

STREAM DP using GPR AE32HV User Manual

Installation and use

ORIGINAL INSTRUCTION IN ENGLISH LANGUAGE





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INDEX

| | | |
|----------|--|-----------|
| 1 | INTRODUCTION | 6 |
| 1.1 | PURPOSE | 6 |
| 1.2 | APPLICATION FIELD | 6 |
| 1.3 | INTENDED READERSHIP | 6 |
| 1.4 | AUTHORIZATION OF USE | 6 |
| 1.4.1 | CE Marking..... | 7 |
| 1.4.2 | UKCA Marking..... | 7 |
| 2 | HOW TO READ THE MANUAL | 8 |
| 2.1 | MANUAL LAYOUT..... | 8 |
| 2.2 | SYMBOLS | 8 |
| 2.3 | GLOSSARY & ACRONYMS | 9 |
| 3 | SAFETY DIRECTIONS | 10 |
| 3.1 | DESCRIPTION | 10 |
| 3.2 | INTENDED USE..... | 10 |
| 3.3 | REASONABLY FORESEEABLE MISUSE..... | 10 |
| 3.4 | LIMITS OF USE | 10 |
| 3.5 | RESPONSIBILITIES | 10 |
| 3.6 | HAZARD OF USE | 12 |
| 4 | GENERAL DESCRIPTION OF THE HARDWARE | 15 |
| 4.1 | E.S.T. EQUALIZED SCRAMBLED TECHNOLOGY..... | 15 |
| 4.2 | SYSTEM COMPOSITION AND OVERVIEW | 15 |
| 4.3 | MECHANICAL STRUCTURE | 18 |
| 4.4 | CONNECTION AND PORTS | 19 |
| 4.5 | BATTERY..... | 19 |
| 4.6 | WHEEL TYPES | 20 |
| 4.7 | WHEEL BLOCKAGE SYSTEM | 20 |
| 4.8 | ADJUSTABLE AND REMOVABLE HANDLE | 21 |
| 4.9 | GPS SUPPORT POLE | 22 |
| 4.10 | DATA LOGGER SPECIFICATIONS | 23 |
| 4.11 | LAPTOP SUPPORT | 23 |
| 4.12 | HOW THE SYSTEM IS DELIVERED AND PACKED | 24 |

| | | |
|-------------------|---|-----------|
| 5 | HOW TO ASSEMBLE THE SYSTEM AND SAFETY GUIDELINES | 24 |
| 6 | HOW TO SET UP THE STREAM DP IN TRANSPORT MODE..... | 26 |
| 6.1 | FOLDING THE HANDLE | 26 |
| 6.2 | DISASSEMBLING THE SYSTEM | 26 |
| 7 | CARE AND TRANSPORT | 28 |
| 7.1 | CLEANING INFORMATION..... | 28 |
| 7.2 | BATTERY REMOVAL INFORMATION | 28 |
| 7.3 | PERIODICAL CHECK | 28 |
| 7.4 | TRANSPORT OF THE SYSTEM | 29 |
| APPENDIX A | DISCLAIMER..... | 30 |
| APPENDIX B | TECHNICAL SPECIFICATIONS | 32 |
| APPENDIX C | CONFORMITY TO EUROPEAN AND UK REGULATIONS..... | 33 |
| APPENDIX D | IMPORTANT NOTE FOR US CUSTOMERS..... | 34 |
| APPENDIX E | IMPORTANT NOTES FOR CANADIAN CUSTOMERS | 35 |
| APPENDIX F | CONTACTS | 36 |

1 INTRODUCTION

This document describes the Stream DP system, the compact GPR massive array system by IDS Georadar using GPR AE32HV antenna.

This document 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 and operating the system.

1.1 Purpose

The purpose of this document is to drive the reader to a list of step-by-step actions to follow in order to install **Stream DP** system, in a thorough and safe way.

The structure of the manual is organized in a collection of "how-to" as well as descriptive chapters. Each chapter contains the illustration and basic description, of the main operations to be carried out for system installation.

1.2 Application field

The main application of **STREAM DP** is the collection of GPR survey over large areas, mainly for underground utility mapping and pipe detection. Also, any type of buried objects or structures may be the aim of the system, if these are buried within its depth of reach.

1.3 Intended readership

The intended reader of this manual is(are) the technician(s) in charge of using the system, that has undergone the IDS GeoRadar training for Stream DP.

1.4 Authorization of use

The use of STREAM DP system may be subject to a license and/or an authorization by the Competent Ministry of the country where the system will be used.

An individual license and restrictions are in place to date in the following European countries:

France: <https://www.anfr.fr/en/broadcasting-authorisation/reseaux-professionnels/les-frequences-utilisees-a-titre-temporaire/les-systemes-dimagerie-radar-de-type-gpr-wpr/>

Germany:

https://www.bundesnetzagentur.de/SharedDocs/Downloads/DE/Sachgebiete/Telekommunikation/Unternehmen_Institutionen/Technik/Inverkehrbringen/Produkten/Schnittstellenbeschreibungen/OrtungsfunkOR/SSBOR_N N022.pdf?__blob=publicationFile&v=4

Portugal: <https://www.anacom.pt/render.jsp?categoryId=389647>

Romania: https://www.ancom.ro/radio-spectrum_2749

Spain: https://www.boe.es/diario_boe/txt.php?id=BOE-A-2011-19146


Sweden:

<https://www.pts.se/sv/bransch/radio/radiotillstand/ansokningshandlingar/>

Liechtenstein and Switzerland:
<https://www.bakom.admin.ch/bakom/en/homepage/frequencies-and-antennas/frequency-use-with-or-without-licences/radiocommunication-licences-in-general.html>

For more details with reference to the restriction, please refer to the following website:

[ECO Frequency Information System \(cept.org\)](https://www.cept.org/)

| | | |
|---|----|----|
|  | CH | DE |
| | ES | FR |
| | LI | PT |
| | RO | SE |
| | | |

1.4.1 CE Marking



This equipment complies with the essential requirements and other relevant provisions of Directive 2014/53/UE. The full Declaration of its Conformity can be found either on the CD or a separate document included with this product.

This is a Class A product. In a domestic environment it may cause radio interference. If so, the user may need to take adequate measures.

1.4.2 UKCA Marking



This equipment complies with the essential requirements of the Radio Equipment Regulations 2017 (S.I. 2017/1206). The full Declaration of its Conformity can be found either on the CD or a separate document included with this product.

Licensing requirements in UK can be found here:

<https://www.ofcom.org.uk/manage-your-licence/radiocommunication-licences/licensed-short-range>

2 HOW TO READ THE MANUAL

As mentioned above (par. 1.1), this User Manual is structured into a “How to” manner. In each of the relevant chapter, the User shall find, action by action, the basics to carry out a Stream DP installation.

2.1 Manual Layout

It is strongly recommended to go through this manual thoroughly, and to read it carefully. However, as the document is divided into a first part (par. 0) that is descriptive of the whole system, but also into procedures (*How to*) that are self-consistent, and that can be read sparsely, it is not mandatory to read this document chapter after chapter, in case of need.

2.2 Symbols

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 behaviour.

For the user's 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 safety purposes, 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.

| 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. |
| information symbols may be placed within a warning message as well as supplementary text. | |
|  • | NOTICE: Note text/to keep in mind |
|  • | Tip text |

2.3 Glossary & Acronyms

The following acronyms are used in this manual:

- **Controller:** PC / Tablet used by the user for data acquisition. The data acquisition SW (client) is performed on the controller
- **EST:** Equalized Scrambled Technology
- **GNSS:** Global Navigation Satellite System
- **GPR:** Ground Penetrating Radar or Georadar or Ground Probing Radar
- **HMI:** Human Machine Interface
- **HW:** Hardware
- **NMEA format:** National Marine Electronics Association format
- **RTK:** Real Time Kinematic
- **SNR:** Signal to Noise Ratio
- **Stream DP:** IDS GeoRadar GPR massive Array System
- **SW:** Software
- **UBLOX:** GPS dispositive within the GPR system
- **uMap:** IDS GeoRadar software for GPR data acquisition

3 SAFETY DIRECTIONS

3.1 Description

The following directions enable the person responsible for the product, and the person who 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 Intended Use

The intended use is the detection of underground targets, such as:

- Water pipes
- Gas pipes
- Sewers
- Optic fibre
- Electric cables
- Telephone cables
- Manholes
- Cavities
- Structures in general

3.3 Reasonably Foreseeable Misuse

- Infringing traffic regulation.
- Use of the product without instruction.
- Use outside of the intended use and limits.
- 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.

3.4 Limits of Use

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



WARNING: POTENTIALLY HAZARDOUS AREAS

working in hazardous areas, such as potentially explosive areas, or close to electrical installations, or similar situations, could result in death or serious injury.

PRECAUTION: Local safety authorities and safety experts must be contacted, by the person in charge of the product, prior commencing any survey in potentially hazardous areas for the due risk assessment.

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 traffic laws and 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 traffic laws, the national laws, regulations, and conditions for the operation of electromagnetics transmitters are respected.

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



Precautions:

Periodically carry out test measurements, particularly after the product has been subjected to abnormal use and before and after of important measurements.

3.6 Hazard of use

**WARNING: CRUSHING HANDS AND FINGERS**

While installing the system, the risk of fingers pinch-out, may occur.

PRECAUTION: To mount the system, the user must always wear protective gloves and safety boots.

**WARNING: RISK OF ACCIDENTS**

During surveys there is a danger of accidents occurring if the user does not pay attention to the surrounding site conditions, such as obstacles, excavations or traffic.

PRECAUTIONS: During operations, the user of the product must be fully aware of the existing site conditions.

**WARNING: ELECTROCUTION**

Because of the risk of electrocution, it is dangerous to use poles and extensions near 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 safety instructions.



NOTICE: 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: LIGHTNING STRIKING**

If the product is used with accessories (for example GNSS pole support), the user may increase the risk of being struck by lightning.

PRECAUTIONS: Do not use the product in a thunderstorm.

**WARNING: SECURING OF THE WORKING SITE**

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, accident prevention, and road traffic.

NOTICE: 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 unauthorized 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.



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 environmentally 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: EXPOSURE OF BATTERIES TO HIGH MECHANICAL STRESS, HIGH AMBIENT TEMPERATURES OR IMMERSION INTO FLUIDS



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: MECHANICAL INFLUENCES TO BATTERIES

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, please contact your local passenger or freight transport company.



NOTICE: Only IDS GeoRadar authorized technical service are entitled to repair this product.

**WARNING: Short circuit of battery terminals**

Risk of fire, electric shock and damage.

PRECAUTIONS: Do not open the battery housing.

Keep away any metallic or wet objects from the battery terminals.

**WARNING: Short circuit of battery terminals**

If battery terminals are short-circuited e.g., by coming in contact with jewellery, keys, metallised paper or other metals, the battery can overheat and cause injury or fire, for example by storing or transporting in pockets.

PRECAUTIONS: Make sure that the battery terminals do not come into contact with metallic objects.

**WARNING: Battery may get hot after prolonged use.**

Risk of burning injuries.

PRECAUTIONS: Avoid touching the hot battery.

Allow the battery to cool down before removing it.

4 GENERAL DESCRIPTION OF THE HARDWARE

The Stream DP is a GPR system composed of a single antenna (named GPR AE32HV) fixed to a compact and manoeuvrable frame.

Stream DP is designed for high productivity and ease of use: light-weight structure for maximal transportability, hot swap batteries for a non-stop performance and multi-environment hardware configuration (rugged and asphalt)

Stream DP is powered with patented Equalized Scrambled Technology (EsT), which overcomes the traditional limitations in depth penetration of GPR solutions and offers an unmatched performance with the deepest sensing capability ever.

The antenna module emits at different polarizations. The general concept of the Stream DP system is to detect the main underground services along the road or in a terrain, by covering the area to be investigated. For this reason, a double polarization array has been designed, one in transversal polarization (compared to the scan direction) - called HH better suited for metal surface subservices (e.g. gas pipe), and one with a longitudinal polarization - called VV- for plastic surface subservices (plastic pipes have higher RCS in longitudinal polarization than in transverse polarization).

The antenna integrates the radar control unit (FCU Fast Control Unit) that manages all the input and output. It is directly connected to the laptop and powered by two Li-Ion batteries.

The system can be used in two configurations: rugged, mounting four side wheels, suited for difficult terrains; asphalt, in which the back side wheels are pivot wheels.

The controller laptop can be fixed on the rudder, thanks to the generic tablet holder.

Stream DP's antenna height can be adjusted manually from the user through a belts system.

4.1 E.s.T. Equalized scrambled Technology

GPR is a well-known and attractive technology which enables the safe analysis of the underground. Radar Dynamic range is the key feature related to GPR sensitivity to low amplitude signals, coming from weak and deep targets.

Equalized Scrambled Technology performs a hardware equalization that brings out the deeper signal at the same level of shallow targets, extending the dynamic range.

E.s.T. is a patented technology. It allows the full and efficient control of GPR waveform, by exploiting the radiating performance of the antenna. E.s.T. includes a multiple stadium receiver such as shallow and deep reflections are equalized with an optimal multi-gain boost, and then “scrambled” together in a single radar trace.

4.2 System composition and overview

The figures below (from) are showing the two types of wheels available: 4 fixed wheels (Fig. 1), and 2 fixed wheels + 2 pivot wheels (Fig. 2).



Fig. 1 – Stream DP Rugged configuration



Fig. 2 – Stream DP Asphalt configuration

Stream DP dimensions are reported on the following pictures (Fig. 3 and Fig. 4).

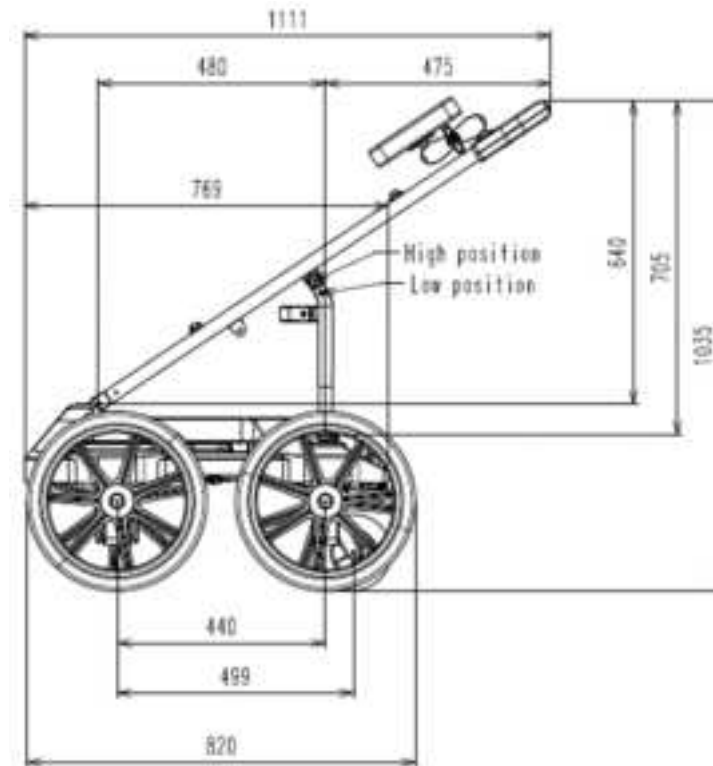


Fig. 3 – Stream DP side view

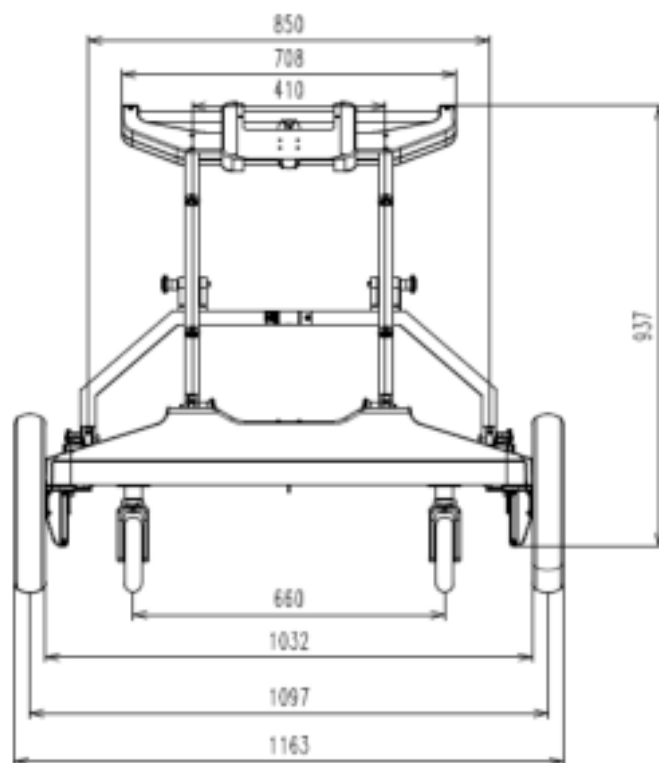


Fig. 4 – Stream DP rear view

4.3 Mechanical structure

The Stream-DP system is composed of the following parts:

- Stream-DP main body (frame, handle, wheels, encoders)
- Antenna module
- Laptop (with uMap data acquisition software)
- Battery
- Battery charger
- GPS support
- Vehicle Towing kit (accessory)

This chapter contains a description of the above-listed parts.

The whole system is shown in Fig. 5.



Fig. 5 - Stream DP overview

The system can be easily disassembled in these sub-components :

- Main frame
- Handle (2 parts)
- Antenna
- Wheels (4 wheels)



Fig. 6 - Stream DP sub-components

Every part of the system weighs less than 20 kg.

4.4 Connection and Ports

GPR AE32HV antenna presents the following ports available on the upper case:

- Two encoder ports (WHEEL): collect distance data from the encoders;
- LAN port: establish a connection with a data logger laptop;
- Secondary LAN port for accessories
- Power out (PWR): enables the power supply on Stream DP accessories
- Synchronism and Positioning (SYNC): transfer PPS and wheel data to an external device, or receive external PPS as input to Stream DP.
- Power-On button: push to switch the system on;
- LED status indicators: system on and batteries status;
- Battery housing: two slots for GEB364 LEICA batteries.



Fig. 7 – Connections and port panel

4.5 Battery

Stream DP is powered by LEICA GEB 364 battery (Fig. 8). It supports hot-swap, to replace one battery without switching off the radar.



Fig. 8 - LEICA GEB364 battery

Battery charger LEICA GKL341 (Fig. 9) LED status:

- While charging, the LED of the battery charger lights up orange.
- When the battery is nearly charged, the LED turns yellow.
- When the battery is fully charged, the LED turns green.



Fig. 9 – LEICA Battery charger GKL341

4.6 Wheel types

The Stream-DP is a four-wheeled system, and the wheels are available in two configurations:

- 2 pivoting wheels (Fig. 10) and 2 fixed wheels (standard Bill of Materials)
- All fixed wheels



Fig. 10 – Pivot vs Fixed wheels

Pivoting wheels are suited for asphalt and flat surfaces, instead, a 4-fixed-wheels system is helpful on uneven ground surfaces. Wheels can be easily changed or replaced by customers.

4.7 Wheel blockage system

A braking system to lock/unlock the system is mounted on the front wheels of the Stream DP, to secure the stop position when the radar is in non-operative mode.

Users can activate the brakes manually, simply moving the lever (Fig. 11).

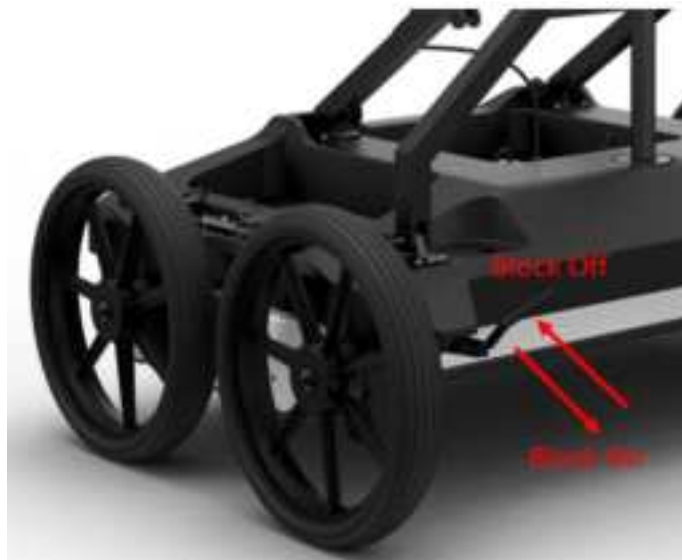


Fig. 11 - How to activate the breakage system



When the Stream DP is not operating, customers must secure the cart by inserting the manual brake.

4.8 Adjustable and removable handle

Stream DP handle is ergonomic and adjustable in two positions.

Two pins fasten the upper part of the handle (Fig. 12): users can easily remove them by pressing the quick-release button, and then, change the position and fix them again.



Fig. 12 - How to adjust handle inclination

Stream DP handle can be also completely removed to facilitate the carriage. Taking out the two inclination pins and the four pins on the main frame (Fig. 13), the handle will be disassembled in two parts.

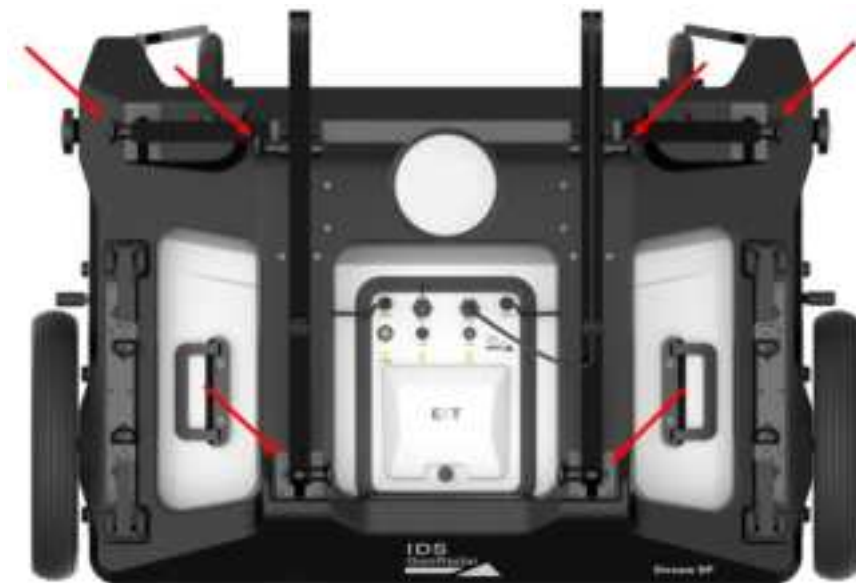


Fig. 13 - Six pins to remove for handle disassembling

4.9 GPS support pole

GPS support pole can be extended up to 2 meters, by unscrewing the plastic bushing (Fig. 14) and pressing the plastic buttons on the pole (Fig. 15).



Fig. 14 - Removing the plastic bushing



Fig. 15 - Plastic lock

The telescopic pole can be inserted into the clamp system and secured with the collar (Fig. 16).



Fig. 16 - Clamp system for GNSS pole

GNSS receiver has to be tightened on the thread (Fig. 17).



Fig. 17 - GPS pole top view

4.10 Data logger specifications

Data logger shall have the following minimum technical features:

- Intel®Core™ i5 Processor.
- Memory 128GB solid-state drive (SSD)
- 8GB RAM
- Monitor 10.1" WUXGA
- USB port
- Bluetooth connection

4.11 Laptop support

The data logger can be fixed directly on the handle: pulling the right part of the support, it's possible to enlarge the width of the tablet enclosure. Then, the user can insert the tablet and release the right part to secure the tablet (Fig. 18).



Fig. 18 - Data logger support

The support includes the tablet cradle to hold the tablet, and two RAM balls (one attached to the cart handles and the other to the cradle). Also, it includes a double socket arm which holds together the RAM balls.

Mount the two RAM balls to attach the tablet to the handle:

- One to the handle top
- The other to the tablet cradle

Use the double socket arm to hold the two RAM balls:

Adjust the tablet cradle until optimal inclination and then tighten the screw on the double socket arm (Fig. 19).



Fig. 19 - How to adjust laptop support

4.12 How the system is delivered and packed

Stream DP components are delivered in a packaging foam on a pallet (Fig. 20).



Fig. 20 - Stream DP packaging



Fig. 21 – Wheel button

2. Place the antenna on a horizontal surface, move the frame over the antenna by fitting the frame in the antenna's inserts
3. Secure the antenna to the lifting system fastening the four hooks
4. Adjust the height from the soil thanks to the lifting system
5. Mount the handle by fixing 6 pins: four short pins on the main frame, two long pins on the central rudder
6. Install the tablet on the support
7. Install GPS pole (optional)
8. Open the battery compartment by loosening the screw, and then insert the battery (up to two) in its compartment.



Fig. 22 - Battery compartment

5 HOW TO ASSEMBLE THE SYSTEM AND SAFETY GUIDELINES

Stream DP can be assembled by a single operator:

1. Fix four wheels on the main body

9. Connect two-wheel cables and turn $\frac{1}{4}$ to fasten (Fig. 23)
10. Connect the LAN cable from the antenna to the tablet port (Fig. 23)



Fig. 23 - Connection overview

11. Turn the system on (Fig. 24)
12. Launch uMap software on the data logger



Fig. 24 - Stream DP operative mode

6 HOW TO SET UP THE STREAM DP IN TRANSPORT MODE

Stream DP can be carried away in two options:

- Folding the handle
- Disassembling the system

6.1 Folding the handle

In order to fold the handle, the user has to remove only the two front pins on the main frame (Fig. 25).



Fig. 25 - How to fold the handle

Now, it's possible to close the rudder (Fig. 26).

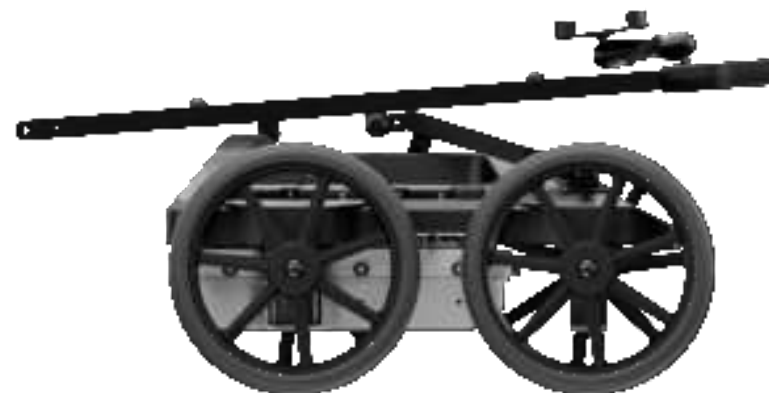


Fig. 26 - Transportation mode

6.2 Disassembling the system

The system can be moved even when it's disassembled.

All the procedures are explained in the paragraph: 5 - HOW TO ASSEMBLE THE SYSTEM AND SAFETY GUIDELINES

There are different slots under the frame to help one or two operators to move the central body.



Fig. 27 - Ergonomic slot (one operator)



Fig. 28 - Ergonomic slots (two operators)

7 CARE AND TRANSPORT

7.1 Cleaning Information

Before cleaning any of the external parts of the apparatus, make sure that all cables and wires have been unplugged, including the power supply cable. If a damp cloth is used, make sure it is not wet, to avoid any damage to the electrical components of the equipment. Wait until the equipment is totally dry before reconnecting the cables.



CAUTION: DAMAGE TO ELECTRICAL COMPONENTS

If a damp cloth is used while cleaning the system or part of it, make sure that this is not wet, to avoid any damage to the electrical components of the equipment

PRECAUTION: Before cleaning any of the external parts of the apparatus, make sure that all cables and wires have been unplugged, including the power supply cable.

The Stream DP should be cleaned periodically using a damp cloth.



NOTICE: If the system is dirty, connectors and encoders may not work properly.

Precautions:

After a field work, check the conditions of the system and clean it if necessary.

Do not use solvents or abrasive detergents.

Do not apply liquid directly to the electrical contacts of the various connectors.

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



CAUTION: DAMAGE TO ELECTRICAL COMPONENTS

Flammable spray could damage the electronic devices, as controller laptop.

PRECAUTION: Verify if the cleaning products are compliant with electronic devices.

7.2 Battery Removal Information

Laptop Batteries: for the battery removal instruction, please do refer to the PC user's manual.

7.3 Periodical Check

The Operator should periodically check the status of the antenna sledge, shells, all cables, and tires, any rotating part, and any (potentially) consumable part. The system must not be used in case of any malfunctioning or broken part, as this may cause other parts to be damaged and/or malfunction consequently.



NOTICE: The Sledges should be periodically checked out to verify their status, and should be removed and replaced, when needed. Prior starting any survey, the status of the sledge should be verified for integrity.

Precautions:

If the antenna shell is exposed, even partially, because of the sledge being consumed, the sledge must be replaced immediately.



NOTICE: All the cables and connectors should be verified at each use of the system

Precautions:

In case of any damage, remove and replace it.



NOTICE: The protective shells should be periodically checked out to verify if damages occurred.

Precautions:

In case of broken/damaged shells, they must be removed and replaced.



NOTICE: The tires should be verified at each use of the system in order to check out whether their internal pressure (this must be compatible with the pressure value indicated on top of the wheel) and their consumption (the wheels should not be smoothed by consumption) are compatible with a safe use of the system.

Precautions:

In case of any deviation from the above either, inflate the tires and/or replace it, as deemed.



NOTICE: All the connectors on top of the SCU, the antennas, the accessories, must be plugged at any time either by the corresponding cable plug, or by the connector cap, when not in use. This is to prevent dust or water ingress, that may damage the connector itself and its functionality.

Precautions:

Verify the connectors status before running a survey.

7.4 Transport of the system

When neither in Operation mode or in Transport mode, the system should always be transported and/or shipped by using the flight case with which the system is delivered (see par. 4.12). Transporting and/or shipping the system outside this packaging or by using other shipping boxes may cause the system, or part of it, to be damaged.



CAUTION: MECHANICAL DAMAGE OF THE SYSTEM

Transporting and/or shipping the system outside its original packaging or by using other shipping boxes may cause the system, or part of it, to be damaged.

PRECAUTION: The system should always be transported and/or shipped by using the flight case with which the system is delivered.

APPENDIX A DISCLAIMER

1. General

- i. The present Disclaimer applies to all products designed, produced and distributed by IDS GeoRadar S.r.l., its Subsidiaries, Affiliated and authorized Distributors (the “Products”). IDS GeoRadar S.r.l. 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 S.r.l.
- 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. User/Buyer hereby consents to the exclusive jurisdiction of Pisa.

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

- i. The User/Buyer, for setting-up and using the Products, shall consult the official documentation provided by IDS GeoRadar S.r.l. 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 S.r.l. 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. Buyer/User further 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 S.r.l. harmless against any liability (including attorney’s fees) for non-compliance with the terms of this article.
- That, if IDS GeoRadar S.r.l. requires that Buyer/User shall carry out a training with reference to some Product categories, no operation or use of the Products shall be started before its designated Operator/s has got the User Certificate, as defined by IDS GeoRadar S.r.l. 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”, e.g. the IBIS Products and Hydra Products, User shall be aware that the results provided by these “Tools” may be not error 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 S.r.l. 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”.

3. Disclaimer for the “Use” of the Products.

- i. The User shall follow the instructions provided by IDS GeoRadar S.r.l. 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 S.r.l. 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, including but not limited to the following main aspects:

- a. Use of IDS GeoRadar S.r.l. 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 S.r.l.;
- 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 not in compliance with the required specifications of IDS GeoRadar S.r.l. not expressly authorized by IDS GeoRadar S.r.l.;
- f. Poor or faulty operation of the electrical and telecommunication networks not directly managed by IDS GeoRadar S.r.l. or its delegates.
- g. Poor or faulty operation Software/Hardware of the third parties connected with IDS GeoRadar S.r.l. 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 S.r.l.

APPENDIX B TECHNICAL SPECIFICATIONS

| Stream DP | |
|-------------------------------------|--|
| TECHNICAL SPECIFICATIONS | |
| Sensor Frequency | 600MHz |
| Weight | 42Kg |
| Stream DP System Size | 116X82 cm |
| Scan Width | 83 cm |
| Number of channels | 30 (19VV-11HH) |
| Power Consumption | Acquisition:19W; Stand-by:15W |
| Max Operating Time | 8H (can be extended by hot swap capability) |
| Environmental | IP65 |
| Max Acquisition Speed | 14km/h (8.7 mph) |
| Positioning | Integrated Encoder and PPS; external GPS and TPS |
| Certificaton | EC, FCC, IC, UKCA |
| Recommended Laptop | Panasonic FZ-G2 |
| SOFTWARE SPECIFICATIONS | |
| uMap Acquisition Software | Automatic calibration for an easy and quick start-up Visualization and storage of antenna array data set (30 channels) Real-time visualization of radar tomography (time slices) |

| | |
|--------------------------------------|---|
| | Connection with NMEA positioning device Multilanguage support Metric and Imperial units |
| IQMaps Processing Software | Advanced 3D processing software with a direct export link to AutoCAD |

APPENDIX C CONFORMITY TO EUROPEAN and UK REGULATIONS

EC DECLARATION OF CONFORMITY

We,

IDS Georadar s.r.l.

via A. Righi, 6, 6 A, 8, 56121 PISA, ITALY

declare under our sole responsibility that the product

Ground Penetrating Radar (GPR)

Model No(s): AE32HV

To which this declaration relates, is in conformity with the essential requirements of

2014/53/EU Directive (RED)

The product(s) has been tested according to the following standards or technical specifications:

| Essential requirements | Standard |
|---|--|
| Essential requirements for the protection of the health and safety of people, pets and goods, Article 3.1a) | - Assessment for conformity to Art. 3.1a (Safety) - Assessment for conformity to Art. 3.1a (Health) |
| Essential requirements on electromagnetic compatibility levels, Article 3.1b) | ETSI EN 301 489-33 V2.2.1 (2019-04) ETSI EN 301 489-1 V2.2.3 (2019-11) |
| Essential requirements for the effective use of radio spectrum, Article 3.2 | ETSI EN 302 066 V2.2.1 (2020-06) ETSI TS 103 361 V1.1.1(2016-03) |

Issued on: 2022, July the 25th

(Signature):



(Printed Name): Guido Manacorda

(Title): R&D Manager

UKCA DECLARATION OF CONFORMITY

We,

IDS Georadar s.r.l.

via A. Righi, 6, 6 A, 8, 56121 PISA, ITALY

declare under our sole responsibility that the product

Ground Penetrating Radar (GPR)

Model No(s): AE32HV

To which this declaration relates is in conformity with the relevant legislation of United Kingdom:

UK SI 2017 No. 1206 The Radio Equipment Regulation 2017

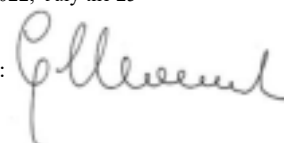
The following BSI standards and technical specifications have been applied:

standard(s) or other normative document(s)

| Essential requirements | Standard |
|---|--|
| Radio Testing (UK Part 2 Chapter 1(6)(2)) | ETSI EN 302 066 V2.2.1 (2020-06) ETSI TS 103 361 V1.1.1(2016-03) |
| EMC testing (UK Part 2 Chapter 1(6)(1)(b)) | ETSI EN 301 489-33 V2.2.1 (2019-04) ETSI EN 301 489-1 V2.2.3 (2019-11) |
| Safety testing (UK Part 2 Chapter 1(6)(1)(a)) | - Assessment for conformity to UK Part 2 Chapter 1(6)(1)(a) (Safety) - Assessment for conformity to UK Part 2 Chapter 1(6)(1)(a) (Health) |

Issued on: 2022, July the 25th

(Signature):



(Printed Name): Guido Manacorda

(Title): R&D Manager

APPENDIX D IMPORTANT NOTE FOR US CUSTOMERS

FCC ID: UFW-AE32HV

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

(c) The manufacturers, or their authorized sales agents, must inform purchasers and users of their systems of the requirement to undertake detailed coordination of operational areas with the FCC prior to the equipment being operated.

(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

This device devices may not be employed for the operation of toys. Operation onboard an aircraft, a ship or a satellite is prohibited.

APPENDIX E IMPORTANT NOTES FOR CANADIAN CUSTOMERS

IMPORTANT NOTE FOR THE CANADIAN CUSTOMERS

IC Certification Number: **8991A-AE32HV**

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.

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s).

Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

NOTE IMPORTANTE POUR LES UTILISATEURS CANADIENS

Numéro de certification : **8991A-AE32HV**

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.

Cet appareil contient des émetteurs/récepteurs exempts de licence qui sont conformes aux RSS(s) exempts de licence d'Innovation, Sciences et Développement économique Canada. L'exploitation est soumise aux deux conditions suivantes :

1. Cet appareil ne peut pas causer d'interférence.
2. Cet appareil doit accepter toute interférence, y compris les interférences qui peuvent provoquer un fonctionnement indésirable de l'appareil.

APPENDIX F CONTACTS

The IDS GeoRadar Support team is available to answer any question about:

- general enquiries
- request of advertising material
- technical issues
- As well as listening to your suggestions too.

Please, feel free to contact us at:



IDS GeoRadar S.r.l.

via Augusto Righi, 6/6A/8
Ospedaletto - 56121
Pisa, Italy



(39) 050 8934 122



support.geo@idsgeoradar.com