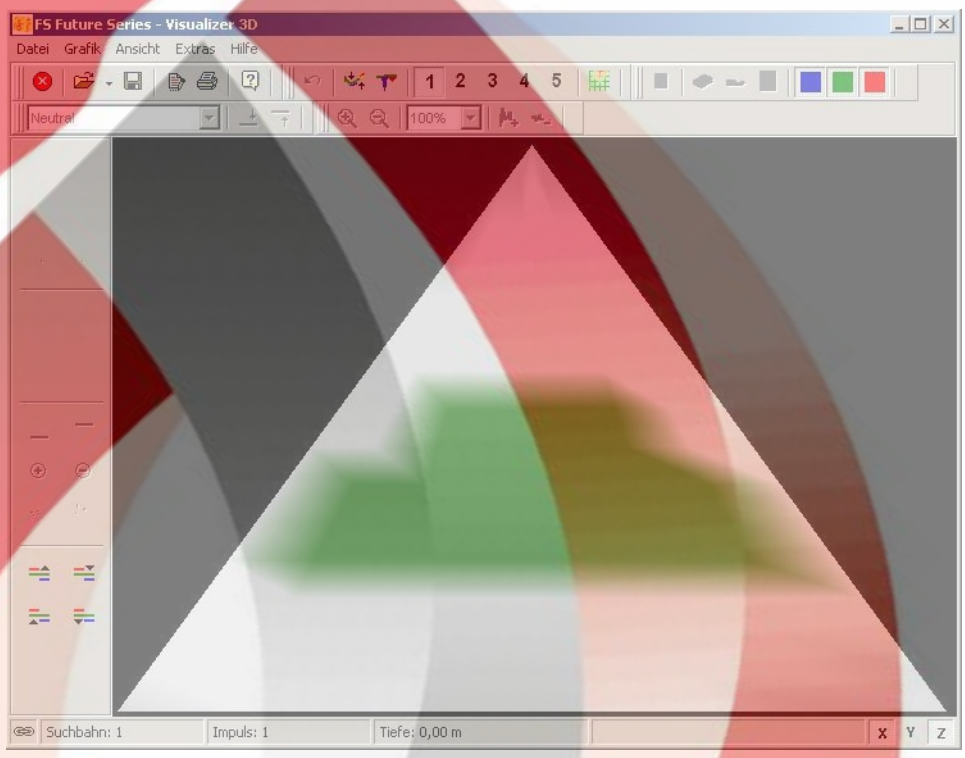


Figure 37: Vertical Live-Scan

The vertical live scan shows a cross section through the measured soil. The representation of depth is limited on 3 meters from the top until the bottom of the graphic.
The measured values of the Live-Scan cannot be stored. You should decide during the measurement if there is an interesting discovery or not. Light green color values indicate possible metal objects and dark grey color represents cavities.