KMS Technologies – KJT Enterprises, Inc.

Appendix 4
Documentation of the Forward Modeling Program MODALL

from

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MODALL is a program for interactive transient EM (LOTEM optimized) forward modeling. It has many different options built in for a variety of modeling setups. This documentation explains how to use the program. The user should be familiar with the content of the chapter 6 of this book. The enclosed program is for demonstration of the material in this book only. It is by no means a competition to commercial software.

This documentation starts first to describe the content of the distribution diskette. The main part of this description covers the menu explanations. In each menu you can change different parameters. To control the program you use the commands specified in each menu explicitly. In general you use <SPACE> to continue and "Q" to go back one menu. The structure of the menus is as follows:

SOFTWARE INSTALLATION

The software is distributed on a 3,5 inch floppy diskette in the back of the book. The diskette contains the following files:

MODALL.EXE	*executable file*
MODALL.MEB	*menu interface data file*
MODALL.DEF	*default data file*
README.1ST	*latest documentation*

To use the software, copy the above files to your path on the hard disk and execute it from there by typing: **MODALL**

Then follow the instructions on the screen.

DESCRIPTION OF THE MENUS

You invoke MODALL by simply saying MODALL. Make sure you have the MODALL.DEF file in your default path. The first program pages will inform about the copyright of the software and the user responsibilities.

From the DEFAULT SETUP menu you will be guided through a number of different menus. Eventually, you will get back to the DEFAULT SETUP screen. You can only leave the program from this screen.

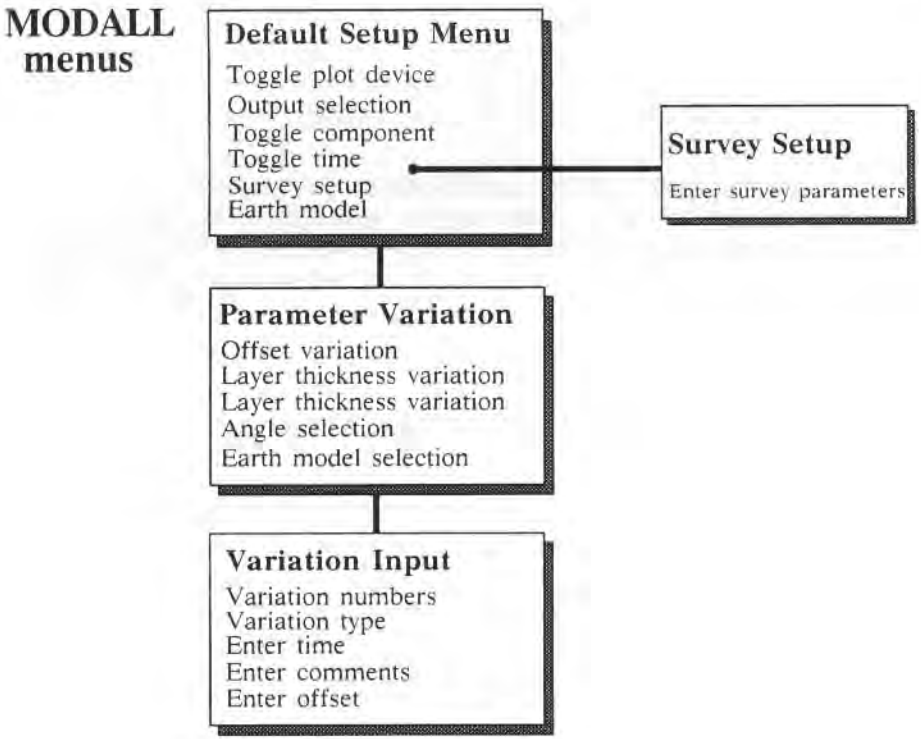

Fig. A4.1: Main menu structure for the program MODALL (subscreens are not shown).

☞ *DEFAULT SETUP MENU*

This menu shows you the defaults used for the modeling and allows you to change them. To do this, you can go into the SURVEY SETUP , or the OUTPUT SETUP or

you can change the basic earth model by pressing "M". The program handles the defaults by using your file MODALL.DEF

In this menu you have the option to toggle several setups. When you press the corresponding key, you will get the next option displayed on the screen. See TOGGLE for further information.

TOGGLE

In the DEFAULT SETUP menu you may toggle:

- Output for plot:
  - Terminal
  - Printer: EPSON, HPGL, PLOTCALL
- Field component: HZ, EX, EY
- Y-axis:
  - Measured voltage in VOLTS
  - Early time apparent resistivity
  - Electric field (for EX and EY)
  - Early + late time apparent resistivity (for HZ only)
  - All time apparent resistivity (for HZ only)
  - Early + late + all time apparent resistivity (for HZ only)
- X-axis:
  - Real time in seconds
  - Russian normalized time (SQRT(2.E7*PI*RHO*T)/H1)

☞ *SURVEY SETUP*

The SURVEY SETUP menu allows you to select all basic survey parameters needed for calculation of the measured voltage. These are:

- Equivalent area of receiver coil (for HZ)
- Length of receiver dipole (for EX & EY)
- Source length in meters
- Source current in Amperes
- Angle between transmitter and offset vector (in degrees)

OUTPUT SETUP

In this menu you can decide the format of your output file:
You can choose between:

- ASCII output file out_name.PRT
- No output file

You can enter an individual filename, but it is recommended that you keep the proposed extensions. If you vary a parameter, so that you calculate different curves,

the program will produce one output file for each curve. The file extension for every output file after the first one will be out_name.PR1, out_name.PR2 etc.

EARTH MODEL

The basic earth model is shown in the DEFAULT SETUP menu. You can change it by pressing **M**. You will then be asked for the layer number, the resistivities and thicknesses. Default values can be used by typing a comma instead of the value.

☞ *PARAMETER VARIATIONS*

This menu allows you to select the parameter you like to vary. You can choose:

- Offset
- Angle between transmitter and offset vector
- Resistivity or thicknesses of individual layers
- Earth models with different layer numbers

This means, you can see different curves on one Plot. See VARIATION INPUT for an example.

☞ *VARIATION INPUT*

This menu allows you to enter the different values of the parameter you have specified in the PARAMETER VARIATIONS menu. Maximum number of variations is 10

EXAMPLE: Base Model:

Resistivities: **10., 1000., 100.** (Ohm-m)
Thicknesses: **200., 2000.** (m)
2nd layer resistivity varied, 3 variations:
1000., 2000., 3000. (Ohm-m)

In this menu you can also change:

- Minimum calculation time
- Comments on the plot
- Default offset

Note: The default offset is not used if offset is the varied parameter.

☞ *MODEL VARIATIONS*

This menu allows you to enter different models to be presented on one plot. This is a helpful option if you select models with different number of layers. Make sure that you have non-zero values in all models you use. Maximum number of models is 4. The menu consists of two pages. In this menu you can also change:

- Minimum calculation time
- Comments on the plot
- Default Offset

EXAMPLES

MODALL is an interactive self explanatory forward modeling package. You should not need specific help examples. Here we have included two test runs with the appropriate outputs. The first example generates a magnetic field forward model and the second example the corresponding electric field.

MODALL EXAMPLE 1: Magnetic field models

This example calculates a magnetic field response and displays it as apparent resistivities. The following sample session contains only the important variable information of the screen. The specific input (screen variables) is printed in bold face. You move from screen to screen using the space bar unless you have modified the parameters.

Type **MODALL**

The program starts and you will see:

START UP SCREEN

DEFAULT setup menu
Plots on **TERMINAL**
Output file, **OFF**
Field component: **HZ**
X-axis in **REAL** time
Y-axis: **EARLY and LATE TIME APPARENT RESISTIVITY**
3 layers
Resistivities: **100 10 100**
Thicknesses: **1000 500**

press **<SPACE>**

PARAMETER VARIATION SELECTION

Default: **3 Offset variations**
Hz - component selected

press **<SPACE>**

VARIATION Input menu

Number of variations: 3
03 Offset variations
5000 10000 15000
Minimum time: **0.001**
Comments: **H-type examples**
Default offset: **10000**
HZ component selected
...working

MODALL now calculates the field for the parameters you have selected and will then display a plot on your terminal.

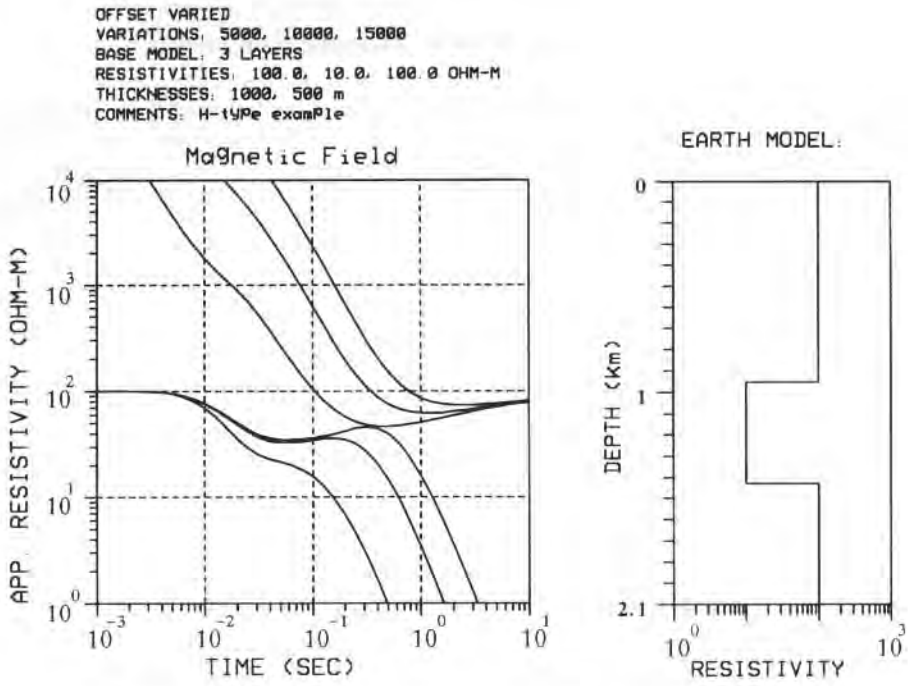

Fig. A4.2: Example plot for the MODALL program calculating the magnetic field response for three different offsets.

MODALL EXAMPLE 2: Electric field models

This example calculates a electric field response and displays it as measured voltage. The following sample session contains only the important variable information of the screen. The specific input (screen variables) is printed in bold face. You move from screen to screen using the space bar unless you have modified the parameters. Use the online help of MODALL for further information:

Type **MODALL**.

The program starts and you see.

START UP SCREEN

DEFAULT setup menu
Plots on **TERMINAL**
Output file, **OFF**
Field component: **EX**
X-axis in **REAL** time
Y-axis: **MEASURED VOLTAGE**
3 layers
Resistivities: **100 10 100**
Thicknesses: **1000 500**

press **<SPACE>**

PARAMETER VARIATION SELECTION
Default: **3 Offset variations**
EX - component selected

press **<SPACE>**

VARIATION Input menu
Number of variations: 3
03 Offset variations
5000 10000 15000
Minimum time: **0.001**
Comments: **H-TYPE EXAMPLES, EX**
Default offset: **10000**
EX component selected

press **<SPACE>**

...working

MODALL now calculates the field for the parameters you have selected and will then display a plot on your terminal.

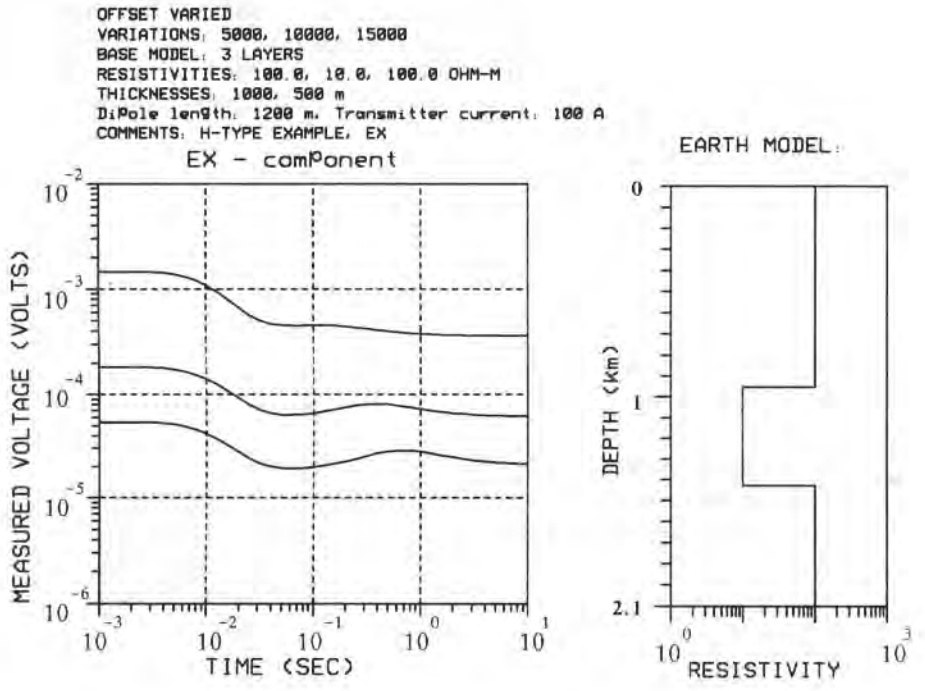

Fig. A4.3: Example plot for the MODALL program calculating the electric field response for three offsets.

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