ARS RESISTIVITY

SCANNER

USER MANUAL

Dear Customer; we would like to thank you for preferring the **DRS Electronics ProRadar Series products**. We strongly recommend you to read this user manual carefully in order to understand how the products operate and to test them in order to gain experience. This is a scientific and electronic device and the user must comply with all instructions in the user manual.

We would like to wish you best for your search.

CAUTION! PLEASE READ THIS MANUAL BEFORE USING THE PRODUCTS.

The information herein can be changed at any time without prior notice.

This user manual cannot be duplicated, distributed and copied without prior consent of DRS Electronics.

General Information

DRS Electronics products must be used carefully as all other electronic devices. Attention must be paid on scanning heads, main unit and scan sensor, they must be protected against impacts and tough objects and no excessive power must be applied to connectors.

Injury

If **DRS Electronics** products are operated properly, they don't cause any injury and health problem. **DRS Electronics** products do not cause any threat to the human body. As in all other electronic devices, **DRS Electronics** products must be kept away from children too. Please pay attention that resistivity scanning probes do not contact with your body during the scan as they may contain high voltage.

Ensure that all precautions are taken against any risk. Do not use your device during the rain or when the ground is extremely wet.

Open your device after being sure that probes are fixed to the ground and cable clips are installed properly. Probes must never touch each other and must not be touched when the device is open. More than half length of the probes must be driven to the ground.

Be sure that main unit battery of the device is fully charged before the scan. Insufficient battery may cause you to be mistaken. Probes should be cleaned with a damp cloth at the end of scan.

CAUTION! SCANNING PROBES HAVE 110 V POWER. DON'T TOUCH SCANNING PROBES DURING THE SCAN AND WHILE CABLES ARE CONNECTED.

Repairing

All repairs arising out of parts defects are free of charge for a period of two (2) years as of the date you purchased the product. Tear and wear from use and malfunctions caused from using unauthorized chargers/probes/cables are exempted from the said warranty. Please consult to your vendor for service requests or questions about the product. The unit is examined and, if necessary, repaired by a qualified technician. All repairs after two years are done for a fee.

In case you damage the product or open its box, the warranty shall be void.

Contents

1 - ASSEMBLY

No assembly required except cables to Main Unit from probes for operation.

2 - PREPARATION OF PC SOFTWARE FOR RECEIVING THE DATA

Please run 3D GROUND MONITORING software, installed in your Tablet PC. You should **"Right Click"** with your mouse on the icon to open Short Cut menu and select **"Run As Administrator"** to permit the software run with the full features. If you do not use a mouse, you can press and hold on the software icon to open Short Cut menu.
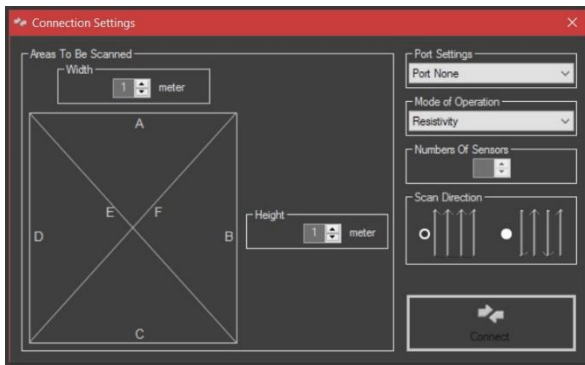
 Software Icon on the desktop

 Please click Program Connection Settings button.

You will be asked to enter information about the area to be scanned on the displayed window.

On the Area to be Scanned:
**Areas To Be Scanned** = You must enter approximate dimension of the area to be scanned.
Port Setting = Select the port to be connected with the device via Bluetooth. This is preset at the factory and you should not change it unless directed to do so.
Operation Mode = DRS ARS works with "Resistivity" option only. Please be sure that "Resistivity" is selected.
No. of Sensors = No. of Sensors does not operate with Resistivity option.
Scanning Direction = Scanning Direction does not operate with Resistivity option..

Click CONNECT option after making all selections. Following screen will appear when device is connected. Program will wait as ready for scanning.
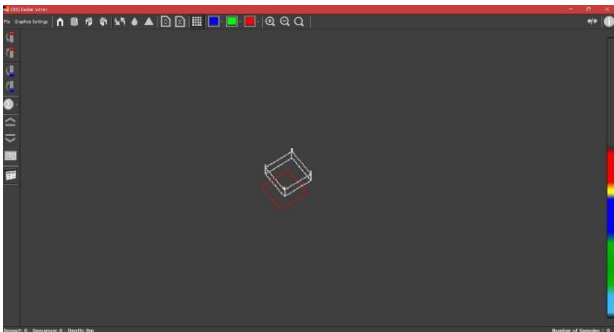

The squares on this screen are prepared according to the number of hits and scans that you selected. Each square is equal to a signal.

Select the operation mode on the device's main menu. Connection settings must be same in order to scan in automatic, manual, live graphic and resistivity modes.

3 - RESISTIVITY USE

3.1 BEFORE STARTING THE SCANNING

Check that battery is full. Prepare the probes in advance on the area to be scanned in the form of a square according to your scanning method. Be sure that cable clips are correctly and properly fixed and if the area to be scanned is composed of very dry soil, slightly wet the area, on which the probes will be fixed, before operating the device.
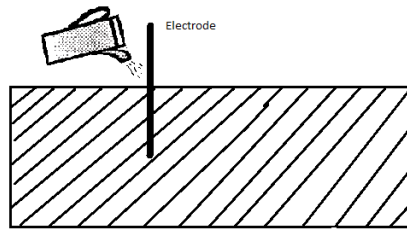
The equipment needed for operation are plastic gloves to protect from electric shock, hammer to drive the probes to the earth, cable pliers to remove probes from earth, screwdriver to replace fuses, white towel to protect panel from sunlight, and measurement tape to determine the distance of probes to each other and their length. These tools will help you during your work.

3.2 RESISTIVITY

The Resistivity Menu is seen on the LCD screen when the system turned on. Resistivity menu is as follows:
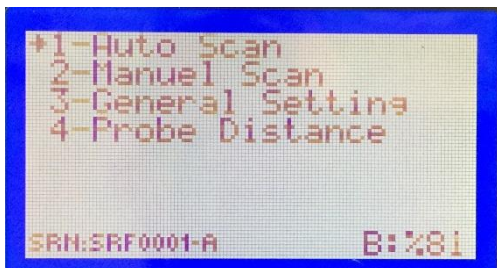
**AUTO SCAN**: Automatic scan is made. Scan is made between 6 lines in total with 4 probes.
MANUEL SCAN: Manuel scan is made on the selected line.
GENERAL SETTING: This menu is used to set resistivity sampling and measurement time.
PROBE DISTANCE: This menu is used to enter the distance of probes from the Main Unit for scaled representation of the measurement on 3D Ground Monitoring Software.

3.2.1 AUTOMATIC SCAN MODE

Press OK on START SCAN option of resistivity menu for automatic scan. **DON'T TOUCH PROBES when scan begins.**
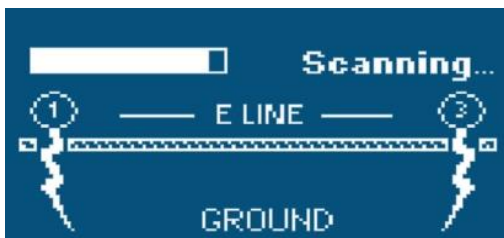
When automatic scan begins, respectively *LINE A* (1st and 2nd Probes), *LINE B* (2nd and 3rd Probes), *LINE C* (3rd and 4th Probes), *LINE D* (4th and 1st Probes), *LINE E* (1st and 3rd Probes), *LINE F* (4th and 2nd Probes) will scan. The screen to the right hand side will be displayed during the scan. The material found on the scanned area will be displayed on screen in real time and you can examine it later on Details page.

Details page will be displayed after automatic scan is completed. The Details page shows which material is seen at which line.
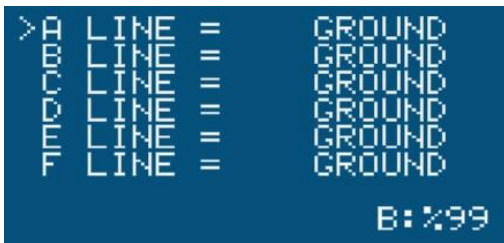
If probes are not connected, a message, such as NOT CON. (Not Connected), is displayed.

If you press OK button on the line that you want to examine, you will be directed to the Details page of that line.

The materials defined in resistivity system are listed below.

| MATERIAL	OHM	SCALE
SILVER	170-250	610-585
GOLD	250-320	584-575
COPPER	320-400	574-550
IRON	400-650	549-490
MINERAL	650-900	489-440
WATER	900-2K	439-295
SOIL (NORMAL)	2K - 5K	294-105
CAVITY/TUNNEL	5K +	105-20

*Values are given in terms of OHM.

These values may vary, based on mineralization, conductivity, fault, humidity, and temperature level of the soil.

If the device finds any material at any line at the end of automatic scan, it will be displayed after the scan is completed. When you select the line and press OK button, you will be directed to the Details page of that line. You can see different materials in the Details page.

If cable connections are not made or there is any discontinuing cable connection, a message, such as NOT CONNECT, will be displayed.

3.2.2 MANUAL SCAN
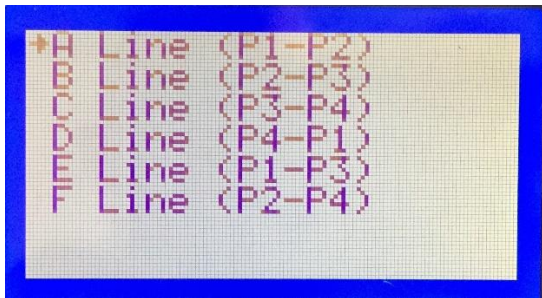
Manual Scan is used only to measure the area between any two selected probes. For example, if you only want to scan LINE A, i.e. between Probes 1 and 2, select SCAN LINE A in Manual Scan. Only the area between the probes that you have selected will be scanned.

CAUTION !! REGARDLESS OF SELECTION OF SCAN A-B-C-D-E-F LINES IN MANUAL SCAN, THE VOLTAGE GENERATED DURING THE SCAN IS VERY HIGH. THEREFORE, PLEASE DON'T TOUCH THE PROBES.

3.2.3 SETTINGS
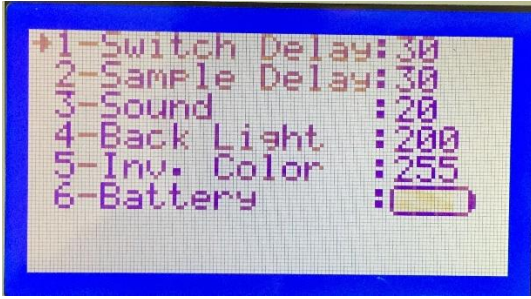
You can set the sampling and measurement time between probes in Settings section. Normal range is set to 30 in both settings. This measurement time range must be increased for deep measurements, soils with high amount of minerals and mining fields. For example, both settings must be 50.
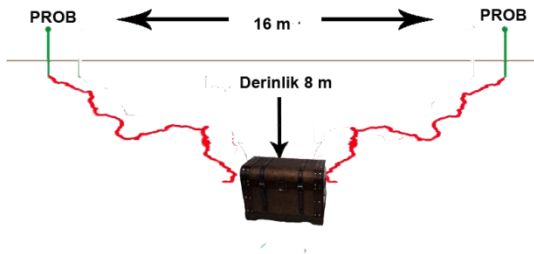
3.2.4 PROBE DISTANCE

You can set distance between probes in this section. Although it does not affect the normal operation of the unit, it does help to transfer underground measurement values to 3D GROUND MONITORING software in scale.

4 - RESISTIVITY DEPTH MEASUREMENT

During the depth measurement, initially the scan must be completed. After scan is completed and values are read, the distance between probes must be reduced and another measurement must be made. Please review the below examples.
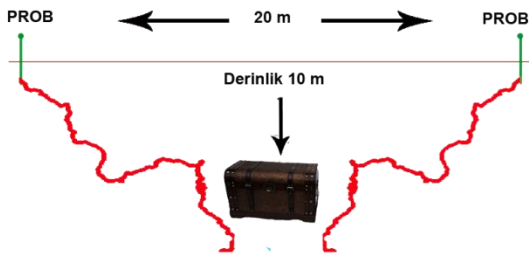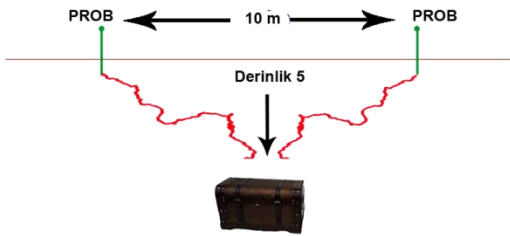

As shown in the adjacent image, the distance between two probes is set as 20m. Total possible depth for resistivity system is 10 meters. Materials at 10 meters depth are detected. However since the depth of metal bag is less than 10 meters as shown in the image, the device will not detect the metal.
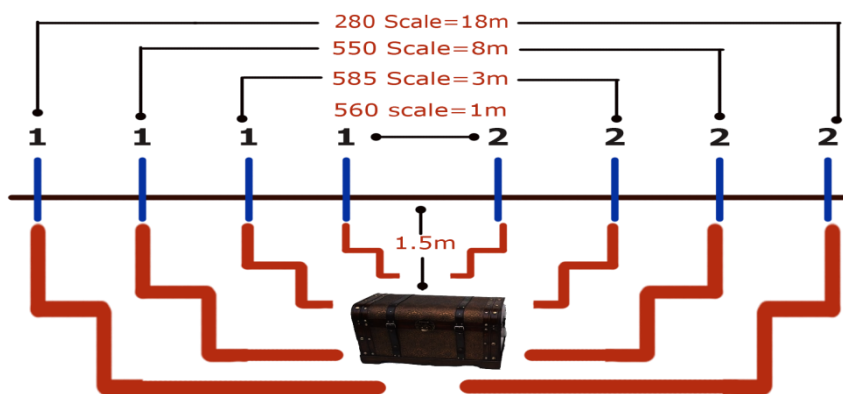

The distance between probes in the adjacent example is set as 16 meters. The system will scan at 8m. depth. Since metal bag is at 8 meters, the system will automatically detect it and display the type of metal. The distance between probes must be reduced to learn exact depth of the metal.

As in the below image, the distance between probes is set as 10 meters and system detects 5m. depth. Since there is not any metal at 5m. depth, the device will not detect the metal.

You must increase the distance between 2 probes as shown in the below example in order to find net depth and type of the metal and you can also find the exact depth of metal, gap and water. You should also read the values in the above given scale and compare them with numeric values displayed on the device. You must take the closest scale value of the object that you search as basis when reading the values.

As shown in this example, the first read value is 560 and second read value is 585. If it is assumed that metal bag is gold, the second read value exactly matches with the value of gold. The value will decrease when the distance between probes is increased. Attention must be paid that the displayed value must be closest to the value of searched material.

5- 3D GROUND MONITORING SOFTWARE - OVERVIEW

Minimum system requirements needed to install 3D Ground Monitoring software to your computer are displayed in the following table:
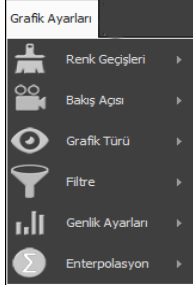
Operating System:	*Windows Xp, Windows 7, Windows 8, Windows 10*
Memory (RAM):	*Min.512 MB*
Graphic Card:	*Min.256 MB (OpenGL Compatible)*
Disk Space:	*Min.300 MB*
Data Transfer (Interface):	*BLUETOOTH*

5.1 MENUS AND BUTTONS
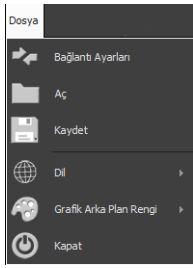
 File Menu. You can access New Connection, File Opening, Saving, Program Language Changing, Software Background Color Changing features from this menu.

 You can set different graphic color tons, graphic perspective, Difference Graphic Options, such as Grid and Raw Data Graphics, and expansion settings of filters from Graphic Settings menu.

 Buttons that you can use to change graphic perspectives:

 The button used to undo the changes to graphics.

 The button used to blur the graphic and removes the problems between data.

 The button used to sharpen the graphic and removes the problems between data.

 Buttons used to expand and narrow the graphics.

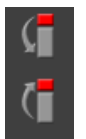 The button used to examine the graphic in the form of a cage and grid.

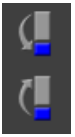 The button that removes Gap, Soil and Metal data in order to allow you to examine single data.

 Buttons used to maximize and minimize graphics and return them to their real sizes.

 Soil menu to select the type of soil.

 Buttons that you can use to increase and decrease ton of color in metal data.

Buttons that you can use to increase and decrease ton of color in gap data.

Buttons that you can use to move the line of depth up and down.
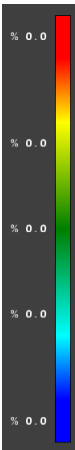
Interpolation button

Virtual keyboard button

Button to read digital values.

Right color bar ensures that you view the values in terms of percentages. It represents the percentages of metal, mineral, soil, hard soil and gap from top to bottom.

5.2 EVALUATION OF MEASUREMENTS

Meanings of Graphic Colors When Standard Colors are Used

Red; Metal
Blue; Gap
Green; Soil
Orange and Yellow; Mineral   .

These details are different in case different color options are used. It might be difficult to differentiate metal and mineral at first look. Sometimes you may see reddish colors for minerals too. But there are some differences between metal and mineral and they can be displayed with analysis. Some of these differences:

METAL	GAP	MINERAL
Has a clear shape	*Has a clear shape*	*No shape and scattered around the graphic*
The graphic has ceiling-floor structure	*The graphic has ceiling-floor structure*	*No ceiling-floor structure*
Its color is red in graphic	*Its color is dark blue in graphic*	*Its color is orange in graphic*
Graphic obviously goes down and becomes flat at the bottom	*Graphic obviously goes down and becomes flat at the bottom*	*Graphic is generally superficial and does not create a plane*
Graphic has BLUE reflections	*Graphic has GREEN reflections*	*No reflection in the graphic*

If graphic represent a special shape, this means metal data (such as square, rectangular, circle, etc.). If orange and yellow tones around the object in the graphic are too much, it is possibly mineral data.

If the object is at a depth, such as 10 cm, 30 cm, there is a high probability that it is a mineral.

You must have and confirm that you have the same data in controlling measurements. Images of metal and mineral are given in the below graphic sample.

Differences between metal, gap and mineral are described in the below table. The features of this table are described with examples on graphics. Please examine it carefully.
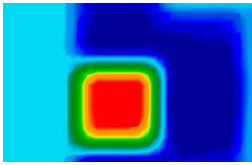

Metal data
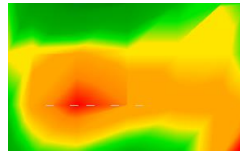
Mineral data

5.2.1 METAL GRAPHIC

The sample graphic below is the data of precious metal, located within a gap, which is created by user for testing purposes. It gives information about the analysis of precious metals within a square metal box.

Real metal objects represent a clear shape, which distinctively separates metals from minerals. The adjacent graphic shows the metal within a gap and it has a square shape. There is a yellow thin layer around the square, which is displayed in red, and this must be available in all metal data. Yellow layer must have the same shape of the red object.

Metals have a very thin yellow /greenish edge formed from ionization.
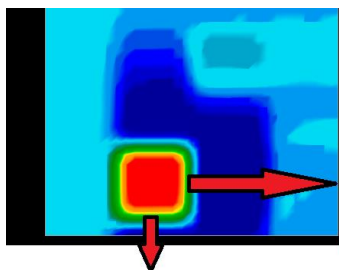
Metals have straight edges and a definite shape
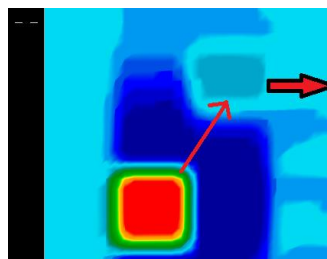
Metals should have a similar shaped blue reflection /shadow close to it.

When metal is queried with F7 and gap is queried with F6 in the software, there must be a reflection in **BLUE** color, which represents a metal object (data is retrieved with north and south magnetic poles in the read values). There is no reflection in minerals.

In order for you to separate precious and non-precious metals: Precious and non-precious metals have same features in the graphic (reflection, becoming hollow, yellow thin layer, ceiling-floor structure). Precious metals keep their red color and additionally there is a yellow thin layer around them.
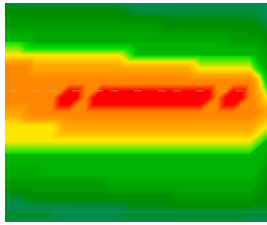

Non-Precious Metal
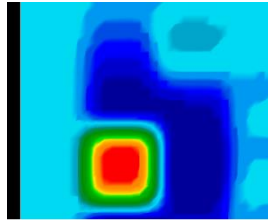
Precious Metal

5.2.2 GAP DATA GRAPHIC

All features described until here are the features of metal data. Gap data do also have same features. They go downwards (becoming hollow) and there must be ceiling-floor structure. But the color of gaps (rooms, tombs, tunnels, etc) is **BLUE**. When the graphic is examined, there is a **LIGHT BLUE THIN LAYER** with same lines of BLUE color (similar to yellow thin layer in metals). Furthermore, the north-south magnetic pole (reflection) of the gap is **GREEN**.
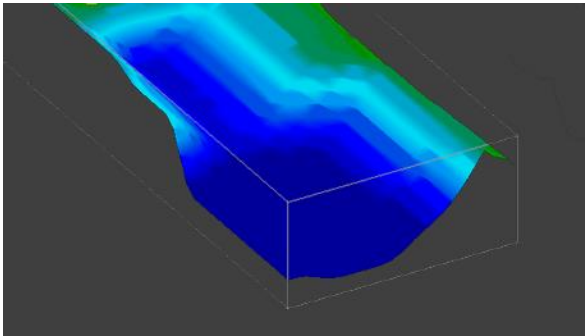
There is an image in the adjacent graphic. There is a LIGHT BLUE thin layer, showing the lines of gap, as described above. CEILING and FLOOR structure is created. Graphic continues to down (becoming hollow).
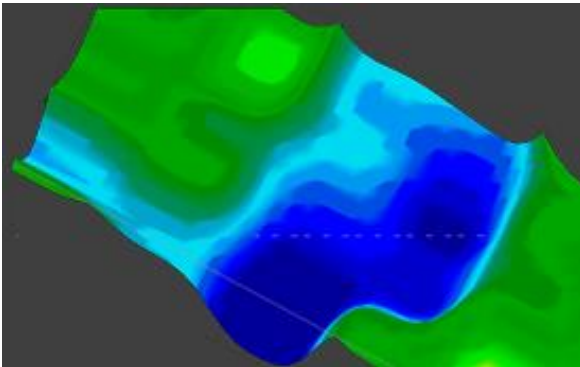
There is also a gap view in this graphic. Green lines, the reflection of gap, are displayed on the left side.

Gap data are similar to the data of metal objects. They have the same features. While there is a yellow thin layer around the metal object, there is a light blue thin layer around gap data. While metal reflects in blue, gap data reflects in green. The gap can be defined (such as tomb, room, tunnel, etc.) by taking depth, width and length measurements Since metal data are described in details and gap data has same features, no extra description is required. Please contact with our expert team for issues that you think insufficiently described.

5.2.3 MEASUREMENT OF DEPTH IN GRAPHICS

Data of the object that you search must be in the middle of the graphic in order to measure depth in graphic. If there are data on the edges, you must center them and perform another control scan. There is a small margin of error in depth measurements (such as 0.50 cm). You must know the type of soil being measured in order to minimize errors. You must select the type of soil from soil option menu of the software.


Soil type selection menu

If you don't exactly know the soil type of scanned area, you must calculate the depth **before saving** graphic data to the software. Stop retrieving data from your device and make necessary analyses. After analyses are completed change your view to bird's-eye view. Move the depth measurement lines to the center of the displayed object by using right-left / up-down keys of the keyboard. You can see the depth in the depth bar indicator at the bottom.

Detailed Depth Measurement of Object

You must change to side view and use Move Downward button for the depth line in order to measure detailed depth of the object in the graphic. You can find total measurement between ceiling and floor of the object by using up - down depth button.
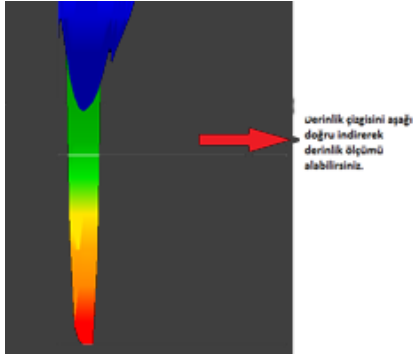
When you use Move Downward button for the depth line in the graphic, the depth line will move down. The depth is shown in meters on the bar, which indicates depth in the software. When you reach to the starting point of the object (red color starting point), you reach to the ceiling of buried object. As you move the depth line to the bottom of the object, you will learn total sizes of the object.