ModelManager

Version 1.1

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Contents

1. Introduction to ModelManager

About ModelManager

ModelManager is an application that allows simple and direct control of data analysis for kinetic systems. The user chooses the type of system, the type of mathematical model or models to which the data will be fitted, selects parameters for optimization and runs the analysis. A report is generated in Microsoft Excel. Systems administrators may add new model and analysis types.

The software is essentially a front end application for the popular ModelMaker numerical modeling package. The advantages of ModelManager are:

- The system is designed for use by technicians and operatives who do not need to know about modeling or programming
- The system guides the end user through a series of set procedures
- Data entry is simple
- Data may be previewed in a simple graph display
- New models may be added to extend the system
- Changes to procedures are controlled by systems administrators and cannot be overridden by individual users
- Reports are generated quickly and easily using Microsoft Excel

How ModelManager works

On opening the application the user can choose to start a new study or to view and edit a previously saved study. On choosing a new study the user then selects the type of kinetic system they are modeling. These include in the current release:

- Parent only

- Parent with multiple applications
- Parent and metabolite
- Sediment partitioning
- Parent with two metabolites

The system allows administrators to change or to add to the list of models. The user then adds details of the study - identification, concentration and time units, the date and any useful comments. Data may then be added and the study configured - which models will be fit to the data, whether the data is to be weighted and so on. Finally the analysis run is started.

Models are or have been created using ModelMaker and it is the underlying ModelMaker calculation engine which performs the optimization, i.e. fits the data to selected models and calculates optimum values for the parameters. The end user does not see this application although a full report, including optimized parameters is generated using Microsoft Excel.

System requirements

ModelManager is a 32 bit application therefore requires Windows 95, 98 or NT. The installation requires about 20 Mb disk space and a minimum of 16MB RAM. We do, however recommend at least 32MB of RAM. Reports are produced using Microsoft Excel 95, 97 or 2000 and therefore this application must also be installed on your system. The application will run on a computer with Pentium 75MHz processor or equivalent although P166 should be regarded as a good working minimum.

Installing ModelManager

It is recommended that you quit any running applications while the installation is performed.

- Insert the CD into the CD-ROM drive of your PC.

- Start Windows Explorer and choose the drive corresponding to the CD-ROM

- Locate the executable (.exe) file **ModelManager Setup.exe**

This is the main install file for ModelManager. It will install the ModelManager executable files, all the model files and any reports files defined for your installation.

- Double click the executable file and follow the on-screen instructions

Un-installing ModelManager

To uninstall ModelManager, the user should select "Remove ModelManager" from the ModelManager program group on the Start Menu. The user will be asked for confirmation, then all ModelManager files and directories will be removed from the disk.

Activating ModelManager

The security used by ModelManager locks the software to your computer. When you first install the application you may run it as a demo version for up to thirty days. You can see how much longer you have left by checking the About… box. This is also the place to activate the application as a fully licensed version:

- Select About… from the Help menu

- Once you have opened this dialog click Licensing…

The licensing dialog includes two automatically generated codes. You need to tell Cherwell Scientific both of these codes in order to activate the license. There are two ways to do this.

- Call us directly while you are sitting at your computer

- Tell us both codes

- We will tell you the activation code which you should type into the edit box

- Click OK

Alternatively if it is inconvenient for you to call us directly:

- When you have opened the Registration dialog Click Freeze
- Note the two codes and call or e-mail us at your convenience

If you do not freeze the codes then the next time you open the Registration dialog at least one of the codes will be different. You can obtain activation / license code by e-mailing us at:

license@modelmanager.com

or by calling your local Cherwell Scientific office.

Technical Support

If you encounter problems using ModelManager then you will find hints and tips and FAQs (Frequently Asked Questions) on the ModelManager web site:

http://www.modelmanager.com

You can also obtain technical support by calling or faxing your local Cherwell office.

Contact Cherwell Scientific

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General support issues: support@modelmanager.com

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Web site

The ModelManager web site is at:
http://www.modelmanager.com

About this manual

Chapters 2 to 5 of this manual present an end users view of using ModelManager. The remaining chapters present information for systems administrators. The software is distributed with the end users section in Microsoft Word format which may be printed out for individual users. Please note that this is copyright of Cherwell Scientific Limited and cannot be altered. You may append or add new sections that are relevant to models you create and add to the ModelManager application.

2. Getting started with ModelManager

ModelManager Basics

Starting ModelManager

Start ModelManager in any of the following ways:

- Double click the shortcut icon that appears on the desktop
- Select the ModelManager program via the Start | Programs menu on the Windows task bar
- Double click Modelmanager.exe executable file in Windows Explorer

Keystrokes

Navigating the application is mostly accomplished using your mouse, clicking on buttons, drop down lists and check boxes. In addition you type text into edit boxes. However many of the text entries and buttons in the ModelManager windows have keyboard shortcuts associated with them. The appropriate shortcut character for a particular button or text field is underlined in its title. For example, the "Next screen" button on any ModelManager screen is shown below:

The shortcut for this button is therefore the character "n". This is activated by holding down the "Alt" button and then pressing and releasing "n" (read Alt+N). Note that although we use N (upper case) in the manual, it is not case sensitive in the application.

Exiting ModelManager

The ModelManager session is terminated by selecting **Exit ModelManager** from the **File** menu, pressing the Exit button on the opening screen or by clicking the button  on the title bar. Confirmation will be requested before ModelManager closes down, if a study is currently in progress then the user will be prompted as to whether to keep or discard unsaved changes.

Tutorial 1: A quick tour

The ModelManager installation includes the following sample files. Use these to explore the various ModelManager screens.

- PM.sty (Parent-metabolite)
- PMA.sty (Parent with multiple applications)
- PMM.sty (Parent with two metabolites)
- PO.sty (parent only)
- SP Demo.sty (Sediment partitioning)

In this short guided tour we will take a look at the Parent only study - PO.sty.

Step 1: Open an existing study

Start ModelManager from the shortcut icon on your Windows desktop or the Start|Programs menu. You are presented with the opening screen.

- Click 2. Open an existing study
- In the Open dialog select the file PO.sty and click Open

A message warns you that the ModelManager database is being accessed and then you are presented with the Study details screen. This lists important information about the study - identification, original date, concentration and time units. To continue either:

- Click Next >>
- Select Next screen from the Screens menu

- Click the Next screen icon on the Shortcuts toolbar

Notice that the screens menu lists all the available screens in ModelManager but most are grayed out. Only the Experimental data entry screen is available as this is indeed the next screen in the procedure. As you progress you will find that you can step back to modify any of the previous stages. Before progressing to the next

screen check out the Measurement units and Time units drop down lists. These contain a number of selections which can be edited by the systems administrator or supervisor. Also note the Number of datasets edit box - this has consequences for the next screen.

Step 2: The Experimental data entry screen

This screen comprises a number of tabbed panels - one for each dataset. This was actually defined in the Number of datasets edit box in the Study details screen. To step between datasets:

- Click on a tab to open the panel and display the data

The panel includes some important information about the dataset, comments and, of course, the data itself. To edit the data:

- Click in a cell in the Experimental data table
- Type a new value
- Press Enter or use the arrow keys to navigate to a new cell

To preview the data displayed:

- Click the button labeled Graph

This opens the Graph screen. This is a basic graph display but gives you a good idea about the status of the data in the study. Note that you can select a logarithmic display and display points rather than a line graph. You cannot print this graph as it is only intended as a preview. Click Close to return to the data entry screen.

- To continue the analysis Click Next>>

Step 3: Configure the analysis

The Configure Analysis screen comprises several panels. In the top left corner you can choose any combination or all of the datasets that have been created:

- Click on the name to select
- Click on a highlighted (selected) name to deselect

In the top right hand corner a choice of three radio buttons enables selection of model parameters. These are described in detail in the next tutorial but briefly these are defined as:

- Use existing parameter estimates

  If the analysis is being run for the first time, then these will be the default parameter values for each model. If analysis has already been performed for a particular model / dataset pair, then the results of the previous analysis will be used

- Use the user inputs to calculate initial estimates

  If you have entered estimates for DT in the previous screen then checking this selection will use these for the calculation.

- Perform parameter search to find initial estimates

  ModelManager uses its own methods to estimate parameter values.

At the bottom left you may select which models are to be run during the analysis (Models to fit) and whether the data is to be weighted. Report DTX at: allows you to specify the value at which ModelManager is to calculate the Degradation Time. In addition to a calculation at this specified time, values for DT50 and DT90 are calculated by default, with errors corresponding to 95% confidence via the appropriate Student t value.

Configure parameters opens the Configure Parameters screen and allows you further control of the parameters to be used. Take a quick look at this screen and then click Cancel to proceed with this trial analysis.

Step 4: Run the analysis

Still in the Configure Analysis screen:

- Click Go

The analysis run starts and the Calculation Status dialog maintains a log of the process. When the analysis is complete Excel starts

automatically. You will be warned that the Excel spreadsheet contains macros and should click Yes to accept and open the report.

Step 5: View the results

Switch to Microsoft Excel to view the report. The report lists study details and plots fitted results. A different worksheet is created for each model chosen and another compares the fitted data. Once created this can be treated like any other spreadsheet - so you can print, copy and paste selections and import into other applications such as your word processor. Note that you can set the location where the report is stored using the Settings dialog opened from the Edit menu.

Step 6: View results of an existing study

You can choose to view the results of an existing study from the opening screen of ModelManager. If you do this then you are prompted to open a file and then presented with the View Existing Study screen. This lists details about the study and allows you to generate a report in Excel.

And finally: The Shortcut Bar

To the top of the main screen, there is a shortcut toolbar which allows easy access to various screens. Use this to move quickly between screens, create, open and save studies in ModelManager. You will notice that when certain screens or functions are unavailable then the relevant toolbar buttons are grayed out.

The Shortcut toolbar

On each screen, various buttons on this toolbar are enabled and disabled, as different options are available on each screen.

Tutorial 2: Creating a new study

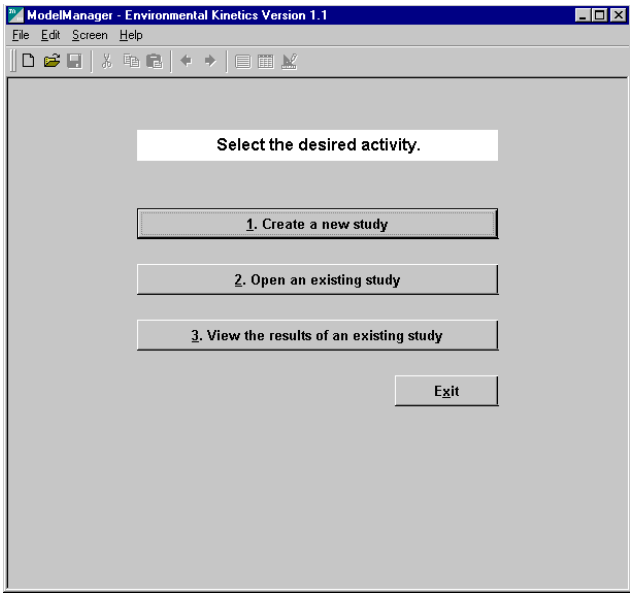
The section will describe how a study can be created, from inputting the data through to generating a report. We also include some more detailed information about the various screens.

Step 1: Create a new study

From the opening screen:

- Click 1. create a new study

The opening screen of ModelManager.



Step 2: Select the study type

Once you have decided to create a new study, you need to specify the type of study which he wants to create. This is done with the study type screen. There are five study types available in ModelManager and the screen has one button for each screen.

The Study Type screen contains five buttons according to the study types available.

Parent Only

This study is used when there is one data series which needs to be analyzed, for example when there is one compound that degrades over time

Parent with Multiple Applications

As with the previous study type, there is only one compound that degrades over time. However, extra quantities of the compound can be introduced into the system as time passes.

Parent and Metabolite

In this study type, as the parent compound degrades another chemical is produced. This study is used to track how they both degrade over time.

Sediment Partitioning

This study type is used to examine how a chemical is absorbed by the sediment in a system from a water column, and how they subsequently degrade over time.

Parent with two metabolites

This study is identical to the Parent and Metabolite case except that two chemicals are formed in the system.

Once a study type has been selected, it may not be altered. If you wish to change the study type, you must quit the current study and begin a new study of a different type.

When the button is pressed, an empty study of the type selected is then created and the user is presented with the Study Details screen. For the purposes of this example, we will create a Parent Only study, so press the Parent Only button.

- In the Select desired study type screen click 1. Parent only

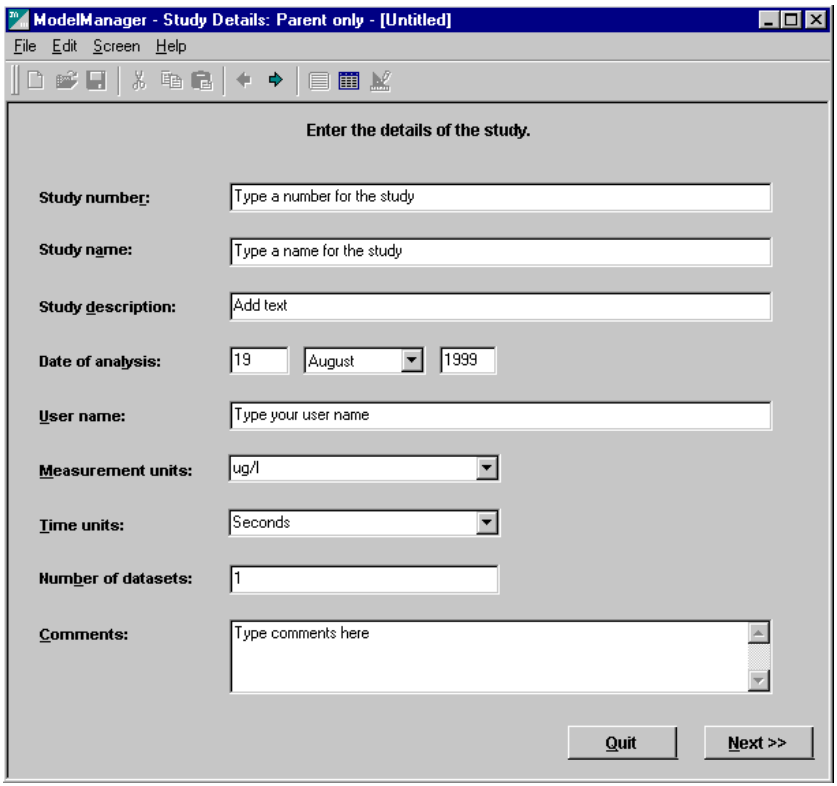
The application pauses (you will see the egg timer icon) while the database is opened and a new study created.

Step 3: Add study details

Once a new study or an existing study has been opened, the user is presented with the **Study Details** screen. This is shown below. The study details screen enables the user to enter comments and specific information about the study. This information can then be shown on the generated report.

You can enter any information you wish here as it does not affect how the analysis performs. In this example we shall enter two sets of data, so press “Alt-b” to go to the number of datasets field and type ‘2’.

The Study Details screen



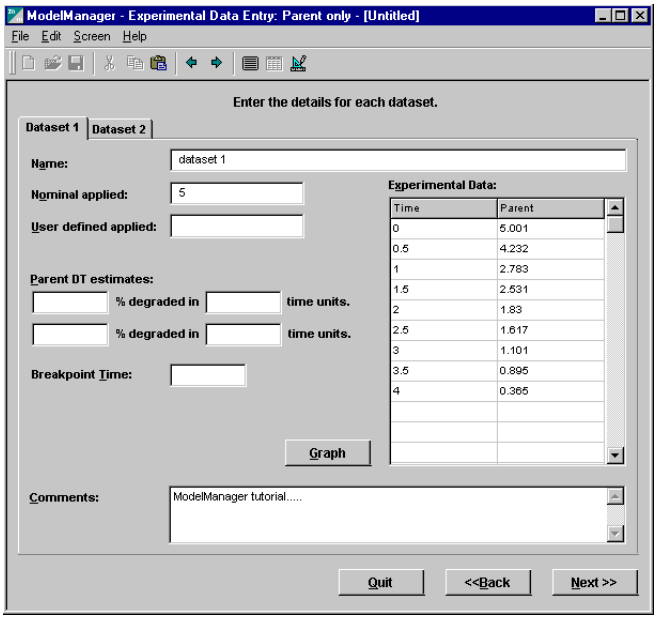
- Type relevant text in the Study number, Study name, Study description and User name edit boxes
- Select measurement and time units from these drop down menus[1]
- Type **2** in the Number of datasets edit box to allow us to add two sets of data
- Click Next>> to proceed to the Experimental data entry screen

[1] note that you can actually change these for this study by typing text in the edit box though they will not be added to the drop down list unless your systems administrator or ModelManager supervisor changes the database directly.

Step 4: Add experimental data (1)

The screen for experimental data entry in the parent only study is shown below. This screen is used to record the experimental data measured during a trial run.

The Experimental Data Entry screen



In this example we will use two sets of data. First fill out the rest of the screen:

- Press <Alt+A> to select or click in the Name edit box and give the first set of data the name **Dataset 1**

In this experiment we know that we put 5 units of the chemical into the system:

- Tab to or click in the Nominal Applied edit box and enter **5**

It is not necessary to enter any estimates of how the compound degrades To add the data

- Select the data grid and enter the following

time	Parent
0	5.001
0.5	4.232
1	2.783
1.5	2.531
2	1.83
2.5	1.617
3	1.101
3.5	0.895
4	0.365

Note that if you have data in digital form - even a simple text file, you can copy and paste the data directly into the table in this screen.

Step 5: Add experimental data (2)

Now enter the data for the second set of data.

- Clicking the Dataset 2 tab at the top of the screen.
- Give this the name **Dataset 2**
- Set the nominal applied to be 500.
- Enter the following data below

Experimental Dataset 2

time	Parent	time	Parent
0	503	100	139
10	424	110	128
20	370	120	125
30	298	130	115
40	262	140	111
50	213	150	104
60	192	160	105
70	155	170	98
80	140	180	88
90	135		

It is possible to get a rough idea of how the compound has degraded by clicking the “Graph” button (Alt+G). The data shown on the graph corresponds with the selected dataset tab on the data entry screen. From this you can see that the data in dataset 1 degrades with roughly a straight line, and in dataset 2 it follows a curve – although the curve becomes noticeably shallower after time 80.

- Press the Next>> button on the data entry screen to move to the final step in the study, the analysis configuration screen

Step 6: Analysis Configuration, run 1

As the name suggests, is where the analysis run is configured. The screen is linked through various options to several other screens. However for this tutorial we will first analyze Dataset 1

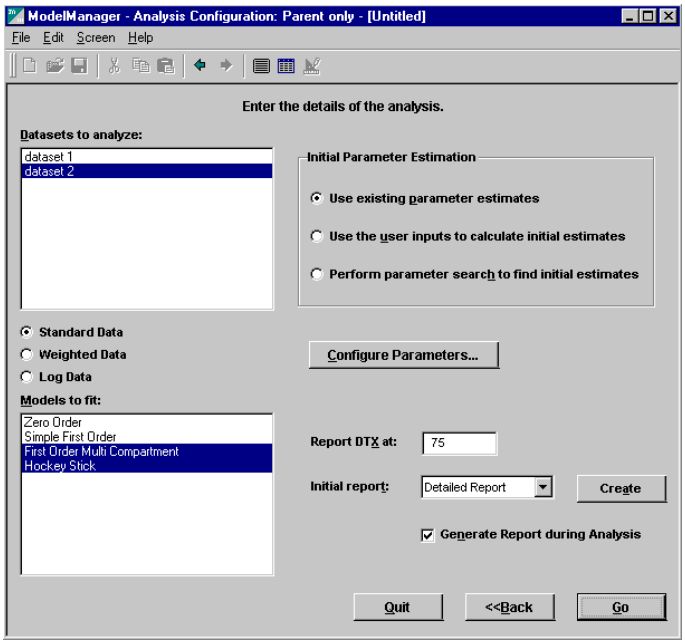
- Click to select Dataset 1
- Check Standard data
- Select Zero Order Simple First Order
- Click Go

Step 7: View the result, run 1

- Switch to Excel to view the report

Note that three sheets are generated, one for each model and one which compares the fits (both in output data and as a plot)

The Analysis Configuration screen



Step 8: Analysis configuration, run 2

Switch back to ModelManager and you should still have the Analysis Configuration screen in view. To perform an analysis run for a different dataset (note that you can in general select more than one dataset):

- Deselect Dataset 1 and select Dataset 2
- Deselect Zero Order and Simple First Order and select First Order Muli Compartment and Hockey Stick
- Click Go

Step 9: View the results

Once again switch to Excel and view the report. You will find sheets for both models and a third showing a comparison.

The elements of the Analysis Configuration screen are as follows:

Datasets to Analyze

The user should select those datasets which are to be included in the analysis from this list. Several datasets may be selected by clicking on their list item. Selected datasets are de-selected by clicking their list item again.

Models to Fit

The user may select which models are to be run during the analysis by selecting the model names from this list. These models will be applied to all datasets selected from the dataset list.

Weight the experimental data check box

This box should be checked if the experimental data is to be weighted. This causes ModelManager to select the appropriate weighted models.

Initial Parameter Estimation

This is a series of options for the initial estimation of the model parameters. Only one option may be selected from this list. There are three options available for all study types except for Sediment Partitioning, for which there are two. The options are:

Use existing parameter estimates

This option takes the parameter estimates which are contained in the database for all models selected for analysis. If the analysis is being run for the first time, then these will be the default parameter values for each model. If analysis has already been performed for a particular model / dataset pair, then the results of the previous analysis will be used. If parameter values have been amended using the "Configure Parameter" screen, the amended values are taken.

Use the user inputs to calculate initial estimates

With this option selected, the initial parameter estimates are taken from user inputs on the Experimental Data Entry, namely the estimates of the percentage of parent (and metabolite) degraded in specified time. In the case of a Parent Only study type, the "Hockey Stick" model also uses the "breakpoint time" on this screen. If the entered degradation estimates are incomplete, ModelManager estimates values from the experimental data. This option is not available for Sediment Partitioning studies.

Perform parameter search to find initial estimates

This option uses the grid search or simulated annealing method to calculate initial values for the parameters. ModelManager first calculates an estimate for each parameter from the user inputs as above which is then used as the basis of the parameter search.

Configure Parameters button

The button named “Configure Parameters…” opens a screen via which the default parameters may be altered for the currently selected models and datasets.

Run Configuration menu item

This takes the user to the Run Configuration screen, on which the default run options may be overwritten. Access to this screen is limited to those with Super-user authority. The Run Configuration screen is described in Section 0.

Optimization Configuration menu item

This takes the user to the Optimization Configuration screen, on which the default optimization options may be altered. Access to this screen is limited to those with Super-user authority.

“Report DTX at” box

This box allows the user to specify the value at which ModelManager is to calculate the Degradation Time. In addition to a calculation at this specified time, values for DT50 and DT90 are calculated by default, with errors corresponding to 95% confidence via the appropriate Student t value.

The report (which should be automatically opened if requested) at the end of the analysis should be specified under the heading “Initial report”. The list of available reports may be altered by means of the ModelManager Wizard tool.

If a report is not desired during the current analysis, the check box under the heading “Generate Report during Analysis” should be de-selected. The user may create a report at any time (while an analysis is not currently running) by clicking the “Create” button. This button is not available until an analysis has already been run.

If a report has been requested to be generated automatically at the end of the analysis, and any of the model optimizations have not been successful, then the user is prompted, at the end of the analysis, as to whether they wish to proceed with report generation.

3. Generating Reports

Creating a report during an analysis

To create a report during an analysis ensure that Generate Report during Analysis (Analysis configuration screen is checked.

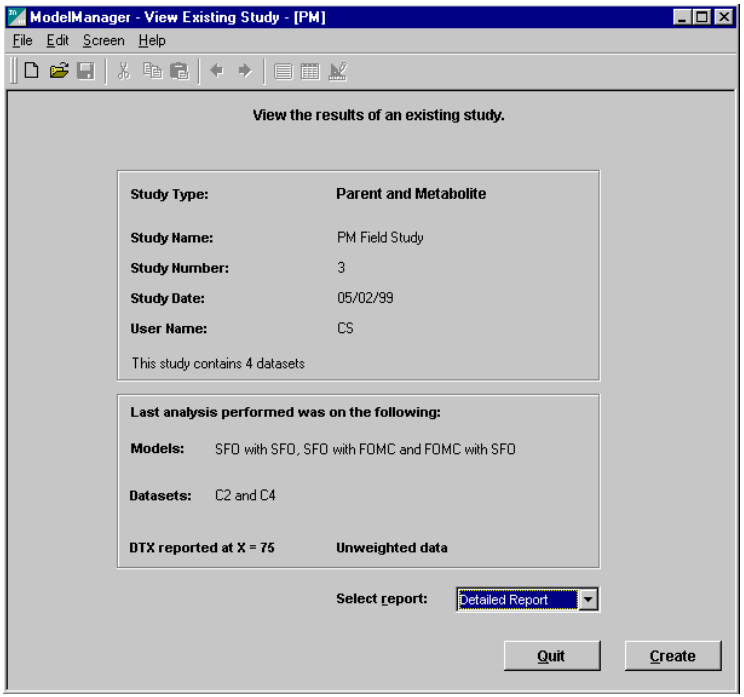
Creating a report from an existing study

If the user has chosen to view the results of an existing study in the opening screen, they will be presented with an Open file type dialog.

- Select a file and click Open

You are then presented with the View existing Study screen.

The View Existing Study screen



This screen provides an alternative way of opening a study. You are presented with a brief summary of the study results, and offered a choice of reports that may be generated. (Select report drop down list). Note that if a report is not currently "allowed", i.e. no analysis has taken place, or the user has changed the configuration of the analysis since the last analysis was done, then the "Create" button will be grayed out.

The elements of the screen are as follows:

Summary This summary lists some details of the study that was selected. This may assist in verifying the selected study is that required.

Select Report This lists the available reports for a particular study type. The user should select the desired report from this list.

Create button This button should be pressed to create the selected report. Note that if a study has been created, saved and exited without any models having been run, this button will not be available, as there will be nothing to report. In this case the user should open the study and run the analysis before this option is available.

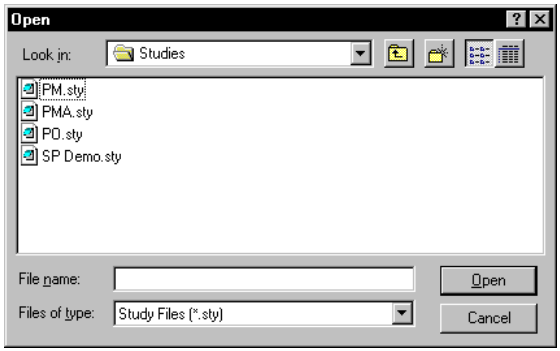
4. Study Files

Open an Existing Study

Once the desired study has been selected, the user is automatically presented with the Study Details screen, containing the information of the selected study.

On the opening screen of ModelManager, the user has the option to open a previously existing study. The user is presented with a dialog which allows them to select which study they wish to open. This dialog is shown below.

Open Study File dialog box



A study file has the extension .STY and is merely a pointer to a database containing all the information relating to that study. For example, if we have saved a study under the name TEST.STY, we would have the following:

- A study file TEST.STY which contains the name of the study database
- A study database named TEST.MDB, in the same folder as TEST.STY, which contains the study data such as datasets, results etc.

When a study is opened, the study database is copied into the installation directory of ModelManager, which is by default:

C:\Program Files\Cherwell Scientific\ModelManager (EK)

The database is renamed mman.mdb, and it is this copy of the study database that may be altered by the user when the study has been opened.

When the user chooses to close a study that is currently open., they are prompted as to whether the study should be saved. If the user selects “yes” then the database mman.mdb (in the installation directory of ModelManager) is copied back to the original location of the opened study. For example, if we had opened the file:

C:\Program Files\Cherwell Scientific\ModelManager (EK)\Studies\TEST.STY

we would have copied the file:

C:\Program Files\Cherwell Scientfic\ModelManager (EK)\Studies\TEST.MDB

to the “working” location:

C:\Program Files\Cherwell Scientfic\ModelManager (EK)\mman.mdb

Once the user has chosen to save the study, then this file above is copied back to the original location:

C:\Program Files\Cherwell Scientfic\ModelManager (EK)\Studies\TEST.MDB

The original file is overwritten.

If the user closes the opened study without choosing to save the file, their changes are discarded. The file mman.mdb is not copied back to the original study location and the original file TEST.MDB is left unchanged.

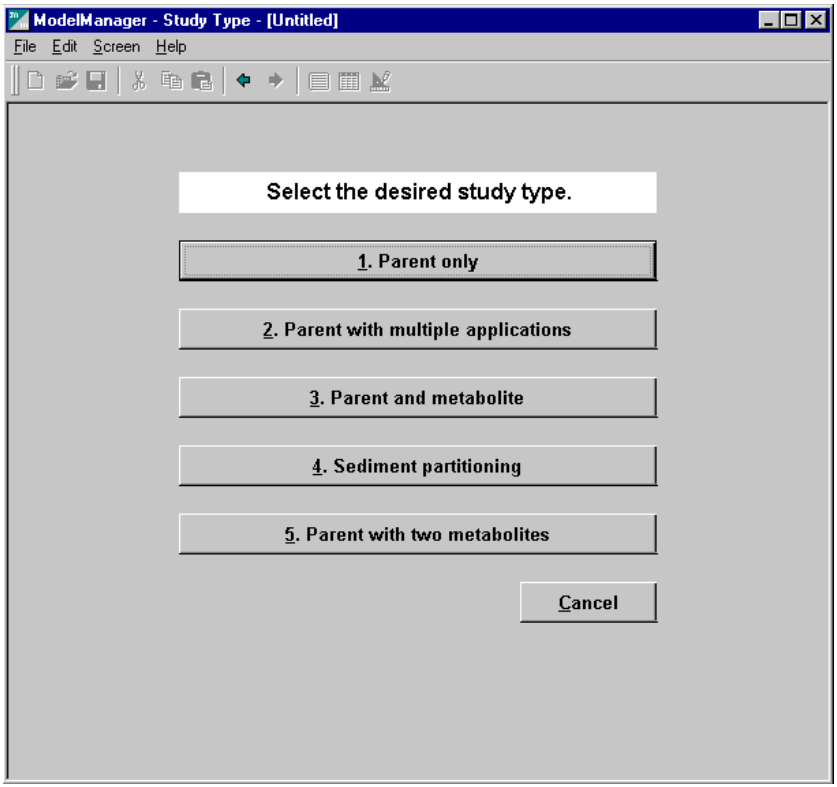
As the study database contains all information as to the status of every control on the ModelManager screens, and details on datasets entered by the user and the results of their analyses, then all of this information is saved when saving a study.

5. ModelManager screens in detail

Study Type Screen

On choosing to create a new study, you are prompted to select a study type by the Study Type screen.

The Study Type screen



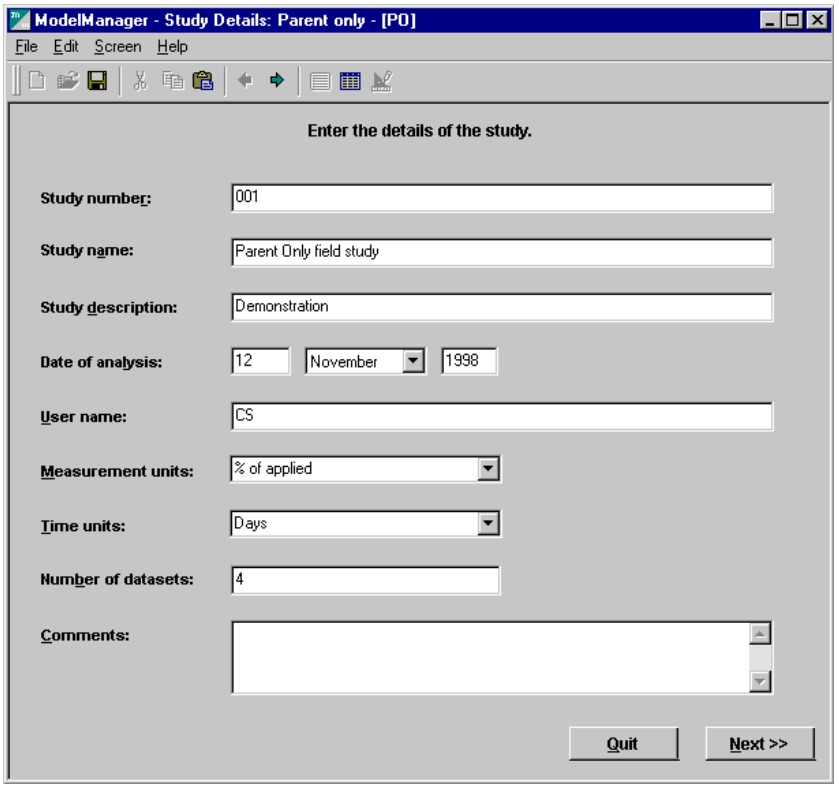
Study Type buttons The buttons describe the study types available. Select one to proceed.

Cancel button Clicking Cancel quits the current study and takes the user back to the opening screen.

Study Details Screen

Once a new study or an existing study has been opened, the **Study Details** screen is displayed.

The Study Details screen



This allows entry of comments and specific information about the study. All the data entered is available when generating reports.

Study details

Use the Study details edit boxes to specify details which identify the study in question. These are:

- Study number
- Study name
- Study description
- User name

- date of analysis (see below)

Date of analysis

The date field on this screen checks the values entered to ensure they are valid. Leap years and year 2000 are handled correctly. If the user enters an invalid date, they will be prompted for a new entry.

When creating a new study, the date field contains the current date. When opening an existing study, the date field is not amended to show the current date.

Measurement units, Time units

These list the range of Measurement and Time units available in the database. You may enter their own time and measurement units if the unit they require is not available.

Number of datasets

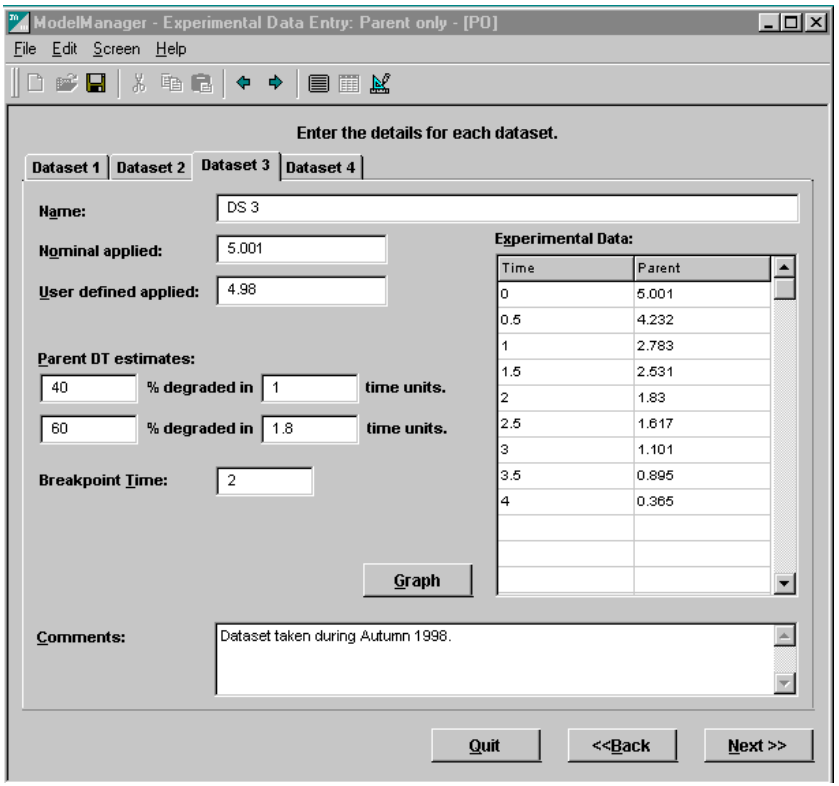
Enter the number of datasets that should be contained in the study. The number of datasets in a study may be adjusted at a later date by returning to the Study Details screen. For all new datasets created, the database is filled with default values for the parameters of all the models relevant to that study type.

There is an upper limit of 10 datasets per study and numbers greater than this limit will be truncated to 10. The default value of 1 (one) is used if zero or negative numbers are used.

Experimental Data Entry Screen

The data entry screen presented to the user by ModelManager will depend upon the study type in question. For the purposes of this description, we shall refer to the screen corresponding to the Parent Only study type.

The Experimental data entry screen



Dataset Tab Controls

All the datasets are available for configuration on a single screen. The Tab control allows switching between datasets (labeled Dataset 1, Dataset 2 etc.).Choose a particular dataset by clicking the appropriate tab.

The available fields on the Experimental Data Entry screen are listed and described below. If a field is not available for a particular study type, this is mentioned in the description of that field.

Dataset name

Enter a name to identify a particular dataset. This name is available for insertion into Reports.

Nominal Applied/User Defined Applied

These relate to the initial amount of parent applied and provide alternative methods of specifying this quantity. Many models contained in ModelManager contain a parameter relating to the initial amount applied, and these extra fields give more flexibility to the user when setting an initial value for this parameter in the optimization routine.

Parent Estimates Enter the value of estimated degradation times for the parent. Note that these figures are optional and may be used on a later screen to calculate the initial parameter values in the optimization. They are, however not available for the Sediment partitioning study type.

Metabolite Estimates For the Parent and Metabolite study type the user enters here the value of estimated degradation times for the metabolite. These figures are also optional and may be used on a later screen to calculate the initial parameter values in the optimization. Note that they are only available for the Parent and Metabolite study type.

Breakpoint Time This field is used only when calculating initial parameter values for the Parent Only Hockey Stick model. It is not required for any other model or study.

Experimental Data This table is used for the entry of numerical experimental data. The time values do not need to be entered in chronological order, as they are re-ordered automatically on leaving the screen. The data entered may be viewed by clicking the **Graph** button.

Comments Any comments the user might like to associate with the dataset.

Graph Button Clicking this button sends the user to the Graph screen. This screen is available to all study types, and is described in Section 0.

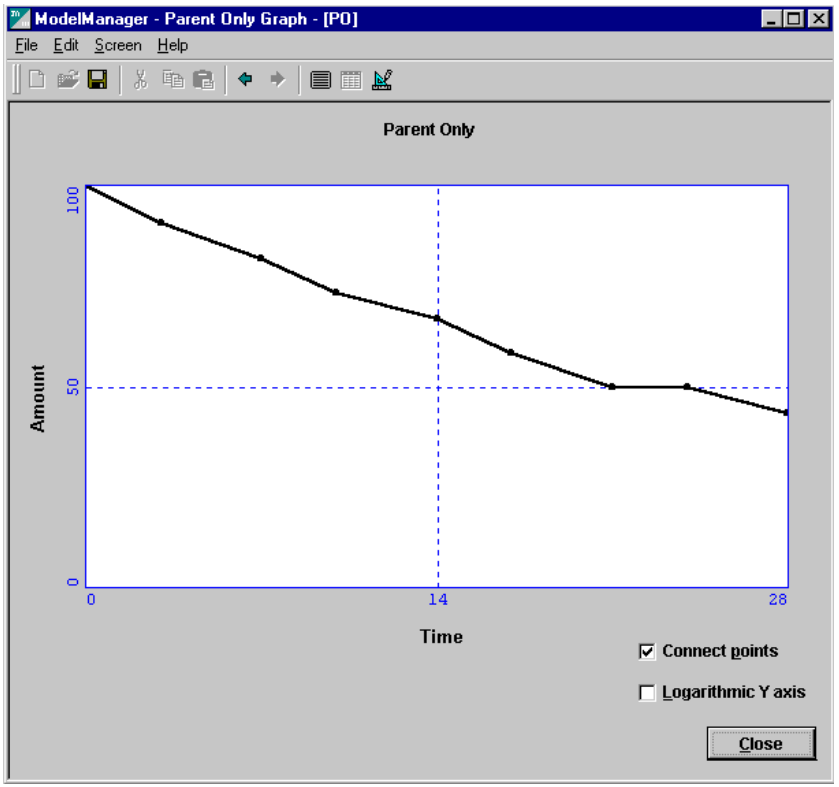
Graph Screen

The appearance of the Graph screen depends on the current study type. For the Parent Only and Multiple Applications study types it contains a single trace, and has two traces for the other two study types.

Graph plot area This displays the data entered in the table of the Experimental Data Entry screen. If no data is available to be plotted, the plot area will not be visible and the user will be shown the information “Empty Dataset”.

Graph Properties There are two properties which may be adjusted by the user. These are:

The Graph screen



- **Disconnect Points / Connect Points**

  The user may choose to display the data with or without a line connecting the points by clicking the button labeled “Disconnect Points”. The line will be removed from the graph and the button will then be labeled “Connect Points”. Clicking again will re-connect the points and so on.

- **Logarithmic Y axis**

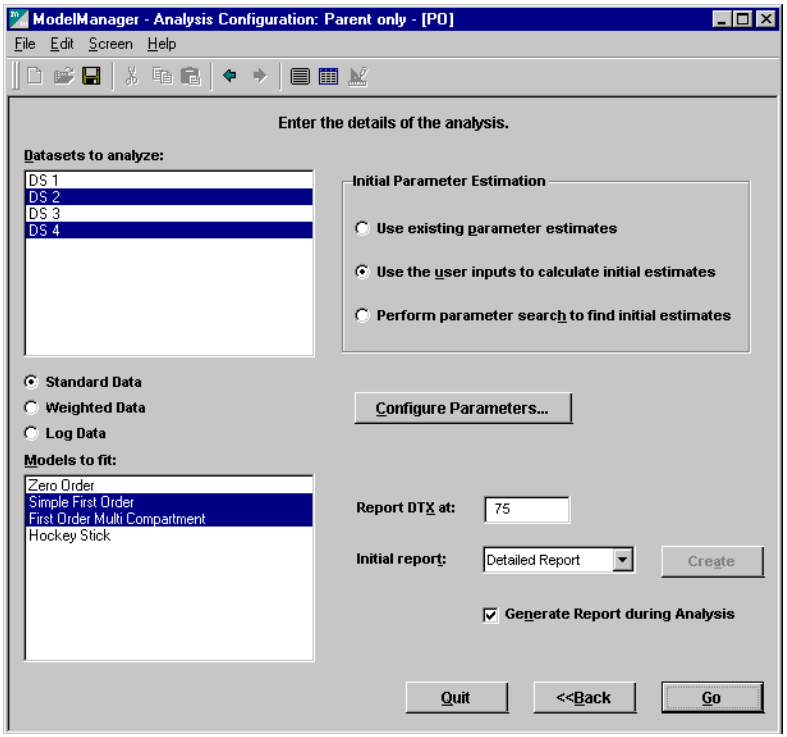
  The user may select the Y axis to have a logarithmic scale. Un-checking the button will cause the Y axis to become linear.

Close button Clicking the Close button takes the user back to the Experimental Data Entry screen.

Analysis Configuration Screen

This is the focal point of the application, where the analysis run is configured. The screen contains links to various option screens.

The Analysis Configuration screen



Datasets to Analyze

The user should select those datasets which are to be included in the analysis from this list. Several datasets may be selected by clicking on their list item. Selected datasets are de-selected by clicking their list item again.

Models to Fit

Select which models are to be run during the analysis by clicking the model names from this list. You may select any combination of the listed models. Click the model again to deselect. The selected models will be applied to all datasets selected from the dataset list.

Weight the experimental data radio buttons

Check one of the three radio buttons to choose whether the data analysis is to be weighted. This causes ModelManager to select the appropriate weighted models.

Initial Parameter Estimation

This is a series of options for the initial estimation of the model parameters. Only one option may be selected from this list. There are three options available for all study types except for Sediment Partitioning, for which there are two. The options are:

- **Use existing parameter estimates**

  This option takes the parameter estimates which are contained in the database for all models selected for analysis. If the analysis is being run for the first time, then these will be the default parameter values for each model. If analysis has already been performed for a particular model/dataset pair, then the results of the previous analysis will be used. If parameter values have been amended using the "Configure Parameter" screen, the amended values are taken.

- **Use the user inputs to calculate initial estimates**

  With this option selected, the initial parameter estimates are taken from user inputs on the Experimental Data Entry screen namely the estimates of the percentage of parent (and metabolite) degraded in specified time. In the case of a Parent Only study type, the "Hockey Stick" model also uses the "breakpoint time" on this screen. If the entered degradation estimates are incomplete, ModelManager estimates values from the experimental data. This option is not available for Sediment Partitioning studies.

- **Perform parameter search to find initial estimates**

  This option uses the grid search or simulated annealing method to calculate initial values for the parameters. ModelManager first calculates an estimate for each parameter from the user inputs as above which is then used as the basis of the parameter search.

Configure Parameters button

The button named "Configure Parameters…" opens a screen via which the default parameters may be altered for the currently selected models and datasets.

Run Configuration menu item

This takes the user to the Run Configuration screen, on which the default run options may be overwritten. Access to this screen is limited to those with Super-user authority.

Optimization Configuration menu item

This takes the user to the Optimization Configuration screen, on which the default optimization options may be altered. Access to this screen is limited to those with Super-user authority. The Optimization Configuration screen is described in Section 0.

"Report DTX at" box

This box allows the user to specify the value at which ModelManager is to calculate the Degradation Time. In addition to a calculation at this specified time, values for DT50 and DT90 are calculated by default, with errors corresponding to 95% confidence via the appropriate Student t value.

Initial Report / Create button / Generate Report checkbox

The report that should be automatically opened (if requested) at the end of the analysis should be specified under the heading "Initial report". The list of available reports may be altered by means of the ModelManager Wizard tool (see the separate documentation on the ModelManager Wizard).

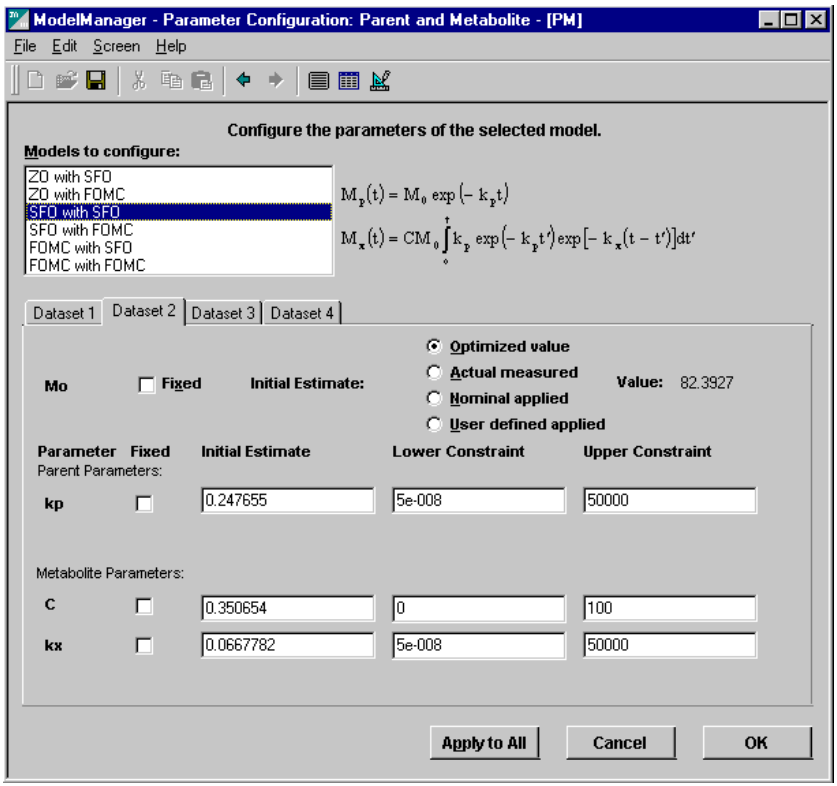
If a report is not desired during the current analysis, the check box under the heading "Generate Report during Analysis" should be de-selected. The user may create a report at any time (while an analysis is not currently running) by clicking the "Create" button. This button is not available until an analysis has already been run.

If a report has been requested to be generated automatically at the end of the analysis, and any of the model optimizations have not been successful, then the user is prompted, at the end of the analysis, as to whether they wish to proceed with report generation.

Configure Parameters Screen

This screen allows the user to alter the default values of a particular model. The parameters for a particular model may be set to different values for different datasets if required.

The Configure Parameters screen



Models to Configure

This list displays all the models associated with the study type, whether they were selected in the analysis configuration screen or not. The user should select the model whose parameter should be edited from this list. Only one model may be selected from this list at any time.

When a model is chosen from this list box, this causes the appropriate parameters to be displayed on the screen. In addition, the appropriate bitmap is selected to display the form of the chosen model.

Model bitmap

The model bitmap displays the equation associated with the chosen model.

Dataset Tab Control

The tab control may be used to switch between datasets, so that the model parameters that are used are dependent on the dataset. For example, the diagram above shows the parameter values to use when running the “First Order Multi-Compartment” model on dataset 1. If a Model / dataset combination is chosen, which was not selected from

the lists on the Analysis Configuration screen, then the screen entries are dimmed and may not be edited.:

M0 Properties

The M0 parameter is common to all models, except for those models included in the Parent with Multiple Applications study type. The value of M0 is specified from the options described in the list below. The user may specify whether the value is "Fixed" in the optimization - i.e. it is not included as an adjustable parameter in the optimization. The value of M0 which is to be used is selected from the four options (three options for Parent with Multiple Applications studies):

- **Optimized value**

  This takes the value which was calculated during the previous analysis. The actual value used is shown to the left of the radio buttons. This option is not available in Parent with Multiple Applications studies.

- **Actual measured**

  This takes the value which was entered on the experimental data entry screen, which corresponds to the entered value at time t = 0.

- **Nominal applied**

  This tells ModelManager to use the value entered on the experimental data entry screen under the heading "nominal applied".

- **User defined applied**

  This tells ModelManager to use the value entered on the Experimental Data Entry screen (see Section 0) under the heading "User defined applied".

If the user selects a value for M0 that is not available, for instance if they select the Nominal Applied value, and have not specified this value on the Experimental Data Entry screen, then they will receive the message "Your initial estimate for M0 does not exist. Please select another.".

For the Parent with Multiple Applications study type, the application data entered on the Experimental Data Entry screen for each dataset are used as a series of fixed M0 parameters.

Parameter Properties

The parameters are configured by entering an initial value, a lower constraint and an upper constraint to be used in the optimization. The parameter may be taken out of the optimization process by selecting the check box associated with that parameter labeled “Fixed”.

“Apply to all” button

When this button is clicked, the parameter estimates and the “Fixed” status for the model currently on the screen are applied across all datasets. This includes the options for the M0 parameter and the constraint ranges of the parameters.

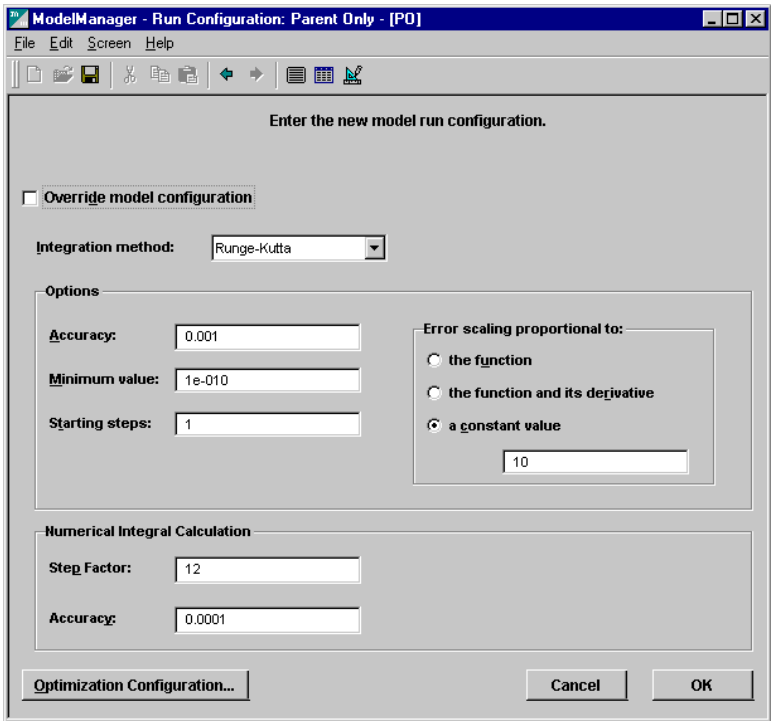
Run Configuration Screen

How to get to this screen

The Run Configuration screen may be opened from the Screen menu. This screen is password protected with “Super-user” privilege. Once a correct password has been entered, the screen shown below will be displayed.

The screen shows the run configuration that may be adjusted for the analysis. The integration schemes used by ModelManager uses a variable (not fixed) step length. A full description of the methods is beyond the scope of this document. Please refer to the ModelMaker user manual for details.

The Run Configuration screen



Override Model Configuration The entries on this screen will not take effect unless this check box is set.

Integration method This specifies which of the four integration methods to use. The available methods are Euler, Mid-point, Runge-Kutta and Bulirsch-Stoer.

Accuracy This specifies the accuracy of the integration method. Small values provide greater accuracy but cause longer run times.

Minimum value This is the minimum value allowed when calculating the model parameters. This is used to prevent numerical overflows during calculation.

Starting steps This is the initial number of divisions that the initial output step should be split into.

Error scaling This allows the user to specify what method is used for the error scaling. The choices are error scaling proportional to:

- the function
- the function and its derivative
- a constant value

See the ModelMaker online documentation for more details on the mathematics behind these options.

Step Factor This allows the user to specify the step factor to use for numerical integration during model calculation.

Integration accuracy This allows the user to specify the numerical accuracy for numerical integration during model calculation.

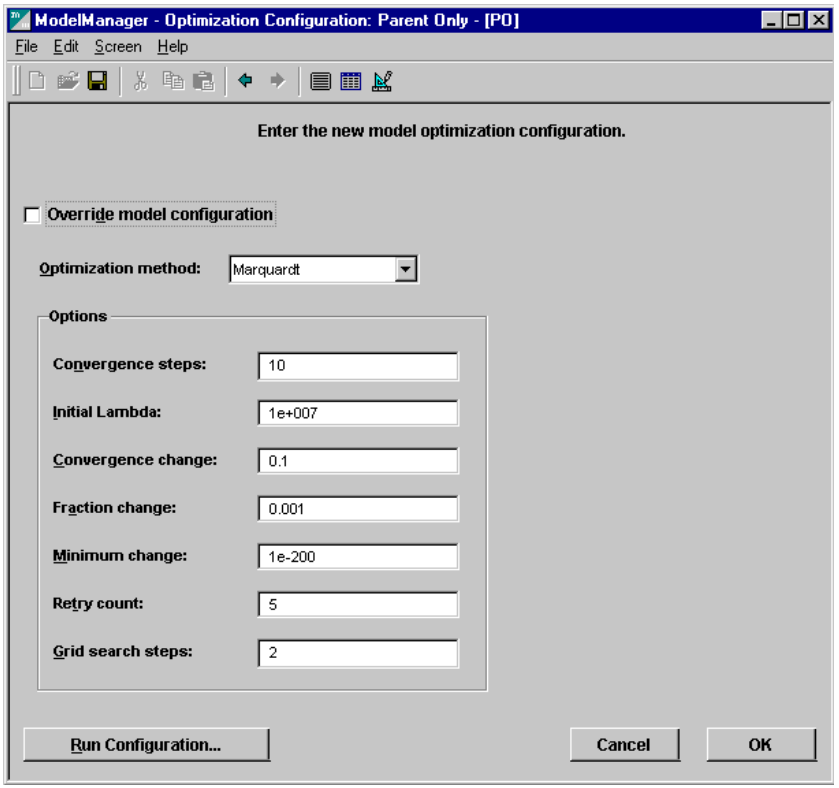
Optimization Configuration button The user may enter the Optimization Configuration screen by clicking this button. As the user has already logged in as Superuser, no further password is required. The Optimization Configuration screen is described in Section 0.

Optimization Configuration

This screen, also opened from the Screen menu, is also password protected, except when entered from the Run Configuration screen.

As for the Run Configuration, a full description of the fields in this screen is beyond the scope of this document. Please refer to the ModelMaker user manual for details. The elements of the screen are described below:

The Optimization configuration screen



Override Model Configuration The entries on this page will not take effect unless this check box is set.

Optimization Method The user may select from Simplex or Marquardt optimization.

Convergence steps This specifies the number of successive convergent steps that must occur before the model is considered to be optimized.

Initial Lambda This value is applicable only for Marquardt optimization, and is the parameter by which the Marquardt method moves between the methods of curvature and steepest descent.

Convergence change This is the fractional change in χ^2 which is considered to be a convergent step.

Fraction change This is applicable to the Marquardt method and controls the values calculated for the curvature matrix.

Minimum change This is also applicable only to Marquardt, and specifies the lowest tolerated value of the fractional change. See the ModelMaker manual for details.

Retry count This is the number of times a calculation is retried if either a parameter violates its constraint range, or if an optimization step is carried out without the parameter value changing.

Grid search steps This specifies the number of steps to use in the grid search. The larger this number the smaller the "mesh" used in the grid search.

Run Configuration button The user may enter the Run Configuration screen (described in Section 0) by clicking this button. As the user has already logged in as Superuser, no further password is required.

ModelXchange

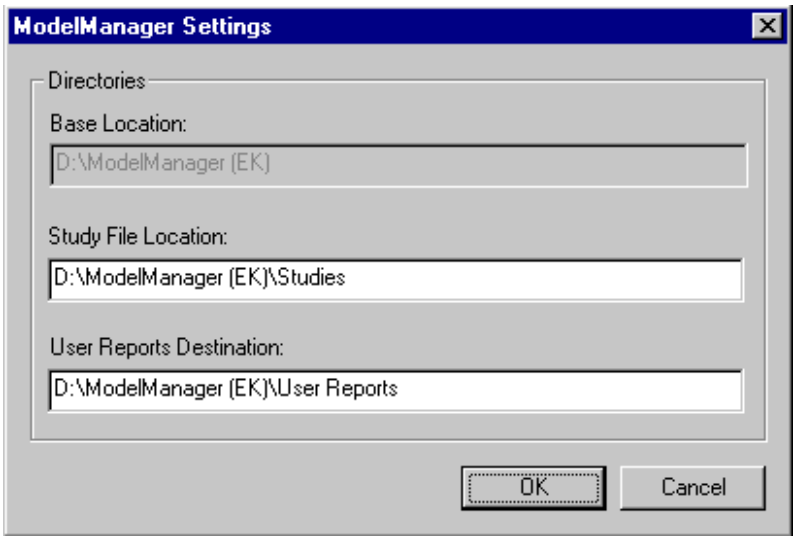
ModelXchange is an administrative function that allows a model set (i.e. the standard, weighted and log models) to be exported and imported through a single file. This functionality will be described in more detail in the systems administrator manual.

Please note that Cherwell Scientific provides a web site www.modelxchange.com for exchanging these files with other users of ModelManager.

Settings Dialog

The Settings dialog may be found under the Edit menu of the ModelManager toolbar.

The Settings dialog



- Base Location - this field is not editable by the user, and displays the installation directory of ModelManager.

- Study File Location - this field shows the default directory that will be displayed when the user opens an existing study in the opening screen of ModelManager. The user may alter this field if loading studies from a different folder.

- User Reports Destination - when ModelManager generates reports, these are saved to the directory named in this field. The user may alter this field to have the reports put into a different folder.

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