

# VIY5-900

## Ground Penetrating Radar



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User Manual  
Part 1. Equipment

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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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### General information

#### VIY5-900. 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.

VIY5-900 Ground Penetrating Radar (GPR) has antenna with central frequencies of 900 MHz.

#### Application of VIY5 series GPR

##### VIY5-900

- 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



VIY5-900 GPR can be ordered with three different options sets:

##### **VIY5-900t. Handcart version.**

- 900 MHz antenna unit
- Cart-46 Foldable Handcart
- SH5-600 Replaceable bottom protector
- DC5-1 Cable (1.5m)
- Charger
- Backpack
- User manual

##### **VIY5-900m. Manual version.**

- 900 MHz antenna unit
- Odometer VO-12
- SH5-600 Replaceable bottom protector
- Transportation pole
- DC5-2 Cable (2.5m)
- DP5 Cable
- Battery box
- Charger
- Backpack
- Laptop holder

- User manual

### VIY5-900tm. Full version.





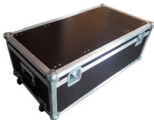


- 900 MHz antenna unit
- Cart-46 Foldable Handcart
- Odometer VO-12
- SH5-600 Replaceable bottom protector
- Transportation pole
- Battery box
- DC5-1 Cable (1.5m)
- DC5-2 Cable (2.5m)
- DP5 Cable
- Backpack
- Laptop holder
- User manual

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

### List of Equipment and Accessories

Item	View	Description
AB5-900		900 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 VIY5-37, VIY5-300, VIY5-600, VIY5-900 GPR  *In case of Handcart version of VIY5-900, 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-12		VO-12 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 VIY5-600 and VIY5-900 GPR
GPR Transportation pole		The pole for transportation of antenna forward and backward. Can be easily mounted to antenna. Designed to be used with VIY5-37, VIY5-300, VIY5-600, VIY5-900 GPR
SH5-600		Protective bottom cover SH5-600 compatible with AB5-600 and VIY5-900 antenna unit.

## General information

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.
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"> <li>• GPS receiver</li> <li>• GPR cable</li> <li>• GPR adapter (10cm)</li> </ul>
Synchro3 Planner		Software package for VIY5 GPR sounding process control, and also for processing and visualizing GPR data. Full software set can be downloaded for free here: <a href="http://viy.ua/download/install_VIY_SGPR.zip">http://viy.ua/download/install_VIY_SGPR.zip</a>

### Main components description

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

Optionally user can use with GPR antenna:

- Cart-46 GPR Handcart with bidirectional odometer
- VO-12 bidirectional odometer
- GPS receiver

### Handcart version

Picture below shows the general view of the version of VIY5-900 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**

# Main components description

## Manual version

Picture below shows general view of the manual version of VIY5-900 GPR with VO-12 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.

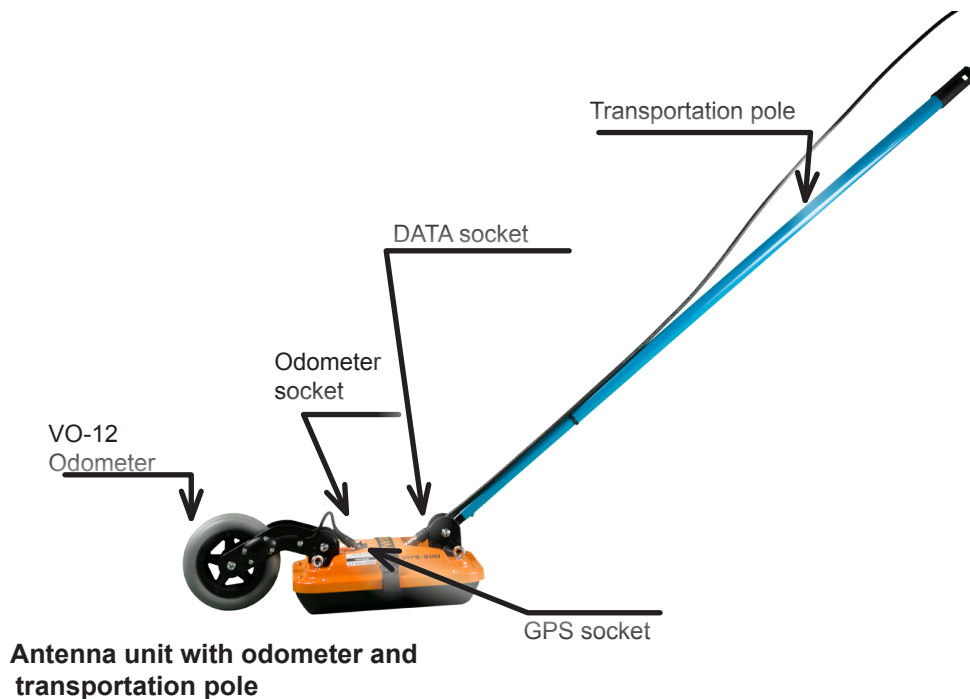
Laptop can be placed on the laptop shelf that should be fastened to operator's backpack.

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.



## VO-12 Measuring wheel (odometer)

VO-12 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, AB5-600 or AB5-900 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.



## Main components description

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The backpack contains compartments for:



**Laptop shelf**

### **Backpack with laptop**

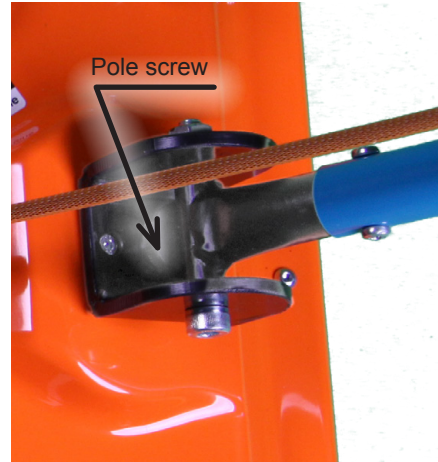
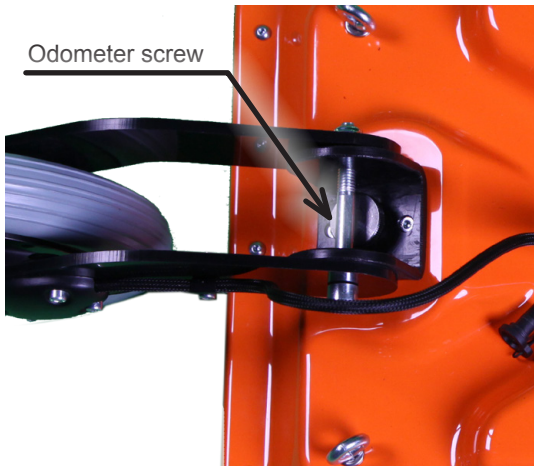
- GPR accessories (cables, charger, transport belt etc.)
- Odometer VO-12
- User's laptop
- Laptop shelf

## Getting Started

### Manual version of VIY5-900 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.



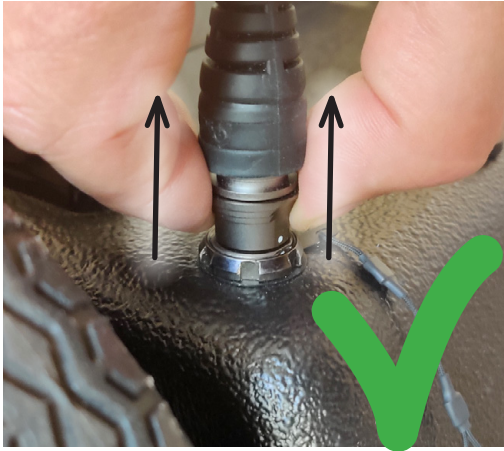
#### Push-pull connectors.

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.



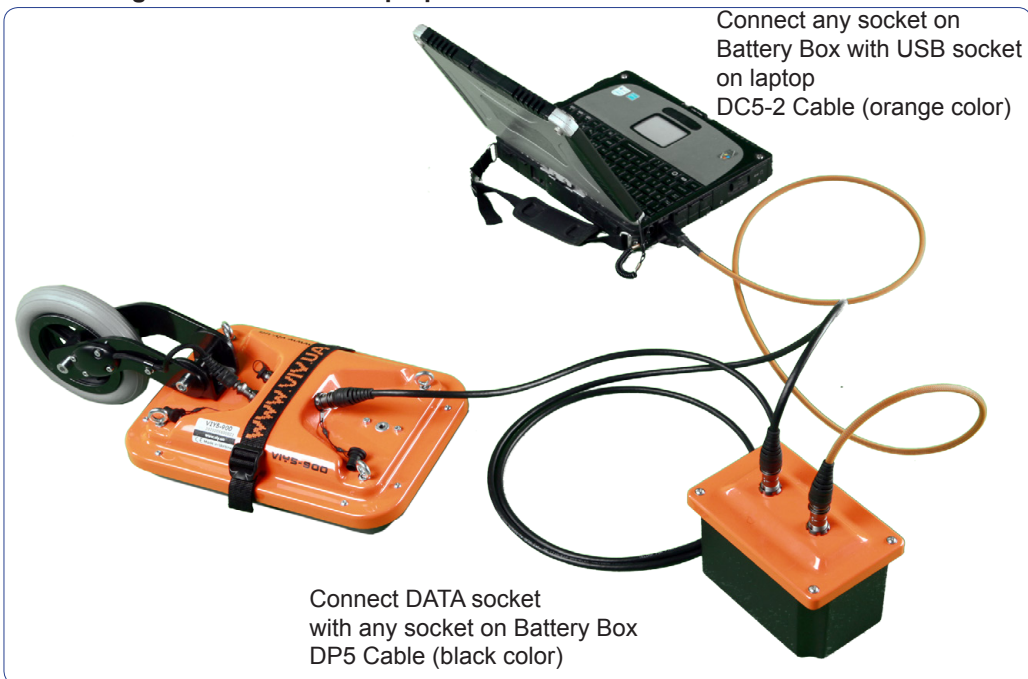
## Getting Started

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



### Handcart version of VIY5-900 GPR

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



## Getting Started

### Cart-46 Handcart

Foldable Cart-46 Handcart was created to carry an antenna unit during survey. The Cart-46 can be used either with VIY5-37, VIY5-600, VIY5-300 or VIY5-900 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.

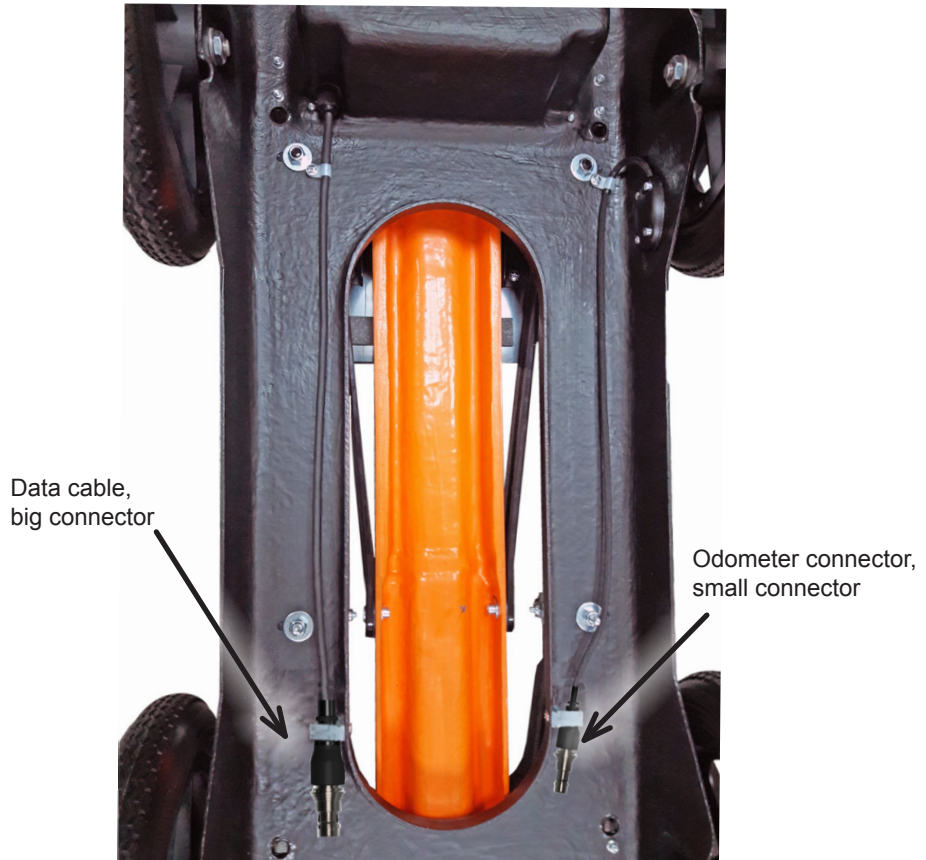




The same way you should loose the eccentric clamp of laptop holder and set it in the position that is the most convenient for work. Then fix the eccentric clamp back.

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.

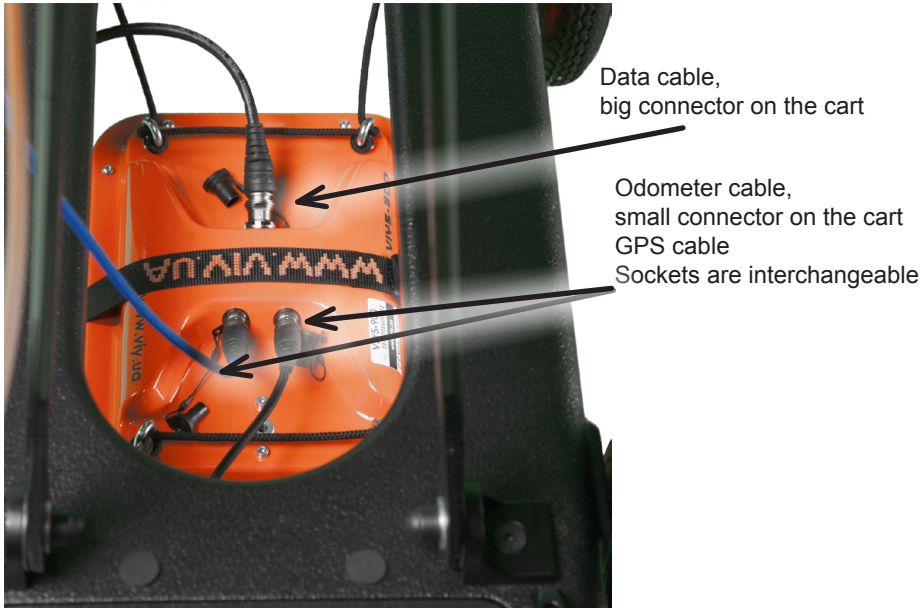
### Plugging connectors



- 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.

## Getting Started

- ✓ 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.

- 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

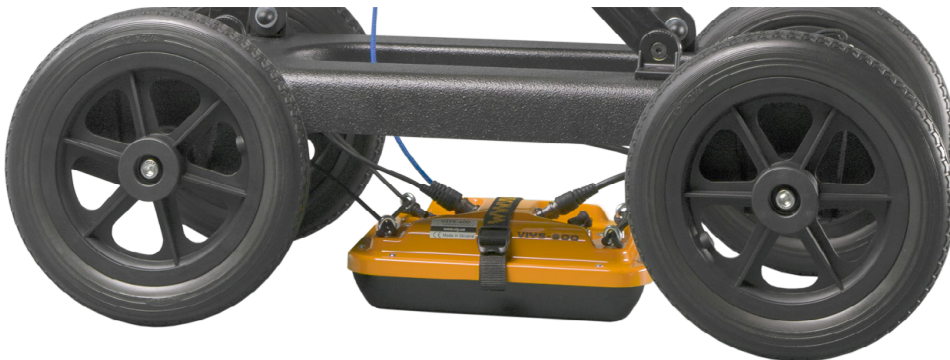
To fold the Cart-46 back to transport position you should perform all described above in a reverse way.  
You can either take an antenna out of the Handcart, or fold the Handcart together with the antenna.

### 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:

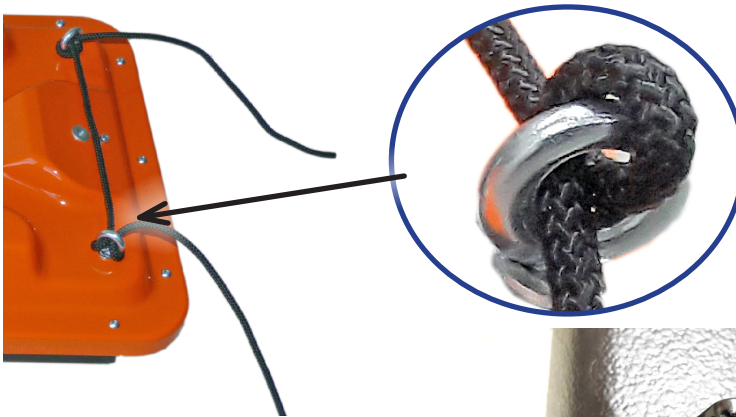
- ✓ We recommend to make a loop on the rope around the ring to secure it there.

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 8.

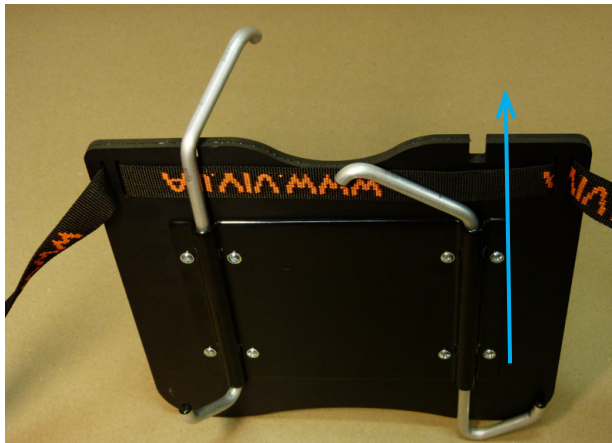
### Mounting the laptop shelf on the operator's backpack

If GPR is used together with VO-12 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.



## Getting Started

- 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 Synchro and Planner 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 Synchro3 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 VIY5-900 GPR

For charging the battery of VIY5-900 GPR 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:



Charging battery with antenna outside of Handcart.

The battery is in the Battery Box:



- ✓ 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).



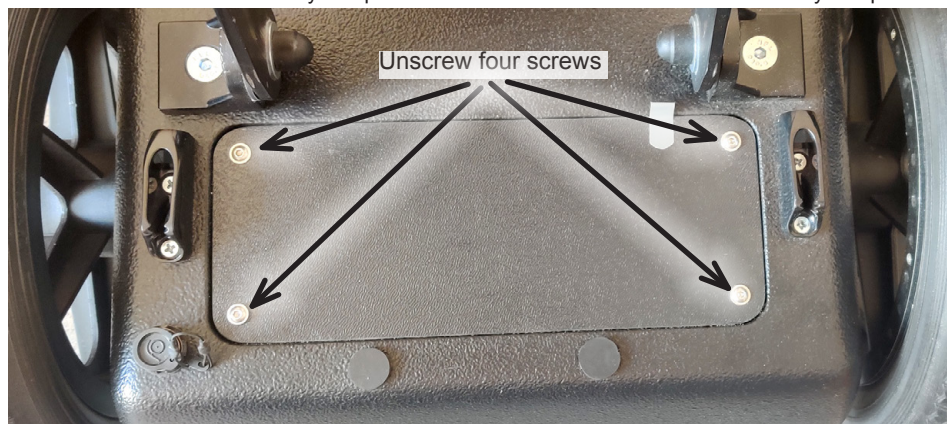
If you notice the Charger error light is on during the charging process, it means that your battery must be replaced for the new one.

✓ 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.



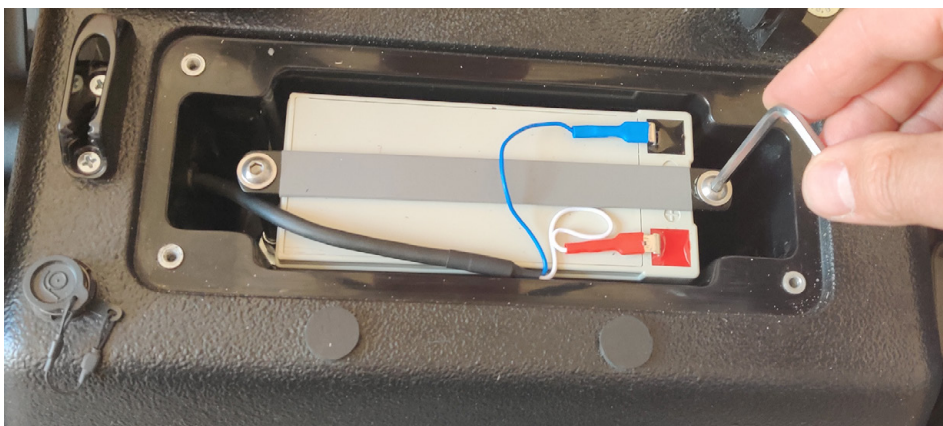
- Use tool from the set of cart



- Remove the cover of battery compartment



- Unscrew two screws using tool from cart set



- Remove fastening bar and unplug connection terminals from the battery



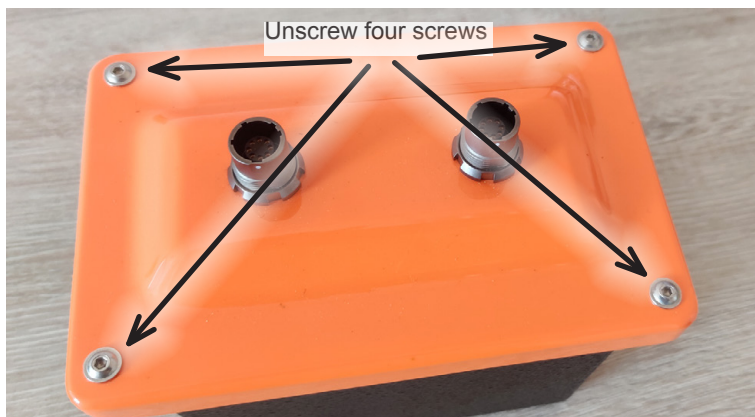
- Take the battery out
- Replace it respecting wires polarity
  - ✓ Connecting the wires to battery, respect the polarity (red wire - battery positive pad, blue – negative pad).
- Mount the fastening bar, fix it with two screws than mount the battery cover back on its place, fix it with four screws.



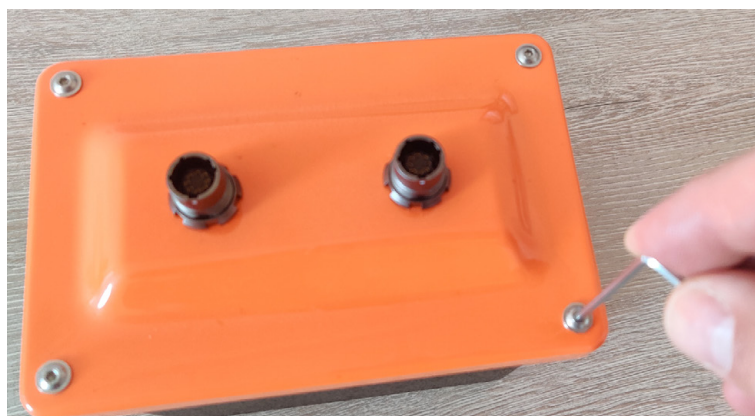
### Replace battery in Battery Box

To replace the battery in the Battery Box:

- Unscrew four screws on the Battery Box cover



- 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

Model of GPR	VIY5-900
Antenna unit, MHz	900
Max sounding depth, meters (depending on soil properties)	2.0
Survey window, nsec	22, 33, 44, 55
Spatial resolution, meters, (not worse)	<0.09 m
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 Inclinator	Built-in
Weight of antenna, kg	1,8
Weight antenna with cart, kg	15
Dimensions of antenna, L x W x H	305 x 210 x 95 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.**

Transient Technologies LLC 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.**

Transient Technologies LLC 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 Transient Technologies LLC product. If you find a product to be defective, please contact your authorized Transient Technologies LLC representative or directly to head office of Transient Technologies LLC. 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 Transient Technologies LLC. It is solely the purchaser's responsibility to determine the suitability of these products for each particular application. Transient Technologies LLC 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.

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