

Operating Manual v. 2.0

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1 Introduction

RadInter is interpretation software developed for RAMAC/GPR Borehole data. The software creates interpretations of the borehole data, where each interpretation is saved as a file.

RadInter allows comparison of measured borehole radar data with theoretically calculated reflection patterns from point-like and plane-like reflectors. The Interpreted reflecting targets can be saved as text files for later use.

Point-like reflectors are determined by the depth along the borehole to the point in the borehole closest to the reflector and the distance from this point to the reflector.

Plane-like reflectors are determined by the depth along the borehole to the intersection point with the reflecting plane, or by the distance between the plane and the borehole, if the plane is parallel to the borehole.

Within RadInter boreholes are considered to be straight lines.

MALÅ GeoScience welcomes comments from you concerning the use and experience of the software, together with comments on the contents and usefulness of this manual. To ease communication, with MALÅ GeoScience, always include software version number.

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2 Installing the software

RadInter is protected with the licence copy protection system; the program will run in Demo mode unless the licence number is entered when starting the program.

The software is delivered on a CD disk. To install the software, insert the disk and run Setup.exe

2.1 System requirements

The RadInter software is designed to run on a PC with the following minimum specifications:

- 500 MHz Pentium or higher
- 32 Mb RAM
- Window 98/NT 4.0/2000 Professional or XP

It is recommended that the system have at least 100 MB free hard disk space available for processing data.

The amount of available RAM memory to a certain degree determines the speed of running RadInter. A minimum of 32 MB is needed but we recommend 64 MB to be able to operate the software smoothly.

2.2 Running the software

Clicking menu "Start" -> "Programs" -> "Mala GeoScience" -> "RADINTER_2" -> "RADINTER.EXE"

3 Description of program window

3.1. Main window

The main window contains the program menus as well as speed buttons for common project options. All other windows appear inside this window.

The bottom of the data window contains a status bar, which shows the sample number, trace number, depth and distance corresponding to the current mouse position.

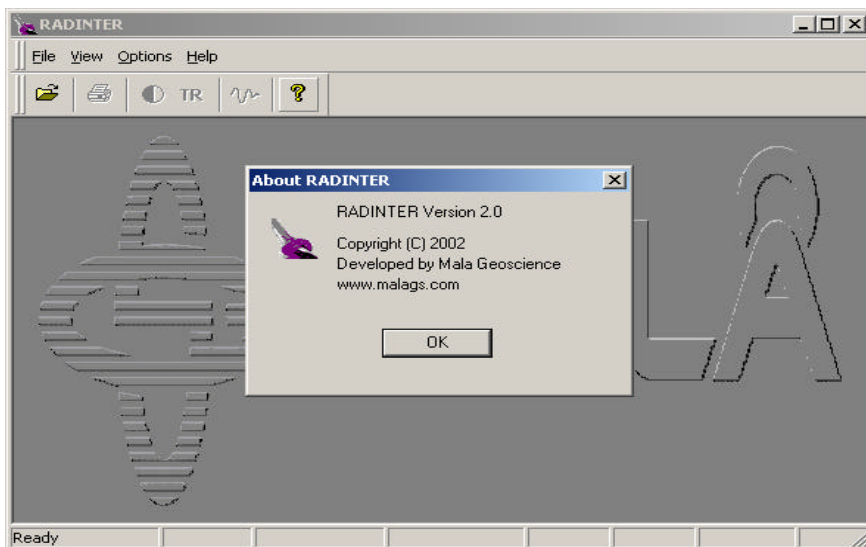


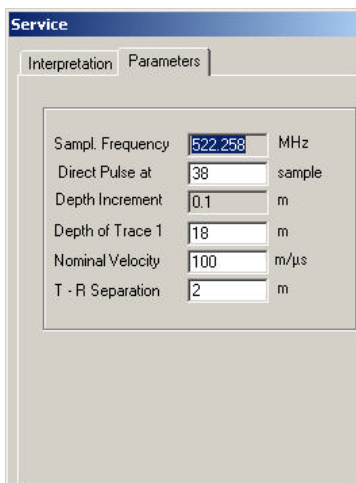
Fig 3.1 Main Window with the About RadInter window.

3.2. Service window

The service window consists of 2 pages: Parameters Page and Interpretation Page. It always appears with the Data window on the right side of the Main window.

Parameters Page

The parameters page contains parameters related to interpretation for the currently selected borehole. Two fields are not editable: Sampl.Frequency and Depth increment. It is possible to edit other fields and it will not change the data file, this changes will be saved in the interpretation file.



The screenshot shows a window titled "Service" with two tabs: "Interpretation" and "Parameters". The "Parameters" tab is active. It contains a list of parameters with their current values and units:

Parameter	Value	Unit
Sampl. Frequency	522.258	MHz
Direct Pulse at	38	sample
Depth Increment	0.1	m
Depth of Trace 1	18	m
Nominal Velocity	100	m/μs
T - R Separation	2	m

Fig 3.2 Parameters

Interpretation Page

The interpretation page contains all editable/changeable information connected with the current interpretation. All information about the current object is visible and it is possible to edit the name of the object.

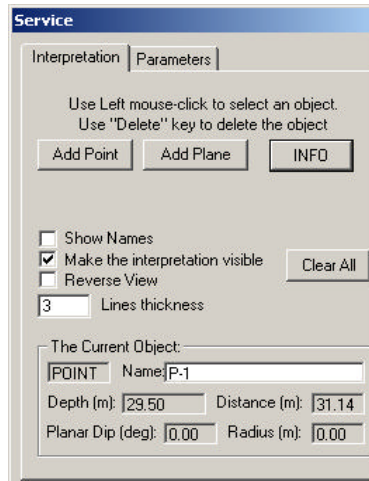


Fig. 3.3. Interpretation tools.

3.3. Filter Manager

The filter page handles the current filter settings for the selected borehole. Applying a filter to the data will not affect the original data file.

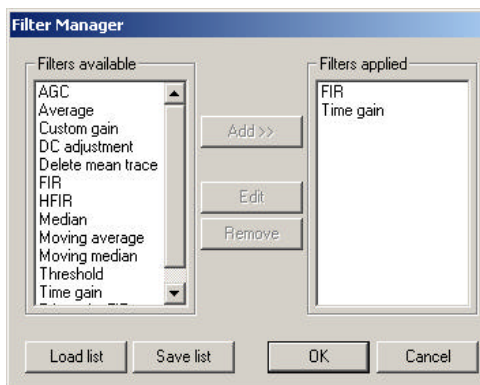


Fig. 3.4 Filter Manager

Adding a filter

Select the filter in the left list. To add a filter to the right list (Filters Applied), press the 'Add' button on the filters window. A dialog will open up, allowing the user to set parameters to the filter. Then the filter will be placed at the end of the right list. Repeat it for every filter you want to add. Press OK. Data will be re-filtered and the data window updated to reflect the changes.

Removing a filter

To remove a filter from the filter list, select the filter in the filter list and click on the 'Remove' button on the filters window. The filter will then be removed. Press OK. Data will be re-filtered; the data window is updated to reflect the changes.

Editing a filter

To edit parameters of a filter, double click on the choice of filter, select it and press ENTER or click on the 'Edit filter' button on the filters window. A dialog will open, allowing the user to edit filter specific parameters. Press OK. The data will be re-filtered and the data window updated to reflect the changes.

3.4. Color map

The palette window contains color map settings for the radargram display. There are two predefined color maps, which can be loaded. To improve interpretation, data can be filtered and showed with different color mappings. The palette window shows the color mapping currently used to display the data. The default palette is a black-white.

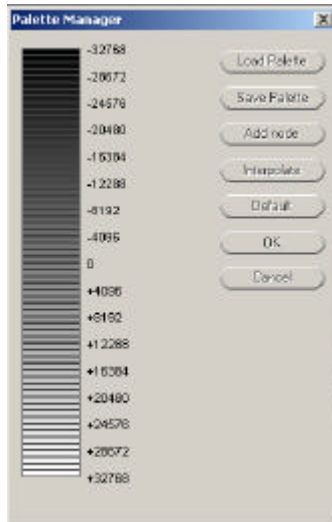


Fig. 3.5 Palette window

Editing colors in the palette

To change a color in the palette, double click and a color dialog will open, allowing selection of the replacement color.

Interpolating between the entries

To interpolate between two or more colors in the palette, select the colors, which are to be used for the interpolation by clicking on them. Press the 'Interpolate colors' button on the color map page speed bar. The palette will be interpolated between the selected colors.

Saving a palette

Although palette settings always are saved in the project, it can be convenient to save palettes for later use. To do this press the 'Save palette' button on the color map page speed bar. A file dialog will open, allowing the user to select a file name for the palette file.

Load a palette

To use a saved palette, click on the 'Load palette' button on the palette window. A file dialog will open allowing the user to select which palette file that will be loaded. The loaded palette will replace the current one.

3.5. Data window

The data window is used for presentation of radar data and for displaying the interpretation data. The program opens a separate page inside the main window. If a reflector has been selected, then information for that reflector is shown in the Interpretation page.

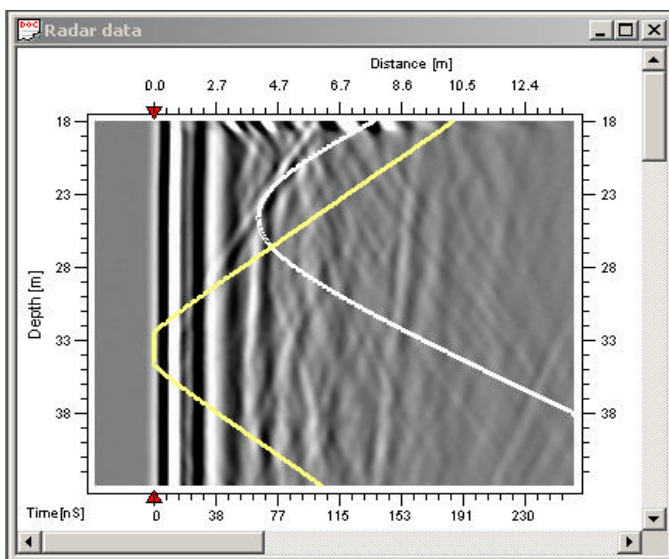


Fig 3.6 Data window, with a point object (in white) and a plane object (in yellow)

4 Handling Data Files

4.1 Open a data file

To load a data file, select 'Open ...' in the file menu. A file dialog will open to allow selection of the file to be loaded. If a data file already is open and interpretation has been done, the user will be prompted to save the interpretation before opening the data file. The data file has extension ".rd3" and the second file with the same name and with extension ".rad" must be in the same directory.

4.2 Close a data file

To close a data file, select 'Close' in the file menu or close the Data window. If the interpretation was changed, it will be prompted to save the interpretation.

5 Handling Interpretation Files

5.1 Starting a new interpretation

When the user load data file, a new, empty interpretation is created.

5.2 Loading an existing interpretation

To load a previously saved interpretation, select 'Open Interpretation' in the file menu. A file dialog will open to allow selection of the file to be loaded. If an interpretation already is open and has been changed, the user will be prompted to save it before opening the file.

5.3 Saving an interpretation

To save an interpretation, select 'Save Interpretation' in the file menu. A file dialog will open allowing the user to input a name for the interpretation file. If the user close the data file, it will be prompted to save the interpretation.

6 The Interpretation Model

An interpretation model is associated with each borehole, which consists of reflector objects. RadInter currently supports two basic types of reflectors: point reflectors and plane reflectors.

6.1 Changing interpretation parameters

The Parameters page on the Service window shows the physical parameters used for the interpretation. Changing the values in the edit boxes can change these.

The direct pulse time can also be changed graphically by selecting and dragging the direct pulse marker (with Ctrl-key pressed), located on the horizontal scale.

There are several parameters on the Interpretation page:

- Make the Interpretation Visible
- Show Names (Names can be placed manually, see Appendix 1)
- Reverse View (it is useful if the case of inverse measurements)
- Lines thickness

There is also button "Info" on the Interpretation page. It opens an additional window. There are few parameters there:

- Site
- Borehole Name
- Interpreted by
- Date (when the interpretation was made)

6.2 Inserting a new reflector

A reflector can be added to the active layer by first selecting the type of reflector to be added (on the Interpretation page) and then graphically place it by pressing down the mouse button on the data window.

6.3 Removing a reflector

To remove the reflector from a layer, first select it by clicking on it on the data window. Then remove it by pressing Delete-key.

6.4 Editing reflector parameters

Reflector parameters can be edited by clicking on the reflector and, while holding down the mouse button and Ctrl-key or Shift key, moving the mouse around. Doing this will change the Depth of plain and point reflectors, the Dip-angle for plane reflectors, the radius and the distance for point reflectors. Detailed descriptions of the commands are found in the Appendix 1.

The user can also edit the name of the reflector on the Interpretation page in the Service window.

6.5 Exporting the model

The interpretation model can be exported to ASCII-format, which allows it to be read into programs like 'Excel'. To do this, select 'Save the interpretation text file' in the file menu. A file dialog will open, allowing the user to input a filename for the export file. An example can be seen in Appendix 2.

7 The trace view

The Trace window is capable of showing a normalized view of a single trace. To open this view, select 'Trace View' in the view menu. To select which trace to show, click by mouse on the Data window. The user can move this current position by the arrow-keys.



Fig 7.1 Trace view

Appendix 1

Program Description:

The Program Name: RADINTER

Short Description: A program for reading, viewing and interpreting borehole radar data.

Hardware Requirement:

Min Screen Resolution: 600x800

Min Color Number: 65536 (High Color)

Recommended:

Screen Resolution: 768x1024 or 864x1152

Processor: Pentium 500 MHz or higher

Software Requirement:

The Program is tested under Windows 98/NT 4.0 and Windows 2000 Prof and XP

1. All Functions

What the program can do:

It can read information from ".rd3" and ".rad" files.

It can show the profile with scales, filters and palettes. Last used filters are saved automatically in the data-directory; last palette is saved automatically in the program-directory.

It can show the trace of the current mouse position or of the position of the crossing after left-mouse-click. Trace-view window can be closed.

The user can regulate the Contrast on the Profile View and the Amplitude on the Trace View.

The user can create, load, edit and save the Interpretation

The user can edit parameters in ".rad" file (on "Parameters" page, see item "Keys" for additional information), but the file is not changed.

The user can do print preview and print the profile with or without Interpretation.

The user can save a text file with all Interpretation information (see Appendix 2, Interpretation Description File)

2. Creation of Interpretations

What is an Interpretation?

It is set of objects (points and planes), as well as set of the parameters and text information.

So, the user can create an Interpretation (and then save it on disk) without objects, only parameters and text information.

Objects:

Click on the button "Add Point" to add a point and then click on any point on the profile.

Click on the button "Add Plane" to add a plane and then click on the profile twice. A Plane is defined by 2 points.

Delete objects:

Select the object by the left-mouse-click and then delete it by "Delete" key (if visibility is off then it doesn't work). Delete all objects by the "Clear All" button on the Interpretation page.

Change colors of the cursor lines, of the objects and of the current object (Menu - Options).

The current object parameters are found on the Interpretation page on the Service Window. Here the current object name can be edited (max 21 characters).

Interpretation can be saved or loaded (Menu: File). It can be saved when changed.

Note! It will not be saved or loaded automatically.

When selecting save or load the interpretation the File Dialog with a pre-selected name of the file will appear, which is the same name as the data-file name but with ".int" extension. The user can of course change the file name, which gives the possibility to create several interpretations for one data file.

It is strongly recommended to use the name of the data-file when the interpretation is saved, for example:

profile101_i01.int

profile101_i02.int

Otherwise it is difficult to correspond the Interpretation to the Profile.

The Interpretation data files are text files, so the user can edit it, or insert objects from one interpretation into another with any text editor.

The Interpretation File Description is seen in Appendix 2.

3. Mouse

Do left-click on the profile and it will be a fixed point with lines crossing on it.

Do left-click on the object to select it.

Press "Ctrl" button and click-and-move the object. The **point reflection** can be moved along the x- and y-axis, but to the left it is constrained by Direct Pulse position. A **plane**

reflection can be moved only along the y-axis, if the plane is parallel to the borehole, then it can be moved only along the x-axis; Direct Pulse position can be moved in this case also.

Press "Ctrl+Shift" buttons and click-and-change objects: The **point reflection** can change its radius (mouse moves along the y-axis, the radius in meters is seen in the status bar). The **plane reflection** can change its Planar Dip angle (mouse moves along the x- and y-axis, the Planar Dip is seen in the status bar)

Press "Shift" + mouse-right-click on the object and it will be a place for the object name.

Note! When the user moves or changes an object by mouse the name sometimes doesn't follow the object precisely. Use "Shift" + mouse-right-click on the object to correct the name position.

4. Keys

The Crossing (which appears after left-mouse-click on the profile) can be moved by the arrow-keys.

Delete – delete the current object (Point or Plane);

For Planes (which are not parallel to the borehole):

Shift+F1 – show only the upper leg of the current Plane;

Shift+F2 – show only the lower leg of the current Plane;

Shift+F3 – show both legs of the current Plane.

5. Status Line

What is shown here:

- Trace and sample of the current mouse position;
- Distance in nanoseconds;
- Depth in meters;

What parameters are saved to the Registry?

- Directory where the user opens data-files.
- colors of all lines (cursor and interpretation)
- time-zero
- last filters (parameters are saved into data-directory)
- contrast
- trace amplitude

Palettes are saved to and load from the program directory.

Appendix 2

RADINTER FILES

Input Data Files (they can't be changed)

1. Data File

extension: .rd3

2. Header File

extension: .rad

It is a text file.

Internal Data Files (they are used only by the program RADINTER)

1. File with the Interpretation Model

extension: ".int"; It is a text file.

Format:

line 1: Site

line 2: BH Name

line 3: Who interpreted (Name)

line 4: Date of the Interpretation

line5:

<zer.level> <depth> <velocity> <ant.separation> <lines thickness>

<max Point> <max

Plane><Unused><reverse><show_names><color1><color2>

depth – depth of first (upper) trace.

max_Point and max_Name – it is for
autocreating names

color1 – color of the objects

color2 – color of the current object

Next lines:

0 <object type> <x1> <y1> <x2> <y2> <x3> <y3> <depth>
<para> <sin_dip> <cos_dip> <radius>< Unused.>< Unused
> <name> <info>

para – it is for planes, if ==4 then it is parallel to the borehole

dip – it is angle between the plane and the borehole

object type - (1=point; 2=plane)

<x3> <y3> - it is the name position on the profile.

2. Interpretation Description File (the Interpretation model text exporting)

Example:

RADINTER MODEL INFORMATION

DATA FILE: G:\Test_EasyInterface\00000001.rd3

Site : Name of the site

Borehole name : BH Name

Interpreted by : Name

Date : 2002-03-02

PARAMETERS:

Direct Pulse (sample): 25

Depth increment (m): 0.10

Depth of first trace (m): 43.60

Nominal velocity (m/s): 100.00

T - R separation (m): 3.00

Object Type	Name	Depth	Distance	Planar Dip	Point refl. Radius
POINT	P-1	8.70	1.67		0.00
PLANE	L-1	35.16		3.40	
PLANE	L-2	0.50		5.09	
PLANE	L-3	38.52		5.40	
PLANE	L-4	50.63		4.25	
POINT	P-2	25.40	2.78		0.00
PLANE	L-5	64.76		3.57	
PLANE	L-6	-19.57		4.24	
PLANE	L-7	-31.11		3.53	
PLANE	L-8	78.50		3.21	
PLANE	L-9	54.11		5.10	
PLANE	L-10	-31.57		4.11	
PLANE	L-11	68.84		3.09	
PLANE	L-12	73.73		4.46	
PLANE	L-13	-39.77		2.57	
PLANE	L-14		2.97		0.00

Note! If a plane is parallel to the borehole, then the Planar DIP angle will be 0 and there will be no Depth, just Distance. Planar Dip – is the angle between the plane and the borehole, it can be from 0 to 90 deg.



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