

SUBvysor-37

Ground Penetrating Radar



Part 1.
Equipment
User Manual

Novatest

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All pictures in this User Manual are given for reference purpose only, and may differ from actual product appearance.
Product design and specification may be changed by manufacturer without notification.

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FCC Notice (for U.S. Customers)

This device complies with part 15F 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, construction companies and private parties operating on behalf of these groups. Operation by any other party is a violation of 47 U.S.C. § 301 and could subject the operator to serious legal penalties.

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

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.

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

For U.S. Customers

GROUND PENETRATING RADAR COORDINATION NOTICE AND EQUIPMENT REGISTRATION

Note: This form is only for Domestic United States users. The Federal Communications Commission (FCC) requires that all users of GPR who purchased antennas after July 15th, 2002 register their equipment and areas of operation. It is required that you fill out this form and fax or mail to the FCC.

Failure to do this is a violation of Federal law.

1. Date:

2. Company name:

3. Address:

4. Contact Information [contact name and phone number]:

5. Area Of Operation [state(s)]:

6. Equipment Identification:

Brand Name: Novatest S.r.l.

Antenna Model No. (center frequency): List all antennas being registered.

Cascade	Frequency	FCC ID

7. Receipt Date Of Equipment:

Mail to: info@novatest.it

General information

SUBvysor-37. NEW GENERATION OF GROUND PENETRATING RADARS

Ground Penetrating Radar (GPR) is designed for non-destructive scanning and inspecting of different structures and underground objects.

GPR can be applied by geophysicists, building companies, can be used in different ecological investigations, utilities condition assessment (including both metallic and non-metallic, plastic, concrete, asbestos pipes). Also the equipment can be used for searching and mapping of: underground water sources leaks, oil and other dangerous liquids underground pollutions; ground water level.

SUBvysor-37 Ground Penetrating Radar (GPR) has Dual Frequency antenna with central frequencies of 300 MHz and 700 MHz.

This GPR combines the best features from both antennas: big depth penetrating and high resolution.

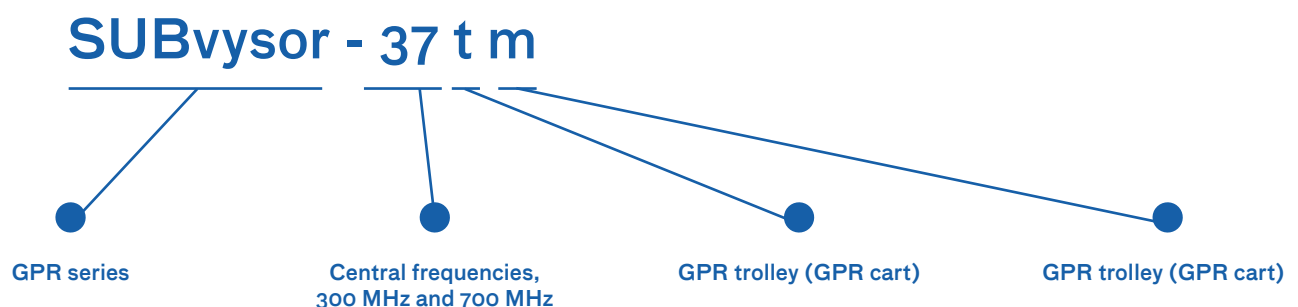
SUBvysor-37 GPR allows user to reach depth of up to 8 meters in certain conditions.

Application of SUBvysor series GPR

- Utilities mapping and detection (pipes, cables);
- Civil engineering surveys (building basements, cellars etc.);
- Search for buried waste products, and graves;
- Mapping and location of near surface voids, karst and other cavities;
- Determination of boundaries of petroleum contamination zones etc.
- Archaeology
- Forensic and security investigations.

PACKAGE OPTIONS

Order information



SUBvysor-37 GPR can be ordered with three different options sets:

SUBvysor-37t. Handcart version

- 300 & 700 MHz antenna unit
- Cart-46 Foldable Handcart
- SH5-300 Replaceable bottom protector
- DC5-1 Cable (1.5m)
- Charger
- Backpack
- User manual

SUBvysor-37m. Manual version

- 300 & 700 MHz antenna unit
- Odometer VO-22
- SH5-300 Replaceable bottom protector
- Transportation pole
- DC5-2 Cable (2.5m)
- Charger
- Battery Box
- Backpack
- Laptop holder • User manual

SUBvysor-37tm. Full version

- 300 & 700 MHz antenna unit
- Cart-46 Foldable Handcart
- Odometer VO-22
- SH5-300 Replaceable bottom protector
- Transportation pole
- DC5-2 Cable (2.5m)
- DP5 Cable
- Battery Box
- Backpack
- Laptop holder
- User manual

Laptop is not included in any GPR set and should be purchased separately

List of Equipment and Accessories

Item	View	Description
AB5-37		300&700 MHz dual frequency antenna unit with digital output, battery on board. Built-in inclinometers. Supports optional connection of GPS and measuring wheels.
Cart-46		GPR Handcart with bidirectional measuring wheel. Contains battery on board*. Designed to be used with SUBvysor-37, SUBvysor-300, SUBvysor-600 GPR *In case of Handcart version of SUBvysor-37, by default the battery is located inside Handcart's compartment.
Battery Box		Battery Box that contains a battery for supplying an antenna unit. Included in a manual version of GPR.
Laptop holder		Laptop holder, designed for fastening the laptop to the operator's backpack.
VO-22		VO-22 is a bidirectional odometer (measuring wheel) that measures traveled distance in both directions. Odometer can be mounted to an antenna unit and should be electrically connected to the antenna by special connector. Compatible with SUBvysor-125, SUBvysor-37, SUBvysor-300, SUBvysor-600 GPR
GPR Transportation pole		The pole for transportation of antenna forward and backward. Can be easily mounted to antenna. Designed to be used with SUBvysor-37, SUBvysor-300, SUBvysor-600 GPR
SH5-300		Protective bottom cover SH5-300, compatible with AB5-37 antenna unit.
Backpack		The backpack for GPR antenna, accessories, laptop, and Battery Box.
DC5-1 Cable		Cable (1.5 m length) to connect DATA socket on the Handcart or Battery Box to a laptop.
DC5-2 Cable		Cable (2.5 m length) to connect DATA socket on the Handcart or Battery Box to a laptop.
DP5 Cable		Cable (2.5 m length) to transfer GPR data between Battery Box and AB5-37 antenna unit.
Charger		Charger for lead acid batteries. Included in all GPR sets.
Transportation Case		Transportation case for Cart-46 with AB5-37 or AB5-300 antenna units. Can be ordered optionally
GPS receiver		External GPS receiver. GPS kit includes: <ul style="list-style-type: none"> • GPS receiver • GPR cable • GPR adapter (10cm)
GPR Logger Mapper 3D		Software package for SUBvysor GPR sounding process control, and also for processing and visualizing GPR data. Full software set can be downloaded for free here: https://www.novatest.it/geophysics/gpr-logger-mapper-3d/

Main components description

GPR consists of antenna unit connected via USB to a computer (laptop). Operator controls antenna unit through SUBvysor software.

Optionally user can use with GPR antenna:

- Cart-46 GPR Handcart with bidirectional odometer
- VO-22 bidirectional odometer
- GPS receiver

Handcart version

Picture below shows the general view of the version of SUBvysor-37 GPR with Cart-46 Handcart.

The antenna unit is suspended under the Handcart on ropes. Laptop should be placed on Handcart laptop holder.

We recommend to stick Velcro tape to the bottom of a laptop and a laptop holder to not let laptop drop.

The antenna should be connected to the Handcart via EXT Handcart cable (built on the Handcart). Then DATA socket on the Handcart should be connected to USB port of operator's laptop via DC5-1 Cable.

Handcart odometer should be connected to Odometer socket on the antenna via Handcart Odometer cable (built on the Handcart).

Bidirectional odometer is built into the right rear wheel of the Handcart.

If GPS is present, it should be connected to GPS socket on the antenna.

Antenna unit with Cart-46 Handcart



Manual version

Picture below shows general view of the manual version of SUBvysor-37 GPR with VO-22 odometer and a transportation pole.

In this case the battery is placed in the Battery Box to make the antenna unit lighter. The Battery Box can be carried inside the operator's backpack.

Laptop can be placed on the laptop shelf that should be fastened to operator's backpack.

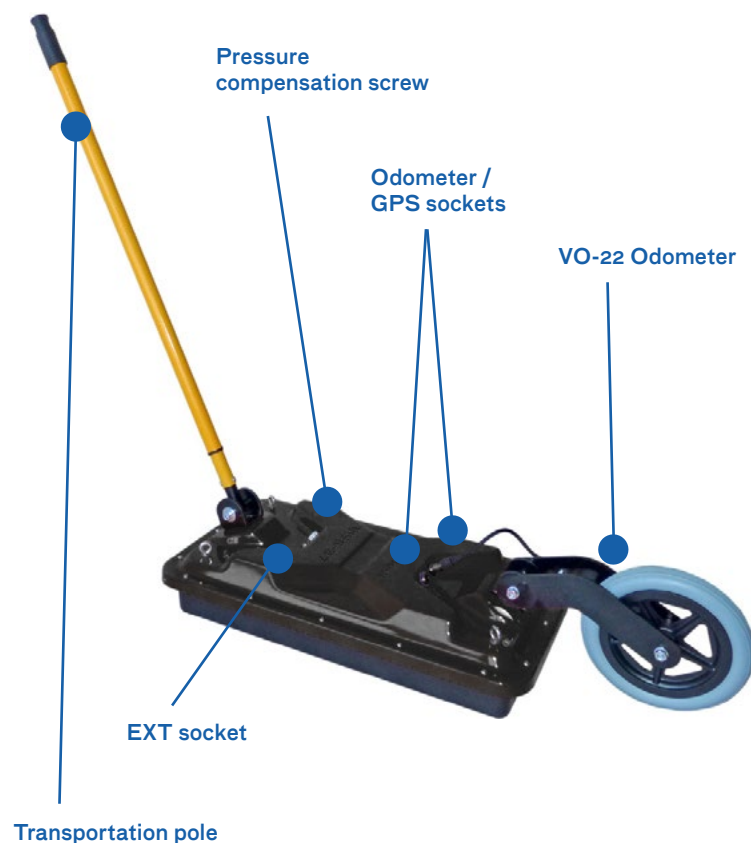
The antenna should be connected to the Battery Box via DP5 Cable.

DC5-2 Cable should be connected to DATA socket on the Battery Box and to USB port of operator's laptop.

Odometer should be connected to Odometer socket on the antenna unit.

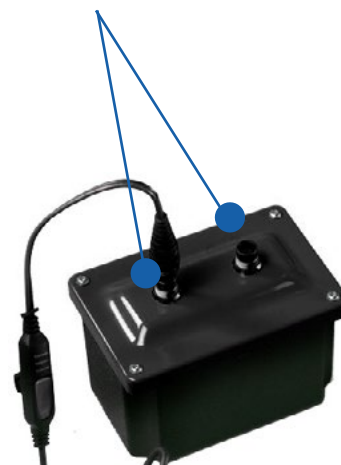
If GPS is present, it should be connected to GPS socket on the antenna unit.

Antenna unit with odometer and transportation pole



Battery unit

DATA / DATA sockets



VO-22 Measuring wheel (odometer)

VO-22 is a bidirectional measuring wheel (odometer) that can be mounted on the antenna unit in manual version of this GPR. It can be mounted to the antenna unit without any extra tools.



Cart-46 Handcart

Cart-46 is GPR Handcart that is designed to carry either AB5-37, AB5-300 or AB5-600 antenna units. It can be folded and deployed easily and within very short time. The Handcart's parts and laptop holder can be fixed with a help of eccentric clamps.

The Handcart contains battery compartment, so user can use it to place GPR battery while carrying antenna on board.

Also the Handcart has its own cables to connect odometer to antenna and to connect EXT socket of antenna to the Handcart's EXT socket.

DC5-1 Cable should be directly connected to antenna's Data socket that is located on antenna's body.

Cart-46 Handcart deployed



Cart-46 folded



Transportation pole

The transportation pole is a special handle that should be mounted to the antenna unit to move antenna forward and backward during data acquisition process.



Backpack for GPR accessories and laptop shelf

The backpack is included in each GPR set. The laptop shelf is an accessory that should be used as a support for user's laptop. The shelf can be fastened to the backpack.

Backpack with laptop



Laptop shelf



The backpack contains compartments for:

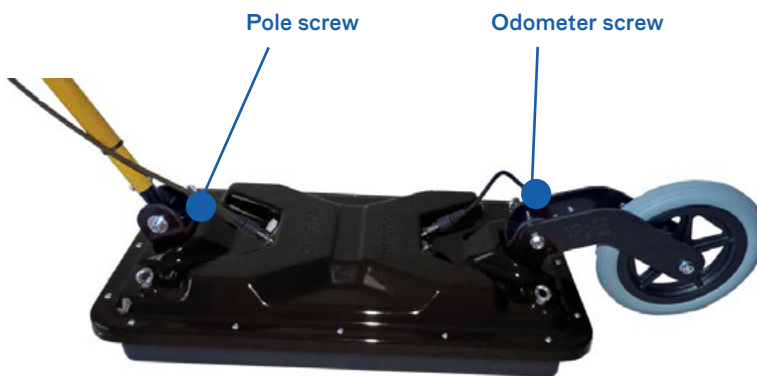
- GPR accessories (cables, charger, transport belt etc.)
- Odometer VO-22
- User's laptop
- Laptop shelf
- Battery Box

Getting Started

MANUAL VERSION OF SUBvysor-37 GPR

Mounting Transportation pole and Odometer to antenna unit

Mount transportation pole and odometer to the antenna unit and screw them manually.



Connect the cable of odometer to antenna socket.

Push-pull connectors

To connect push-pull connectors you should open cap then match together the white marks on a plug and a socket correspondingly and then insert the plug by holding its housing.



To disconnect - just pull the plug ring back and disconnect it.

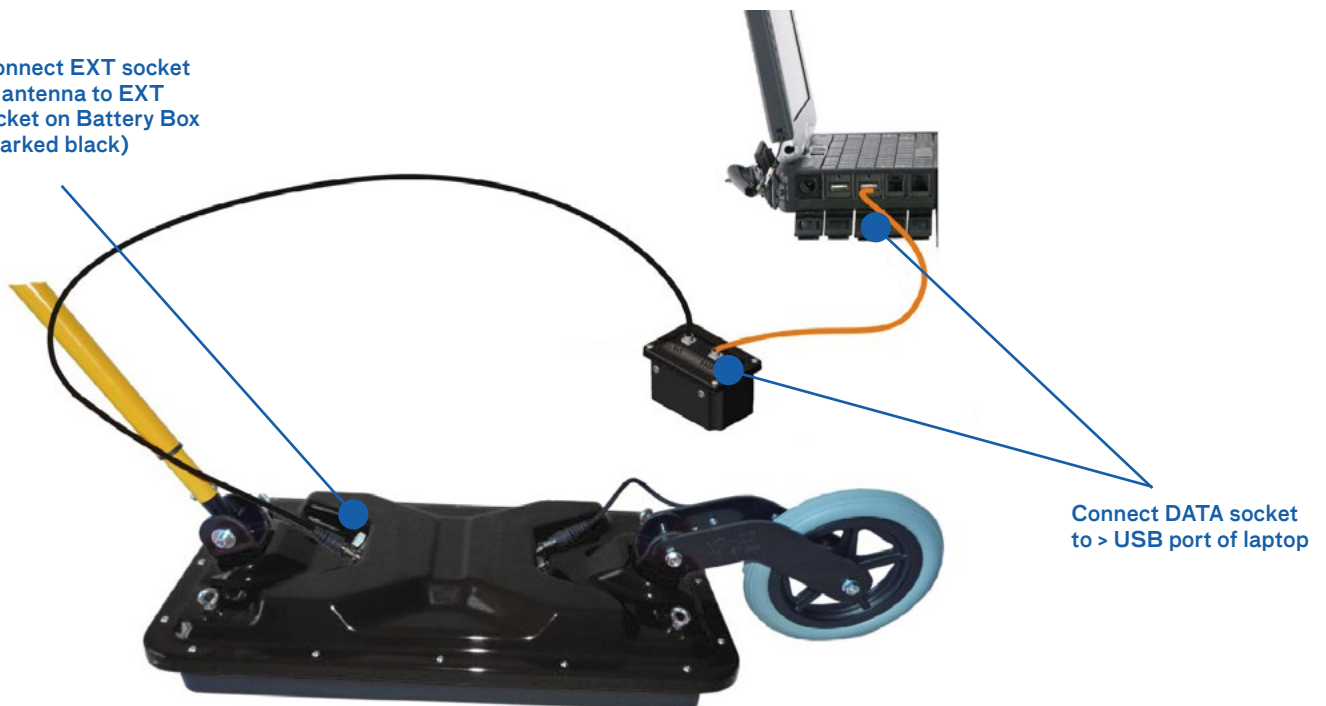


GPR power supply is turning on when DATA socket is connected to the socket

Do not pull the cable trying disconnect the plug. It may damage the connectors!

Connecting antenna unit to a laptop

Connect EXT socket
on antenna to EXT
socket on Battery Box
(marked black)



Connect DP5 Cable (black cable) to EXT socket on antenna unit and to EXT socket on the Battery case.
Connect DC5-2 Cable (orange cable) to DATA socket on the Battery Box and to USB port of a laptop.

HANDCART VERSION OF SUBvysor-37 GPR

In Handcart version the antenna unit is installed into the Cart-46 Handcart.



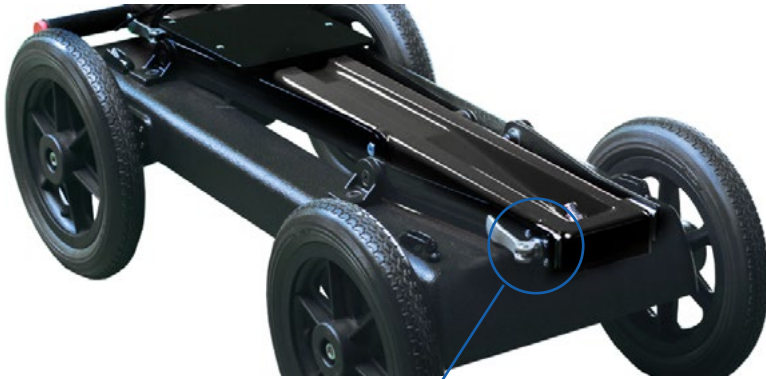
Cart-46 Handcart

Foldable Cart-46 Handcart was created to carry an antenna unit during survey. The Cart-46 can be used either with SUBvysor-37, SUBvysor-600, or SUBvysor-300 antenna units.

Before operating you should unfold Cart-46 to the working position.

DEPLOYING CART-46 HANDCART

To unfold the Handcart you should loose an eccentric clamp and unfold the Handcart. Then fix the clamp back.



Eccentric Clamp

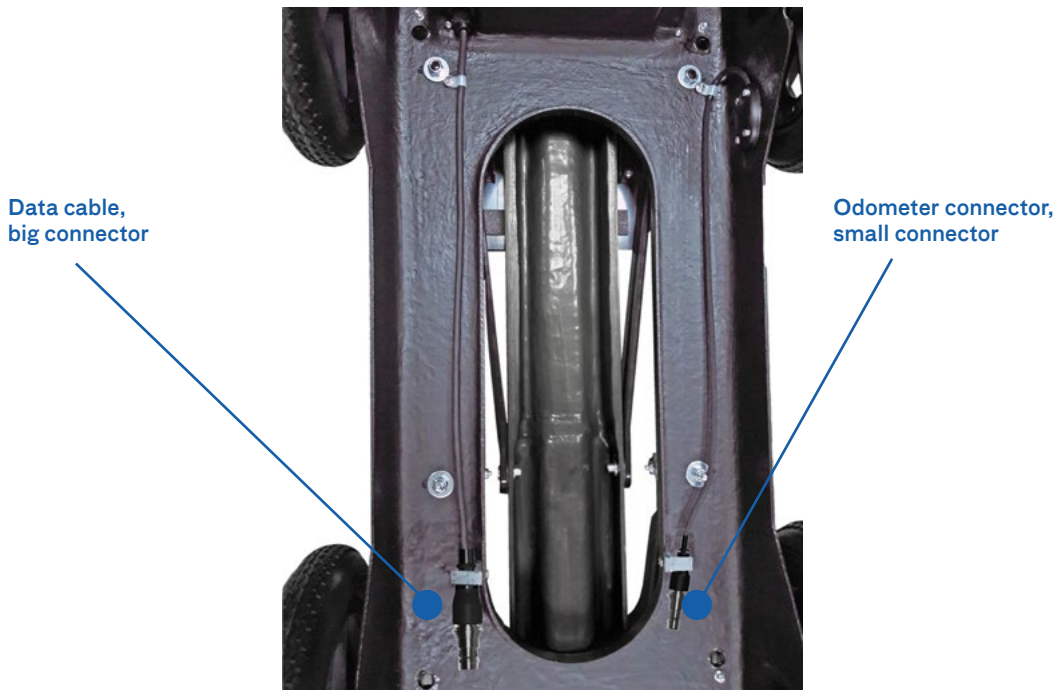
Cart-46 Handcart in unfolded position



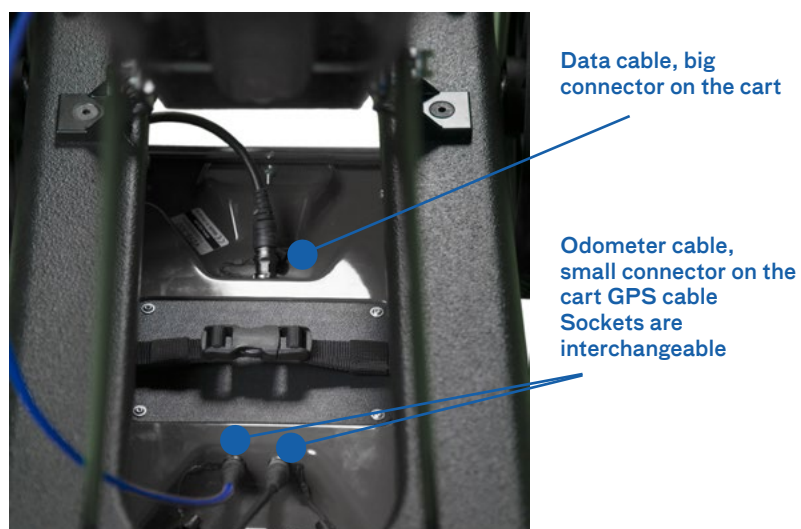
The same way you should loose the eccentric clamp of laptop holder and set it in the position that is the most convenient for work. Then fix the eccentric clamp back.

We recommend to use Velcro tape to fix a laptop to the laptop holder. You can stick some tape on the bottom of your laptop and another part of the tape - on the laptop holder.

PLUGGING CONNECTORS



- Odometer connector and DATA connectors are clamped to the bottom of Cart-46.
- You should take them out from their holders.
- Connect big connector forward socket on antenna unit.



Connect small connector to odometer socket on antenna unit.
There are two identical small sockets for GPS and odometer. You can connect either GPS or odometer to any of these sockets.
Color of Handcart's cables may differ from the ones on the pictures

- Connect DC5-1 Cable to Data socket on the body of Handcart



- Connect another end of the DC5-1 Cable to USB port of your laptop

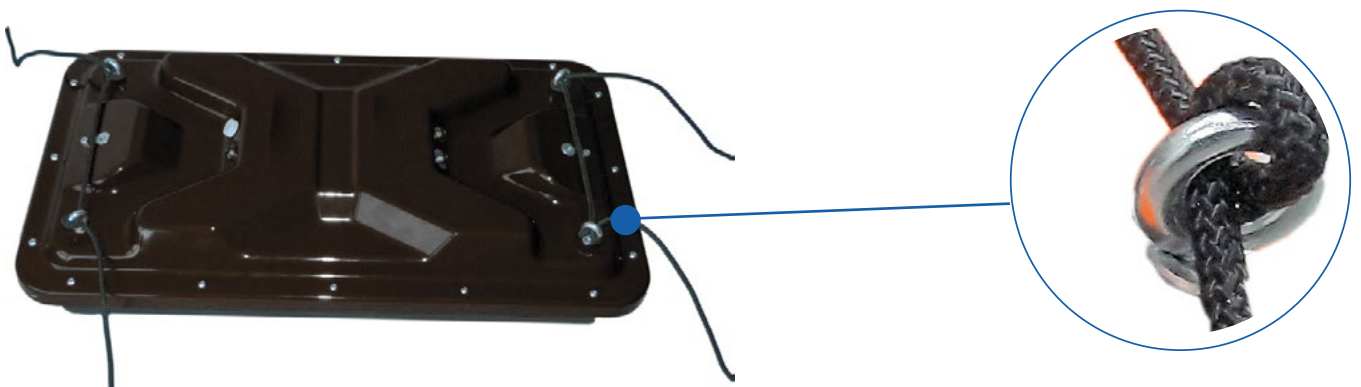
FOLDING CART-46 BACK TO TRANSPORT POSITION

To fold the Cart-46 back to transport position you should perform all described above in a reverse way.

You can either take an antenna out of the Handcart, or fold the Handcart together with the antenna.

MOUNTING THE ANTENNA UNIT ON THE CART-46 HANDCART

- Place the antenna unit on a ground and insert mounting ropes into antenna's mounting rings:



We recommend to make a loop on the rope around the ring to secure it there.

Place antenna under the Handcart.

From the bottom of the Handcart insert 4 ends of the rope into fastening slots on the Handcart:



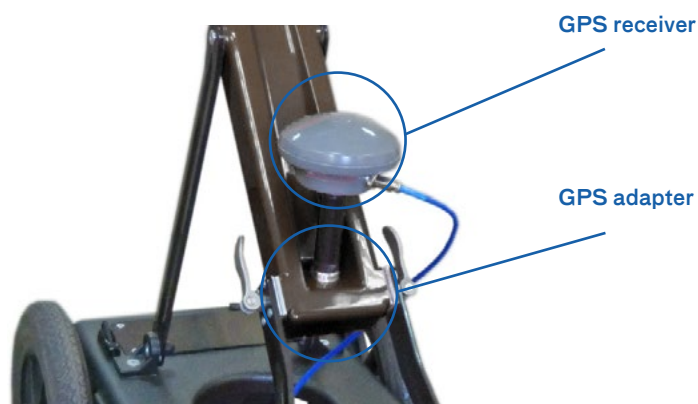
Adjust ropes the way that the bottom of the antenna almost touches the ground:



You need just tighten the rope into the slots. It will be fixed that way. The bottom of the antenna should be parallel to ground.

MOUNTING GPS RECEIVER ON CART-46

GPS receiver can be used optionally and should be mounted on Cart-46 via GPS adapter.



Connect GPS cable to GPS receiver and to GPS socket on antenna. More detailed description of antenna's sockets you can find in "Manual version" on page 10.

MOUNTING THE LAPTOP SHELF ON THE OPERATOR'S BACKPACK

If GPR is used together with VO-22 odometer, the laptop should be mounted on the special portable shelf that should be fastened to the operator's backpack.

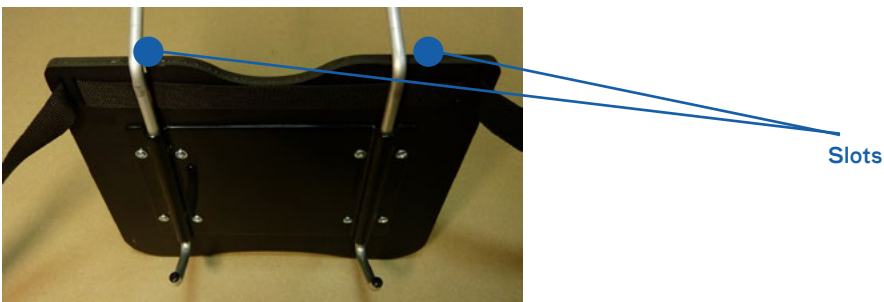


To mount the laptop shelf follow the next steps:

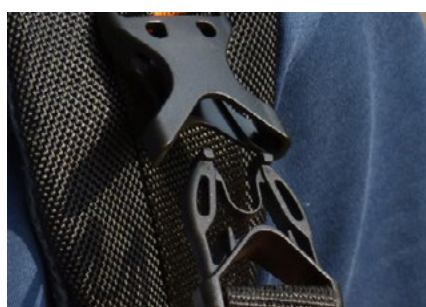
- Take the laptop folder out of the backpack.
- Stick the Velcro tape on the top of Handcart shelf and on the laptop bottom in some places (the Velcro tape is included in GPR set).
- Turn the shelf over and pull out the metallic holders (in direction shown by an arrow below).



- Turn the metallic holders 90 degree aside and put them into slots as shown on the picture below.



- Put the backpack on, adjust the backpack side stripes and fasten the backpack belt.
- Fasten operator's shelf locks to the corresponding locks on the backpack stripes.



- Tuck the lower holders of the shelf behind the operator's backpack belt.



- Mount the laptop on the shelf, fastening it on the shelf with Velcro tape.



- When the work is finished, fold the shelf in the back order and pack it to the backpack.



GPR PARAMETERS SETTING AND GPR CALIBRATION

Please read **User Manual part 2. Software** to find instructions about setting up all the main GPR parameters, its calibration and directions of using GPR Logger and Mapper 3D software.

GPR battery

Each antenna unit is equipped with the sealed lead acid rechargeable battery (12 V, 7 Ah). The power supply of the antenna unit prevents the deep discharge of the battery. The battery charge level is indicated in the Status bar of the Main window of the GPR Logger software the battery.



When the battery voltage is low and close to the critical value, the power supply begins beeping. When the battery voltage is below the cut-off threshold (10.8V) the power supply will turn the antenna unit off but beep sound will continue ringing twice per second. That indicates the normal state of GPR and the necessity of battery charging.

For battery charging use the charger that is included in GPR set.

Charging battery of GPR SUBvysor-37

For charging the battery of GPR SUBvysor-37 you should connect the charger plug into DATA socket that is located on the Handcart (or into DATA socket on a Battery Box if connected), and then plug the charger to the AC power (220-240V AC, 50-60 Hz).

Charging battery with antenna installed on the Handcart.
The battery is inside the battery compartment in the Handcart.



To 220-240 AC

Charging battery with antenna outside of Handcart.
The battery is in the Battery Box: To



Connect adapter to the any socket on Battery Box.
To get more information please read the charger User manual that is in the charger set.

Battery replacement

All models of GPR use the same standard sealed lead acid rechargeable battery (12 V, 7 Ah).

If you notice the Charger error light is on during the charging process, it means that your battery must be replaced for the new one.

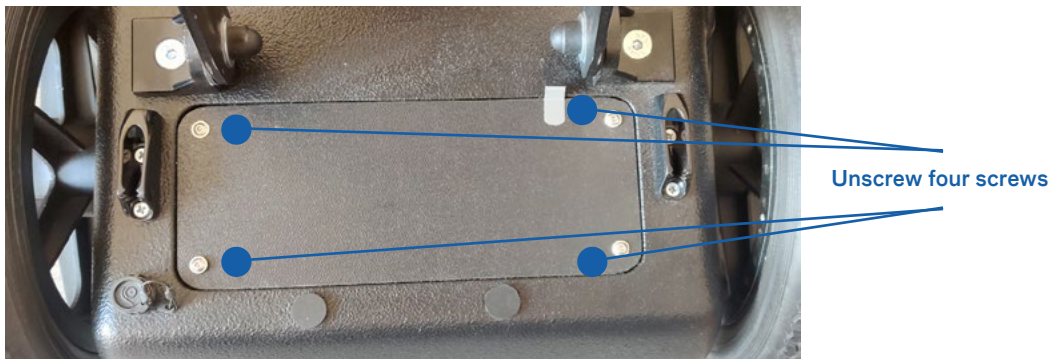


To get more information please read the charger User manual that is in the charger set.

Replace battery in Cart-46

To replace the battery in the battery compartment of the Handcart:

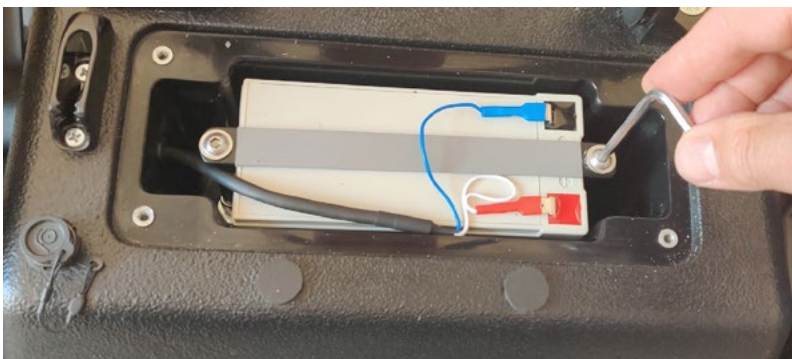
- Unscrew 4 screws on the Battery compartment cover and take the cover off the battery compartment.



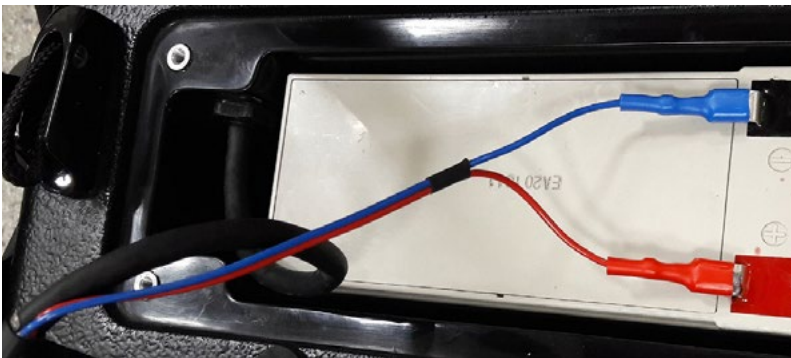
- Use tool from the set of cart
- Remove the cover of battery compartment



- Unscrew two screws using tool from cart set



- Remove fastening bar and unplug connection terminals from the battery



- Take the battery out
- Replace it respecting wires polarity

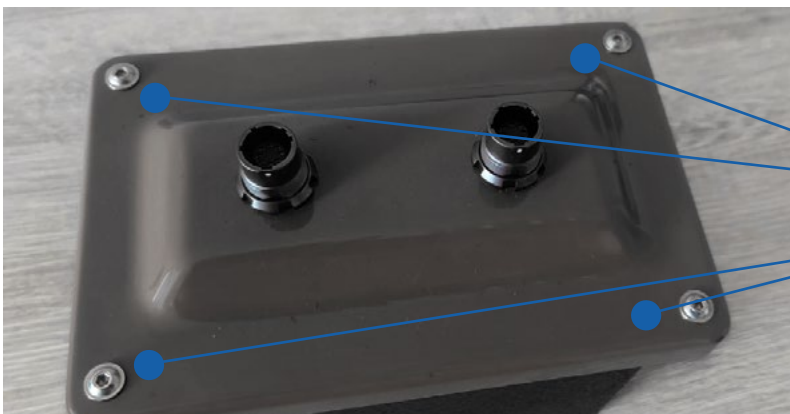
Connecting the wires to battery, respect the polarity (red wire - battery positive pad, blue - negative pad).

- Mount the fastening bar, fix it with two screws than mount the battery cover back on its place, fix it with four screws.

Replace battery in Battery Box

To replace the battery in the Battery Box:

- Unscrew four screws on the Battery Box cover



Unscrew four screws

- Use the tool from GPR set



- Take the cover off the battery compartment.



- Take the battery out
- Replace it respecting wires polarity

Connecting the wires to battery, respect the polarity (red wire - battery positive pad, blue – negative pad).

- Mount the Battery Box cover back on its place, fix it with four screws.

Specifications

Each antenna unit is equipped with the sealed lead acid rechargeable battery (12 V, 7 Ah). The power supply of the antenna unit prevents the deep discharge of the battery. The battery charge level is indicated in the Status bar of the Main window of the GPR Logger software the battery.

Model of GPR	SUBvysor-37
Antenna unit, MHz	300 & 700
Max sounding depth, meters (depending on soil properties)	8.0
Survey window, nsec	30...75 nsec / 66...166 nsec
Spatial resolution, meters, (not worse)	<0.1 m (700 MHz) <0.3 m (300 MHz)
Maximum number of samples per trace	1000
Data acquisition rate, traces per second*	Up to 150
Dynamic range	Not less than 135 dB
Interface	USB2
Trigger mode	Single, internal, external
Analogue-to-Digital Converter range	18 bit
Three-dimensional Inclinometer	Built-in
Weight of antenna, kg	6
Weight antenna with cart, kg	20,5
Dimensions of antenna, L x W x H	550 x 310 x 170 mm
Dimensions of cart, working mode L x W x H	900 x 460 x 1050 mm
Dimensions of cart, folding mode L x W x H	900 x 460 x 300 mm
Operating temperature range	-20°C to 40°C
Environmental rating	IP65**
Continuous operation time	Not less than 8 hours

* Data acquisition rate depends on samples per trace and trace stacking.

** Optionally can be IP67

All antennas support external GPS that can be directly connected to antenna

Limited Warranty

1. Warranty

Novatest S.r.l. warrants the enclosed hardware products to be free from defects in material and workmanship for a period of 12 (twelve months) from the date of original retail purchase.

2. Repair Procedures, Exclusive Remedy

Novatest S.r.l. will, at its option, repair or replace products not conforming to this limited warranty at no charge. This is the sole and exclusive remedy available for breach of warranty or under any other legal theory with respect to Novatest S.r.l. product. If you find a product to be defective, please contact your authorized Novatest S.r.l. representative or directly to head office of Novatest S.r.l.. When you receive authorization, return the product as directed, including proof of purchase and date, at your expense and risk. Product repairs not covered by warranty, and product updates, will be provided at a set rate.

3. Limitations

This warranty is to be avoided if the product is damaged by importer or abnormal use or by accident, if the product is altered or modified in any way, or if any attempt is made to repair the product without authorization from Novatest S.r.l.. It is solely the purchaser's responsibility to determine the suitability of these products for each particular application. Novatest S.r.l. products are in all events not suitable, and are not authorized, for use with systems potentially injurious to life or health. This warranty is not assignable.

4. No Other Warranties

Except as provided in this limited warranty. Novatest S.r.l. hardware is provided 'as is'. All other warranties and representations, oral or written, express or implied, including but not limited to any implied warranties of merchantability or fitness for a particular purpose, are excluded and do not apply, there are no warranties which extend beyond the description of the face hereof. Except as required by law, no representative, agent, or employee of Novatest S.r.l. is authorized to make warranties, representations, or obligations inconsistent with or in addition to those set forth in this limited warranty. Novatest S.r.l. does not warrant for the contents and services of other sites, which you may access from hyperlinks on Novatest S.r.l. websites, Novatest S.r.l. installation cd or any material.

5. No Damages

In no event will Novatest S.r.l. be liable for direct, indirect, special, incidental, or consequential, damages resulting from any breach of warranty or under any other theory, even if advised of the possibility of such damages. In event Novatest S.r.l. be liable for sums in excess of the purchase price of the product. Novatest S.r.l. is thus not liable for lost profits or goodwill; downtime; damage or destruction of any program, data, equipment, or other property; cost of recovering, reprogramming, or reproducing any program, data, or equipment; personal injury or loss; or any other damages.

6. General

This agreement is the entire agreement between you and Novatest S.r.l.; supersedes any prior or different agreements, representations, or proposals; and may be changed only by written agreement with Novatest S.r.l. . Waiver by any default or breach of this agreement will not constitute a waiver of any subsequent default or breach of the same or different kind. The invalidity of any provision of this agreement shall not affect the validity of the other provisions hereof.

