

C-Thru

**All-in-one Ground Penetrating Radar (GPR) for
accurate scanning and real time analysis**

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1 INTRODUCTION

This document describes the C-Thru radar system, and it refers to the concepts the user should learn before initiating the utilization of this device. Therefore it is mandatory to carefully reading the entire document before starting the system.

This manual contains a complete description of the C-Thru radar system, detailing the assembly procedure, and the operating procedures of the system.

1.1 Purpose

Reading this document will provide all the necessary knowledge relating to:

- System description and set up.
- Safe utilization of the system and instructions for its general maintenance.
- Use of the acquisition software and managing the results.

1.2 Application field

This system is dedicated to locate rebars, voids, post-tension cables, cavities, conduits, and any others objects buried in the structure before cutting or drilling into the concrete. It can be used in every construction sites and operations including building renovation, overpasses, bridges and tunnels surveys, as well as for detailed analysis of the original engineering project and comparison with the as-built structure.

1.3 Intended Readership

The intended reader of this manual should be the technician in charge of using the system that has undergone the IDS GeoRadar training for C-Thru.

2 HOW TO READ THE MANUAL

2.1 Manual Layout

This manual is composed of several parts. After an Introduction, the first part describes the device and its components, with the explanation of the main features.

The second part shows the procedure to setup the device and how to configure it correctly (Assembly Procedure).

The third part illustrates the main features of the software, and its use on the work field, are described.

Eventually, the maintenance plan, and additional information are illustrated.

2.2 Glossary & Acronyms

DAD: Digital Antenna Driver

RADAR: RAdio Detection And Ranging

LASER: Light Amplification by Stimulated Emission of Radiation

USB: Universal Serial Bus

GPR: Ground Penetrating Radar

AC: Alternate Current

HF: High Frequency

2.3 Definitions

Raw data: unprocessed data obtained during a field survey.

Maps: graphics showing the change in received radar signal with respect to the scanning direction.

Survey: the name given to a collection of acquisitions, which together cover all the areas of an investigation: typically an entire job area.

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

Setup: initialization of a piece of equipment or a software process.

Encoder: a distance measurement device which constantly signals the distance travelled from the start of the scan back to the Control Unit .





Transmitter: part of the antenna dedicated to emitting the radar signals.

Receiver: part of the antenna dedicated to detecting the radar signals.

Augmented reality: Digital on-site representation of data and targets through the external PC

2.4 Symbols

This manual contains the following symbols with related meanings:

Type	Description
 DANGER	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
 WARNING	Indicates a potentially hazardous situation or an unintended use which, if not avoided, could result in death or serious injury.
 CAUTION	Indicates a potentially hazardous situation or an unintended use which, if not avoided, may result in minor or moderate injury.
 To keep on mind	Important part which must be adhered to in practice as they enable the product to be used in a technically correct and efficient manner.

Warning messages are an essential part of the safety concept of the instrument. They appear wherever hazards or hazardous situations can occur.

Warning messages:

- make the user alert about direct and indirect hazards concerning the use of the product.
- contain general rules of behavior.

For the users 'safety, all safety instructions and safety messages shall be strictly observed and followed! Therefore, the manual must always be available to all persons performing any tasks described herein.

DANGER, WARNING, CAUTION and **NOTICE** are standardized signal words for identifying levels of hazards and risks related to personal injury and property damage.

For your safety it is important to read and fully understand the table below with the different signal words and their definitions! Supplementary safety information symbols may be placed within a warning message as well as supplementary text.

3 SAFETY DIRECTIONS

3.1 Description

The following directions enable the person responsible for the product, and the person who actually uses the equipment, to anticipate and avoid operational hazards.

The person responsible for the product must ensure that all users understand these directions and adhere to them.

3.2 Definition of Use

Intended use:

- Concrete inspections.
- Rebars and void detection and mapping .
- Measuring horizontal and vertical position of rebars and void.
- Creation of concrete tomographies.

3.3 Reasonably Foreseeable Misuse

- Use of the product without instruction.
- Use outside of the intended use and limits.
- Disabling safety systems.
- Removal of hazard notices.
- Opening the product using tools, for example screwdriver, unless this is permitted for certain functions.
- Modification or conversion of the product.
- Use after misappropriation.
- Use of products with obvious damages or defects.

- Use with accessories from other manufacturers without the prior explicit approval of IDS GeoRadar s.r.l
- Inadequate safeguards at the working site.
- Aiming directly into the sun.

3.4 Limits of Use

Environment: Suitable for use in an atmosphere appropriate for permanent human habitation. Not suitable for use in aggressive or explosive environments.



DANGER: Local safety authorities and safety experts must be contacted before working in hazardous areas, or close to electrical installations or similar situations by the person in charge of the product.

3.5 Responsibilities


Manufacturer of the product - IDS GeoRadar s.r.l is responsible for supplying the product, including the user manual and original accessories, in a safe condition.

Person responsible for the product - the person responsible for the product has the following duties:

- To understand the safety instructions on the product and the instructions in the user manual.
- To ensure that it is used in accordance with the instructions.
- To be familiar with local regulations relating to safety and accident prevention.
- To inform IDS GeoRadar s.r.l immediately if the product and the application becomes unsafe.


- To ensure that the national laws, regulations and conditions for the operation of electromagnetics transmitters are respected.

3.6 Hazards of Use





CAUTION: Watch out for erroneous measurement results if the product has been dropped or has been misused, modified, stored for long periods or transported.

Precautions: Periodically carry out test measurements and perform the field adjustments indicated in the user manual, particularly after the product has been subjected to abnormal use and before and after of important measurements.




DANGER: Because of the risk of electrocution, it is dangerous to use poles and extensions in the vicinity of electrical installations such as power cables or electrical railways.

Precautions: Keep at a safe distance from electrical installations. If it is essential to work in this environment, first contact the safety authorities responsible for the electrical installations and follow their instructions.




WARNING: During dynamic applications, for example stakeout procedures there is a danger of accidents occurring if the user does not pay attention to the environmental conditions around, for example obstacles, excavations or traffic.

Precautions: The person responsible for the product must make all users fully aware of the existing dangers.



CAUTION: If the accessories used with the product are not properly secured and the product is subjected to mechanical shock, for example blows or falling, the product may be damaged.

Precautions: When setting-up the product, make sure that the accessories are correctly adapted, fitted, secured, and locked in position. Avoid subjecting the product to mechanical stress.



WARNING: Inadequate securing of the working site can lead to dangerous situations, for example in traffic, on building sites, and at industrial installations.

Precautions: Always ensure that the working site is adequately secured. Adhere to the regulations governing safety and accident prevention and road traffic.

WARNING: If the product is improperly disposed of, the following can happen:

- If polymer parts are burnt, poisonous gases are produced which may impair health.
- If batteries are damaged or are heated strongly, they can explode and cause poisoning, burning, corrosion or environmental contamination.
- By disposing of the product irresponsibly you may enable unauthorised persons to use it in contravention of the regulations, exposing themselves and third parties to the risk of severe injury and rendering the environment liable to contamination.

Precautions:

RECYCLING



The crossed out wheeled bin symbol shown on the equipment indicates that the product must be recycled separately from other waste at the end of its useful life.

Separate waste disposal of this product at the end of its useful life will be organised and managed by IDS GeoRadar. When you decide to dispose of the equipment, contact IDS GeoRadar and follow the system that IDS GeoRadar has set up to permit the separate collection of the apparatus at its life end.

Adequate separate collection for its subsequent recycling, treatment and environmental friendly disposal contribute towards avoiding any unnecessary effects on the environment and to health and favour the reuse or recycling of the materials that make up the equipment. Unauthorised disposal of this product as unsorted waste by its possessor will lead to an administrative penalty foreseen by national regulations.



WARNING: If the product is used with accessories, you may increase the risk of being struck by lightning.

Precautions:

Do not use the product in a thunderstorm.



WARNING: During the transport, shipping or disposal of batteries it is possible for inappropriate mechanical influences to constitute a fire hazard.

Precautions:

Before shipping the product or disposing of it, discharge the batteries by running the product until they are flat.

When transporting or shipping batteries, the person in charge of the product must ensure that the applicable national and international rules and regulations are observed. Before transportation or shipping contact your local passenger or freight transport company.



WARNING: High mechanical stress, high ambient temperatures or immersion into fluids can cause leakage, fire or explosions of the batteries.

Precautions:

Protect the batteries from mechanical influences and high ambient temperatures. Do not drop or immerse batteries into fluids.



WARNING: Only IDS GeoRadar authorized technical service are entitled to repair these product.

4 C-Thrue HARDWARE DESCRIPTION

4.1 General

The C-Thrue and its accessories are delivered within a dedicated suitcase, Fig. 1 :



Fig. 1 – C –Thrue suitcase

The C-Thrue system is composed by the following parts:

- C-Thrue main body.
- Embedded PC directly connected to the control unit.
- Integrated Antenna module and radar control unit (DAD).
- Multi-touchscreen display for the radar data visualization.
- 2 rechargeable 15 Volts Li-ion batteries.
- USB port for the radar data transfer and software updating.

- 4 Encoder wheels
- 3 laser interfaces for the 2D positioning system.
- Accessories:
 - Battery charger (with universal adapter)
 - Safety lace to hook the system to the wrist
 - Six reflective bars for 2D positioning system
 - Sticky modelling paste
- Optional accessories:
 - Telescopic rod support
 - External PC to remote by Wi-Fi connection the embedded pc and for augmented reality data display.

This chapter contains the description of the above listed parts.

The whole system is shown in Fig. 2 and Fig. 3.



Fig. 2 – The C-Thrue

4.1.1 C-Thru main body

The C-Thru main body dimension are 285 mm x 200 mm x 160 mm or 11,2 in x 8,6 in x 6,3 in (length x width x height) and its weight is 2,4 Kg (5 IB), including battery.

- Environment feature: IP 65
- Operating temperature: -20/+50 °C

The main body of the system consists of the following parts (Fig. 3):

- Multi-Touchscreen for the embedded PC.
- Integrated Control unit
- 4 wheels for distance measurement and encoder-to-DAD input
- Handle
- Battery compartment
- USB port for radar data transfer and software updating, Fig. 4.
- Power button to switch on/off the system, Fig. 4.
- Remote control connector interfaces, Fig. 4.

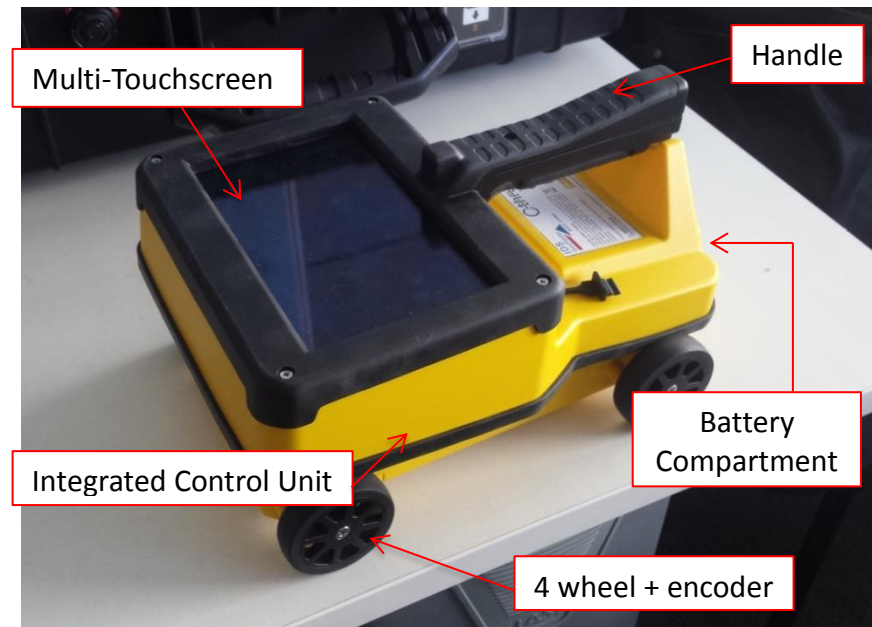


Fig. 3 – Image of the C-Thru and its main components

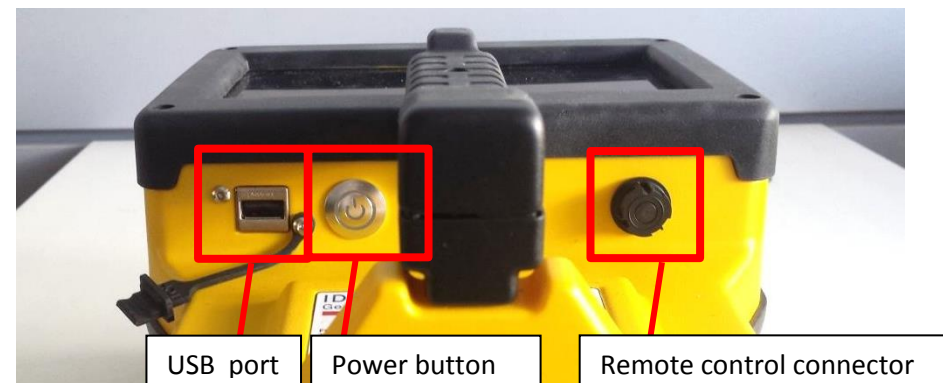


Fig. 4 – Detail of the USB port, Power button and remote control connector interfaces

4.1.2 Antenna

The C-Thru System is developed with a dual polarization antenna (1 VV and 1HH channel), with a central frequency of 2 GHz.

Dual polarization permits detection on both first and second levels of rebars. (Fig. 5). The offset between the VV and HH antenna center, is 10 cm (see Fig. 5 and Fig. 6).

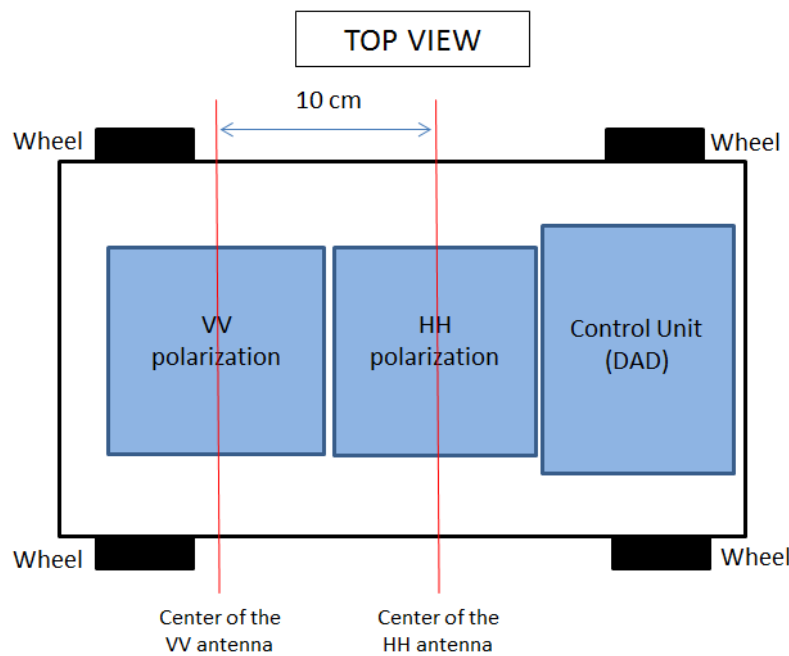


Fig. 5– C-Thru Internal sketch

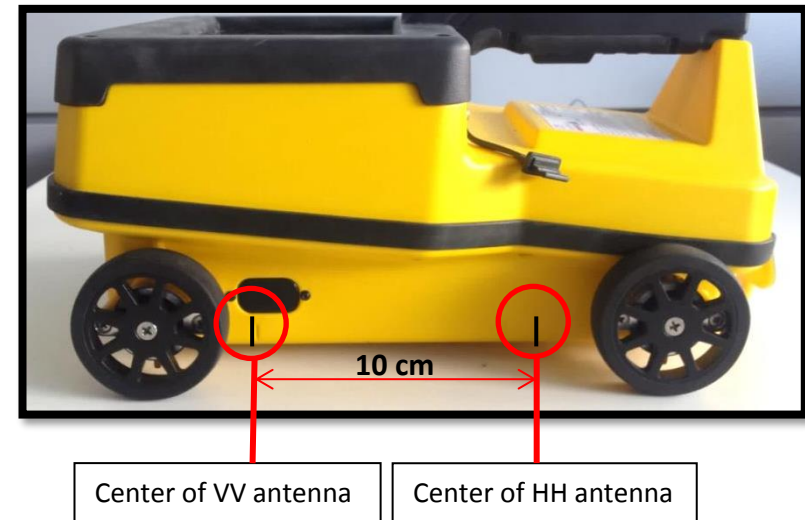


Fig. 6 –VV and HH center of position

4.1.3 Control unit

The Radar Control Unit (DAD) is lodged and integrated within the main system body (Fig. 5). No Cables have to be connected on it. Under the handle, there is a power button to turn it on/off (Fig. 4).

The main power characteristics of the Control Unit are:

Voltage: 12 V +/- 10%

Absorbed power: 8 W

4.1.4 Wheel Encoders

The C-Thru employs bidirectional encoders for collecting distance data, regardless which one of the four wheel is in direct contact with the surface

This feature ensures that the distance is correctly registered even in rough surface when, at times, not all the wheels are in touching with it (Fig. 7).

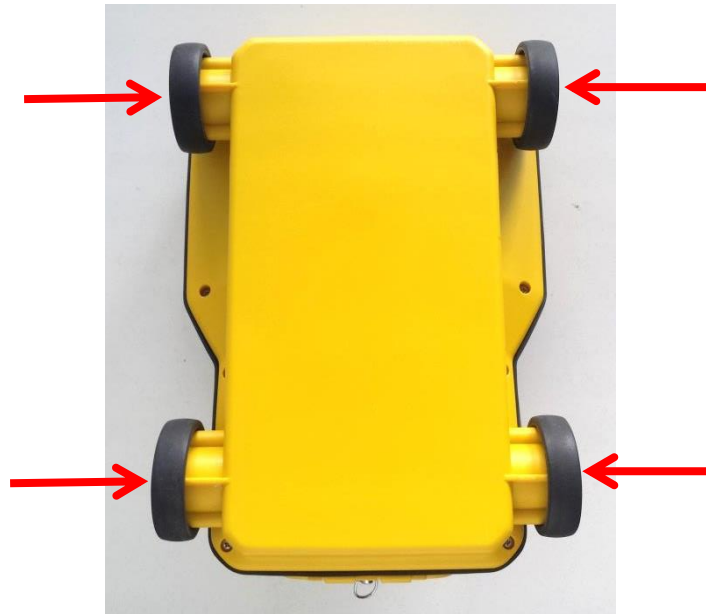


Fig. 7 – Wheel encoder (red arrows)

4.1.5 Lasers

3 laser interfaces are integrated in the main body of the C-Thru. One is in the front part, and the other two are in the right and left side of the system (Fig. 8). They are mounted exclusively for the 2-D positioning system used with reflective bars (Par 4.5.1).



This is a CLASS 1 Laser. This means that the laser is not detected by a naked eye, and is not dangerous for the eyes itself.

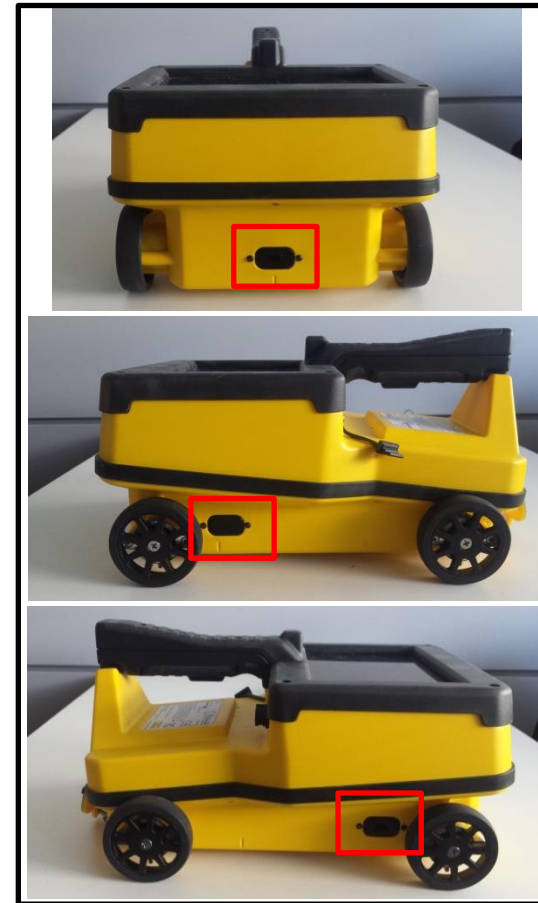


Fig. 8 – Lasers position on C-Thru main body



CAUTION: don't look at the Laser with any magnifier glass.

4.1.6 Handle

The C-Thru handle (Fig. 9) is ergonomic and designed to operate the system only with one hand.



Fig. 9 – C-Thru handle

A safety tie (Fig. 10) is provided to attach the system to the wrist.



Fig. 10 – Safety tie

The User should make a knot around the C-Thru handle with the slimmest part of the lace, and then wear the lace on wrist from the wider side of the lace (Fig. 11).



Fig. 11 – How to use the lace/tie

In the upper part of the handle there is a start/stop acquisition and marker positioning button (Fig. 12, red square) easy to use with the thumb (Fig. 12).



For FCC rules and regulations, there is an additional button under the handle (blue square, Fig. 12). Hold this button during the acquisition, release at the end of it. Hold the button with the forefinger.

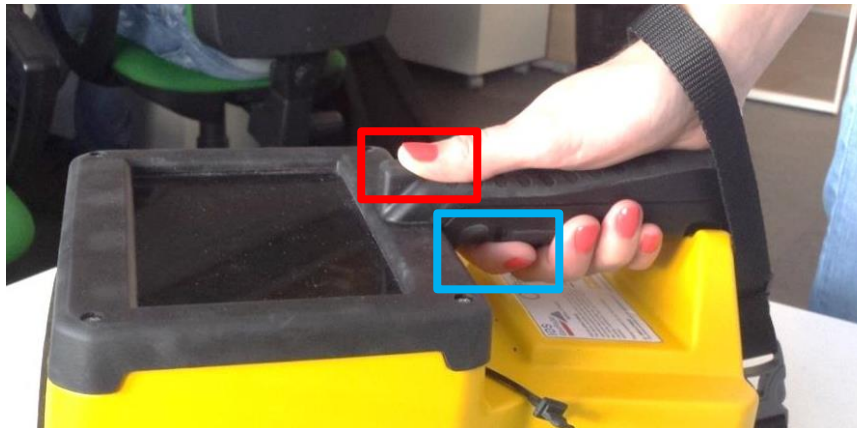


Fig. 12 – Button for start/stop acquisition and marker positioning (red square) and the additional button (blue square) for FCC regulations

4.2 Multi – touch Screen

The system is provided with an integrate OS (Fig. 13), with the software already installed; the user can operate C-Thru also with a Wi-Fi connected laptop, whose minimum requirements are the following:

- Processor: i3 1.7 GHz
- RAM: 1 GB
- Graphic adapter compatible with Open GL 2 or newer
- Operative system: Windows 7, 8 or 10
- Ethernet port



Fig. 13 – Multi touchscreen

4.3 Batteries

The C-Thru is powered by rechargeable Li-ion Battery (15V-3.2Ah) with 2 hours runtime (Fig. 14).

The system is supplied with two batteries (1 plus 1 spare).



Fig. 14 – Li-ion batteries for C-Thru

The C-Thru Li-ion Battery is lodged in the rear part of the system, under the handle.

To open the battery compartment cover the User should make a ¼- turn left screw. Turn to the right side to close it. Insert the battery from rear side of the system as shown in the following pictures (see Fig. 15).

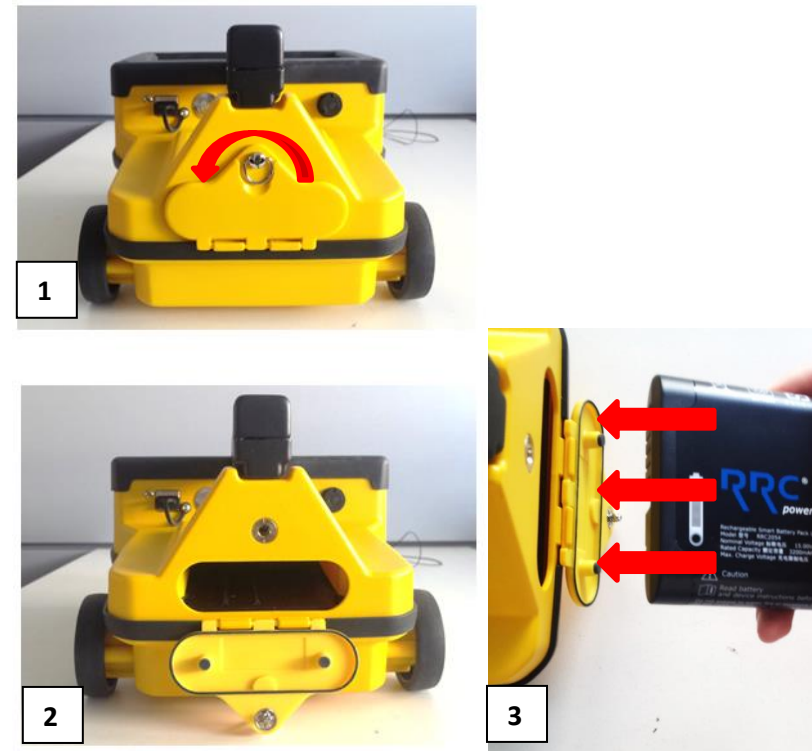


Fig. 15 – Battery compartment cover

4.4 Battery charger

The battery charger (Fig. 16) has to be connected to the electricity mains at AC 110/220V.

It is composed of three parts: an electrical transformer, a cable from transformer to the main AC, and battery housing. (see Fig. 16).

The battery charging is concluded when the Led becomes green.



Fig. 16 – Battery charger components

4.5 Accessories

4.5.1 Reflective Bars for system positioning

The C-Thru is also provided with positioning bars kit (Fig. 17 and Fig. 18) allowing the User to create a local reference system axis. Thanks to their reflective side (Fig. 19), Lasers are able to detect them, measuring distances.

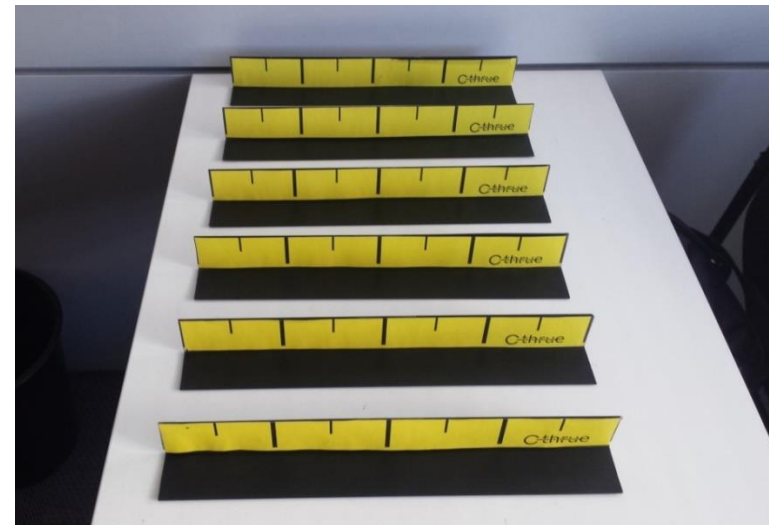


Fig. 17 – Positioning bars

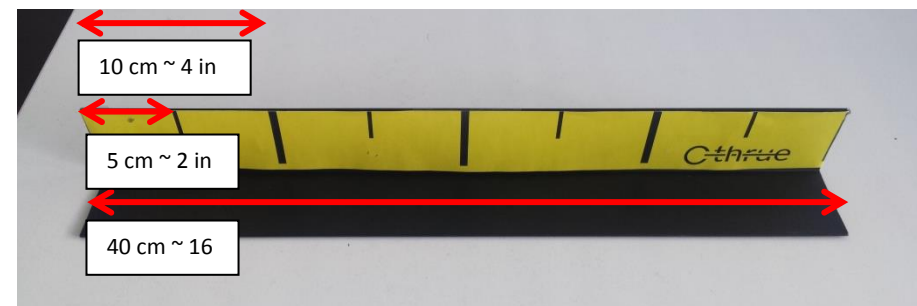


Fig. 18 – Distances between notches

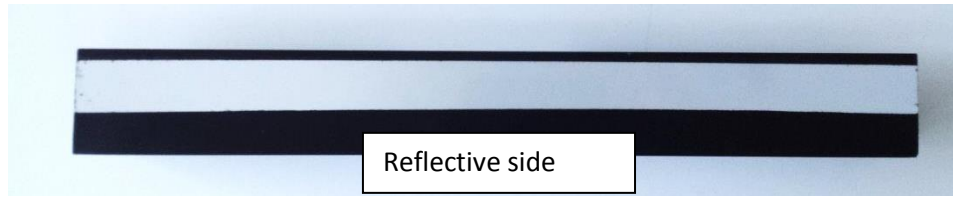


Fig. 19 – Reflective side of the bars

To fix the reflective bars to a wall or pavement surface, a sticky modelling paste is provided (Fig. 20).



Fig. 20 – Sticky modelling paste

5 ASSEMBLY PROCEDURE

The procedure to assemble the C-Thru is straightforward and can be performed by one person.

To assemble the system the User should follow these steps:

1. removing the radar main body from the luggage, Fig. 21;

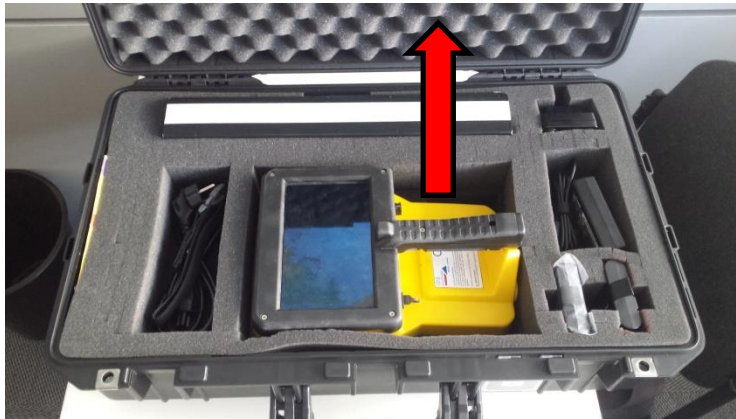


Fig. 21 the system and its luggage

2. Fixing the safety lace to the system, Fig. 22;



Fig. 22 the safety lace

3. Inserting the battery, Fig. 23;



Fig. 23 the battery case

4. Mounting the telescopic rod support (optional)
5. Wearing the safety lace to the wrist, Fig. 24;



Fig. 24 wearing the safety lace

6. Switch on the system from the power button, Fig. 25;



Fig. 25 the switch button

6 ONE VISION SOFTWARE GUIDE

automatically recognises and differentiates rebars and voids in concrete structures.

The software is specifically developed and suitable for in the field analysis:

- Automatic system calibration for an easy and quick set-up and start;
- Automatic recognition of rebars and voids in concrete structures;
- Digital on-site representation of data and targets through Augmented Reality;
- Real time visualisation of 3D radar tomography;
- Real time data sharing enabling double data visualisation and high resolution imaging both on product display and remote desktop connection to external device;
- Capability to mark targets within the software;
- Fully integrated with GRED HD post-processing software;
- Ability to export full survey report;
- Export to CAD and GIS.
- Augmented reality for 3D data visualisation and sharing across operators – in real time or intervals after acquisition.

GRED HD 3D - Advanced GPR processing and imaging software

GRED HD 3D is an advanced post-processing software enabling users with the following functionalities:

- Radar-scan viewer, filter and advanced filtering macros;
- Layer picking for automatic analysis of sub-layers;
- Tomographic map view (C-Scan) including radar scan fusion;
- 3D data visualization;
- Advanced targeting using radar-scan and tomographic view.

7 HOW TO MANAGE THE ACQUISITION IN A JOB SITE



Automatic" mode

Step 1: Assemble the system and place the pad on the surface to be investigated (Fig. 5.5).

Fig. 5.5 – Aladdin System

Step 2: Start the K2 FW software, perform the calibration and set the Aladdin structures kit parameters (as described in Par. 5.2 of this manual).

NOTE!

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

Step 3: Position the antenna on the initial pre-set coordinate in the L (or T) direction and carefully position the antenna until the acoustic signal stops.

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

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

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“ALADDIN” STRUCTURE KIT - User Manual
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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-Canada 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-Canada System): The scan is STOPPED by releasing the START button

8 CARE AND TRANSPORT

8.1 Cleaning Information

Before cleaning any external part of the apparatus, make sure that USB port and the battery compartment cover has been closed. If a damp cloth is used, make sure it is not too wet, to avoid any damage to the electrical components of the equipment. Wait until the equipment is totally dry before using it.

The C-Thru should be cleaned periodically using a damp cloth.

Do not use solvents or abrasive detergents.

Do not apply any liquid directly onto the electrical contacts of the connectors.

If a specific spray is used to clean the touchscreen, make sure it is not flammable; in any case, do not spray it directly on the screen, instead, spray it onto the cleaning cloth.

8.2 Battery Removal Information

For the external PC battery removal instruction, please do refer to the PC user' manual.

Radar batteries:

Manufacturer: FIAMM FG21202 / SAFT MP176065

Type: rechargeable lithium-ion

Characteristics: 15V-3.2Ah

Removal instructions:

- Be sure that the system is off.
- Use the ¼ turn left screw to open the battery compartment cover
- Remove the battery from the compartment (optional) opening the strap.



CAUTION: insert the battery in a dry location

8.3 Periodical Check

The Operator should periodically check the status of the System

8.4 Proper system use



The following points must be followed to operate in safety conditions, to avoid any issues to the system parts and to secure a long life to the system

- **Surface of use:** operating the system over very rough or sharp surface is not recommended.
- **At least one of the 4 wheels** must be always in contact to the surface during the acquisition, in order to measure correctly the distance travelled. The best radar image results are reached when all the 4 wheels are in contact with the surface itself
- **Safety lace:** the operator has to use the safety lace secured to wrist and to the system, in each situation during the acquisition phase over surfaces the optimal height of the system's antenna is reached when all the 4 wheels are in contact with the surface itself
- **Allowed velocity:** the system has to be use only with human hands
- **Moving and correct usage of the system:** to transport the system from one site to the next, always use its suitcase.

CARE AND TRANSPORT

- **Positioning bars:** after the acquisition, always remove and safely store the positioning bars.
- **Positioning bars:** use at least 3 square of sticky modelling paste for each bar. Don't use any other type of material
- **Positioning bars:** if the bars are attached to the ceiling, always use safety helmet and safety glass.
- **For FCC regulations:** do not fix with any scotch-tape the button under the handle.

9 TROUBLESHOOTING

10 IDS GEORADAR ON-LINE ASSISTANCE

10.1 Download area

The Georadar section of the IDS GeoRadar website has a download area you can access to get the latest update of software, manuals, guides and other useful tools.

To do this, the first step is to request an account activation in <http://idsgeoradar.com/customer-area/customer-area-registration>

The request will be handled by the Customer Care of IDS GeoRadar, after which you will receive an email with your credentials for accessing the download area during login at <https://support.idscorporation.com>

10.2 Screen Connect Support Center Remote Assistance

The Screen Connect Support Center is a service that allows the activation of a two host session, making your application or your desktop available to another user.

It can be used to perform web conferences and presentations, and is easy to use thanks to a simple and intuitive interface.

Since there are no firewalls or other types of network configurations, it is a fast and secure means of reaching any client host in any part of the world. In fact, you only need to accept to download a small plugin used to permit the service authentication and functioning.

10.2.1 How to use the Screen Connect service

You will receive an email from IDS GeoRadar Customer Care containing a link to the support session (see Fig. 26).

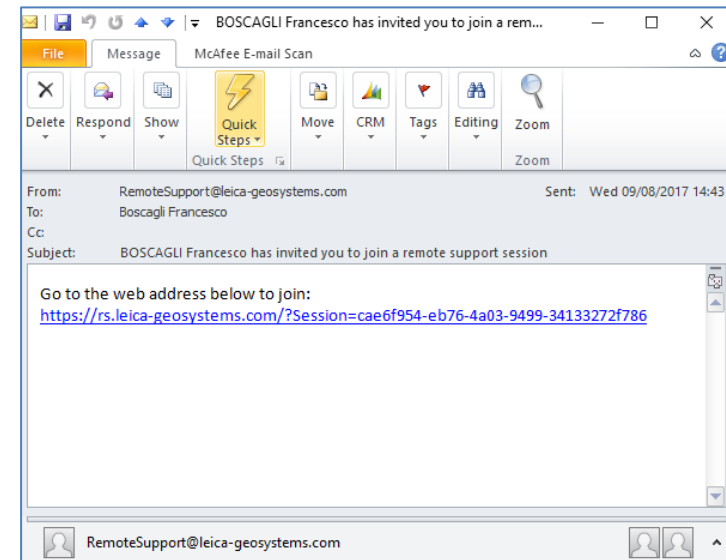


Fig. 26 – IDS GeoRadar email sent to the client

Clicking on the link in the email, the following window appears. Click on the arrow to join the session (see Fig. 27).

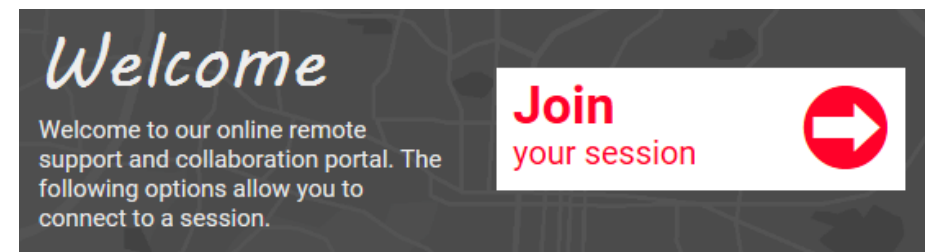


Fig. 27 – Client data insertion form

Click on Run to download the Screen Connect application (see Fig. 27).

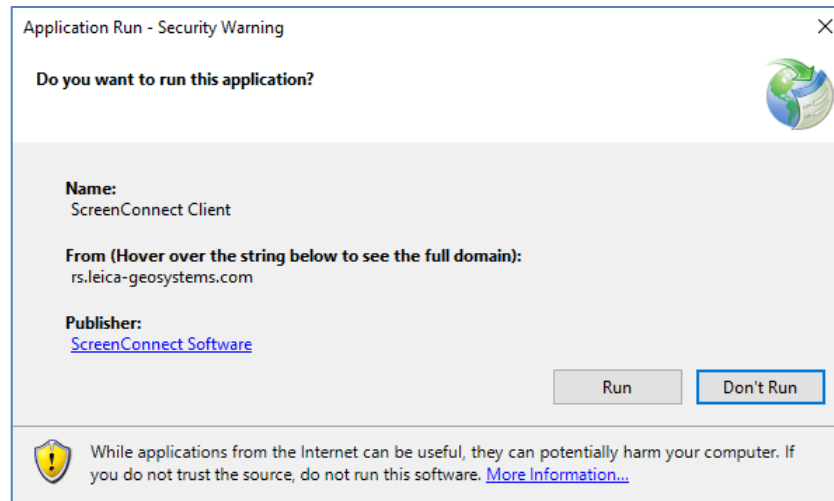


Fig. 28 – Run Screen Connect application

When the IDS Georadar technician try to connect to your pc you will receive a Popup requesting the authorization, click on Allow (see Fig. 29).

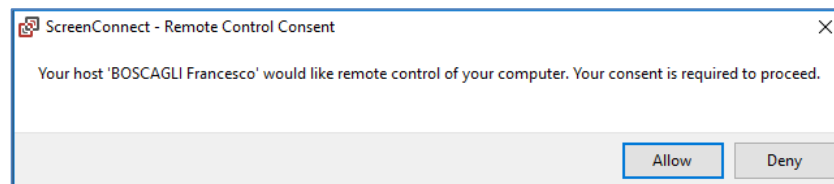


Fig. 29 – Authorization request

At this point, IDS GeoRadar Customer Care can perform a range of operations on your desktop:

Send and receive files;

Directly control your PC;

Chat to ask some physical operation to be performed (for example connect a cable, turn off/on a system, move some parts);

APPENDIX A - Technical Specification

C-thrue	
SYSTEM SPECIFICATIONS	
Antenna Center Frequency	2.0 GHz
Number of Antennas	
Antenna Polarisation	Horizontal and Vertical
Number of Radar Channels	2
Scan Interval	Up to 10 scans/cm
Depth Range	Up to 80 cm (up to 31.5 in.)
Display modes	B-Scan and C-scan (radar tomography)
Positioning system	“Virtual Pad” (based on 3 High safety - Class 1 laser sensors with reflective bars)
AC Power Conduits Detection	EM sensor integrated (50/60 Hz)
Battery	Li-ion battery, 15V, 3.2Ah, 2-hour runtime
Data Storage	32 GB
Connectivity	USB, Wi-Fi
ENVIRONMENTAL SPECIFICATIONS	
Operating Temperature	-20°C to +50°C (-4°F to +122°F)
Storage Temperature	-40°C to +60°C (-40°F to +140°F)
Environmental	IP65
MECHANICAL SPECIFICATIONS	
Dimensions (length x width x height)	285mm x 200mm x 160mm (11,2in x 8,6in x 6,3in)
Weight	2.4 kg (5 lb) with battery
Display	7.0 inches

	TFT multi-touch
SOFTWARE SPECIFICATIONS	
C-thrue software	Quick start-up Real time radar data acquisition, processing and visualization in B-Scan Real time feature marking, management and editing tool Rebar/Void automatic discrimination VirtualPad - Positioning & navigation system Visualization of C-scan (radar tomography) Real time diagnose of radar and the other devices Metric and imperial units Available in more than 20 languages First rebar layer automatic detection Automatic job reports Real time Power conduit sensing display
ACCESSORIES SPECIFICATIONS	
C-thrue External Controller	Remote control of C-thrue Representation of results in Augmented Reality (when used with Virtual Pad) Display: 10.1 inches Drop resistant: 1.8 m (5.9 ft) Connectivity: 4G LTE, Wi-Fi Environmental: MIL- STD 810G and IP65
C-thrue Handle	Aluminum handle 1.5 m (5 ft) Remote control buttons



Exposure to Radio Frequency (RF)

In the normal manner of intended use, this product does not pose health or safety risks regarding radio frequency signals.

APPENDIX B - DISCLAIMER

DISCLAIMER

Generals.

- i. The present Disclaimer applies to all products (the “Products”) designed, produced and distributed by IDS GeoRadar s.r.l. its Subsidiaries, Affiliated and authorized Distributors. IDS GeoRadar reserves full ownership and intellectual property rights of any “Information” contained in this Disclaimer including Trade Marks and Graphics. No part of this Disclaimer may be used or reproduced in any forms without the prior written agreement of IDS GeoRadar.
- ii. In the event that any provision of this Disclaimer may be invalid, unlawful or incapable of being enforced by a rule of law, all other provisions shall, nonetheless, remain in full force and effect. Failure to either enforce or exercise any right, privilege, or legal remedy at any time, any provision contained in this Disclaimer, shall not be deemed a waiver of such provisions or right, remedy, or privilege.
- iii. This Disclaimer shall be interpreted, governed, construed and enforced in accordance with the laws of Italy. Buyer hereby consents to the exclusive jurisdiction of Pisa

Initial Precautions for Setting-up and Use of the Products.

- i. The Buyer, for setting-up and using the purchased Products, shall consult the official documentation provided by IDS GeoRadar for the Products (“Reference Documentation”) and carefully ascertain the compliance with national laws and requirements, which may limit or even forbid their use.
- ii. For Products which shall operate by circulation in Public Areas/Roads, with or without moving traffic, Buyer/User shall verify the approval of local authority and/or site’s owner according to their specific procedures. IDS GeoRadar shall not be liable for any direct, indirect, special, incidental or consequential damages or injuries, including without limitation, lost revenues or lost profits, resulting by un-authorized use of the Products in Public Areas/Roads.
- iii. For IBIS Products Family, Buyer/User warrants:
 - that these Products are not being used, in the design, development, production or use of chemical, biological, nuclear

ballistic weapons. Buyer/ User will defend, indemnify and hold IDS GeoRadar harmless against any liability (including attorney’s fees) for non-compliance with the terms of this article.

- that no operation or use of the IBIS products shall be started before its designated Operator/s has got the IBIS User Certificate, as defined by IDS GeoRadar specific procedure which the Buyer confirms to know and accept.
- iv. For Products which include specific “Operational” software with automatic data processing and analysis “Tools”, i.e. the IBIS Products, User shall be aware that the results provided by these “Tools” may be not free. User that completely relies on the outcomes provided by these Tools only, does it at his own risk.
 - v. In no event IDS GeoRadar shall be liable for special, direct, indirect, incidental, exemplary, punitive or consequential damages including, but not limited to, loss of profits or revenue, caused by the use of the Products, either separately or in combination with other products or relied upon the results provided by the above “Tools”.

Disclaimer for the “Use” of the Products.

- i. The User shall follow the instructions provided by IDS GeoRadar in its official “Reference Documentation” for the Product, in particular the User’s Technical Manual which contains all the specific steps and recommendations for a correct setting-up and use of the Product.
- ii. In no event IDS GeoRadar shall be liable for special, direct, indirect, incidental, exemplary, punitive or consequential damages including, but not limited to, loss of profits or revenue, caused by the missed or incomplete observance of the instructions and prescriptions for the use of the Products, either separately or in combination with other products, in particular for the following main aspects:
 - a. Use of IDS GeoRadar Products outside its limitation of use, without proper and adequate scientific/technical knowledge or without specific training.
 - b. Use of results/outcomes of the measurements performed by the Product aimed to safety aspects without using adequate control procedures and assessment by skilled personnel.
 - c. Opening of the Equipment (for HW Products) without express written authorization of IDS GeoRadar.
 - d. Unauthorized changes and additions to the Products.
 - e. Use of the Products connected to suspected non-working

equipment or with equipment (mainly PC) having characteristics non in compliance with the required specifications of IDS GeoRadar on not expressly authorized by IDS GeoRadar.

- f. Poor or faulty operation of the electrical and telecommunication networks not directly managed by IDS GeoRadar or its delegates.
- g. Poor or faulty operation Software/Hardware of the third parties connected with IDS GeoRadar Equipment.
- h. Poor or faulty operation of the Products due to Software Virus which infected the Products after their delivery.
- i. Use of the Products which have encountered suspected manumissions, accidents, electrostatic shocks, flashes, fire, earthquake, flooding or other natural disasters or unexpected events.
- j. Use or storage of the Products outside the limits of the “Operational Temperature Range” specified by IDS GeoRadar.

Disclaimer for the “IBIS Family” Products.

- i. IBIS Products include specific “Operational” software with automatic data processing and analysis which may give outcomes/results for helping User in the monitoring of “the stability conditions” of a specific event.
- ii. Nevertheless, IDS GeoRadar has the obligation to remind the Users that the performance of IBIS might be influenced by two main factors which may distort its outcomes, thus giving rise to false or missing alarms:
 - a. the parameters introduced by the operator/s.
 - b. the particular environmental conditions: (even though the radar technology employed by IBIS, is deemed among the most reliable for the monitoring of “instable slopes).
- iii. Therefore, when IBIS Products are used in “Critical Monitoring for safety purposes” applications, like real time monitoring of unstable slopes including Opencast Mining, User must be aware that the “the assessment of the stability conditions of the observed targets” must be tasked to skilled and certified operator/s able to understand data supplied by either IBIS or other equipment employed to such purpose; only operators officially trained and regularly updated by IDS GeoRadar (holding an “IBIS User Certificate” thereof) are allowed to use IBIS products.

- iv. IDS GeoRadar assumes no liability for any direct, indirect special, incidental or consequential damages or injuries caused by such reliance or for the use of IBIS Products by operator not holding an “IBIS User Certificate” issued by IDS GeoRadar. Any Buyer or User that completely relies on information obtained from the automated data processing/analysis tools only does so at his own risk and possible damages caused to IBIS products during operations performed by not-certified operators are not covered by the applicable Warranty Terms in force.

APPENDIX C – WARRANTY CONDITIONS

Warranty Conditions

A. Standard Warranty Conditions

1. IDS GeoRadar s.r.l, warrants that its products shall be free from defects in material and workmanship, for a period of 12 months from the delivery date duly registered and certified (“Effective Date”) in the “Warranty Registration Form” enclosed hereto. IDS GeoRadar shall repair or replace Products or parts thereof found faulty (the “Faulty Parts”) which are returned to IDS GeoRadar, and which, at IDS GeoRadar’s judgment, were defective or became defective during its normal use. Seller’s obligations shall not apply to Faulty Parts that:
 - (a) Buyer do not properly store, install, use, or maintain;
 - (b) Buyer modify, or perform tests which are not approved in writing by the Seller;
 - (c) Buyer have subjected to any kind of misuse, detrimental exposure beyond its intended purpose or damaged in an accident or by natural disaster or calamities.
 - (d) Are repaired by other than IDS GeoRadar personnel; in which have been installed HW/SW accessories not supplied by IDS GeoRadar; are integrated or connected to equipment different from the ones supplied by IDS GeoRadar (except the PC data Logger conform to IDS GeoRadar specifications);
 - (e) Whose operational software was not installed as per IDS GeoRadar instruction (see IDS GeoRadar User’s Guide for the Data Acquisition Software);
2. Seller’s Products may include specific “Operational” software with automatic data processing and analysis tools (SW) supplied under a License agreement (EULA). While every effort is made to ensure the accuracy of the information/results provided by these tools, they must not be intended as a substitute for people analysis; rather, they have to be intended as an advisor and the user must not completely rely on the results provided by them. Under no circumstances does IDS warrant that the SW will operate uninterrupted or error free The SW is provided “as is” without warranty of any kind. IDS GeoRadar warrants for a period of sixty (60) days from the Effective date that, under normal use, the SW support media will be free of defects in material and workmanship; in such case the provisions of above point a) apply
3. Any different warranty, granted by the Buyer to its retailers and clients, even as final consumers, pursuant to the European Union law in force regarding the rights of the consumers, does not engage IDS GeoRadar in anyway.
4. The above mentioned warranty excludes any other remedies and it has to be considered the only and exclusive remedy foreseen for the Buyer and its retailers and clients, with reference to IDS GeoRadar Products purchase, being, expressly understood that any kind of limitation and/or discharge of responsibility provided by the present warranty is referred to both (I) the responsibility as against any third parties, pursuant to the legislation regarding the producer responsibility and (II) the warranty provided by the law in force.

B. Warranty Procedure

1. To proceed in the application of warranty terms, Buyer shall have to contact IDS GeoRadar

Customer Care Office to get the clearance to return the Faulty Parts.

2. The Faulty Parts once received by IDS GeoRadar will be inspected to verify they are eligible for repair or replacement..
3. Buyer is responsible for ensuring that the Faulty Parts be returned to IDS GeoRadar with a suitable packing (it is recommended that the original packing be saved for a better understand of the failure cause); IDS GeoRadar will not be obliged to repair or replace Faulty Parts damaged from abuse, misuse, negligence, accident loss or damage in transit.
4. The Shipping costs for Products returned during the warranty period, are as follows:
 - (f) From Buyer Site to Seller site → shipping costs, as per Incoterms CIP, are borne by Buyer
 - (g) From Seller Site to Buyer site → shipping cost, as per Incoterms CIP, are borne by Seller
5. The warranty period on the repaired or replaced Faulty Parts is 6 (six) months or the unexpired portion of warranty on such Faulty Parts whichever date comes later.

C. Special Warranty Conditions for IBIS Products

Without prejudice to the Warranty terms defined in the above Clauses A and B, the following special conditions apply to the IBIS products.

1. IDS GeoRadar offers to the Buyer, optionally, special Support and Maintenance Plans to be performed along the life of the equipment. These plans set forth special Warranty conditions which are detailed in the relevant options purchased.
2. IBIS Product Family is subject to export/import regulations as per EU export control regime Council Regulation (EC) No. 428/2009 and successive amendments. The category of exportation for IBIS F product family is 6A008.d. Buyer warrants that the IBIS Products to be purchased: a) shall not be re-exported, directly or indirectly, outside Buyer’s country in violation of any law or regulation or to embargoed or otherwise restricted countries, b) shall not be used, in the design, development, production or use of chemical, biological, nuclear ballistic weapons. It is Buyer’s responsibility to know the law pertaining to export/import procedures in the country of destination of the Products. Buyer will defend, indemnify and hold Seller harmless against any liability (including attorney’s fees) arising out of Buyer’s failure to comply with the terms of this article. Should the Authorities issue an export restriction which leads to the cancellation of a purchase order already accepted by IDS GeoRadar, IDS GeoRadar only liability shall be to return to Buyer any account paid without interests. Buyer shall comply with the laws and procedures in force in the country of destination of the Products.
3. IBIS can be used in Critical Monitoring for safety purposes applications, like real time monitoring of unstable slopes including Opencast Mining. Buyer shall be aware and agree that the assessment of the stability conditions of the observed target must be tasked to skilled and certified operator/s able to understand data supplied by either IBIS or others. The performance of IBIS can be, in fact, influenced either by the parameters introduced by the operator/s or by particular environmental conditions which may distort its outcomes, thus giving rise to false or missing alarms.
4. IDS GeoRadar assumes no liability for any direct, indirect special, incidental or consequential damages or injuries caused by such reliance or for the use of IBIS Products by operator who have not achieved a training course certified by IDS GeoRadar. Any person or entity that completely relies on information obtained from the automated data processing/analysis tools only or by operators who have not achieved a training course certified by IDS GeoRadar, does so at his own

risk

D. Limited Liability

Without prejudice to the exclusion of liability stated at the above Clause C.

1. Seller's sole obligation and liability under this Agreement shall be limited to the repair or replacement of the Product, or the refund of the purchase price at the Seller's sole option. This Article sets forth the sole and exclusive remedies for claims based upon defects or nonconformity of the Products, whether the claim is on contract, warranty, tort (including negligence), strict liability, or otherwise.

The cumulative liability of Seller, including its subcontractors or suppliers, for any and all claims, including but not limited to claims based on Seller's negligence of any degree, strict liability, breach of contract, warranty, reliance on the accuracy, reliability, or timeliness of the information provided by the SW, patents or otherwise, shall not exceed the sums cashed by IDS GeoRadar for the purchased Products, which give rise to the claim, and any such liability shall terminate upon the expiration of the warranty period.

APPENDIX D – CONFORMITY TO EUROPEAN REGULATION

CONFORMITY TO EUROPEAN REGULATIONS

The equipment conforms to the following requirements set by EC regulations, including subsequent modifications, and to the legislation set by the member states that implement these regulations:

2014/053/EEC Radio Directive

Warning: this equipment is destined for use in industrial environments (Class A apparatus). In residential, commercial and light industry environments, this apparatus may generate radio interference: in this case, the user may be required to operate while taking appropriate countermeasures.

The apparatus is sensitive to the presence of external electromagnetic fields, which may reduce its performance.



APPENDIX E - IMPORTANT NOTICE FOR THE US CUSTOMER

FCC ID: UFW-CTHRUE

This device complies with part 15 of the FCC Rules:

Operation is subject to the following conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation

Warning: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Operation of this device is restricted to law enforcement, fire and rescue officials, scientific research institutes, commercial mining companies, and construction companies. Operation by any other party is a violation of 47 U.S.C. § 301 and could subject the operator to serious legal penalties.

Coordination Requirements.

(a) UWB imaging systems require coordination through the FCC before the equipment may be used. The operator shall comply with any constraints on equipment usage resulting from this coordination.

(b) The users of UWB imaging devices shall supply detailed operational areas to the FCC Office of Engineering and Technology who shall coordinate this information with the Federal Government through the National Telecommunications and Information Administration. The information provided by the UWB operator shall include the name, address and other pertinent contact information of the user, the desired geographical area of operation, and the FCC ID number and other nomenclature of the UWB device. This material shall be submitted to the following address:

Frequency Coordination Branch., OET

Federal Communications Commission

445 12th Street, SW

Washington, D.C. 20554

ATTN: UWB Coordination

(d) Users of authorized, coordinated UWB systems may transfer them to other qualified users and to different locations upon coordination of change of ownership or location to the FCC and coordination with existing authorized operations.

(e) The NTIA/FCC coordination report shall include any needed constraints that apply to day-to-day operations. Such constraints could specify prohibited areas of operations or areas located near authorized radio stations for which additional coordination is required before operation of the UWB equipment. If additional local coordination is required, a local coordination contact will be provided.

(f) The coordination of routine UWB operations shall not take longer than 15 business days from the receipt of the coordination request by NTIA. Special temporary operations may be handled with an expedited turn-around time when circumstances warrant. The operation of UWB systems in emergency situations involving the safety of life or property may occur without coordination provided a notification procedure, similar to that contained in CFR47 Section 2.405(a)-(e), is followed by the UWB equipment user.

Notice: Use of this device as a Through-wall imaging system system is prohibited by FCC regulations.

APPENDIX F - IMPORTANT NOTE FOR CANADIAN CUSTOMERS

Canadian Requirements of RSS-220 for Hand-held Antennas

IMPORTANT NOTE FOR THE CANADIAN CUSTOMERS

IC Certification Number: **8991A-CTHRUE**

This device complies with the requirements of IC Standard RSS-220

This In-wall Radar Imaging Device shall be operated where the device is directed at the wall and in contact with or within 20 cm of the wall surface.

This In-wall Radar Imaging Device shall be operated only by law enforcement agencies, scientific research institutes, commercial mining companies, construction companies, and emergency rescue or firefighting organizations.

NOTE IMPORTANTE POUR LES UTILISATEURS CANADIENS

Numéro de certification : **8991A-CTHRUE**

Cet appareil est conforme aux exigences de la norme RSS IC-220

Cet appareil de radar de structure (murs, poutres, dalles...) ne doit être utilisé qu'en contact avec la structure ou à 20 cm maximum décollé de cette structure.

Cet appareil de radar de sol ne doit être utilisé que par les forces de l'ordre, les instituts de recherche scientifiques, les sociétés minières, les sociétés de construction, et les organisations de secours d'urgence ou de combat du feu.

CANADIAN REPRESENTATIVE

Company Name : Leica Geosystems Ltd

CN Number : 3177B

Contact Name : Sudha Sachdeva

City : SCARBOROUGH, Ontario M1W3S2

Telephone No : +1 416 497 2463

Email : sudha.sachdeva@leicaus.com

Canadian Requirements of RSS-220 for Ground Antennas

IMPORTANT NOTE FOR THE CANADIAN CUSTOMERS

IC Certification Number: **8991A-CTHRUE**

This device complies with the requirements of IC Standard RSS-220

This Ground Penetrating Radar Device shall be operated only when in contact with or within 1 m of the ground.

This Ground Penetrating Radar Device shall be operated only by law enforcement agencies, scientific research institutes, commercial mining companies, construction companies, and emergency rescue or firefighting organizations.

NOTE IMPORTANTE POUR LES UTILISATEURS CANADIENS

Numéro de certification : **8991A-CTHRUE**

Cet appareil est conforme aux exigences de la norme RSS IC-220

Cet équipement géoradar doit être utilisé que lorsqu'il est en contact ou à moins de 1 mètre du sol.

Cet équipement géoradar doit être utilisé que par des organismes d'application de la loi, des instituts de recherche scientifique, des sociétés minières commerciales, des entreprises de construction et de secours d'urgence ou les organisations de lutte contre les incendies.

APPENDIX G - CONTACTS

IDS GeoRadar s.r.l. – GeoRadar Division

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