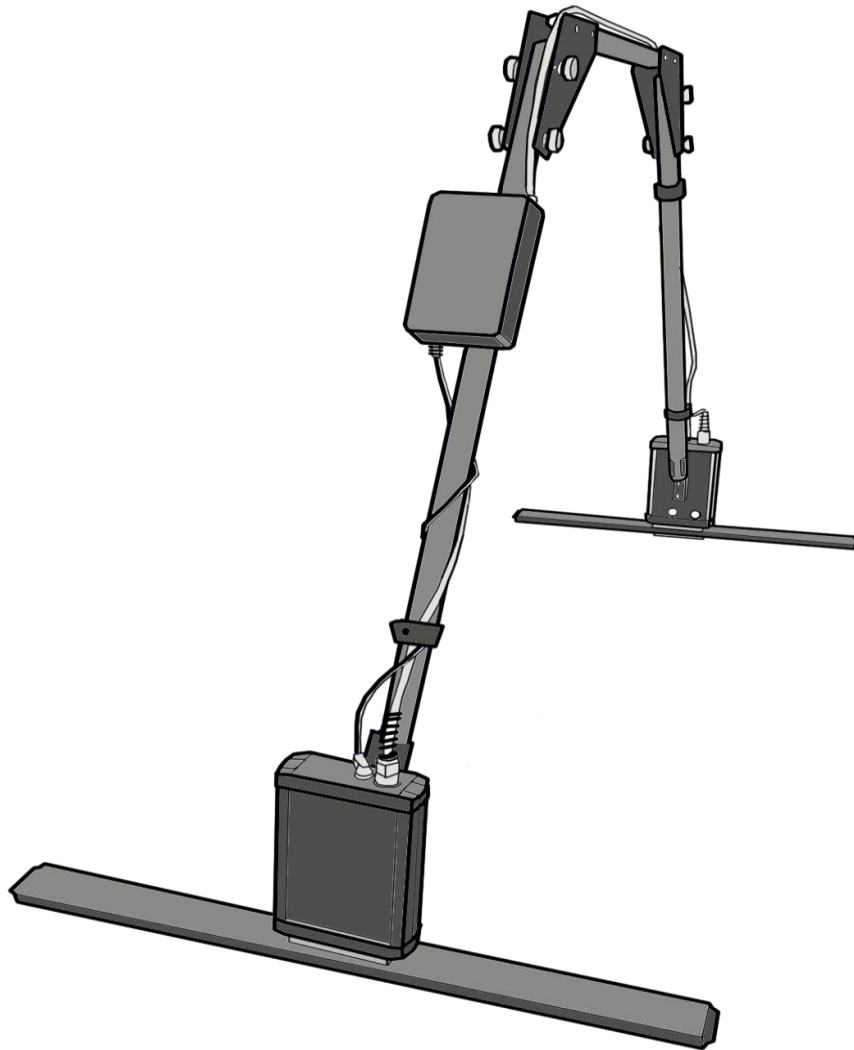


EZ Rad Pro Dipole

Powered by  Coerad



USER MANUAL

Ground Penetrating Radar

Unit Includes Backpack Carrier and Tablet Computer

Before you start:

SAFETY INFORMATION: Thank you for purchasing the EZ Rad Pro Dipole Powered by Oerad. Please read this User Manual carefully before connecting and operating the unit. Electromagnetic radiation from EZ Rad Pro GPR systems powered by Oerad do not constitute a safety or health hazard under normal operating conditions.

WARNING: To reduce the risk of fire or annoying interference use only the recommended accessories and do not disassemble this product's modules. There are no user serviceable parts inside.

CAUTION: There is a fire danger if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of batteries according to the manufacturer's instructions.

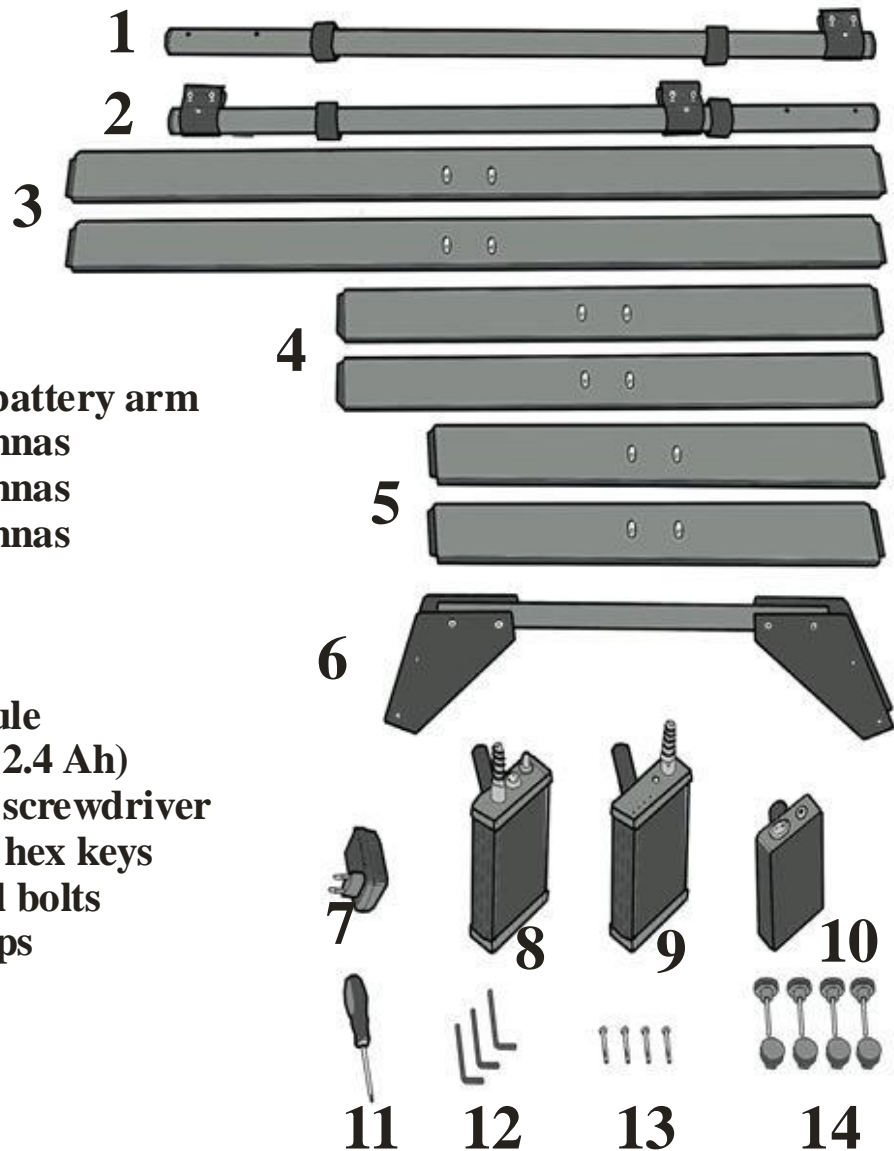
DIPOLE EXPLANATION: The Ez Rad Pro Dipole is an Ultra-Wideband (UWB) shielded pulsed Ground Probing Radar (GPR) for non-destructive imaging of subsurface structures. It consists of transmitter and receiver boards and antennae, a controller board and an optional distance measurement wheel. The EZ Rad Pro Dipole System is designed and manufactured by Oerad Ltd for Terra Exploration Group for exclusive distribution and sales in selected markets worldwide. **DIPOLE USES:** The Dipole has a wide variety of usages including but not limited to underground utility detection, non-destructive archaeological surveys, underground water detection, road inspection, rock composition determination, cavities localization, ice thickness determination, geophysical research of underground layers, etc. It is designed to withstand the harsh conditions of outdoor surveys and construction sites.

Technical Specification

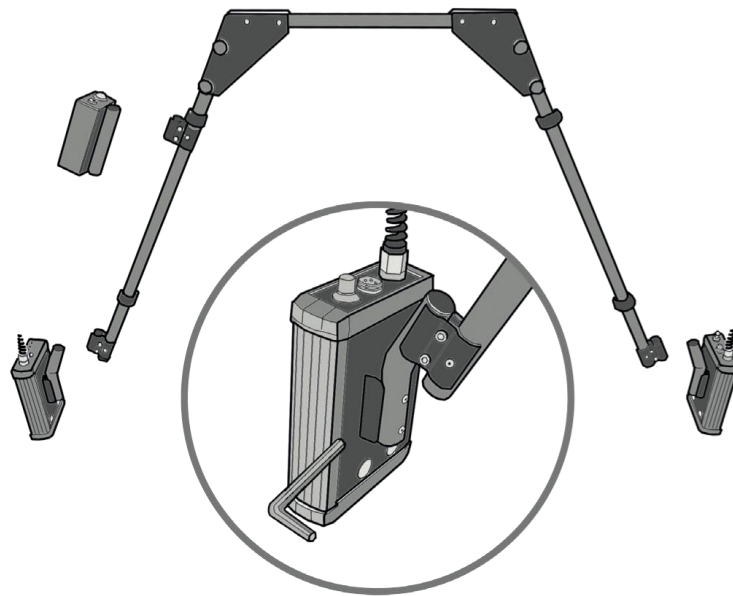
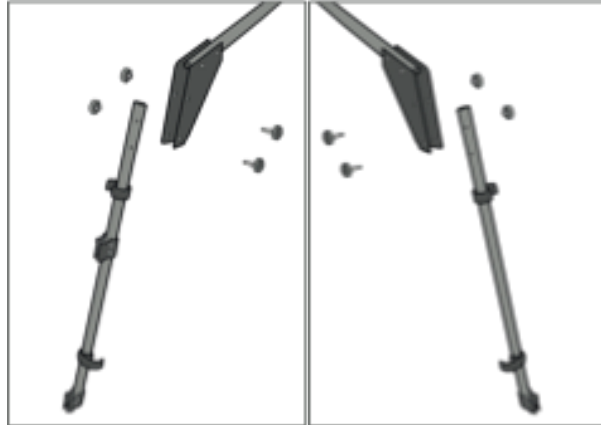
	100 MHz	300 MHz	500 MHz
Frequency Bandwidth	10 MHz - 500 MHz	10 MHz - 500 MHz	30 MHz - 800 MHz
Central Frequency	100 MHz	300 MHz	500 MHz
Vertical Resolution	0.5 m	0.3 m	0.2 m
Horizontal Resolution	0.5 m	0.3 m	0.2 m
Weight	2.5 kg	2.5 kg	2.5 kg
Size	75/110/78 cm	75/110/35 cm	75/110/25 cm
Pulse Length	10 ns	2.5 ns	2 ns
Pulse Rise Time	2 ns	2 ns	1.5 ns

Parts List

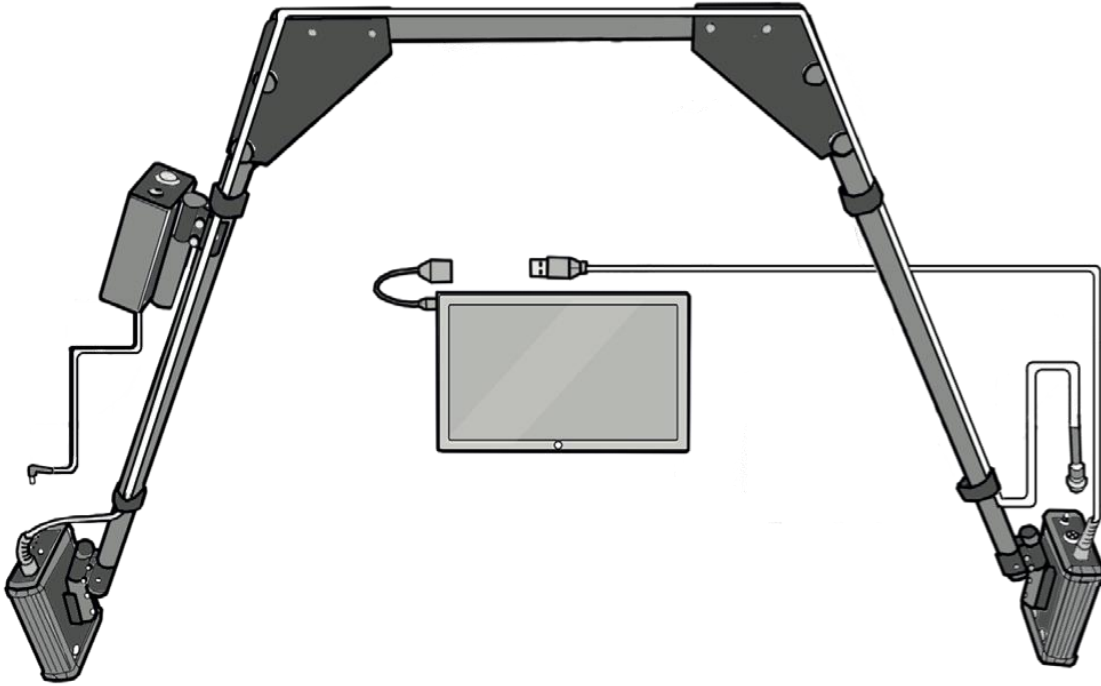
1. Receiver arm
2. Transmitter and battery arm
3. 2 x 100MHz antennas
4. 2 x 300MHz antennas
5. 2 x 500MHz antennas
6. Main frame
7. Battery charger
8. Receiver Module
9. Transmitter module
10. Battery (Ni-MH 2.4 Ah)
11. Assembly tools - screwdriver
12. Assembly tools - hex keys
13. 4 x stainless steel bolts
14. 4 x bolts with caps



Assembly



* Transmitter & Battery module must be placed on the same arm

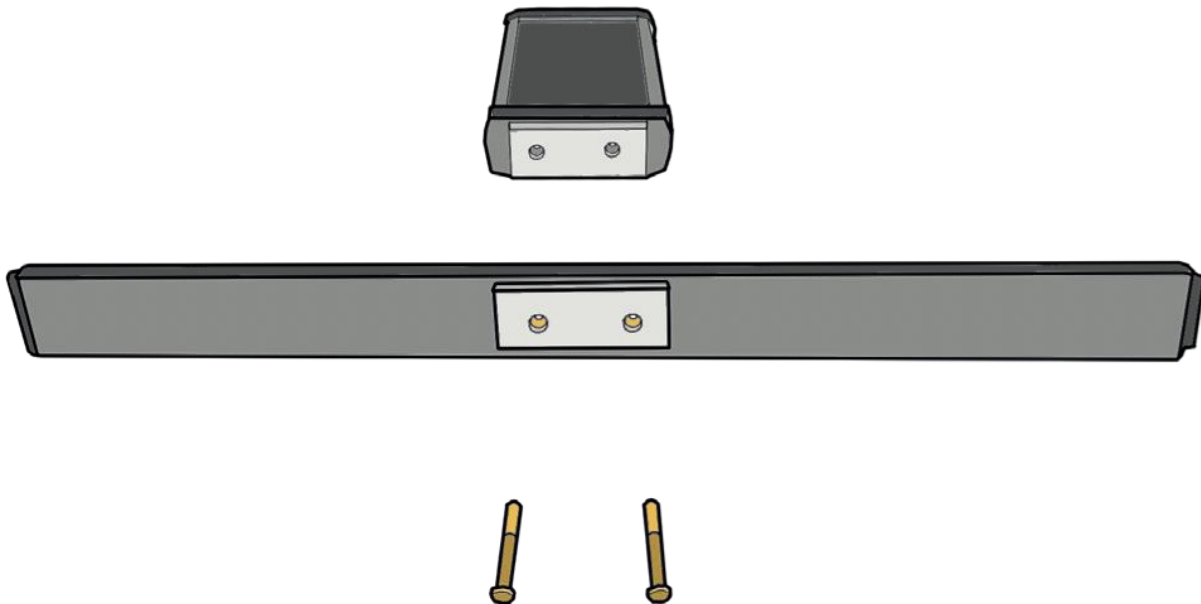


Battery cable to Transmitter module

Transmitter cable to Receiver module

Receiver cable to USB OTG to PC/tablet

- Velcro holders on the Dipolo arms help secure the cables' position



Attach antennas to the bottom of the Receiver & Transmitter modules. Make sure the bronze side of the antenna connectors are facing down to provide solid electrical connection.

Software Information

1. Make sure all cables are securely connecting the GPR and the tablet. Grant all permissions to Oerad App via your Android's 'Settings >
2. Applications > Oerad > Permissions' menu. In order to avoid battery drainage and unnecessary signal transmission, turn off your GPR and disconnect it from your tablet when finished surveying. For further details on technical specification requirements, how to download, install and configure the Oerad App, please refer to the app's user manual available at <https://oerad.eu/software>.
3. Operating Modes Survey. Real time data visualization and recording. Live filter application.
4. Viewing recorded files and filter apply data filters to files: Settings; Recording options. Set radar as Scudo and choose your preferred distance measurement units. Manage dielectric constants.

Operating Modes Survey

Real time data visualization and recording. Live filter application.

Open File

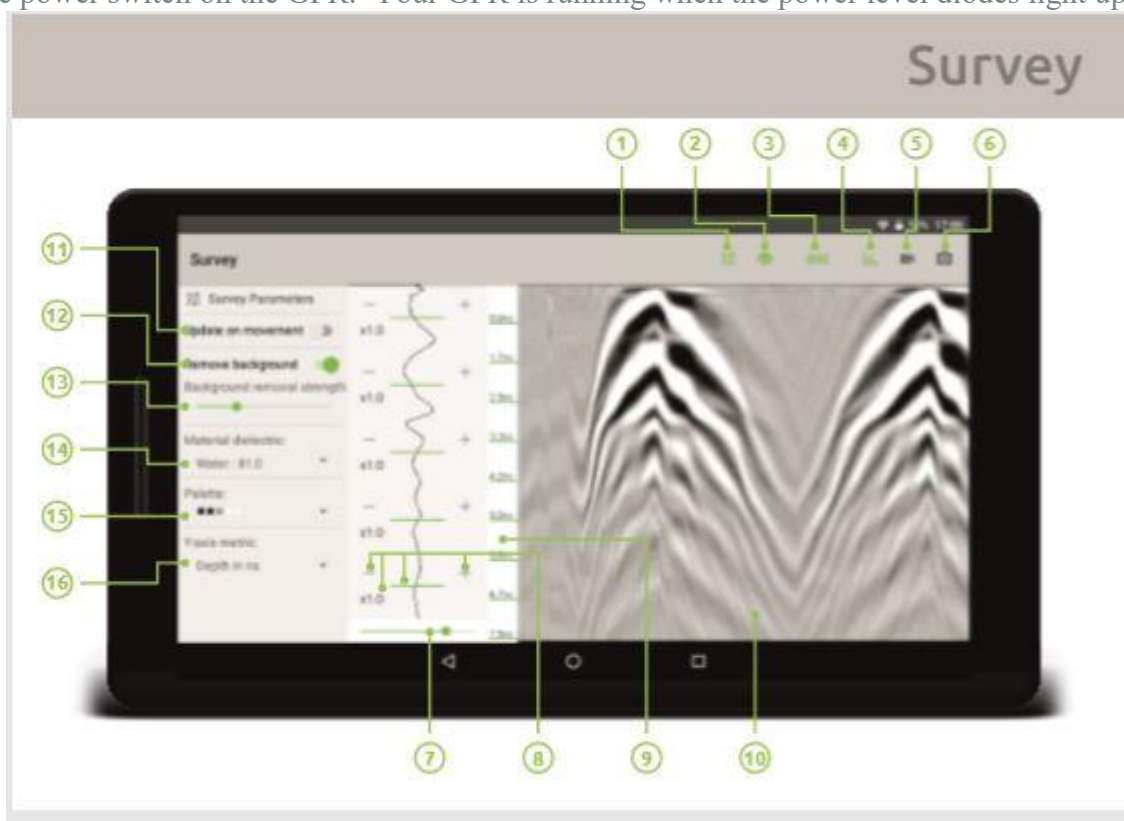
Viewing recorded files and filters; apply data filters to files.

Settings

Recording options. Set radar as Scudo. Manage dielectric constants.

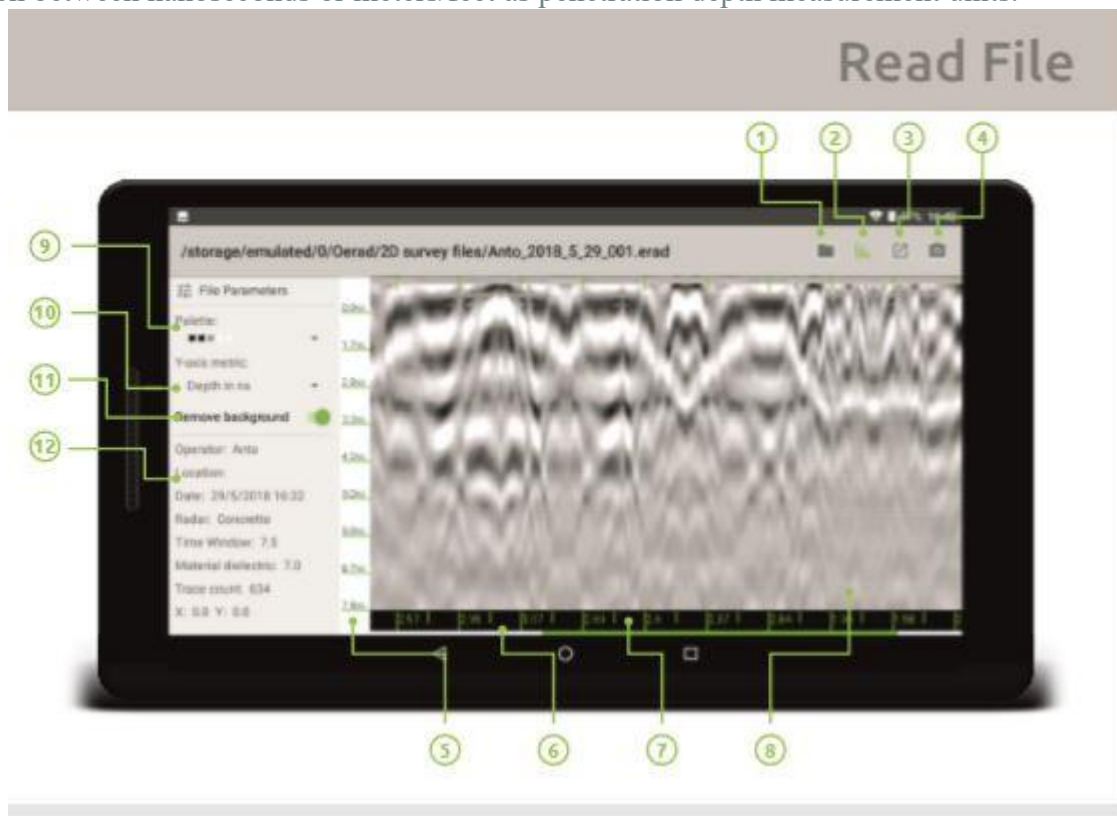
Startup

- Assemble your system as shown in the Assembly section of this user manual.
- Attach all cables to GPR and tablet.
- Start up the Oerad app.
- Press the power switch on the GPR. Your GPR is running when the power level diodes light up.



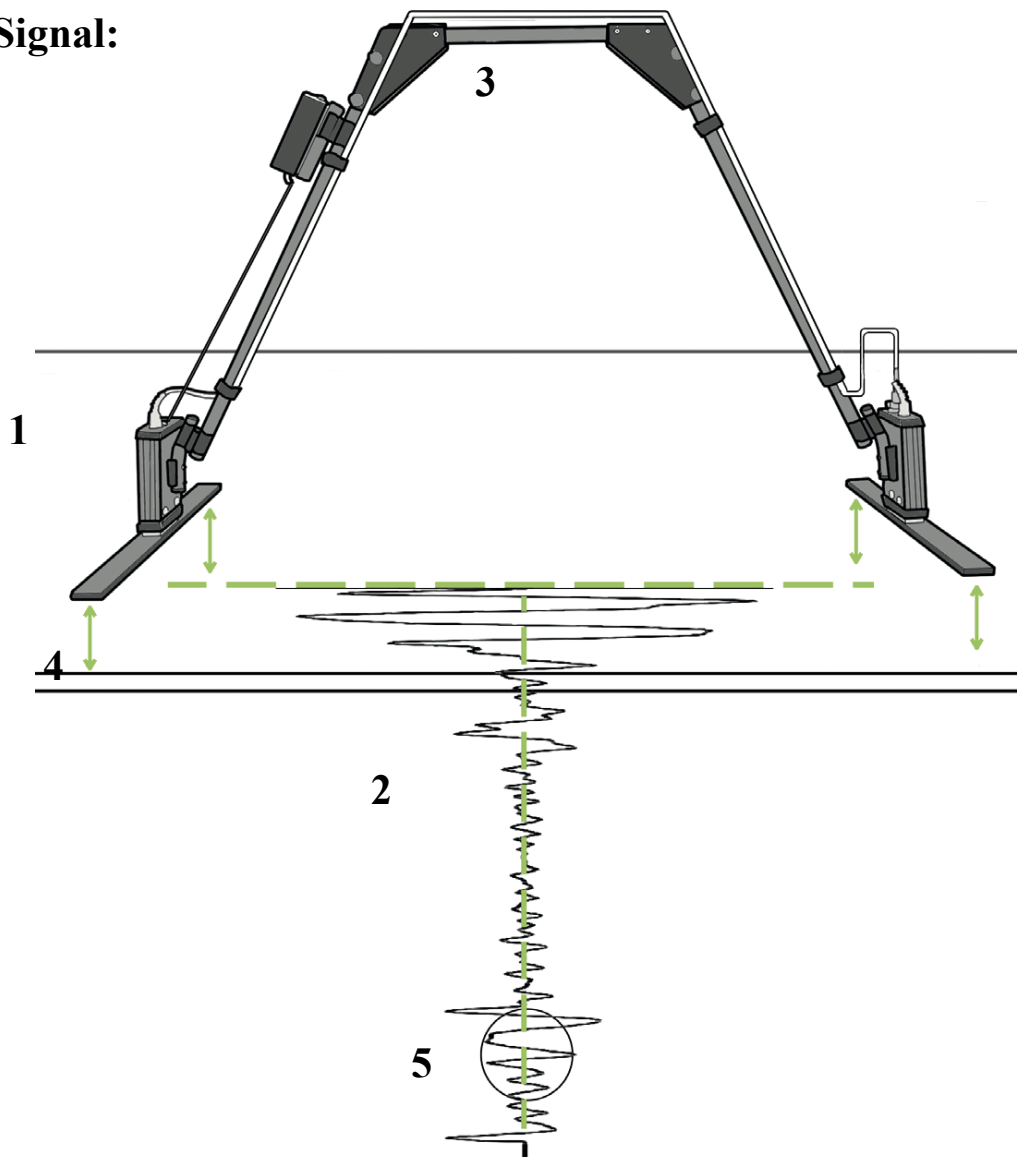
1. Survey parameters toggle - open / close the parameters menu on the left.
2. Pause / Resume survey.
3. Time window toggle - toggles between the GPR short and long operational time windows.
4. Apply background removal filter. It is recommended to have this filter on.
5. Record a SEG-Y or ERAD file for later viewing.
6. Take a screenshot of the current scene, saved as JPEG.

7. Hardware gain controller at five levels. Used to amplify the signal when the material does not allow good signal penetration.
8. Software gain control at five zones of the wave. Allows amplifying the signal locally at points of interest and reducing the signal strength elsewhere to reduce noise. -: reduce amplitude; +: amplify signal; x1.0: amplification factor; green bar: amplification factor.
9. Y-Axis showing penetration depth expressed in nanoseconds or meters/feet.
10. Radargram streaming live data from the GPR. Double tap anywhere on it to pause/resume surveying.
11. Update radargram on movement is only applicable to devices supporting a distance measuring wheel.
12. Apply Background removal filter. It is recommended to have this filter on.
13. Background removal strength toggle. It is recommended to have it set higher when moving slower or over greater distances.
14. Material dielectric helps calculate the penetration depth based on the surveyed material.
15. Change palettes to optimize anomaly detection.
16. Switch between nanoseconds or meters/feet as penetration depth measurement units.



1. Open new file. Files generated by EZ Rad Pro Powered by Oerad are located in the main storage folder under Oerad.
2. Apply background removal filter. It is recommended to view files with this feature turned on.
3. Export file to SEG-Y file format.
4. Take a screenshot of the current scene, saved as JPEG.
5. Y-Axis showing penetration depth of the recorded file in ns or in meters/feet.
6. Progress bar showing your current position within the file.
7. X-axis showing distance data when files are recorded with an optional distance measuring wheel.
8. Radargram of the recorded sounding data. Tap and swipe right to navigate to the end of the file. Tap and swipe left to navigate to the beginning of the file.
9. Change palette of displayed file.
10. Change the penetration depth measurement unit displayed in the Y-axis.
11. Apply Background removal filter. It is recommended to view files with this feature turned on.
12. General information about recorded file. Includes: Operator, Location, Date of record; Dielectric constant of surveyed material; Device used for surveying; Time window at time of survey; Trace count in file; X & Y for files recorded with a distance measuring device.

GPR Signal:



1. Air.
2. Rock/Soil/etc.
3. Hold the GPR by the main frame.
4. Optimal distance between the GPR and the ground is no more than 0.1m, but can be up to 0.5m. Use centering toggle to recalibrate signal start.
5. Detected object.
6. GPR can be moved in any direction, regardless of Tx and Rx position.
7. Signal center is between the antennas vertically and horizontally.
8. A typical signal from a Dipole system.

Objects such as cellular towers, power lines or other EM wave emitting devices may cause interferences in the signal. This may result in radargram deterioration.

Because of the emission pattern of the dipole antennas, trees, buildings or other big structures may be detected.

High humidity in a material has a direct negative impact on penetration depth.

Explanation of Terms:

Hz - Hertz, measurement unit for frequency.

Radio Wave - Electromagnetic wave with frequency ranging from 30Hz to 300GHz. For GPR from 10MHz up to 3GHz.

Radar - A system that uses radio waves to detect objects. Main components & signal flow: Transmitter -> Transmission antenna -> Receiver Antenna -> Receiver data processor.

Frequency Bandwidth - The spectrum of the radar's transmitted radio waves' frequencies.

Central Frequency - Transmitted waves at peak power (usually the center of the frequency spectrum).

UWB - Ultra Wide Band radar that transmits over a frequency bandwidth > 500MHz.

GPR & Time-domain GPR - State-of-the-art high resolution radar with low power consumption. Survey Sounding - The act of using GPR technology for object detection/determination.

Radargram - Image produced by a radar.

SEG-Y - General purpose file format for recording geophysical data from 1973.

ERAD - Oerad's open radar format optimized for small data storage.

Time Window - Operational window of the receiver antenna.

Penetration Depth - Theoretical maximum depth achieved during a given time window and a material's dielectric constant.

Dielectric Constant - Measure of a material's ability to store electrical energy in an electric field.

Attenuation - Reduction in GPR signal amplitude caused by energy dissipation in a material.

Dynamic Range - Ratio b/n the max amplitude signal recordable by GPR and its noise floor.

GPR Trace - Sequence of sample points collected by the receiver that indicate time variation of the amplitude of the recorded signal (in a given time window).

Resolution - Smallest detectable difference/object in a surveyed material/soil/wall.

Gain - Signal amplification.

Background Removal - Adaptive cancellation of the effects of a surveyed material.

DC Drift - Low frequency noise causing the signal to drift from the center line.

Pulse - Energy packet emitted from the transmitter antenna. Its properties are length, power and rise time - a measurement of how fast a pulse achieves peak power.

Potential Dipole Detection Depths:

