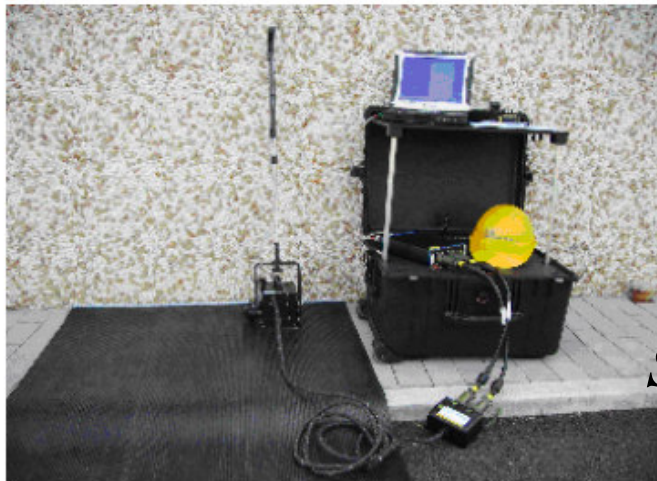


# **“ALADDIN SK2” STRUCTURE KIT**

## **USER MANUAL**

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## **“ALADDIN SK2 ” STRUCTURE KIT User Manual**

*Pisa, 28/06/2006*

<i>Document Evolution</i>		
Revision	Date	Reason of change
Rev. 1.0	19/12/2005	First Edition
Rev. 1.1	28/06/2006	Upgrade of the survey kit
Rev. 1.2	25/07/2006	FCC information included

<i>Versions covered by this document</i>
K2 01.01.000, 01.02.000, 01.02.002.
GRED 3D 01.00.000, 01.00.001, 01.00.002, 01.03.016

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IDS will not be held responsible for the consequences of an improper use of the equipment
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### IMPORTANT NOTE FOR THE US CUSTOMERS

In the US this unit operates under FCC rules Part 15. According to these rules, the system includes a manually operated switch (“dead-man switch”) that causes the transmitter to cease operation within 10 seconds of being released by the operator.

The use of this switch is further explained in this manual; specific instructions for operating a system sold in the US are identified by the following label



This equipment complies with part 15 of the FCC rules. Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

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## ***1. INTRODUCTION***

This manual contains a complete description of the "Aladdin" structures kit, including details on how to assemble the kit hardware, use it and operate the software interface

### ***1.1 Purpose***

This document is intended to be used as a guide for the installation and use of the "Aladdin" structures kit.

### ***1.2 Field of application***

This product must only be used for applications in the civil engineering field.

### ***1.3 Reference***

#### ***1.3.1 Referenced Documents***

[RD1] MN/2004/005 (K2 Data Acquisition Software User's guide)

[RD2] MN/2005/002 (GRED 3D Data Elaboration Software).

### ***1.4 Acronyms and Definitions***

#### ***1.4.1 Acronyms***

**K2:** IDS georadar data acquisition software.

**DAD:** radar control unit

#### ***1.4.2 Definitions***

*Field survey:* a group of field acquisitions relating to a single survey

*Raw data:* unprocessed data obtained during a field survey.

*Maps:* graphics showing the change in received radar signal (signal intensity in gray scale) with respect to the scanning direction. These signals must be processed to be comprehensible

*Survey*: the name given to a collection of acquisitions, which together cover all the areas of a large investigation: typically an entire town or a large urban area.

*Scan*: a single movement of the antenna trolley from the beginning to the end of a pre-established path.

*Data processing*: this is applied to the raw data to permit the acquired sections to be viewed in a comprehensible way.

*Setup*: initialisation of a piece of equipment or a software process

## ***1.5 How to use this manual***

This manual is divided into the following sections:

Chap. 1: Introduction.

Chap. 2: System composition.

Chap. 3: How to set up the system.

Chap. 4: How to use the system.

## 2. SYSTEM COMPONENTS

The "Aladdin SK2" structures kit consists of the following parts:

1. bipolar antenna
2. connection box
3. trolley handle.
4. antenna trolley
5. notebook PC.
6. 2CH MCH DAD.
7. 2 cables to connect the D-D 65cm antenna to the DAD.
8. 1 battery.
9. 1 battery charger.
10. USB stick + K2 acquisition software.
11. CD-ROM + GRED 3D processing software.
12. transportation case.
13. PSG (Pad Survey Guide) carpet.
14. Optional: Kit with special trolley + optical carpet + optical reader.

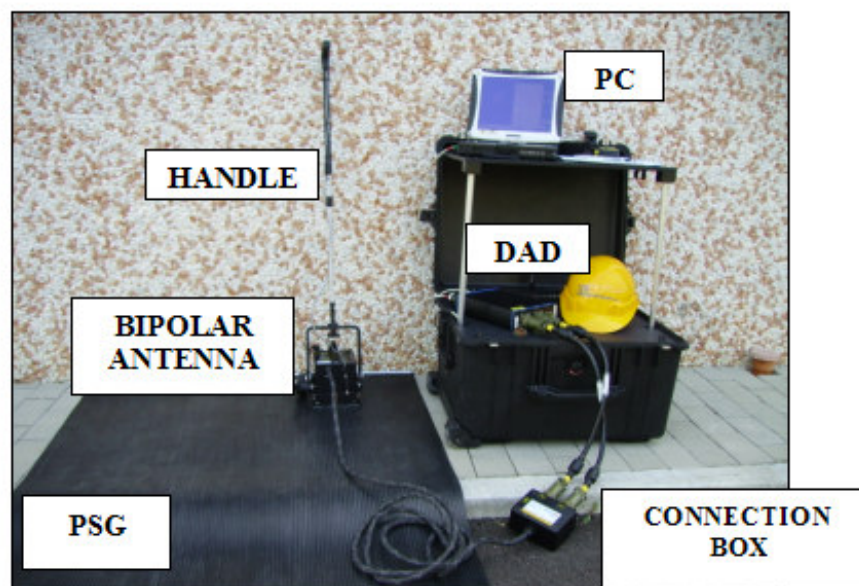


Fig. 2-1 – "Aladdin S K2" structures Kit



### 3. HOW TO SET UP THE SYSTEM

#### 3.1 Opening the case

When you receive the case containing the "Aladdin" structures kit, follow the procedure below:

- Open the protective case, remove the bottom divider and take out the antenna trolley steering handle (see Fig. 3-1).



Fig. 3-1 – Opening the case

- If you want to remove the battery, unscrew the black screw shown in the picture (Fig. 3-2).

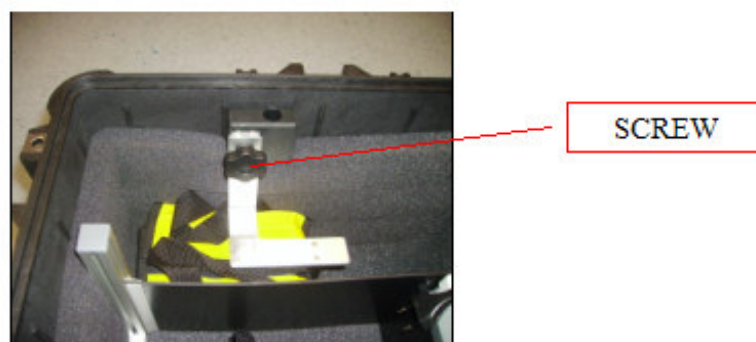
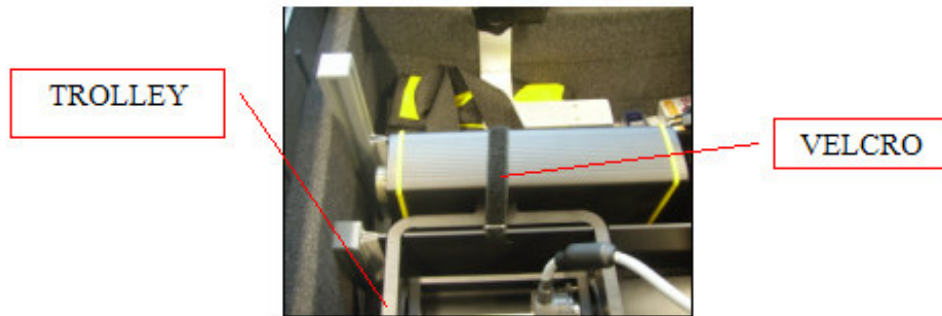


Fig. 3-2 – Removing the battery

- Undo the Velcro that keeps the DAD unit blocked, now remove the DAD and the trolley (Fig. 3-3).



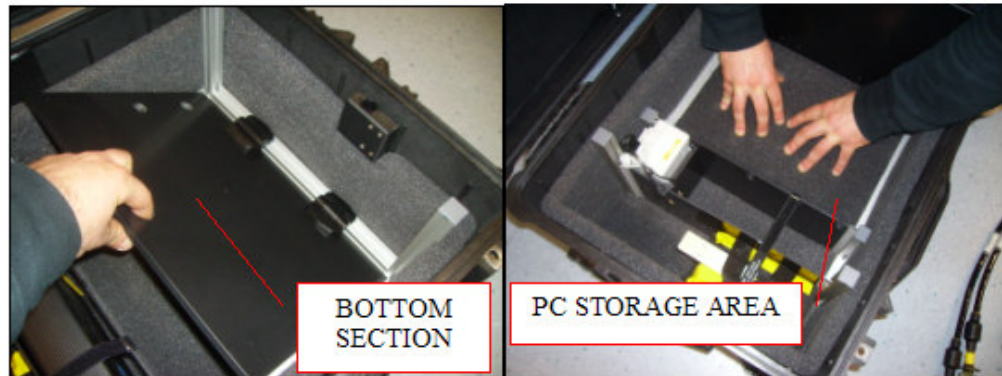
**Fig. 3-3 – Removing the DAD and the antenna trolley**

- Remove the bipolar antenna, pushing the lever towards the foam support then lift the antenna out rotating it slightly (see the direction of the red arrow in Fig. 3-4); when you have to replace the antenna in the case, be careful that the white pegs on the side of the antenna are blocked into the two holes inside the case (indicated with the red circle).



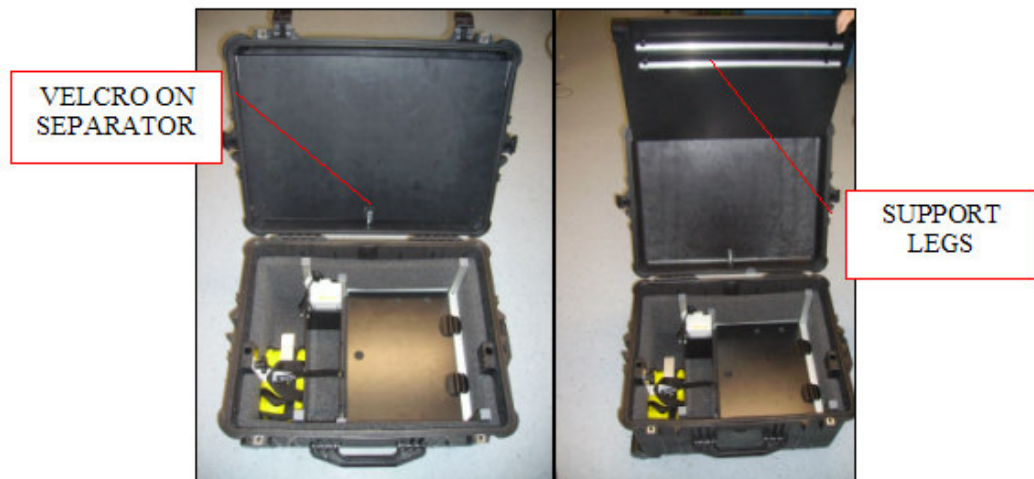
**Fig. 3-4 – Removing the bipolar antenna**

- Open the bottom section (Fig. 3-4 and Fig. 3-5); this is the PC storage area; if a PC has not been supplied with your order, you can store your own PC here using the pre-cut foam to model a suitably shaped space (Fig. 3-5). The maxim space available for storing a PC is 34cm x 27cm x 5cm



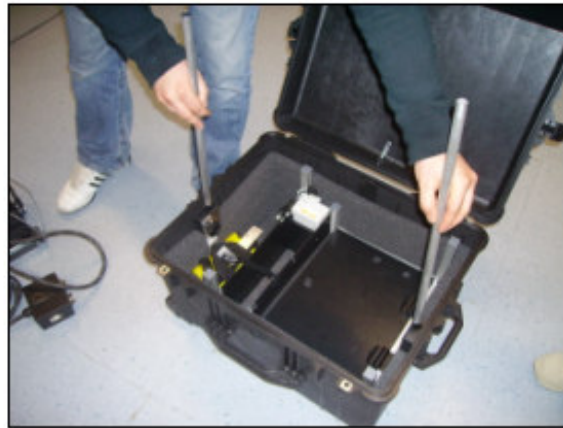
**Fig. 3-5 – Bottom section**

- Undo the Velcro on separator of the top part of the case and lift up the top section (Fig. 3-6).



**Fig. 3-6 – Upper section**

- Remove the two support legs and insert them in the holes in the bottom of the case (Fig. 3-7).



**Fig. 3-7 – Inserting the support legs**

- Close the lid of the case, inserting the legs into the upper supports (Fig. 3-8).



**Fig. 3-8 – Fixing the worktable**

- Connect the power cable to the battery then replace the lower cover onto the case to provide a second surface for sitting the material from the kit (Fig. 3-9).



Fig. 3-9 – Final set-up of the worktable

## 3.2 Connecting up the system

### 3.2.1 How to assemble the frame to the antenna

As we can notice from the Fig. 3-10 the procedure of assembly of the frame on the antenna is the following:

- Link the frame as indicated in the pictures below and then push it up in order to connect it in the lateral white nuts.

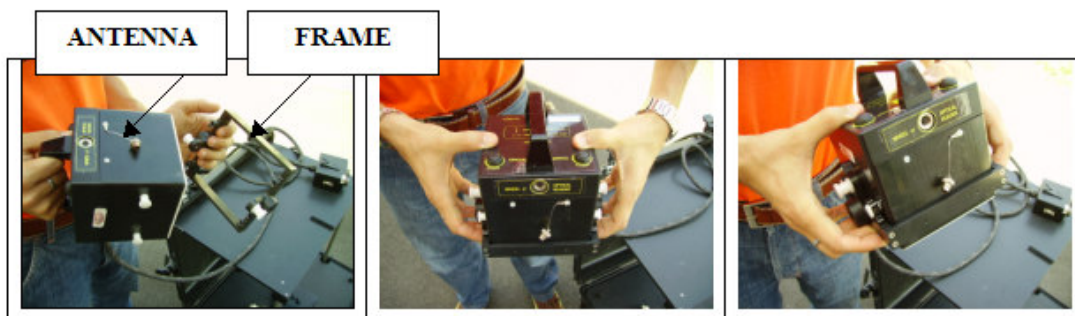


Fig. 3-10 – Assembly of the frame on the antenna

### 3.2.2 How to assemble the metric wheel to the frame

- Screw the central nut of the metric wheel in the lateral hole located on the frame, keeping the wheel in vertical position (see Fig. 3-11).

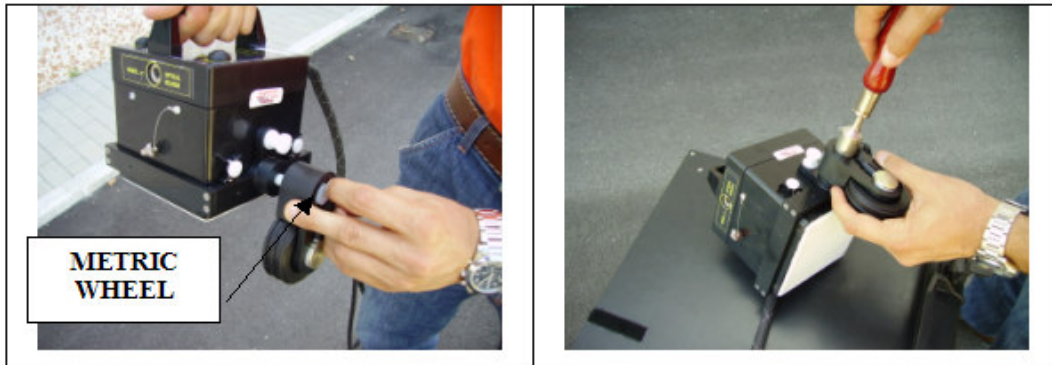


Fig. 3-11 – Assembly of the metric wheel on the frame

### 3.2.3 Assembly of the slide on the frame

- Put the slide under the antenna fitting the two lateral holes located on the front and back side of the antenna as indicated in Fig. 3-12. The slide holds a special film PSG type (Pad Survey Guide) in order to use it only in combination with the PSG carpet (see Par 4.2.3).
- Screw the four nuts to the relative holes.

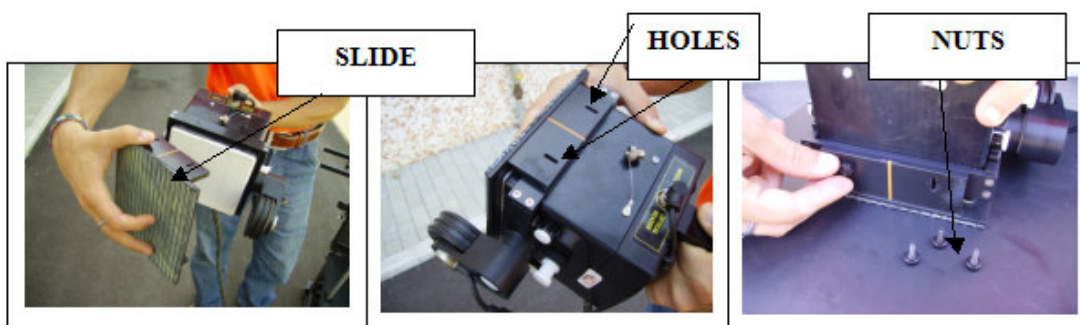


Fig. 3-12 – Assembly of the slide on the frame

### 3.2.4 How to assemble the fork and the handle on the frame

- In order to assemble the handle it's necessary to insert the fork at the end of the handle in the point indicated in Fig. 3-13 and then screw the nut.
- Then connect the fork of the handle to the frame making pressure on the two white lateral nuts up to link them.

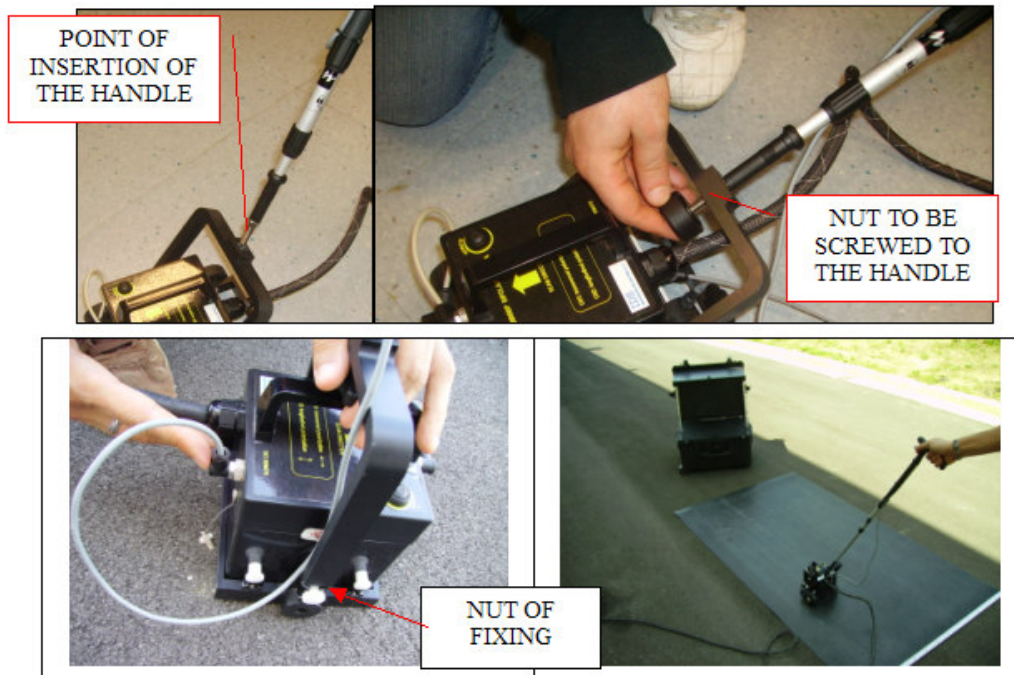


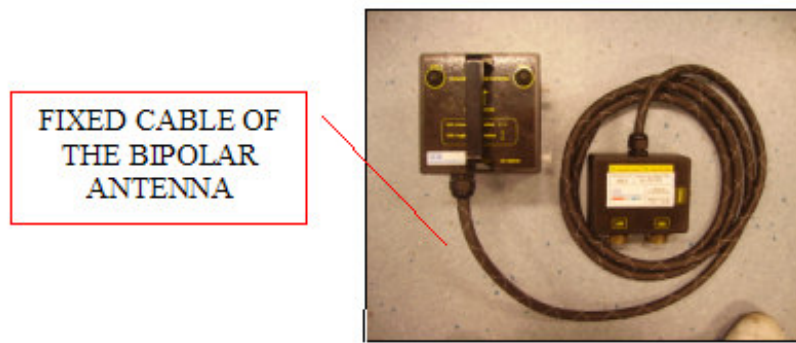
Fig. 3-13 – Assembly of the handle to the frame

## 3.3 Cable connection of the system

### 3.3.1 Complete list of cables

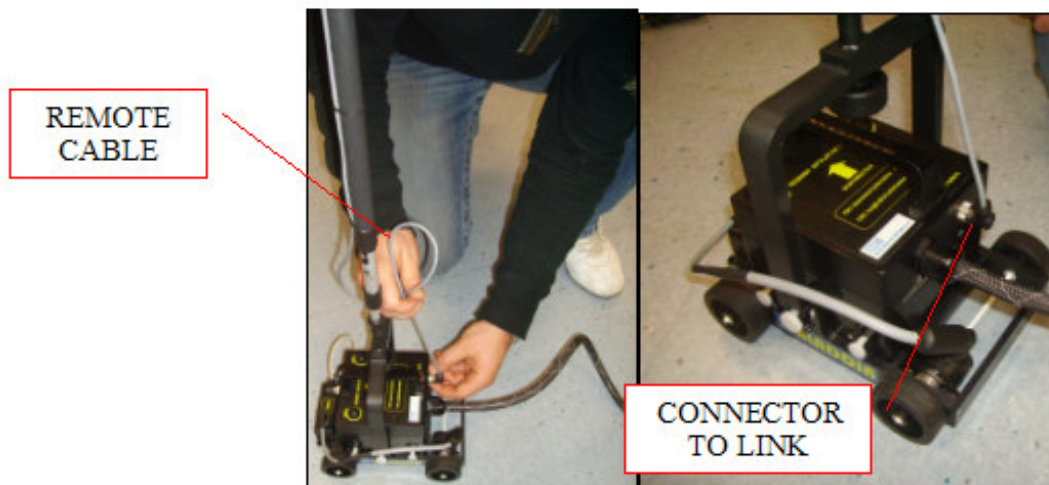
The following list contains all the structures kit cables and how they are connected:

- Fixed connection between the bipolar antenna trigger box (Fig. 3-14);



**Fig. 3-14 – Fixed connection cable between the bipolar antenna trigger box**

- Remote control cable connecting the antenna to the handle (Fig. 3-15); after inserting and tightening the handle screw to the fork connected to the antenna, connect the handle cable to the port situated on the back of antenna labelled "REMOTE" (Fig. 3-15).



**Fig. 3-15 – Connecting the remote control cable**

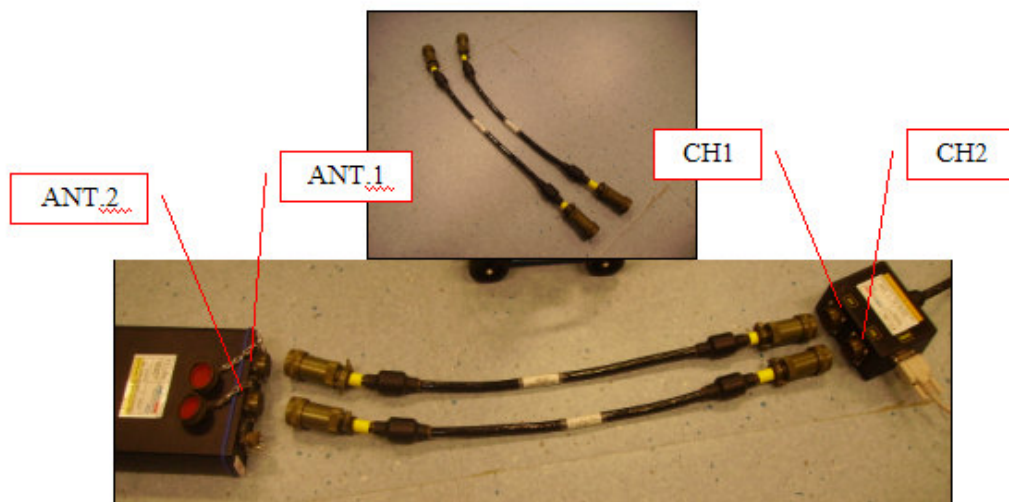
- Serial cable connecting the PC to the distribution box (Fig. 3-16); connect the serial cable to the serial port of the trigger box and the PC (Fig. 3-16).





**Fig. 3-16 – Connecting the serial cable**

- 2 65cm D-D cables connecting the trigger box to the DAD (Fig. 3-17); connect the cables respectively to the ports ANT.1 CH1 and ANT.2 CH2 indicated on the DAD and on the trigger box



**Fig. 3-17 – Connecting the D-D cables**

- LAN cable connecting the PC to the DAD (Fig. 3-18); connect the large LAN connector to the port on the DAD and the other end to the smaller port on the back of the PC;



**Fig. 3-18 – LAN cable**

- Cable connecting the battery power supply to the DAD (Fig. 3-19); connect the metallic connector to the DAD and the white plastic connector to the battery.



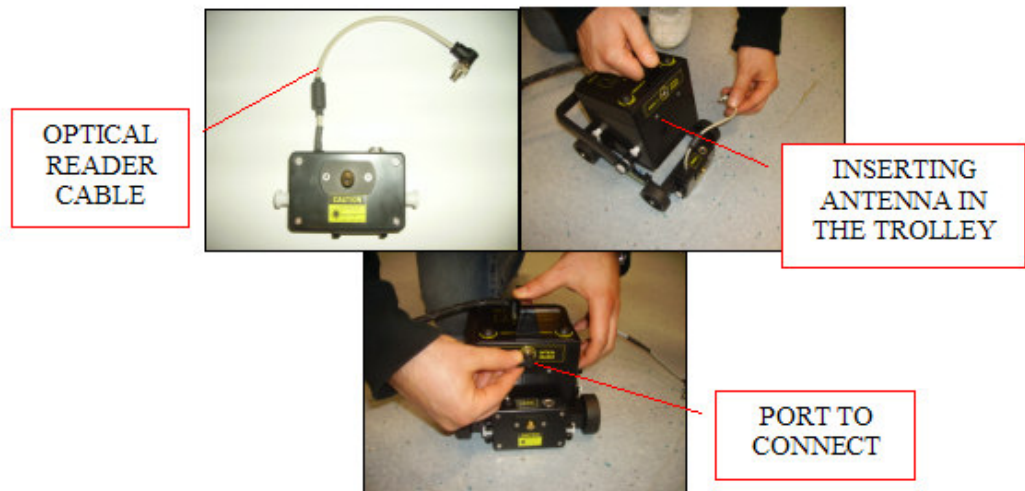
**Fig. 3-19 – Power cable**

- Metric wheel cable: connect the cable of the metric wheel to the WHEEL port located on the front side of the antenna (Fig. 3-20).



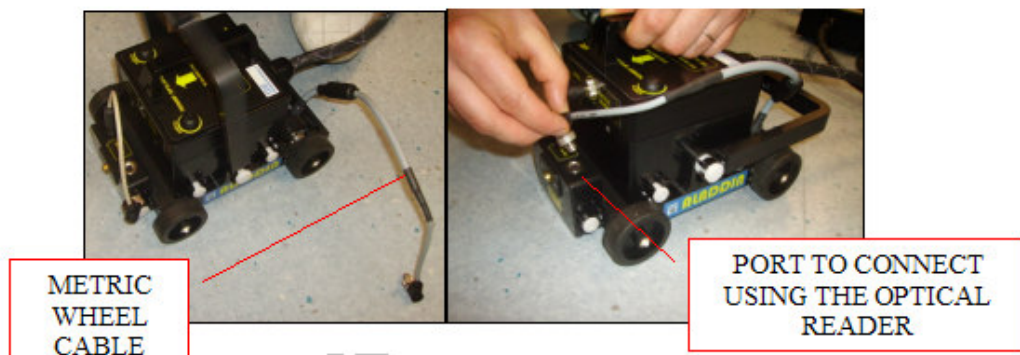
**Fig. 3-20 – Metric wheel cable**

- (Optional) Optical reader cable (Fig. 3-21); after having inserted the bipolar antenna in the trolley as shown in Fig. 3-21, connect the optical reader cable to the port labelled "OPTICAL READER".



**Fig. 3-21 – Optical detector, cable and antenna connection**

- (Optional) Antenna survey wheel cable (Fig. 3-22); connect the survey wheel cable to the port positioned on the optical detector if one is being used. If an optical detector is not being used, the survey wheel cable must be connected to the port on the front of the bipolar antenna (Fig. 3-22).



**Fig. 3-22 – Survey wheel cable**

### ***3.4 Technical advice***

Pay special attention to the following technical advice to avoid operational problems:

- Fix the pad to the surface being investigated with adhesive tape.
- Avoid treading on the paper pad, this may damage it making it unusable.
- Block the antenna cable to the handle with Velcro when using the device so the cable doesn't get in the way
- If a high frequency antenna is being used, it must be connected to the trigger box and the trigger box to the DAD using the D-D cable.
- The optical detector device isn't waterproof therefore it shouldn't be used in damp conditions.
- When the optical detector is in use, don't look at the laser beam.

## 4. HOW TO USE THE SYSTEM

### 4.1 Main functions

To access the "Aladdin" structures kit from the K2 SW (see MN\_2004\_005), you have to open a dedicated session.

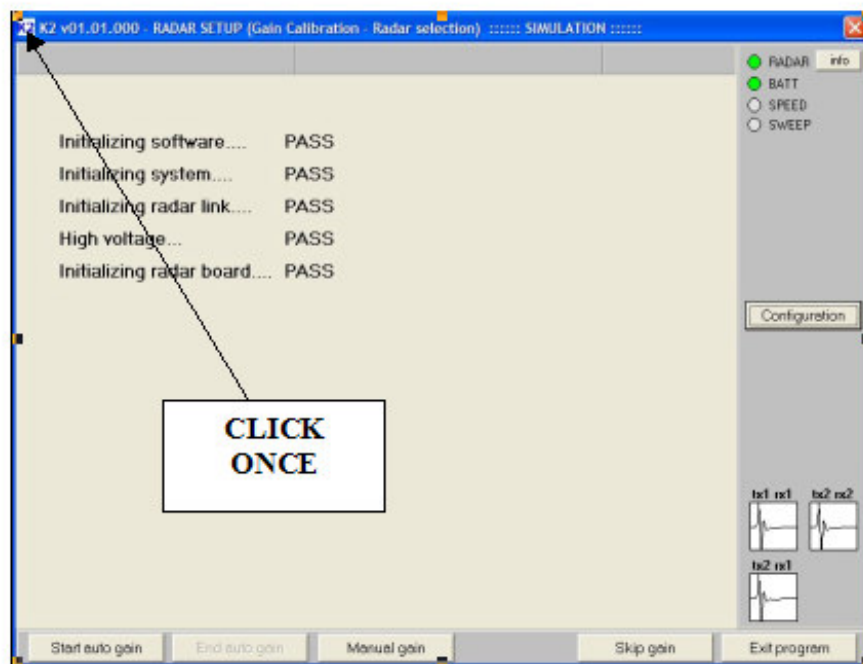


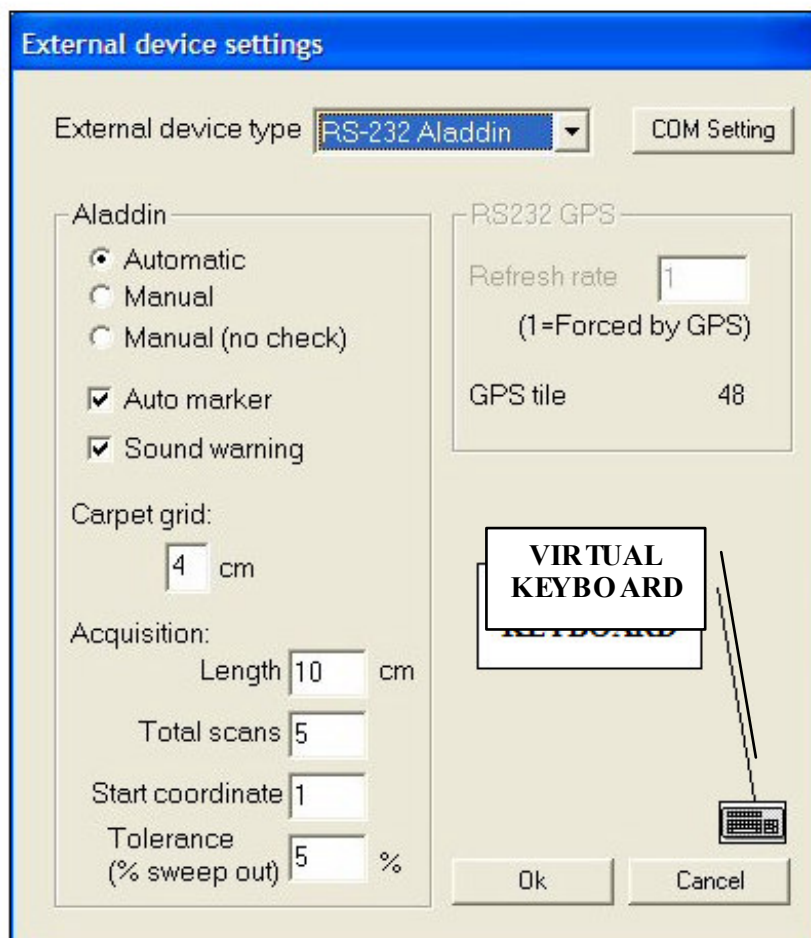
Fig. 4-1 – Opening window K2 SW

**Step 1** Click once with the left mouse button on the "K2" icon contained in the blue bar at the top of the initial K2 SW window (see Fig. 4-1). A series of options appears, from which you have to select *External device settings* (see Fig. 4-2)



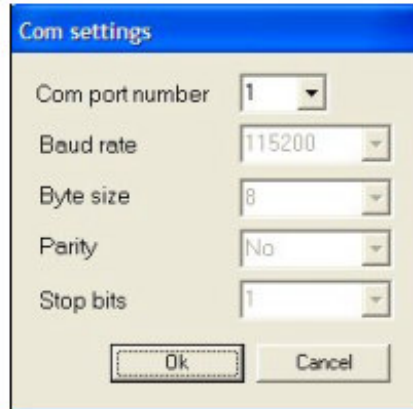
**Fig. 4-2 – External device settings command**

**Step 2** this opens the window shown in Fig. 4-3, select *RS-232 Aladdin* in the *External device type* field. *CLICK ONCE*



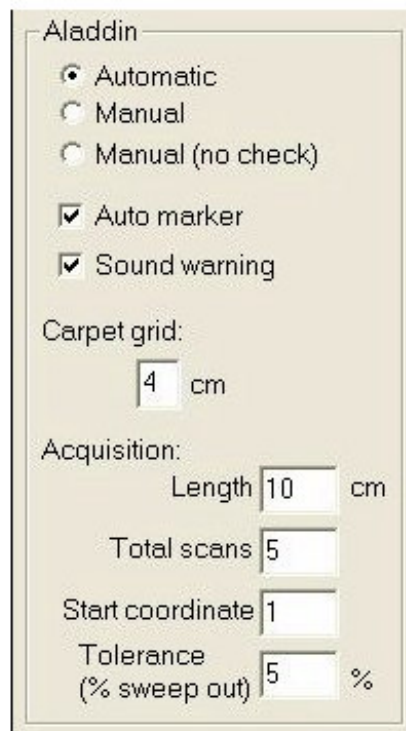
**Fig. 4-3 – External device settings Window**

**Step 4** Click on the *COM Settings* button. This will open the window shown in Fig. 4-4, from where you just have to select the *Com port number* you have used to connect the kit to the structure, then press the OK button



**Fig. 4-4 – Com settings Window**

**Step 5** Use the Aladdin field shown in the window in Fig. 4-3 to set the acquisition parameters to be used with the structures kit (see Fig. 4-5):



**Fig. 4-5 – Aladdin Field**

The *Aladdin* field consists of the following parameters: ·

- **Automatic:** an automatic acquisition mode in which once the other parameters have been set, it is sufficient to press start, stop and any automatic user markers, positioning the system just before the horizontal line shown on the pad. This mode contains automatic data quality control (see the *Tolerance* field later on).
- **Manual:** in this mode, once you start, the acquisition is performed independently of the position of the antenna with respect to the pad. This mode also contains automatic data quality control (see the *Tolerance* field later on).
- **Manual (no check):** this acquisition mode has no type of automatic data quality control, and leaves you free to acquire data as you wish. In this case, the system limits itself to providing an acoustic warning if the system is not following the pre-established scan path. It is also possible to make acquisitions without using the optical reader.
- **Auto marker:** this sets an automatic *user marker* each time the antenna crosses a horizontal line on the pad
- **Carpet grid:** this represents the size of each square that the optical detector signals with user markers on the pad; e.g. *2cm* represents a 2x2cm square, while *4cm* represents a 4x4cm square and so on.
- **Acquisition:**
  - **Length:** this represents the length of the pass you intend to perform on the pad..
  - **Total scans:** this represents the total number of passes that you intend to perform starting from the initial coordinate indicated on the pad.
  - **Start coordinate:** this represents the initial acquisition coordinate shown on the pad..
  - **Tolerance (% sweep out):** this is the factor that controls the quality of acquired data; this factor controls how much road is covered by the antenna with respect to the pre-set value and if the path length is greater than your user set percentage error. In *Automatic* mode, if this value



is exceeded, the software forces you to repeat the pass being performed.

You also have the option of calling up the virtual keyboard by pressing the button shown in Fig. 4-3.

To confirm all the set parameters, press the OK button in the window shown in Fig. 4-3.

Confirmation that Aladdin has been activated is given in the initial K2 SW window, with ALADDIN shown under the other lights (circled in Fig. 4-6 in red) accompanied with three of its own lights which simulate the three infrared sensors that make up the optical reader.

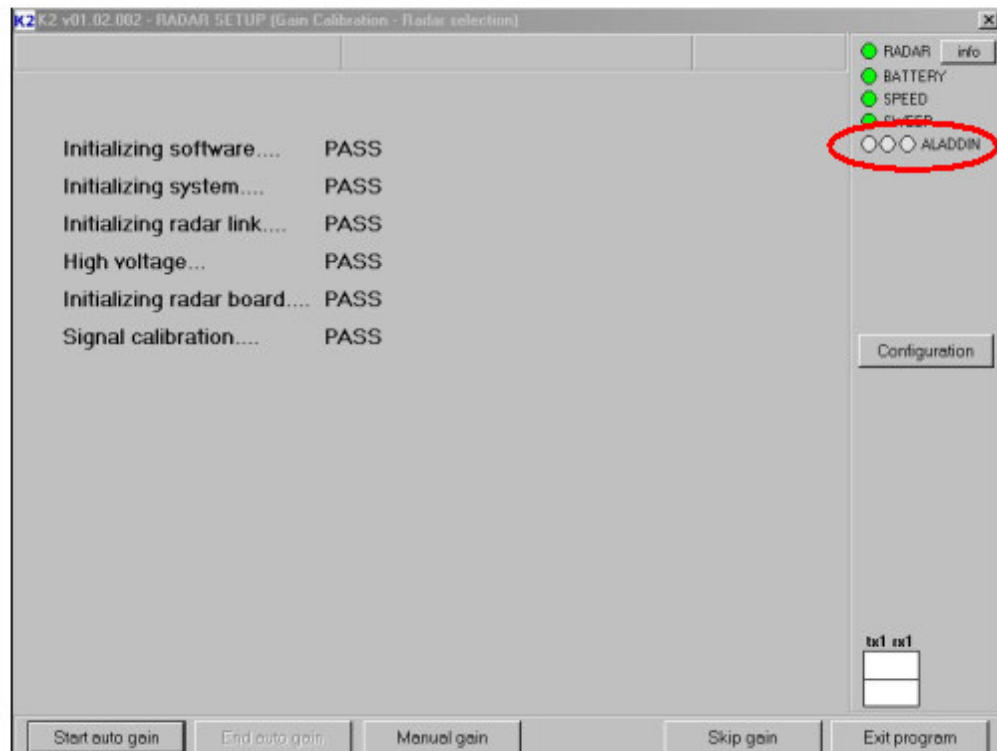


Fig. 4-6 – Initial K2 SW window when using the Aladdin structures kit

## 4.2 Work procedure using the Aladdin system

### 4.2.1 "Automatic" mode

**Step 1:** Assemble the system (see Fig. 4-7), and place the pad on the surface to be investigated (Fig. 4-8).



**Fig. 4-7 – Aladdin System**

<b>NOTE!</b>	The pad consists of a grid of longitudinal and transversal lines that indicate the profiles to be traced using the antenna. In addition, there is a black square at the bottom right hand corner which represents the antenna parking area, containing an optical detector that temporarily deactivates the acoustic signal.
--------------	--

**Step 2:** Start the K2 SW, perform the calibration (as described in Par. 4.2 and 4.3 of MN\_2004\_005) and set the Aladdin structures kit parameters (as described in Par. 4.1 of this manual).

<b>NOTE!</b>	If you are using a bipolar antenna, only longitudinal scans must be performed; for a single high frequency antenna, perform both longitudinal and transversal scans
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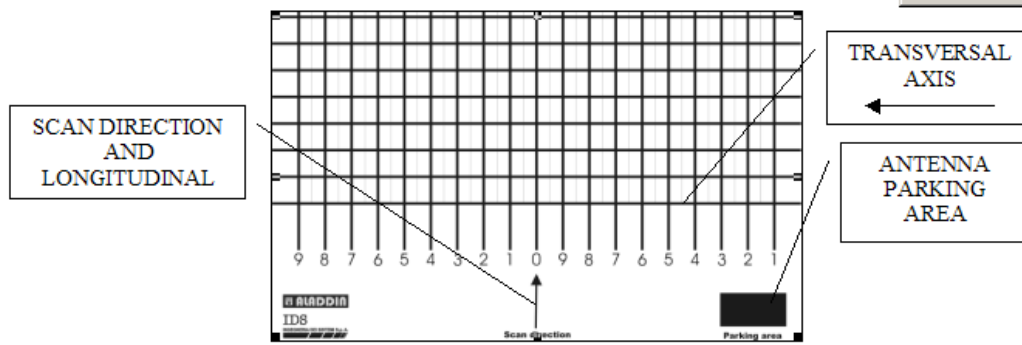


Fig. 4-8 – Pad for the structures kit

**Step 3:** Position the antenna on the initial preset coordinate (Fig. 4-9) in the L (or T) direction and carefully position the antenna until the acoustic signal stops

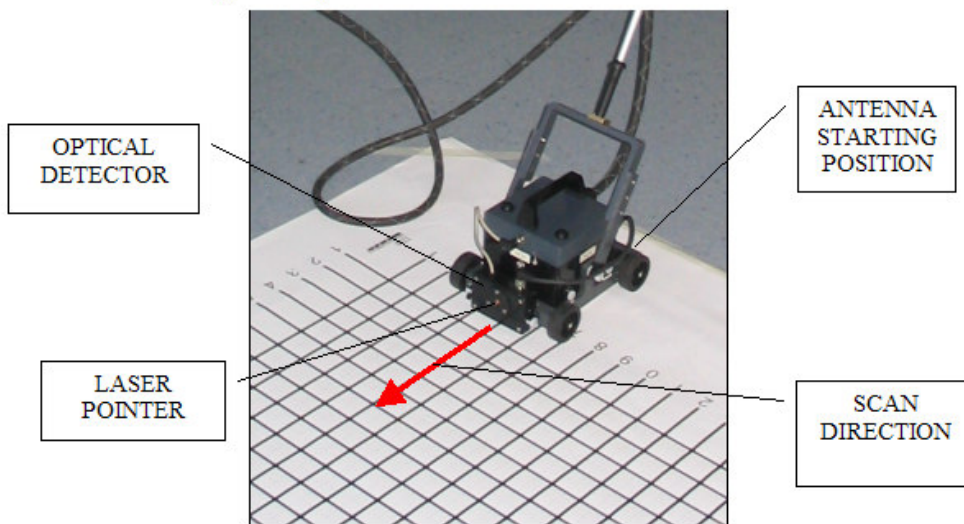
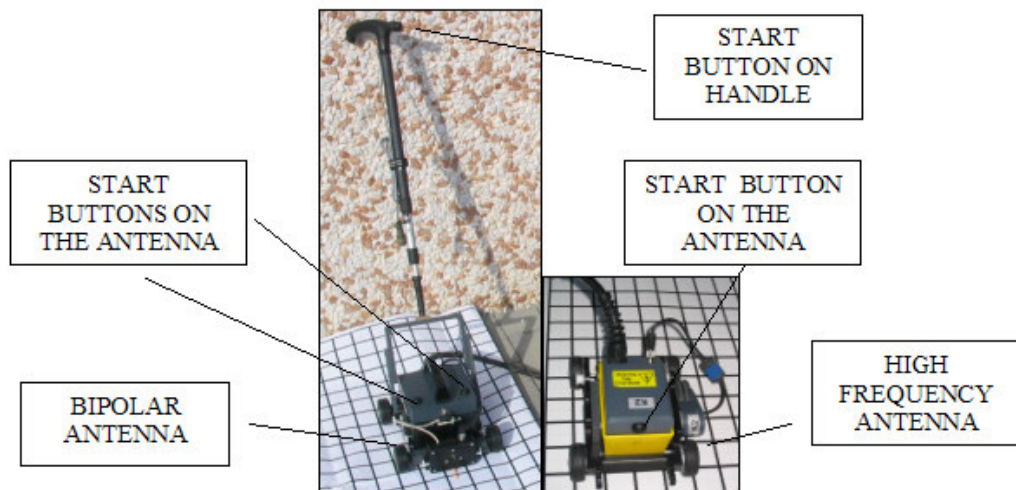


Fig. 4-9 – Starting position

**Step 4A (Standard System):** Press one of the START buttons placed on the handle or directly on the antenna (Fig. 4-10); a special acoustic signal will confirm that the START button has been pressed

**Step 4B (US System):** Press one of the START buttons placed on the handle or directly on the antenna **and keep it pressed** (Fig. 4-10); a special acoustic signal will confirm that the START button has been pressed. Releasing the button, will stop the collection after 10 sec.





**Fig. 4-10 – START buttons**

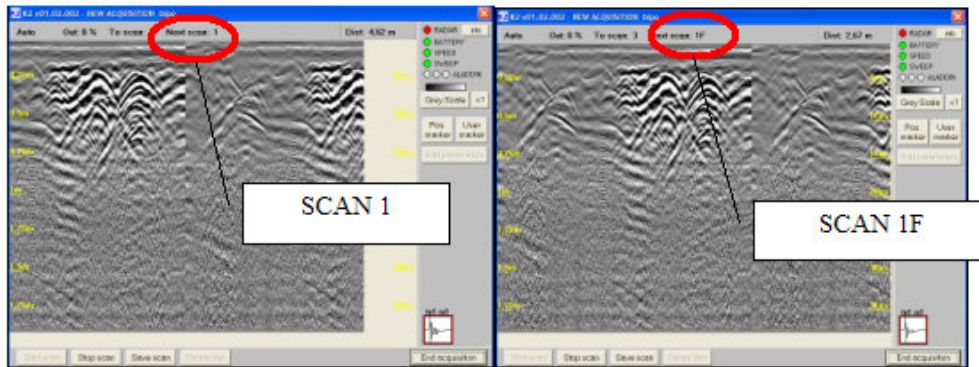
**Step 5:** Move the antenna in the pre-established direction; acquisition will start as soon as the optical detector crosses the first horizontal line.

**Step 6:** If you have pre-set "Auto Marker", each time the antenna crosses a horizontal line, the system will insert a **User Marker** on the scan.

**Step 7:** The scan will be automatically STOPPED as soon as the optical detector encounters the last horizontal line pre-set by the operator on the basis of the set scan **Length**.

**Step 8:** Continue the procedure described from step 3 onwards on the next pre-set coordinate.

<b>WARNING!</b>	There is one particular case where you must pay attention: if you use a 2x2 pad, the optical detector must carefully follow a thick line followed by a fine line, the fine lines being indicated with the extension F (see for example Fig. 4-11 which shows increasing coordinates (e.g. 1, 1F, 2, 2F and so on). In <i>Automatic</i> mode, you have to keep alignment under control during scanning, making use of the laser pointer.
-----------------	---



**Fig. 4-11 – Sequence of 2 scans using a 2x2 pad**

#### 4.2.2 “Manual” Mode

**Steps 1-4:** Follow the same procedure described for "Automatic" mode above.

**Step 5:** Acquisition starts when you press the START button, independently of the position of the first horizontal line encountered.

**Step 6A (Standard System):** Insertion of *User Markers* during scanning is performed by rapidly pressing the START button.

**Step 6B (US System):** Insertion of *User Markers* during scanning is performed by rapidly releasing and pressing again the START button.

**Step 7A (Standard System):** The scan is STOPPED by keeping the START button pressed

**Step 7B (US System):** The scan is STOPPED by releasing the START button



<b>NOTE!</b>	The system keeps control of data quality ( <i>Tolerance</i> ) in both <i>Automatic</i> and <i>Manual mode</i> . In fact, if this tolerance is respected, a confirmation acoustic signal is activated; if the tolerance exceeds the pre-set percentage during the scan, an error acoustic signal is heard, the scan isn't saved and you have to repeat it.
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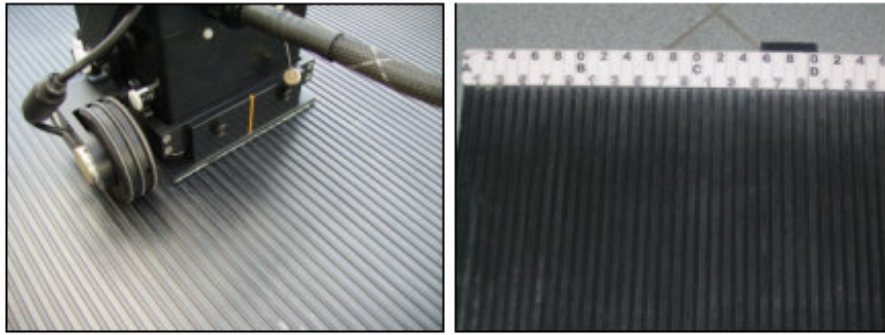
### 4.2.3 “Manual (no check)” Mode

**Step 1-7:** In this case the user must use the PSG carpet –Pad Survey Guide Guide (Fig. 4-12) with the slide applied under the frame (see Par. 3.2.3).



**Fig. 4-12 – PSG Carpet**

The PSG carpet holds alternated upper and lower guides in order to make the slide perfectly fit and for the antenna to realize straight scans. Also the slide holds a special film on its external surface removing to the minimum the friction during the drag of the antenna on PSG. Finally the PSG holds on its edge a graduated horizontal pole with the indication of numbers and letters in progressive sequence, in order to give to the user a reference point at the beginning of the scan (Fig. 4-13).



**Fig. 4-13 – Features of PSG and slide**

Follow the same operative procedure used in the "Manual" procedure described above.

<b>NOTE!</b>	The main difference with respect to the "Manual" mode consists in the absence of the <i>Tolerance</i> control factor, therefore you are free to choose how long the scan should be ( <i>Length</i> ). This mode is useful when scans of different lengths have to be performed. This is the only mode in which the user can work with the optical detector deactivated.
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<b>WARNING!</b>	Once the scans are finished, you can activate the <i>Review Acquisition</i> button (see Par. 4.7 in manual MN_2004_005); this opens the window shown in Fig. 4-12, from where pressing the <i>Gred3D button</i> (circled in red), you can automatically start the GRED 3D NAVIGATOR SW for the survey underway. The GRED 3D NAVIGATOR SW can be used to process the raw data as required. For information on the GRED 3D NAVIGATOR SW, see the user manual MN_2005_002.
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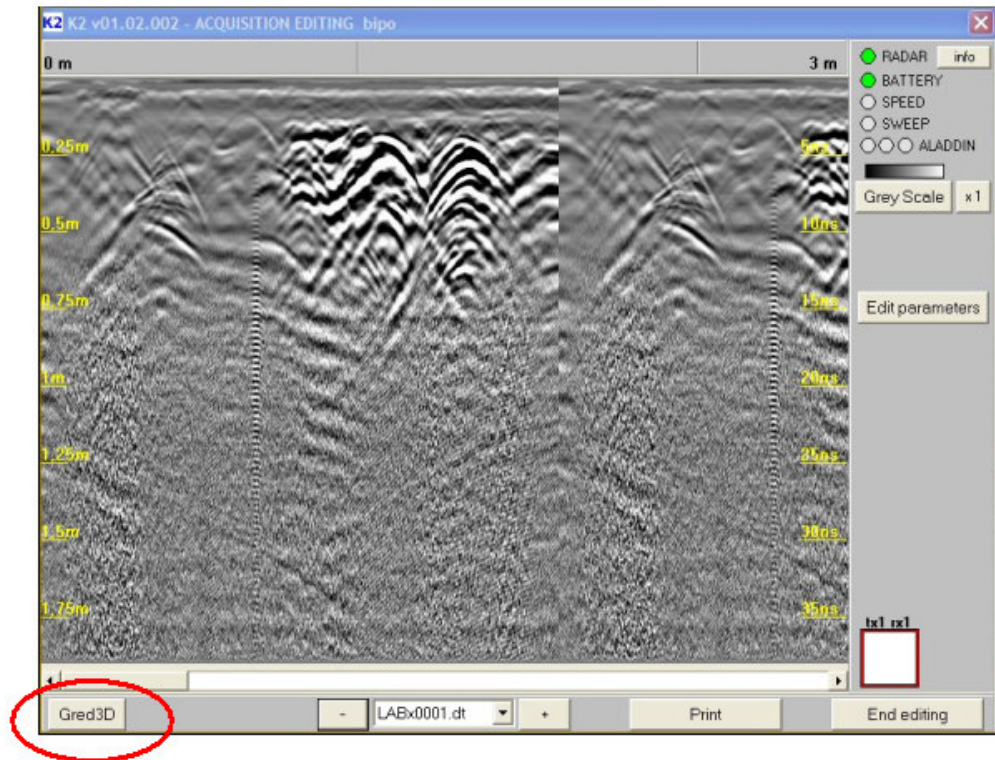


Fig. 4-14 – Gred3D Button