



Zond Aero 500

Ground Penetrating Radar

USER'S MANUAL

Riga, 2021

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1. GENERAL DESCRIPTION

The Zond Aero 500 Ground Penetrating Radar (GPR) in operating condition consists of two parts: Control Unit with built-in battery 11.1V 8.7 A*h, integrated with antenna 500A, and notebook-type PC compatible computer under Windows 7/8/10 and Prism2 software or any other standalone TCI/IP logger (hereinafter logger). The logger is connected to the Control Unit via Ethernet cross cable (Fig. 2). The antenna and the Control Unit are fit into plastic case with two runners (hereinafter shockproof case) as shown on Fig. 2. Brief description of parts of Zond Aero 500 GPR is given below.

Logger. Any computing device with the Ethernet LAN card 10/100BaseT is suitable for Zond Aero 500 GPR operation. The **TCP/IPv4** protocol is used for the data exchange between the logger and the Control Unit. Therefore, prior to connection of the logger to the Control Unit, you have to set **IP address of logger** as **192.168.0.2** (if this address is occupied or is not accessible, you could use any address from 192.168.0.2 to 192.168.0.254, except 192.168.0.10 and 192.168.0.100. **Please, consult with your network administrator before changing IP addresses**). Set **Subnet mask** as **255.255.255.0**. The logger performs the following functions: it controls operation modes of the GPR, and receives, stores, processes and displays the data.

Battery. The Zond Aero 500 GPR is equipped by the Li-Ion battery 11.1 V 8.7 A*h, which is built-in to the shockproof case. The status of the battery (voltage and percentage of the battery level) is transmitted via TCP/IP protocol during data acquisition and is displaying by the logger software in data acquisition mode. Charging of the built-in battery is possible using the Mascot 2541 charger, which is supplied with the kit.

Control Unit & Antenna. The general view of the Control Unit is shown on Fig. 1. It is mounted on the top of antenna 500A and has two outgoing cables – Ethernet cable for Ethernet connection and power cable for the powering from the shockproof case battery or any other external 12V source.

Survey wheel (optional). The Zond Aero 500 GPR is capable to support positioning by the external survey wheel with the Prism2 software help (while GPR mounted in the shockproof case only). The rotary encoder AB interface is used for the distance and direction measurements. There is a 4-pin survey wheel connector on the Control Unit which should be connected by the proper cable from the shockproof case control panel like shown on Fig. 3. The survey wheel mounts on dovetail bracket and connects to the external waterproof connector like shown on Fig. 4.

Antenna. The Zond Aero 500 GPR contains the shielded air-launched high-frequency antenna system with central frequency 500 MHz.

2. PREPARING OF THE GPR FOR OPERATION

Connect the Ethernet communication cable of the control unit to the LAN connector of the logger as shown in Fig. 1.

Connect the powering cable to appropriate connector on the harness coming out from the shockproof case control panel.

Connect the survey wheel cable coming out from the shockproof case control panel to the control unit.



Fig.1. Zond Aero 500 GPR



Fig.2. Zond Aero 500 GPR in the shockproof case.



Fig.3. View of shock proof case control panel with mounted Zond Aero 500 GPR.



Fig.4. Survey wheel mounted on the shock proof case.

2.2. First run of the Zond Aero 500 GPR

- 1) Place the Zond Aero 500 GPR in a working position as it shown on Fig.2 and perform all necessary connections.

- 2) Turn ON the GPR using ON/OFF switch of the shockproof case control panel. The red light-emitting diode should to light up.
- 3) Turn on the logger. If you are using the PC Compatible computer (hereinafter computer) under the Windows 7/8/10, you have to install the Prism2 software package using the flash USB disk supplied with the kit. The installation process is described in the User's Manual of Prism2 software. Once the installation is completed, you have to perform the actions described in the Prism2 User's Manual (paragraphs 5.1 and 5.2 "Configuring the computer to connect with Zond-12e GPR Control Unit" and paragraph 6 "What to Do Immediately After Installation").
- 3) Run Prism2 software, its main menu is shown on Fig.5.

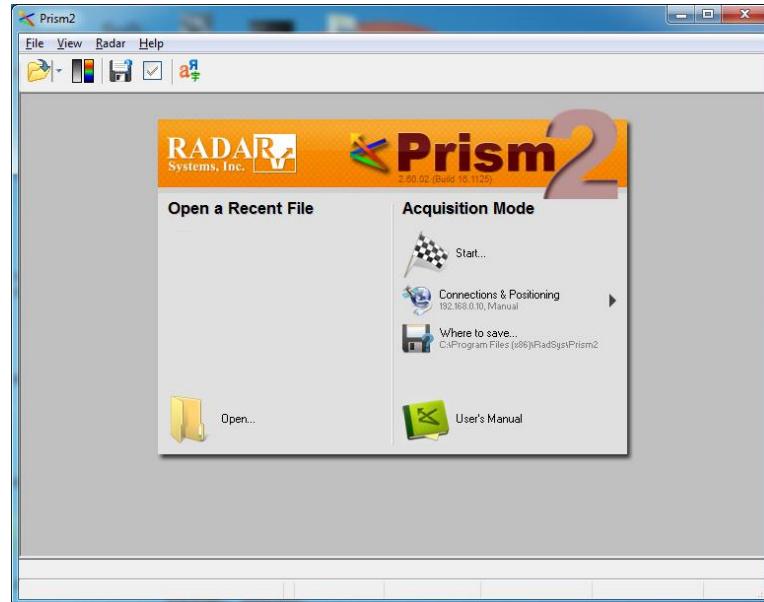


Fig. 5. Main menu of Prism2 software.

- 4) Click the **Start** button to enter the data acquisition mode like shown on Fig. 6.

NOTE: We would like to recommend the user to use the keyboard for the navigation in the data acquisition mode (use the following keys to navigate ←, →, ↑, ↓, Spacebar, Enter and Escape). It's much more convenient to use it in the field conditions instead of cursor oriented operations due to its invisibility on the direct sun light. If you are using tablet computer, touchscreen or other mouse-like tracking device please mark the menu "Radar->Tablet controls" first.



Fig. 6. Data acquisition mode.

5. Enter **Setup** menu. Once **Setup** is activated, the screen shows **ZOND SYSTEM 12e SETUP** dialog box as on the picture below. Menu options are selected using cursor keys and Enter or Space. A signal may not be seen in the proper position as on the picture at the first run. To set correct position of the signal choose the **Pulse delay** menu and press “A” key on keyboard to start automatic adjustment. Press the Enter and then **Close** setup menu after pulse delay adjustment is finished.

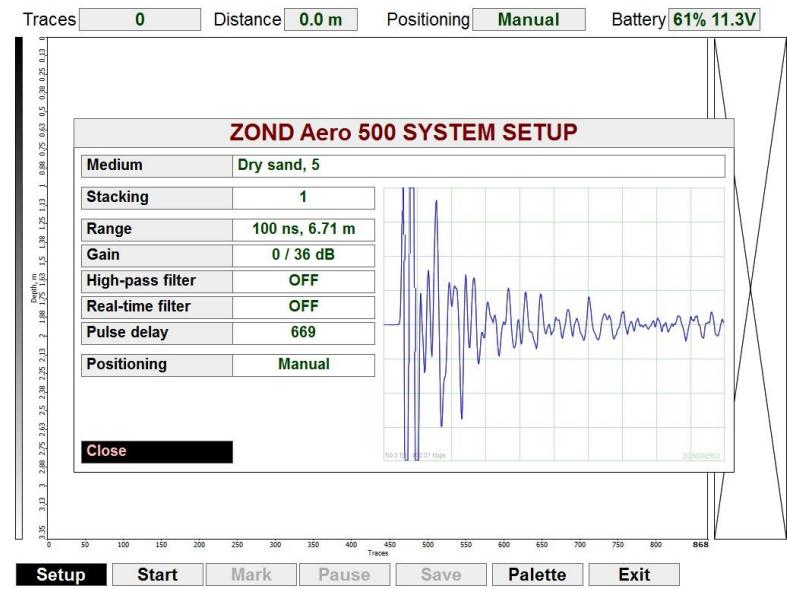


Fig. 7. Setup menu.

Note: Zond Aero 500 GPR has built-in deactivating mechanism, i.e. transmitter is switched ON only when operator enters the SETUP dialog box or STARTs a data acquisition. Transmitter switches OFF immediately after operator STOPs the data acquisition or leaves the SETUP dialog box.

2.3. Data acquisition.

Please put Ethernet cable into groove of the shockproof case wall and then close it as it is shown on Fig.6. before the data acquisition starting. If Ethernet cable is too short, it is possible to add one more cable using the coupler included in accessories kit.



Fig. 8. Zond Aero 500 GPR data acquisition.

Right after SETUP dialog box is closed button START activates. Press it to start the data acquisition. The acquired data will appear as on picture below. Press Escape key or STOP button to stop the data acquisition.

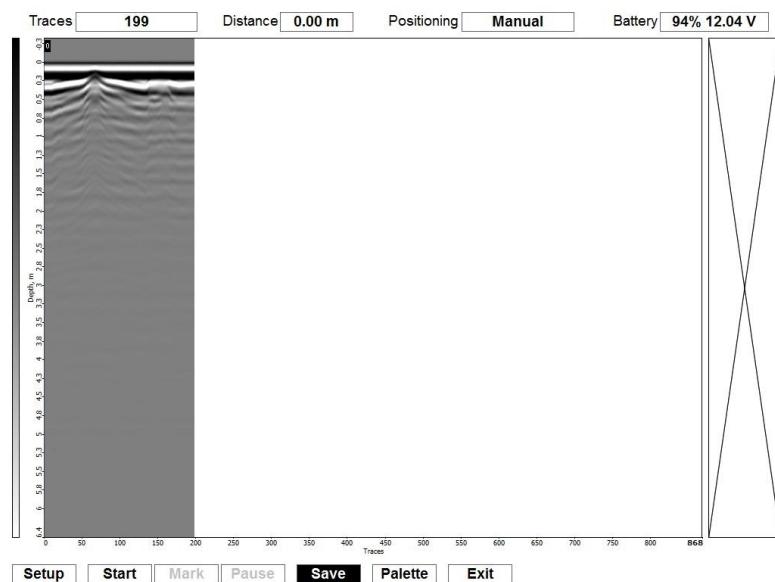


Fig. 9. Data acquisition.

3. CLIMATE OPERATION ENVIRONMENT

3.1. The Zond Aero 500 GPR can be operated at air temperature from 263°K (-10°C) to 323°K (+50°C) and relative humidity up to 95% at temperature 308°K (+35°C).

3.2. It is allowed to operate at lower temperature by applying the heat insulating cover for the control unit and battery.

3.3. It is not recommended to switch on the Zond Aero 500 GPR earlier than after an hour after its transfer from the negative temperature to a warm environment.

3.4. In case of operation of the Zond Aero 500 GPR in conditions of high air temperature (higher than +35°C) it is not recommended to leave the instrument in place where it can be affected by the direct sun light.

4. TRANSPORTATION RULES

4.1. In case of observing of rules of packaging of the instrument according to the Operation Manual it is allowed its transportation in soft and rigid package by railway, road and air transport without restriction of distance.

5. GUARANTEES

5.1. Radar Systems Inc. guarantees free of charge repair of any components of the Zond Aero 500 GPR and eliminate any defects for one year commencing on the date of purchase under condition of delivery of failed components to Radar Systems, Inc. address. Warranty does not extend to the case of mechanical damages due to incorrect use. In all other cases repair is performed for extra pay.

6. CE DECLARATION OF CONFORMITY



For the following equipment:

Zond Aero 500 GPR consisting of:

1. Control Unit;
2. Antenna 500A;

is herewith confirmed to comply with the requirements set out in the Council Directive on the Approximation of the Laws of the Member States relating to Electromagnetic Compatibility and Radio Spectrum Matters (99/5/EC), Short range devices, Ground- and Wall-Probing Radars applications, Low-voltage Directive (73/23/EEC) and the Amendment Directive (93/68/EEC). For the evaluation regarding the Directives, the following standards were applied:

1. EN 302 066-2
2. EN 55022
3. EN 61000 – 4 – 2
4. EN 61000 – 4 – 3
5. EN 61000 – 4 – 4
6. EN 61000 – 4 – 5
7. EN 61000 – 4 – 6
8. EN 61000 – 4 – 7
9. EN 61000 – 4 – 8
10. EN 61000 – 4 – 11
11. EN 61000 – 6 – 3
12. EN 61000 – 6 – 1

7. FEDERAL COMMUNICATIONS COMMISSION (FCC)



7.1. Class A Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two 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.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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.

7.2. Coordination Requirements

1. GPR as Ultra-WideBand (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.
2. 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

3. 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.
4. 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.

7.3. GPR Coordination Notice and Equipment Registration (For U.S. Customers)

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. If you have purchased any of the antennas listed in question 6 after July 15th, 2002, you must 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)]	
Brand Name	Radar Systems, Inc.
6. Model	Zond Aero 500
FCC ID	
7. Receipt Date of Equipment	

Fax this form to the FCC at: 202-418-1944

or mail to:

Frequency Coordination Branch,
OET Federal Communications Commission
445 12th Street, SW
Washington, D.C. 20554
ATTN: UWB Coordination

or fill this form online:

https://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/techops/safety_ops_support/spec_management/library/gprc.cfm

Do not send this information to Radar Systems, Inc. or its representatives

8. INDUSTRY CANADA (IC)



8.1. Industry Canada Regulations – English

This device complies with RSS-220 of the Industry Canada Rules. Operation is subject to the following two 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.

Ground penetrating radar is a field disturbance sensor that operates when in contact with or within 1 m of the ground for the purpose of detecting or mapping subsurface structures. While primarily used for examining "underground," the term "ground" can be expanded to mean any lossy dielectric material. The energy from the GPR is intentionally directed down into the ground for this purpose.

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.

8.2. Règlement d'Industrie Canada – Français

Ce dispositif est conforme à la norme CNR-220 d'Industrie Canada applicable aux appareils radio exempts de licence. Son fonctionnement est sujet aux deux conditions suivantes: (1) le dispositif ne doit pas produire de brouillage préjudiciable, et (2) ce dispositif doit accepter tout brouillage reçu, y compris un brouillage susceptible de provoquer un fonctionnement indésirable.

Un radar à pénétration du sol désigne un capteur de perturbation de champ qui fonctionne en contact avec le sol ou à au plus 1 m du sol pour détecter ou cartographier des structures situées sous la surface. Bien que de tels dispositifs soient principalement utilisés pour examiner le « sous-sol », le terme « sol » peut être étendu pour représenter tout matériau diélectrique avec pertes. L'énergie émise par le radar à pénétration du sol est intentionnellement dirigée vers le sol à cet effet.

Ce dispositif radar à pénétration du sol ne doit être utilisé qu'en contact avec le sol ou à au plus 1 m du sol.

Ce dispositif radar à pénétration du sol ne doit être utilisé que par des organismes d'application de la loi, des établissements de recherche scientifique, des sociétés minières commerciales, des entreprises de construction, et des organismes d'intervention d'urgence ou de lutte contre les incendies.

9. OUR ADDRESS

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