Intended Audience

This manual is written to provide a general description and usage guidelines for anyone using this application – it does not provide any clinical interpretation of the data that you may collect and analyze and no clinical interpretations should be assumed.

Operating Environment

This program runs on any 32-bit Microsoft operating system using an Intel compatible processor. This application should also run under current versions of WINE, an Open Source implementation of the Windows API on top of X and Unix that runs on Linux and FreeBSD operating systems, although full operation is not guaranteed under WINE.

It is assumed that the end-user is familiar with the operating system environment that they are using and no special reference is made to any specific operating system within this manual. Manuals for these operating systems are available from the appropriate sources – contact your supplier or system administrator if you need additional support for your operating system.

All Motion Lab Systems applications fully support the C3D file format. Detailed information on the C3D file format is available on the Internet at http://www.c3d.org - additional information on manufacturer specific C3D implementations may be obtained from your C3D application developer.

Year 2000 compliance

Motion Lab Systems, Inc. has reviewed and tested this application for Year 2000 (Y2K) compliance. The program will continue to function correctly on and beyond the year 2000.

Trademarks

All trademarks and registered trademarks are the property of their respective owners.
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Introduction

Overview

RData2 is a 32-bit program written for the Windows™ operating system. It is supplied with sample data and a full installation setup and removal program.

The RData2 program enables anyone to create a variety of ASCII formatted files from a number of different file formats that are in common use in Biomechanics, Motion and Gait Analysis laboratories. The native file formats are read by RData2, the contents of the file is translated into ASCII text and then written to a file. The user has a very large degree of control over the structure and contents of the ASCII files created by RData2 and can automate the process to export hundreds of files per minute when large translation or data extraction needs arise.

RData2 gives everyone the ability to extract 3D and analog data quickly and easily and its graphical interface allows the user to visualize the often complex binary formats used by many data capture systems to select the correct data items. Unlike many ASCII translation applications, RData2 can be run both as a standard GUI interface application and can also be called from within other applications (Excel, Access, Visual Basic applications, etc.) allowing the often complex binary to ASCII translation process to be handled independently of the users application allowing Students and Researchers to concentrate on analyzing the data, not reading the data.

In addition, RData2 can read a list of file names to be processed from a text file allowing tedious ASCII translation operations to be performed in minutes, not months. This feature alone has saved many people literally months of time over the alternative of manually opening each one of thousands of files to select and export the individual data records.

RData2 reads the following file formats

<table>
<thead>
<tr>
<th>File Type</th>
<th>File description</th>
</tr>
</thead>
<tbody>
<tr>
<td>.ADC</td>
<td>Analog data formats from RSX and VMS based Vicon systems.</td>
</tr>
<tr>
<td>.ANA</td>
<td>A standard analog data format from Motion Analysis Corporation systems.</td>
</tr>
<tr>
<td>.C3D</td>
<td>A standard binary format that contains 3D data, analog data and data parameters. RData2 reads C3D files from DEC, MSDOS and SGI systems.</td>
</tr>
<tr>
<td>.DAT</td>
<td>Analog data files from obsolete MS-DOS based CODAS systems.</td>
</tr>
<tr>
<td>.EMG</td>
<td>Analog data files produced by BTS Spa TELEMG systems.</td>
</tr>
<tr>
<td>.VAD</td>
<td>Analog data from Oxford Metrics 370 systems</td>
</tr>
<tr>
<td>.WDQ</td>
<td>Analog data files produced by Dataq Instruments analog systems.</td>
</tr>
</tbody>
</table>
Other formats or custom versions of this program may be available. If your format does not appear in the list of supported file formats then please contact us to see if it has been added recently. Motion Lab Systems, Inc. can be found on the Internet at http://www.motion-labs.com

Two output file formats are supported – the CAMARC DST (Data Storage and Transfer) format and a flexible, user defined, ASCII text (TXT) format. The DST format offers a number of “standard” output formats with relatively little opportunity for customization, while the TXT format allows the user extensive control to specific the exact contents of the output file to suit almost any requirement.

The DST format is relatively standardized format where the precise content of the output file is defined by a “lexicon” description – this enables the DST format to be customized in well defined ways. One of the DST lexicons supported by RData2 is used by the GaitCD package by Christopher L Vaughan and available form Kiboho Publishers – this package allows you to explore 3D data on your own PC, with dynamic 3D animation, all major gait parameters and standardized output plots. The GaitCD package is available from the http://www.kiboho.co.za/GaitCD web site.

Anyone can run RData2 in the demonstration mode to evaluate the program using the demodata.c3d file supplied with the application and installed in the `demodata` directory. The application is supplied with a number of different sample files and can be used to open and view the content structure of any supported file in the evaluation mode. However only files that contain less than 100 frames of data (e.g., demodata.c3d) can be exported to one of the supported file formats (DST or TXT) with the evaluation version.

A registration number for RData2 can be purchased from Motion Lab Systems, Inc. to enable the full functionality of the program with files of any size. Registered versions of the RData2 application are “site licensed” and can be run on any number of computers that are owned, or in use, at the registered site. Please contact Motion Lab Systems, Inc. if you are unsure of our license policy or conditions.

**Installation**

You can use the Windows Add/Remove Programs option in Control Panel to install RData2 or, if you download a copy from our web site (http://www.motion-labs.com), then just run the installation file. This will install the program on your system together with some example files that you can use to demonstrate and play with the program.

![Are you installing an evaluation version?](https://example.com/evaluation-question.png)

*Figure 1: RData2 is available for evaluation*

During the installation you will be asked if you are installing an evaluation version – answer Yes to install the evaluation version if you are not a licensed RData2 user. If you answer No at this prompt then you will be required to enter a license number after you accept the standard license agreement.

Upon completing the installation you will be offered the opportunity to view the readme file that contains the latest revision information about the program and also,
if you are connected to the Internet, the chance to check for an updated version of the program. The web site will always contain the latest update but if you are installing from CDROM then it is recommended that you check for an update.

All minor (point revision – i.e. 2.6.xx to 2.7.xx etc.) updates to the RData2 program are included in the purchase or evaluation of the software. Major revisions of the program (i.e. 2.xxx to 3.xxx) require that you purchase a new version of the program or maintain a software service contract with Motion Lab Systems, Inc.

If you have not purchased a license then you can run in evaluation mode by entering 0000-0000-0000-0000 as the serial number so that you can try out the product before you purchase a copy. If you have purchased a copy then enter your license number together with your User Name and Organization details exactly as supplied.

If you accept the default options during installation, then you will have created a short-cut in the Motion Lab Systems menu group called RData2 – ASCII export.

RData2 shows the name of the registered user in the About dialog box accessed from the Help drop-down menu and in the main window when the program first starts. The About dialog box can be opened by choosing the About command (Help menu) or by clicking on the button on the Toolbar. This dialog box will also show you the current version number of the program.

Program updates

If you are connected to the Internet than you can check for updates for all Motion Lab Systems applications including the RData2 program by running the update utility in the Motion Lab Systems : Utilities menu group – click on Check for updates and you will be offered the opportunity to download and install all of the latest program versions.

You must have an Internet connection to automatically check for updates to our programs – running the “Check for updates” program will automatically contact our FTP site and determine if a newer version of the application is available. If a new version has been released then the “Check for updates” program will offer to download and install it to make sure that you always have the latest release.

Figure 2: Checking for the latest version is easy with an Internet connection.
If you do not have Internet access on the computer that you have installed our application then you can visit our web site or FTP site and download the current version – this can then be run on your computer to update (if required) the program.

Motion Lab Systems policy is to provide updates to its applications to fix bugs and add additional features at no charge during the life of the application. In addition a free viewer and other file editing and file access tools (MLSviewer and C3Dserver) are available for the DST and C3D file formats from the Motion Lab Systems website.

**Evaluation mode**

RData2 can run in an evaluation mode so that you can try out the product before you purchase a copy. In this mode, you will be able to export data from files that have less than 100 frames of data – note that the `demodata.c3d` file supplied with the program contains 99 frames and can be used to evaluate the RData2 application.

![Unregistered Copy](image)

*Figure 3: The registration status of RData2 is displayed upon startup.*

A registered version of the RData2 application allows export of data for any length file. You can purchase a registration key from Motion Lab Systems, Inc.
Using the program

The User Interface

The C3D file demodata.c3d supplied with the program contains 99 frames of data and can be used with the evaluation version of the RData2 application.

When the Motion Lab Systems RData2 program is started the application window will appear - this will be blank except for a menu bar and Toolbar that appear at the top of the window. The program (like all MLS programs) is a 32-bit Windows application and will respond to all the normal commands to position and control the display. It can be represented on the screen in one of the three ways: full screen (maximized), as an application icon (minimized), or within a window (restored). The application remembers the state in which it was when it was last used and the size of the main window and the position of the Toolbar will be the same.

The name of the Data file that is being analyzed will be displayed in the top left corner of the application (after the name of the Application).

![Motion Lab Systems RData2 - [demodata.c3d]](image)

Figure 4: The RData2 application Title Bar

At this point virtually all the commands that you will need are on the short-cut bar at the top of the program window.

Application Workspace

Each data file that is opened in RData2 has a display window of its own – you can open several files at the same time. The contents of the data file are displayed in each window in the form of a data tree. The tree will have one or more of the items. The first item (or root) of the tree is the name of the file. Each item can be selected (or deselected) by double clicking on it.

When a data file is opened, the application looks through the list in the Selection Page of the File type to decide which items should be selected by default. You should make changes on that page if you want some particular selection scheme. There is one selection page per file type and they can be accessed using the Defaults command (Export menu) See Page 15.
File Menu

Figure 5: The RData2 File menu

The File Menu can always be selected from the left side of the Menu Bar. This menu contains commands that operate on files and is used to select files to be opened. It also contains the commands to save the contents of the file to a DST File or a Text File using the “Save As…” option.

A list of recently opened files is always displayed at the bottom of the File Menu so that you can rapidly access any of the last few files that you have been working on.

Open

Shortcut – CTRL+O

The Open command is available on the RData2 toolbar at the top of the application window or via a keyboard shortcut.

This command can be used to open an existing data file. The following data file formats are recognized by the RData2 application:

- **C3D Files**
  These can be INT or REAL files in DEC, PC or SGI format. RData2 can export all of the parameters in a C3D file.

- **VAD Files**
  These are Vicon Analog Data files. For a VAD file, there is also a file with the .CAR extension. This file contains all the parameter data that are not in the VAD file. If this file is present in the same directory as the VAD file, then the required parameter data can be read from the .CAR file.

- **ADC Files**
  These are all old file formats that contain analog data and were created by the RSX11-M and VMS data collection system manufactured by Oxford Metrics Ltd. RData2 creates a default set of parameters for each ADC file that is opened.

- **MAC Files**
  These are files created by Motion Analysis Corporation that contain analog data. RData2 creates a default set of parameters for each MAC file that is opened.

- **CODAS Files**
  These are files created by Windaq (Dataq Corporation) that contain analog data in the CODAS format. RData2 opens both the standard and multiplexer versions of the CODAS file format. The application creates a default set of parameters for a CODAS file that is opened.
**BTS Files**

These are analog files created by BTS Spa EMG systems. RData2 creates a default set of parameters for each BTS file that is opened.

The RData2 application automatically determines the format of each file when it is opened and then reads the data from the file to display the contents. RData2 does not provide any functions to edit or process the file except to export the contents – the original file is unchanged by the export operation.

The File Open command opens up a standard File Open Dialog box and allows the user to browse through the directories and select the correct file by simply double-clicking on the filename. Each file is opened in its own window.

A file can also be opened by dropping it into the application workspace or by double clicking on it in the Windows Explorer if the file type has been associated with this application.

**Methods of Running RData2**

RData2 can be run using a wide variety of different methods, allowing it to be incorporated into other applications in addition to the traditional “run from the menu” method. This makes it very easy to incorporate RData2 into other applications to automate users written data analysis in Excel, Access, Visual Basic, Java etc. The following options are available:

- RData2 can be run by choosing it from the Start Menu as is done normally. In this case, the application opens and waits for the user to select a file to open. RData2 can be configured to define the exact format of the output file in this mode.

- You can run RData2 and supply with it a file name, in which case it will open with that file using the default export format selected in GUI mode. For example, you would need to type `E:\MLS\RData2\Release\RData2.exe C:\Data\test.c3d` to open RData2 with the file test.c3d. In this instance the path names are important as the locations of the program and the data are required.

- You can run RData2 and supply with it two file names, an import file and an export file. In this case, the application will read the data from the import file and write it to the export file, using the previously set defaults. The application will inform you if the operation was successful or not. The application will not open in this method. For example, you would need to type `E:\MLS\RData2\Release\RData2.exe C:\Data\import.c3d C:\Data\export.txt` to export the data in file import.c3d to file export.txt. In this instance the path names are important as the locations of the program and the data are required.

- There is also a method to automate RData2 using Excel by writing an Excel macro:

  ```vba
  Dim X As Object
  Set X = CreateObject("RDExport")
  X.szDataFile = "C:\Data\import.c3d"
  X.szExportFile = "C:\Data\export.txt"
  X.Export
  ```
The file names used for the conversion and export operation can be stored within the spreadsheet – in this example the file names are stored in Cells B2 and C2:

```vba
Dim X As Object
Set X = CreateObject("RDExport")
X.szDataFile = Worksheets("Sheet1").Range("B2").Value
X.szExportFile = Worksheets("Sheet1").Range("C2").Value
X.Export
```

**Close**

This command can be used to close the current open file. If any changes have been made to the file, which have not been saved, RData2 will prompt you to save them before it closes the file.

This command is available only when a file is open.

**Save**

The Save command is available on the RData2 toolbar at the top of the application window or via a keyboard shortcut.

Shortcut – CTRL+S

If you want to save a VAD file as a C3D file then you will need to use the Save-As command.

This command is the one that is used to export the data file. This export can be done to a Text File or to a DST file. The choice will be made based on whether the DST File command (Export menu) or the Text File command (Export menu) [See Page 12] has been chosen. It is not possible to have both of them selected.

The exported file is saved in the same directory as the data file. The extension of the file is changed to **DST** if it is being exported to a DST file or **TXT** if it is being exported to a Text File. If a file with the same name already exists, you will be prompted if you want to overwrite the file.

You can choose your location and name of the file by using the Save As command (File menu).

It is possible for you to set the manner in which the exported files will be formatted. This can be done on the DST Export Property Page and the Text Export Property Page for DST Files and Text Files respectively after choosing the Defaults command (Export menu) [See Page 15].

The number of frames exported can be set using the Frames command (Export menu) [See Page 12]. By default all the frames present in the file are exported.

**Save As**

The SaveAs command is available on the RData2 toolbar at the top of the application window or via a keyboard shortcut.

Shortcut – CTRL+A

This command is the one that is used to export the data file allowing you to choose a name and location for the exported file. This export can be done to a Text File or to a DST file.

You can choose your location and name of the file by using the Standard Windows Save As dialog box. When this dialog box opens, the default name of the file will be the same as the data file, with the extension changed to **DST** if it is being exported to
a DST file or TXT if it is being exported to a Text File. This determination is based on whether the DST File command (Export menu) or the Text File command (Export menu) [See Page 12] has been chosen. You can change the type of file it will be exported in from the dialog box. If you do not provide an extension, an extension will be added based on the export type.

To export a data file with its existing name and directory (with the extension changed), use the Save command (File menu).

It is possible for you to set the manner in which the exported files will be formatted. This can be done on the DST Export Property Page and the Text Export Property Page for DST Files and Text Files respectively after choosing the Defaults command (Export menu) [See Page 15].

The number of frames exported can be set using the Frames command (Export menu) [See Page 12]. By default all the frames present in the file are exported.

It is possible to export a VAD file to a C3D file using this command (See Page 40).

**Most Recently Used Files**

The application maintains a list of the four most recently used files. Clicking on their name with the mouse can reopen these files (or highlighting their name and pressing enter).

If the file can not be found for any reason then it will not be possible to open it and the entry for that file name will be removed from the file list. You can then either use the File – Open menu to look for the file or select another file from the remaining list of “Most Recently Used Files”

**Exit**

This command causes any open data files to be closed and the RData2 application to exit.

---

**View menu**

![Motion Lab Systems RData2 - [demodata.c3d]](image)

*Figure 6: The RData2 View menu*

The View menu is very simple and allows you to decide if you want the Toolbar and Status Bar to be present.
Toolbar

This command can be used to display and hide the Toolbar, which includes buttons for some of the most common commands in RData2, such as File Open. A check mark appears next to the menu item when the Toolbar is displayed.

The toolbar is displayed across the top of the application window, below the menu bar. The toolbar provides quick mouse access to many tools used in RData2.

<table>
<thead>
<tr>
<th>Toolbar Button</th>
<th>Menu Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>📜</td>
<td>Open command (File menu)</td>
</tr>
<tr>
<td>📋</td>
<td>Save command (File menu)</td>
</tr>
<tr>
<td>📆</td>
<td>Save As command (File menu)</td>
</tr>
<tr>
<td>🎉</td>
<td>About command (Help menu)</td>
</tr>
<tr>
<td>✈</td>
<td>Close command (File menu)</td>
</tr>
<tr>
<td>⌘ F1</td>
<td>SHIFT + F1</td>
</tr>
</tbody>
</table>

Status Bar

This command can be used to display and hide the Status Bar, which describes the action to be executed by the selected menu item or depressed toolbar button, and a progress meter. A check mark appears next to the menu item when the Status Bar is displayed at the bottom of the RData2 window.

Figure 7: The RData2 Status Bar

The left area of the status bar describes actions of menu items as you use the arrow keys to navigate through menus. This area similarly shows messages that describe the actions of toolbar buttons as you depress them, before releasing them. If after viewing the description of the toolbar button command you wish not to execute the command, then release the mouse button while the pointer is off the toolbar button.

The right area of the status bar is used as a progress meter when a long operation like exporting the data is carried out.

Logging

This command allows you to set the options for logging the operations that are carried out by the application. This can also be useful in tracing any problems that might arise.

This command opens the Logging dialog box shown below.
The Logging dialog box has the following controls:

- **Enable Logging** - select this check box if you want the operations in the application saved to a log file. Note that the log file can get very large if this is always enabled.

- **Log on Errors Only** – check this option to only write to the log file when an error is detected. This can make it easy to make a quick diagnosis of many simple problems when running RData2 via another application.

- **Log File** - enter the name of the log file to which the application operations should be written.

- **OK** - this closes the dialog box and saves the changes made.

- **Cancel** - this closes the dialog box without saving the changes made.

---

**Export Menu**

The Export menu has all the commands that are associated with the exporting of data. You can select the default format to export to and also set the defaults for the Application. RData2 will remember the various configuration changes and apply the new settings whenever the program is started.
DST File
This command is used to tell the application that it should export the data in the file to a **DST File by default**. When this is the case, a check mark appears next to this menu item.

Use the Text File command (Export menu) to set the default export to Text File.

Text File
This command is used to tell the application that it should export the data in the file to a **Text File by default**. When this is the case, a check mark appears next to this menu item.

Use the DST File command (Export menu) to set the default export to DST File.

Frames
This command allows you to select the frames that should be exported from the data file. By default all the frames present in the file are exported.

This command opens the Frames dialog box in which you can set the First Frame and Last Frame to be exported.

**Frames dialog box**
This dialog box can be used to select the range of frames that will be exported by RData2. The dialog box tells you about the First and Last Frame of data in the file in the Output Frame Range.

![Frames dialog box](image)

*Figure 10: The RData2 Frames dialog box*

This dialog box has the following fields:

- **First Frame** - This is the First Frame of data that will be exported.
- **Last Frame** - This is the Last Frame of data that will be exported.
- **OK** - Click on this button to validate the changes you have made and close the dialog box.
- **Cancel** - Click on this button to ignore all your changes and close the dialog box.
VDO Information

This command allows you to enter information that will be exported to the DST file, if the VDO lexicon is chosen. This command opens the VDO Information dialog box with three tabs, **Labels**, **Other Data** and **Channel Selection**. The Channel Selection tab is present only when this command is invoked with a C3D file as the active file.

There are two things that happen when the VDO lexicon is chosen:

Additional information not present in the C3D file is required. This information can be entered in the Other Data tab. All the information in this tab is exported to the output file.

The marker and analog labels need to be changed to ones that are recognized by the VDO lexicon. This can be done in the Labels tab. Only those analog or marker channels that have entries in this tab are exported.

The application also creates additional analog channels which are written to the export file. You can choose which channels should be exported from the Channel Selection tab. By default all calculated channels are exported.

VDO Information dialog box

This dialog box allows you to choose the information written to the DST file with the VDO lexicon.

This dialog has three tabs, **Labels**, **Other Data** and **Channel Selection**.

Labels

![VDO Information dialog box](image)

*Figure 11: The RData2 Labels tab in the VDO Information dialog box*

This tab has a list box with two columns, Label and New Label. When there is marker data in the C3D file with a label from the Label column, it is replaced with the corresponding value in the New Label column.
You can use the **Add** button to add a new translation. This will create a new entry. You can then double click on the entry to edit it.

The **Delete** button can be used to delete a translation.

**Other Data**

![Figure 12: Other Data tab in VDO Information dialog box](image)

This tab has one list with two columns, **Variable** and **Value**. All the items in the **Variable** column are written to the DST file. You can edit any entry by double clicking on it.

You can edit an entry by clicking on the **Add** button while an entry can be deleted by clicking on the **Delete** button. The variable should be preceded by '!' or '$' to show whether it is a text section or numeric section for the DST file.
Channel Selection

This tab allows you to choose which of the calculated analog channels will be written to the export file. Six channels are calculated for each force plate. All these channels are listed in the Force Plate Channels box. You can select or un-select the channels in this box. By default all the channels are selected.

Defaults

This command can be used to set the defaults for the Application. The command opens the **Options dialog box**, which is a property sheet with pages in which you can set the defaults you want in the Application.

The following pages are present in the property sheet:

- **DST Export** - This page contains all the defaults that can be set in the export of data to a DST File. See Page 27.
- **Text Export** - This page contains all the defaults that can be set in the export of data to a Text File. See Page 31.
- **BTS Selection** - This page allows you to control which elements of a BTS file will be selected for export by default. See Page 52.
- **C3D Selection** - This page allows you to control which elements of a C3D File will be selected for export by default. See Page 35.
- **VAD Selection** - This page allows you to control which elements of a VAD File will be selected for export by default. See Page 39.
- **ADC Selection** - This page allows you to control which elements of an ADC File will be selected for export by default. See Page 43.
• **ADC Parameters** - This page allows you to set the values for certain important parameters that are created for ADC files by the application. These parameters are important when the data needs to be exported in a scaled form. *See Page 43.*

• **MAC Selection** - This page allows you to control which elements of a MAC File will be selected for export by default. *See Page 46.*

• **CODAS Parameters** - This page allows you to control which elements of a CODAS File will be selected for export by default. *See Page 49.*

**Batch File**

The batch file option allows the user to specify an external text file that contains a list of data files that RData2 will process automatically. This list may contain any data file type that is recognized by RData2 – each file will be exported to the default file type (DST or TXT) specified by the RData2 configuration when the export operation is started. Files will be processed according to the setting of the RData2 configuration options.

A log file of the export operation can be generated to include information on each file export result or only those results that produce errors.

This command is available only when there are no files open in the application and allows you to automatically export one or more files by reading the input filename, output filename and frame range information from a text file. The text file should contain one line per file to be exported, with the items separated by commas as shown below:

```
Input_File, Output_File, Start_Frame, End_Frame
```

If you want to add a comment, the line should start with a semi colon (;).

• **Input File** - This is the name of the data file. The entire path of the data file should be specified. This parameter is required.

• **Output File** - This is either the name of the output file or the entire path of the output file. If only the name of the file is given, the file is created in the same directory as the input file. This parameter is optional; if it does not exist then output filename will be automatically derived from the input filename.

• **Start Frame** - This is the frame from which the data export is started. If this parameter is not present, the export is started from the first frame present in the data file. If the frame specified here is not valid, the export is started from the first frame.
• **End Frame** - This is frame at which the export of data is stopped. This can be valid only if the Start Frame is present. This frame should be greater than the start frame and also should be less than or equal to the last frame in the data file.

This command opens the Batch File Processing dialog box which allows you to perform the export of data.

This dialog box has the following controls:

• **Text File** - This is the file in which the details of the export operation are found. This can be any normal ASCII text file.

• **Browse** - This button allows you to browse the directory structure and find the text file in which the export commands are found. This file is read and the input and output files are reported in the Files To Export box.

• **Files to Export** - This is a list control which lists the input and output files.

• **Export** - Click on this button to perform the export of data.

• **OK and Cancel** - Both these buttons close the dialog box.

![Batch File Processing dialog box](image)

**Figure 14: The RData2 Batch File processing dialog**

If logging is enabled (Edit menu) then the results of the export operation will be recorded in a file for later analysis.

If the output files exist when a batch operation is run then the user will be prompted to overwrite the existing files, skip or exit the batch function:

• **Yes** - overwrite the existing file for ONLY the current source file.

• **No** - skip ONLY the current source file.

• **Yes To All** - overwrite all target files from this point on in the current batch operation

• **Cancel** - exit the batch operation
Window menu

Figure 15: Window menu

This menu contains commands that are useful in arranging the open windows in the application workspace.

**Cascade**
This command can be used to arrange multiple opened windows in an overlapped fashion.

**Tile**
This command can be used to arrange multiple opened windows in a non-overlapped fashion.

**Arrange Icons**
This command can be used to arrange the icons for minimized windows at the bottom of the main window. If there is an open document window at the bottom of the main window, then some or all of the icons may not be visible because they will be underneath this document window.

**1,2, … command**
RData2 displays a list of currently open document windows at the bottom of the Window menu. A check mark appears in front of the file name of the active window. Choose a file from this list to make its window active.

Help menu

Figure 16: Help menu

This menu contains commands useful in finding Help and to register the Application.
Help Topics

This command gives an index of the help topics that are available for the application. It is possible to search for a topic of interest. Help is available by highlighting a menu item and then clicking the F1 key. Help can also be sought by clicking the Shift-F1 keys. This transforms the cursor into a help cursor and the user can click on the item of interest to see the help topic associated with it.

Register…

This command enables you to register this application if you have previously downloaded an evaluation copy and subsequently purchased a registration key for the program. This command opens the Register dialog box. Motion Lab Systems registration keys consist of a User Name, Organization Name and a sixteen digit serial number. You must enter this information correctly before the application will export data from files with more than 100 frames.

Register dialog box

This dialog box can be used to register the Application. You can enter you name and organization and the 16 digit code given to you by Motion Lab Systems.

![Register dialog box](image)

*Figure 17: Register dialog box*

This dialog box has the following fields:

- **User Name** - Enter the name of the User.
- **User Org** - Enter the Organization of the user.
- **Reg. Num** - Enter the 16 digit code provided to you by Motion Lab Systems. If RData2 is already registered, **Licensed Copy** will appear in this field.
- **OK** - Click on this button to validate the changes you have made and close the dialog box. The modifications you made will be written to the registry and the code will be checked.
- **Cancel** - Click on this button to ignore all any changes and close the dialog box.
**MLS Home Page**

If you have an Internet connection and use the World Wide Web then you can launch your Internet Web browser directly from this item and visit the Motion Lab Systems Home Page. You can check here for new updates to this application as well as download evaluation copies of other Motion Lab Systems software products. You can also contact Technical Support directly from this Web Page.

**About RData2**

This opens a dialog box provides information about the application.

![About dialog box](image)

*Figure 18: About dialog box*

This dialog box shows the following information:

- The Name of the Application with the Application Icon.
- The Version Number of the Application.
- The Name and Organization of the user.
- Whether you are using an Evaluation Copy or a Registered Copy of the Application.

**General Information**

This section lists some general information about the Application.

**Value dialog box**

This dialog box is used to throughout the application where any value might need modification.

This dialog box has the following fields:

- **Value** - When the dialog box opens that field will contain the value that needs modifications. Make any changes you need to make in this field. The application will also tell you the limits if any of the value that you can enter.
• **OK** - Click on this button to validate the changes you have made and close the dialog box.

• **Cancel** - Click on this button to ignore all the changes and close the dialog box.

### Title Bar

The title bar is located along the top of a window. It contains the name of the application and document.

![Motion Lab Systems RData2 - [Testq22.adc]](image)

*Figure 19: The title bar*

To move the window, drag the title bar. Note: You can also move dialog boxes by dragging their title bars.

A title bar may contain the following elements:

- Application Control-menu button
- Maximize button
- Minimize button
- Name of the application
- Name of the document
- Restore button

### Scroll Bars

Displayed at the right and bottom edges of the document window, if the size of the window is smaller than what it should be to display the contents of the window. The scroll boxes inside the scroll bars indicate your vertical and horizontal location in the document. You can use the mouse to scroll to other parts of the document.

### Size command (System menu)

This command can be used to display a four-headed arrow so you can size the active window with the arrow keys.

After the pointer changes to the four-headed arrow:

1. Press one of the DIRECTION keys (left, right, up, or down arrow key) to move the pointer to the border you want to move.
2. Press a DIRECTION key to move the border.
3. Press ENTER when the window is the size you want.

Note: This command is unavailable if you maximize the window.
Shortcut
Mouse: Drag the size bars at the corners or edges of the window.

**Move command (Control menu)**

This command can be used to display a four-headed arrow so you can move the active window or dialog box with the arrow keys.

Note: This command is unavailable if you maximize the window.

Shortcut
Keys: CTRL+F7

**Minimize command (application Control menu)**

This command can be used to reduce the RData2 window to an icon.

Shortcut
Mouse: Click the minimize icon on the title bar.
Keys: ALT+F9

**Maximize command (System menu)**

This command can be used to enlarge the active window to fill the available space.

Shortcut
Mouse: Click the maximize icon on the title bar; or double-click the title bar.
Keys: CTRL+F10 enlarges a document window.

**Next Window command (file Control menu)**

This command can be used to switch to the next open file window. RData2 determines which window is next according to the order in which you opened the windows.

Shortcut
Keys: CTRL+F6
Keys: CTRL+SHIFT+F6 to go to previous file window
Close command (Control menus)

This command can be used to close the active window or dialog box. Double-clicking a Control-menu box is the same as choosing the Close command.

Note: If you have multiple windows open for a single file, the Close command on the file Control menu closes only one window at a time. You can close all windows at once with the Close command on the File menu.

Shortcuts

Keys:  CTRL+F4 closes a file window
       ALT+F4 closes the RData2 window or dialog box

Restore command (Control menu)

This command can be used to return the active window to its size and position before you chose the Maximize or Minimize command.
Export File Formats

There are five different types of elements of a data file that can be saved to a DST file. A particular type of data file may have one or more of these elements in it. These elements are:

- **Header Information** - This is the information present in the Header of a data file and usually contains important information about data collection.
- **Groups** - This is a collection of similar parameters.
- **Parameters** - A parameter contains data about a particular aspect of data collection or storage. Each parameter has a name and a data type. Like parameters are “grouped” into Groups.
- **Analog Data** - This is the Analog data that is collected.
- **Marker Data** - This is the data pertaining to the markers and contains co-ordinate information.

You can see the chapters on the individual file types to see details about the elements described for that file type.

---

**DST Export**

This section explains the DST File format that is used by RData2. It also tells you how you can set the defaults for the manner in which data is written to the DST File.

**DST File Format**

The first line of the DST file created by RData2 contains the text:

```
#!DST-2.0 Data file created by RData2
```

The first text item is the name of the Original file from which data was exported as shown below.

```
$OriginalFile
D:\MLS\RData2\test.c3d
```

This is the part that is written to every DST file. Listed in the sections below are the parts of the DST file that may or may not be present depending on the choices you make.
Header Information

The contents of the header information that is written to a DST file depends on the type of file being exported. The header from a C3D file is shown below.

$HeaderInformation
Number of Channels : 16
Number of Analog Frames : 386
Analog to Video Ratio : 2
Number of Markers : 12
Number of Marker Frames : 193
Video Frame Rate : 50.000
Scaling Factor : 0.1333

If there are any events present in the file (only for C3D files), they will be written as shown below.

$HS
Type : EVENT
Label : HS
Status : ON
Time : 1.5800

$Event_Name, is the name of the event.
Type, shows you that the data is event data.
Label, is the label given to the event.
Status, (ON or OFF), tells you if the event is enabled or disabled.
Time, is the time in seconds at which the event occurs from the start of data collection.

Groups

The groups that have been selected for export will be written in the order that they were present in the Data file. An example is shown below.

$POINT
Type : GROUP
Name : POINT
Description : 3-D point parameters
Locked : FALSE
Number : -1

$Group_Name, is the name of the group.
Type, shows you that the data is group data.
Name, is the label given to the group.
Description is the description given to the group, which tells you about the function of the Group.
Locked, (TRUE or FALSE) tells you if the Group is locked or unlocked.
Number, is the unique number given to a Group? This number is always negative.

Parameters

The parameters that have been selected for export will be written in the order that they were present in the Data file. An example is shown below.
$X\_SCREEN$

Type    : PARAMETER
Name    : X\_SCREEN
Description : Lab. axis along X-screen
Locked   : FALSE
Group    : POINT
Number of Dimensions : 1
Dimensions : 2
Data Type : CHAR
+Y

$Parameter\_Name$, is the name of the parameter.

Type, shows you that the data is parameter data.

Name, is the label given to the parameter.

Description is the description given to the parameter, which tells you about the function of the parameter.

Locked, (TRUE or FALSE) tells you if the parameter is locked or unlocked.

Group, is the name of the Group to which this parameter belongs. This is obtained from the parameter number. This number will be the same as the absolute value of the Group number of the Group to which the parameter belongs.

Number of dimensions, is the number of dimensions in the parameter. A scalar value will have 0 dimensions. A parameter containing data of type CHAR must have at least one dimension, which tells you the number of characters in each data element. It is possible to have a maximum of seven dimensions.

Dimensions, list the dimensions of the parameter, with spaces between parameters.

Data Type, is the type of data contained in the parameter. This can be CHAR, BYTE, INT OR FLOAT.

After the Data Type, the data in the parameter is listed with one data item per row.

**Analog Data**

An example of the Analog data where three frames are written is shown below:

```
!emg2 -1
2066
2066
2066
```

The first line contains the name of the channel. The –1 indicates that the data is one dimensional. Following that is the data, with one analog frame per line.

**Marker Data**

An example of the Marker data where three frames are written is shown below:

```
!lthi -3
8650 27914 3970
8653 27831 3981
8662 27760 3976
```

The first line contains the name of the channel. The –1 indicates that the data is three dimensional (note, that it is also possible to have the residual and mask). Following that is the data, with one video frame per line.
VDO Lexicon
The VDO lexicon is a specific form of the DST file. When the VDO lexicon is chosen the header and parameter information is never written to the DST file.

The application allows you to write some specific data which are required by the VDO lexicon.

The marker names are also translated to names that are required by the VDO lexicon. These two things can be done using the VDO Information command on the Export menu.

All the Analog channels that are selected in the tree view are exported with the data that is found in the C3D file.

In addition to this there are certain values that are calculated and written to the DST file. These are:

- ForcePlateNFX, ForcePlateNFY, ForcePlateNFZ: These are the forces in the X, Y and Z directions of the Nth Force Plate, which are based on the same coordinate system as the markers. Thus the data is converted to the laboratory coordinates. The units are in Newtons.

- ForcePlateNDX, ForcePlateNDY: These are the X and Y positions of the point of application of the ground reaction force. The units are in metres. The origin and X,Y directions coincide with those of the markers.

- ForcePlateNTZ: The torque applied about the vertical Z axis to the subject’s foot. The units are in Newton-metres.

DST Export Options
It is possible to control some aspects of the way in which the data is exported to a DST File. This can be done on the DST Export Page, which can be accessed using the Defaults command (Export menu).
This page has list control with two columns, **Option** and **Value**. Those options, which contain Yes/No values, can be modified by just double clicking on the option.

The following options are available for DST Export:

- **Analogue Data Scaled** - The Analogue data will be scaled, if possible before it is exported.

- **Video Data Scaled** - The video data will be scaled, if possible before it is exported.

- **Show Residual** - The residual that is present for each marker at every frame will also be output. Applicable for C3D Files only.

- **Show Mask** - The Camera mask that is present for each marker at every frame will also be output. Applicable for C3D Files only.

- **Output Precision** - This can be used to set the output precision, i.e. the number of digits after the decimal point, if the data being output is floating point data. To modify this value double click on **Output Precision**. This will open the Value dialog box (See Page 20) where you can make the modification. This can take values between 0 and 8, both inclusive.

- **Lexicon** - This can be used to set the lexicon of the DST file that will be exported. The two available lexicons are the MLS and VDO lexicons. This decides the format of the DST file. You can double click on this to change the lexicon that will be used. The VDO lexicon is available only for export from C3D files.
Text Export

This section explains the Text File format that is used by RData2. It also tells you how you can set the defaults for the manner in which data is written to the Text File.

Text File Format

The text file that is written is a delimited text file. This means that delimiters separate the columns. The delimiters that you can choose to use are the space, tab and comma.

The first row is the name of the Original file from which data was exported as shown below.

OriginalFile C:\MLS\RData2\test.c3d

This is the one line that is written to every Text file. Listed in the sections below are the parts of the Text file that may or may not be present depending on the choices you make.

Header Information

The contents of the header information that is written to a DST file depends on the type of file being exported. The header from a C3D file is shown below.

First Parameter Record 2
Number of 3D Points 20
Number of Analog Channels 30
First Video Frame 40
Last Video Frame 52
Maximum Interpolation Gap 10
Marker Scale Factor 0.116667
Data Start Record 11
Analog to Video Ratio 1
Video Frame Rate 60.000

If there are any events present in the file (only for C3D files), they will be written as shown below.

Event Name HS TO IC
Status ON ON ON
Time 1.5800 2.2200 2.7000

The Row heading is:

**Event Name**, is the name of the event.

**Status**, (ON or OFF), tells you if the event is enabled or disabled.

**Time**, is the time in seconds at which the event occurs from the start of data collection.

The events are written in columns, with one event occupying a column.

Note that the information in the output file always represents the contents of the original input file – in the above example the “Data Start Record” contains the value 11. This is the value present in the C3D file and has no relation to the start of data records in the ASCII text output file produced by RData2.
Groups

The groups that have been selected for export will be written in the order that they were present in the Data file. An example is shown below.

<table>
<thead>
<tr>
<th>Group Name</th>
<th>POINT</th>
<th>ANALOG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>3-D par</td>
<td>Analog data parameters</td>
</tr>
<tr>
<td>Locked</td>
<td>FALSE</td>
<td>FALSE</td>
</tr>
<tr>
<td>Number</td>
<td>-1</td>
<td>-2</td>
</tr>
</tbody>
</table>

The row headings are:

Group Name, is the name of the group.

Description is the description given to the group, which tells you about the function of the Group.

Locked, (TRUE or FALSE) tells you if the Group is locked or unlocked.

Number, is the unique number given to a Group. This number is always negative.

The different groups exported are written in columns, with one group per column.

Parameters

The parameters that have been selected for export will be written in the order that they were present in the Data file. An example is shown below.

<table>
<thead>
<tr>
<th>Param Name</th>
<th>X_SCREEN</th>
<th>GEN_SCALE</th>
<th>MAX_RESID</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Lab.axis</td>
<td>Gen Scale</td>
<td></td>
</tr>
<tr>
<td>Group</td>
<td>POINT</td>
<td>ANALOG</td>
<td>SEG</td>
</tr>
<tr>
<td>Locked</td>
<td>FALSE</td>
<td>FALSE</td>
<td>FALSE</td>
</tr>
<tr>
<td>Number</td>
<td>1</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Data Type</td>
<td>CHAR</td>
<td>FLOAT</td>
<td>FLOAT</td>
</tr>
<tr>
<td>Dimensions</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Dim 1</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Data 1</td>
<td>+Y</td>
<td>0.0049</td>
<td>8.0000</td>
</tr>
</tbody>
</table>

Parameter Name, is the name of the parameter.

Description, is the description given to the parameter, which tells you about the function of the parameter.

Locked, (TRUE or FALSE) tells you if the parameter is locked or unlocked.

Group, is the name of the Group to which this parameter belongs. This is obtained from the parameter number. This number will be the same as the absolute value of the Group number of the Group to which the parameter belongs.

Number, is the number given to the parameter. This decides the Group that the Parameter belongs to.

Data Type, is the type of data contained in the parameter. This can be CHAR, BYTE, INT OR FLOAT.

Dimensions, is the number of dimensions in the parameter. A scalar value will have 0 dimensions. A parameter containing data of type CHAR must have at least one dimension, which tells you the number of characters in each data element. It is possible to have a maximum of seven dimensions.

Dim N, list the dimensions of the parameter, with N going from 1 to a maximum of 7. There will be as many rows allotted to this as are necessary depending on the Parameters exported.

Data N is the data element N. There will be as many data entries as are necessary.
**Analog Data**

An example of the Analog data where three frames are written is shown below:

<table>
<thead>
<tr>
<th>Frames</th>
<th>FX1</th>
<th>FY1</th>
<th>FZ1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6.0200</td>
<td>-3.9780</td>
<td>25.2960</td>
</tr>
<tr>
<td>2</td>
<td>6.8800</td>
<td>-3.5360</td>
<td>22.3200</td>
</tr>
<tr>
<td>3</td>
<td>5.5900</td>
<td>-4.4200</td>
<td>-25.2960</td>
</tr>
</tbody>
</table>

The columns have headings, which are the names of the exported channels. The first column contains the Frame Number or the Time at which the sample was collected. The following columns contain the channels of Analog Data.

**Marker Data**

An example of the Marker data where three frames are written is shown below:

<table>
<thead>
<tr>
<th>Frames</th>
<th>rsho X</th>
<th>rsho Y</th>
<th>rsho Z</th>
<th>lsho X</th>
<th>lsho Y</th>
<th>lsho Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>684</td>
<td>3393</td>
<td>1248</td>
<td>993</td>
<td>3346</td>
<td>1223</td>
</tr>
<tr>
<td>2</td>
<td>688</td>
<td>3378</td>
<td>1249</td>
<td>998</td>
<td>3328</td>
<td>1225</td>
</tr>
<tr>
<td>3</td>
<td>692</td>
<td>3362</td>
<td>1253</td>
<td>999</td>
<td>3314</td>
<td>1227</td>
</tr>
</tbody>
</table>

The columns have headings, which are the names of the exported marker with X, Y, Z, Res (for Camera Residual) and Msk (for Camera Mask) suffixed to them. The first column contains the Frame Number or the Time at which the sample was collected. The following columns contain the marker data.

**Text Export Options**

It is possible to control some aspects of the way in which the data is exported to a Text File. This can be done on the Text Export Page, which can be accessed using the Defaults command (Export menu).
The following options are available for Text Export:

- **Analogue Data Scaled** - The Analogue data will be scaled, if possible before it is exported.
- **Analogue Column Names** - The names of the channels will be present as a column heading for each channel that is exported.
- **Video Data Scaled** - The video data will be scaled, if possible before it is exported.
- **Video Column Names** - The names of the marker will be present as a column heading for each channel that is exported. The name of the Marker is suffixed with X, Y, Z, Res and Msk for the X-Coordinate, Y-Coordinate, Z-Coordinate, the Camera Residual and the Camera Mask respectively.
- **Show Residual** - The residual that is present for each marker at every frame will also be output. Applicable for C3D Files only.
- **Show Mask** - The Camera mask that is present for each marker at every frame will also be output. Applicable for C3D Files only.
- **Output Precision** - This can be used to set the output precision, i.e. the number of digits after the decimal point, if the data being output is floating point data. To modify this value double click on **Output Precision**. This will open the Value dialog box (See Page 20) where you can make the modification. This can take values between 0 and 8, both inclusive.
- **Delimiter** - This is the character that is used between consecutive items in a row. The three delimiters offered at present are COMMA, SPACE and TAB. You can go from one to the other by double clicking on **Delimiter**.
- **Samples By Frame** - This option can be used to specify the manner in which the samples are indexed. If the value of this option is FRAMES, Frame numbers will be written for each frame of data, starting with the first frame being exported. If this is TIME, the time at which each frame was collected will be written for each frame of data. You can toggle the selection by double clicking on the Option.
- **Start Frames at 1** - This option can be used to specify the manner in which the frame number/ time should be written to the file. If the value of this option is FALSE, Frame numbers will be written for each frame of data, starting with the first frame being exported (or time will be written according to the time at which the frame was collected). If this is TRUE, the number given to the first frame written to the Text File will be 1 (or the time will be 0.000).
- **Double Delimit Trajectory** - This option is applicable to marker data written to the Text File. An extra delimiter is placed between each trajectory group that is written to the file.
- **Column Width** - This can be used to set the width of the columns when Analog and Marker data are written to the Text File. This will be the total width including the precision. No rounding off or truncation, of data will be done to fit the specified width. To modify this value double click on **Column Width**. This will open the Value dialog box.
where you can make the modification. This can take values between 1 and 40, both inclusive.

- **Delimit Column Names** - This option is used to tell the application whether the labels given to the analog and marker data columns should have a delimiter placed between them.

- **Mean and Standard Dev.** - This option is used to tell the application to calculate the mean and the standard deviation for each column of data written out to the text file.
C3D Workspace

This section describes the workspace of the Application for a C3D File. The C3D window has a Tree with the root of the Tree being the name of the C3D File. Below that are the following components:

**Header Information**

This is the part which contains all the information contained in the Header record of the C3D File, including any event information that may be present in the file. The following items will be exported:

- First Parameter Record
- Number of 3D Points
- Number of Analog Channels
- First Video Frame
- Last Video Frame
- Maximum Interpolation Gap
- Marker Scale Factor
- Data Start Record
- Analog to Video Ratio
- Video Frame Rate

**Parameters**

This section lists all the Parameters in the C3D File. These parameters are grouped according to their function. Thus they are displayed with related parameters being groups together into Groups. Each Group has a name and zero or more parameters in it.

If you double click on Parameter, the selection states all of all its sub items will be toggled. The same is not true when you double click on a Group - only the selection state of the Group will be toggled.
**Data**

This section has all the data collected in the file. This data is of two types, Analog data and Marker data. If you double click on **Data**, the selection state of all the Analog channels and markers will be toggled.

**Analog Data**

This lists all the Analog Channels that are present in the file. If the parameter ANALOG:LABELS is present, the labels of these channels will be shown to you. If not, they will be given default names. If you double click on **Analog Data**, the selection state of all the channels will be toggled.

**Marker Data**

This lists all the Markers that are present in the file. If the parameter POINT:LABELS is present, the labels of these channels will be shown to you. If not, they will be given default names. If you double click on **Marker Data**, the selection state of all the markers will be toggled.

When a data file is opened, the application looks through the list in the C3D Selection Page (See Page 35) to decide which items should be selected by default. You should make changes on that page if you want some particular selection scheme as a default.

---

**C3D Selection Property Page**

This page can be used to decide which items in a C3D File should be selected by default. This page has a List Control with two columns, the first one shows you the **File Element** and the second one shows you the **Output**. Those options, which contain Yes/No values, can be modified by just double clicking on the option.
The following elements will be present:

- **Header Information** - If selected, the data present in the Header of the C3D File will be exported. The Header also contains any events that might be present in the file.

- **Analog Data** - If selected, all the analog channels in the file will be selected.

- **Marker Data** - If selected, all the markers in the file will be selected.

The three items shown will always be present in the List. Following these will be the names of Groups that might be present in the C3D File. Selecting a Group will mean that all parameters belonging to that Group will be selected by default.

When you run the application the first time and see this page, there might not be any Groups here, if no C3D File is open. To start populating the list, open this page from a C3D File, which contains parameters that are usually present in your file. Then you will see the Groups in the List. These Groups will always be remembered by the Application - from this point on.
The workspace of the application for VAD Files is built like a Tree. The first item (or root) of the tree is the name of the file. It has the following branches shown below. Each item can be selected (or deselected) by double clicking on it.

**Header Information**

This is the part which contains all the information contained in the Header record of the VAD File. The following items will be exported:

- Video Frame Rate
- Start offset in video fields from start of video
- Number of Analog Channels
- First Frame
- Last Frame
- Analog Rate

**Parameters**

This section lists all the Parameters. The parameters that are read are the ANALOG, POINT and the FORCE_PLATFORM parameters. These are read from the .CAR file, if it is present in the same directory. If not, the application creates default parameters for you. These parameters are grouped according to their function. Thus they are displayed with related parameters being grouped together into Groups. Each Group has a name and zero or more parameters in it.

If you double click on **Parameter**, the selection states all of all its sub items will be toggled. The same is not true when you double click on a Group - only the selection state of the Group will be toggled.

**Data**

This section has all the data collected in the file. There is only one type of data, namely Analog Data. If you double click on **Data**, the selection state of all the Analog channels will be toggled.
Analog Data

This lists all the Analog Channels that are present in the file. If you double click on Analog Data, the selection state of all the channels will be toggled.

When a data file is opened, the application looks through the list in the VAD Selection Page (See Page 39) to decide which items should be selected by default. You should make changes on that page if you want some particular selection scheme as a default.

Default VAD Parameter Creation

The application looks for a session file for the VAD File that is being opened. If this file is found in the same directory as the data file, the necessary parameters are read from the file. If not, the application creates these parameters for you.

Listed below are the parameters that are created for you.

- **Analog** - This is a Group which contains all the parameters related to the Analog data.
- **Force Platform** - This is a Group which contains all the parameters related to the force plates present in the data collection.
- **Point** - This is a Group which contains all the parameters related to the Video data.

**Analog Parameters**

- **Gen_Scale** - This is the General Scale factor. This defaults to 0.00488.
- **Rate** - This is sampling frequency of the Analog data. This information is obtained from the VAD File.
- **Used** - This is the number of Analog Channels that are present in the VAD File. This information is obtained from the VAD File.
- **Scale** - This is the scale factor. Each analog channel has a scale factor associated with it. This defaults to 1.0.
- **Offset** - This is the analog offset. Each analog channel has an offset associated with it. This defaults to 2048.
- **Units** - These are the units associated with each analog channel. This defaults to None.
- **Labels** - This is the Label of each channel. This defaults to CHXXX.
- **Description** - This is the description for each channel of Analog data. This defaults to Channel XXX.

**Force Plate Parameters**

- **Used** - This is the number of Force Plates used. This defaults to 0.
- **Zero** - This is the frame interval to have zero offset. There are two numbers which default to 1 and 10.
• **Type** - This is the type of each force plate that is present. There will be as many data entries as there are force plates. This defaults to 2 to each force plate.

• **Corners** - These are the corners for each force plate that is present. There will be (4 corners * 3 dimensions), i.e. 12 data items for each force plate. They all default to 0.

• **Origin** - These are the origins for each force plate that is present. There will be 3 data items for each force plate. They all default to 0.

• **Channels** - These are the analog channels that are assigned to each force plate. There will be six possible channel assignments for each force plate. They all default to 0.

**Point Parameters**

• **Rate** - This is the video sampling frequency. This defaults to the video frequency that is reported in the VAD File.

• **Frames** - This is the number of frames of video data. This can be computed only if the video frequency reported in the VAD File is greater than 0. This defaults to 0.

---

**VAD Selection Property Page**

This page can be used to decide which items in a VAD File should be selected by default when you open a VAD File. This page has a List Control with two columns, the first one shows you the **File Element** and the second one shows you the **Output?**. Those options, which contain Yes/No values, can be modified by just double clicking on the option.

*Figure 23: VAD Selection Property Page*
The following elements will be present:

- **Header Information** - If selected, the data present in the Header of the VAD File will be exported.
- **Analog Data** - If selected, all the analog channels in the file will be selected.

The two items shown will always be present in the List. Following these will be the names of Groups that might be present in the VAD File. Selecting a Group will mean that all parameters belonging to that Group will be selected by default. At present three groups, ANALOG, POINT and FORCE_PLATFORM are read from the .CAR file, which accompanies the VAD file.

When you run the application the first time and see this page, there might not be any Groups here, if no VAD File is open. To start populating the list, open this page from a VAD File, which contains parameters that are usually present in your file. Then you will see the Groups in the List. These Groups will always be remembered by the Application - from this point on.

---

**VAD to C3D Conversion**

A VAD file can be converted to a C3D file by choosing the Save As command (File menu) (See Page 8) and then from the Save As type – choose C3D File.

![Figure 24: Save as C3D file](image)

The header of the C3D file is created from the information present in the VAD file. The default parameters created for the VAD file are converted to C3D parameters. In addition a POINT:DATA_START parameter is also created. The analog data present in the VAD file is written to the C3D file.

VAD files can be created to store data with 14-bit and 16-bit resolution. At present only the original 14-bit VAD format is supported due to a lack of any documentation of the 16-bit format from the manufacturer.
ADC Workspace

The workspace of the application for ADC Files is built like a Tree. The first item (or root) of the tree is the name of the file. It has the following branches shown below. Each item can be selected (or deselected) by double clicking on it.

**Header Information**

This is the part which contains some general information about the ADC File. The following elements will be exported:

- Number of Analog Channels
- First Frame
- Last Frame

**Parameters**

This section lists all the Parameters. The parameters that are created are the ANALOG and the POINT parameters. These parameters are grouped according to their function. Thus they are displayed with related parameters being groups together into Groups. Each Group has a name and zero or more parameters in it.

If you double click on Parameter, the selection states all of all its sub items will be toggled. The same is not true when you double click on a Group - only the selection state of the Group will be toggled.

**Data**

This section has all the data collected in the file. There is only one type of data, namely Analog Data. If you double click on Data, the selection state of all the Analog channels will be toggled.

**Analog Data**

This lists all the Analog Channels that are present in the file. If you double click on Analog Data, the selection state of all the channels will be toggled.

When a data file is opened, the application looks through the list in the ADC Selection Page (See Page 43) to decide which items should be selected by default. You should make changes on that page if you want some particular selection scheme.
There are two parameters of the ADC file, which are required when data needs to be exported. These are the General Scale Factor and the Sampling Rate. You can set these values using the ADC Parameters Property Page from the Defaults command (Export menu).

---

**Default ADC Parameter Creation**

The application creates a default set of parameters for you. Listed below are the parameters that are created for you.

- **Analog** - This is a Group which contains all the parameters related to the Analog data.
- **Point** - This is a Group which contains all the parameters related to the Video data.

**Analog Parameters**

- **Gen_Scale** - This is the General Scale factor. You can change this from the ADC Parameters Page.
- **Rate** - This is the sampling frequency of the Analog data. This is the product of the video rate (which you can set using the ADC Parameters Page) and the analog frames per video frame which is obtained from the ADC file.
- **Used** - This is the number of Analog Channels that are present in the ADC File. This information is obtained from the ADC File.
- **Scale** - This is the scale factor. Each analog channel has a scale factor associated with it. This defaults to 1.0.
- **Gain** - This is the gain factor. Each analog channel has a gain factor associated with it. This defaults to 1.0.
- **Offset** - This is the analog offset. Each analog channel has an offset associated with it. This defaults to 2048.
- **Units** - These are the units associated with each analog channel. This defaults to V.
- **Labels** - This is the Label of each channel. This defaults to CHXXX.
- **Description** - This is the description for each channel of Analog data. This defaults to Channel XXX.

**Point Parameters**

- **Rate** - This is the video sampling frequency, which you can set using the ADC Parameters Page.
- **Frames** - This is the number of frames of video data. This is obtained from the ADC file.
ADC Parameters Property Page

The application creates default parameters for you. Most of the data in the parameters are obtained from the ADC file. The application allows you to edit the data to be present in some of them, which are not present in the ADC file.

This page can be used by you to edit the values of these parameters. This page has a List Control with two columns, the first one shows you the Parameter and the second one shows you the Value.

![Figure 25: ADC Parameters Property Page](image)

The following parameter values can be edited:

- **Gen_Scale** - Double click to change the value.
- **Rate** - This is the rate at which the video data is collected. There are four possible values: 50Hz, 59.89 Hz, 60Hz and 200 Hz. As you double click, the application will go through these values.

ADC Selection Property Page

This page can be used by you to decide which items in an ADC File should be selected by default. This page has a List Control with two columns, the first one shows you the **File Element** and the second one shows you the **Output**. Those options, which contain Yes/No values, can be modified by just double clicking on the option.
Figure 26: ADC Selection Property Page

The following elements will be present:

- **Header Information** - If selected, the general information pertaining to an ADC file will be exported.

- **Analog Data** - If selected, all the analog channels in the file will be selected.

The two items shown will always be present in the List. Following these will be the names of Groups that are created for the ADC file. Selecting a Group will mean that all parameters belonging to that Group will be selected by default. At present two groups, ANALOG and POINT are created for an ADC file.

When you run the application the first time and see this page, there might not be any Groups here, if no ADC File is open. To start populating the list, open this page from an ADC File, which contains parameters that are usually present in your file. Then you will see the Groups in the List. These Groups will always be remembered by the Application - from this point on.
MAC File

MAC Workspace

The workspace of the application for MAC (Motion Analysis Corporation) Files (with .ANA extension) is built like a Tree. The first item (or root) of the tree is the name of the file. It has the following branches shown below. Each item can be selected (or deselected) by double clicking on it.

**Header Information**

This is the part which contains some general information about the MAC File. This information is obtained from the first line of the MAC file. The following elements are output to an export file:

- Number of Analog Channels
- First Frame
- Last Frame
- Sampling Frequency

**Parameters**

This section lists all the Parameters. The only parameter that is created is the ANALOG parameter. Parameters are grouped according to their function. Thus they are displayed with related parameters being groups together into Groups. Each Group has a name and zero or more parameters in it.

If you double click on **Parameter**, the selection states all of all its sub items will be toggled. The same is not true when you double click on **Data** - only the selection state of the Group will be toggled.

**Data**

This section has all the data collected in the file. There is only one type of data, namely Analog Data. If you double click on **Data**, the selection state of all the Analog channels will be toggled.

**Analog Data**

This lists all the Analog Channels that are present in the file. If you double click on **Analog Data**, the selection state of all the channels will be toggled.
When a data file is opened, the application looks through the list in the MAC Selection Page to decide which items should be selected by default. You should make changes on that page if you want some particular selection scheme.

Default MAC Parameter Creation

The application creates a default set of parameters for you. Listed below are the parameters that are created for you.

- **Analog** - This is a Group which contains all the parameters related to the Analog data.

Analog Parameters

- **Gen_Scale** - This is the General Scale factor. By default this is given a value of 0.0048828125 which is 10/2048.
- **Rate** - This is sampling frequency of the Analog data. This value is obtained from the first line of the MAC file.
- **Used** - This is the number of Analog Channels that are present in the MAC File. This information is obtained from the MAC File.
- **Gain** - This is the gain factor. Each analog channel has a gain factor associated with it. The possible gains are 1, 2, 4 and 8 corresponding to full scale voltages of (+/-)10, 5, 2.5 and 1.5V respectively. This defaults to 1.0 if the values are not found in the file.
- **Scale** - This is the scale factor. Each analog channel has a scale factor associated with it. The scale factor is calculated as Full Scale Voltage/10. This defaults to 1.0 if the gains are not found in the MAC file.
- **Offset** - This is the analog offset. Each analog channel has an offset associated with it. This defaults to 2048.
- **Units** - These are the units associated with each analog channel. This defaults to V.
- **Labels** - This is the Label of each channel. This defaults to CHXXX. This data is also found in the MAC file.
- **Description** - This is the description for each channel of Analog data. This defaults to Channel XXX.

MAC Selection Property Page

This page can be used by you to decide which items in a MAC File should be selected by default when you open a MAC File. This page has a List Control with two columns, the first one shows you the **File Element** and the second one shows you the **Output**. Those options, which contain Yes/No values, can be modified by just double clicking on the option.
The following elements will be present:

- **Header Information** - If selected, the general information pertaining to a MAC file will be exported.

- **Analog Data** - If selected, all the analog channels in the file will be selected.

The two items shown will always be present in the List. Following these will be the names of Groups that are created for the MAC file. Selecting a Group will mean that all parameters belonging to that Group will be selected by default. At present only one group, ANALOG is created for a MAC file.

When you run the application the first time and see this page, there might not be any Groups here, if no MAC File is open. To start populating the list, open this page from a MAC File, which contains parameters that are usually present in your file. Then you will see the Groups in the List. These Groups will always be remembered by the Application - from this point on.
CODAS Files

CODAS Workspace

The workspace of the application for CODAS Files (with .DAT or .WDQ extension) is built like a Tree. The first item (or root) of the tree is the name of the file. It has the following branches shown below. Each item can be selected (or deselected) by double clicking on it.

**Header Information**

This is the part which contains some general information about the CODAS File. This information is obtained from the header of the CODAS file. The following information is written to the export file:

- Number of Analog Channels
- Sampling Rate
- First Frame
- Last Frame

**Parameters**

This section lists all the Parameters. The parameter that is created is the ANALOG parameter. These parameters are grouped according to their function. Thus they are displayed with related parameters being groups together into Groups. Each Group has a name and zero or more parameters in it.

If you double click on Parameter, the selection states all of all its sub items will be toggled. The same is not true when you double click on a Group - only the selection state of the Group will be toggled.

**Data**

This section has all the data collected in the file. There is only one type of data, namely Analog Data. If you double click on Data, the selection state of all the Analog channels will be toggled.

**Analog Data**

This lists all the Analog Channels that are present in the file. If you double click on Analog Data, the selection state of all the channels will be toggled.
When a data file is opened, the application looks through the list in the CODAS Selection Page to decide which items should be selected by default. You should make changes on that page if you want some particular selection scheme.

**Default CODAS Parameter Creation**

The application creates a default set of parameters for you. Listed below are the parameters that are created for you.

- **Analog** - This is a Group which contains all the parameters related to the Analog data.

**Analog Parameters**

- **Gen Scale** - This is the General Scale factor. By default this is given a value of 0.0048828125 which is 10/2048.
- **Rate** - This is sampling frequency of the Analog data. This value is obtained from the header of the CODAS File.
- **Used** - This is the number of Analog Channels that are present in the CODAS File. This information is obtained from the CODAS File.
- **Gain** - This is the gain factor. It is given a default of 1.
- **Scale** - This is the scale factor which is obtained from the CODAS file.
- **Offset** - This is the analog offset. Each analog channel has an offset associated with it. This value is obtained from the CODAS file.
- **Units** - These are the units associated with each analog channel. This defaults to V.
- **Labels** - This is the Label of each channel. This defaults to CHXXX. This data is also found in the MAC file.
- **Description** - This is the description for each channel of Analog data. This defaults to Channel XXX.

**CODAS Selection Property Page**

This page can be used by you to decide which items in a CODAS File should be selected by default. This page has a List Control with two columns, the first one shows you the **File Element** and the second one shows you the **Output?**. Those options, which contain Yes/No values, can be modified by just double clicking on the option.
The following elements will be present:

- **Header Information** - If selected, the general information pertaining to a CODAS file will be exported.
- **Analog Data** - If selected, all the analog channels in the file will be selected.

The two items shown will always be present in the List. Following these will be the names of Groups that are created for the CODAS file. Selecting a Group will mean that all parameters belonging to that Group will be selected by default. At present only one group, ANALOG is created for a CODAS file.

When you run the application the first time and see this page, there might not be any Groups here, if no CODAS File is open. To start populating the list, open this page from a CODAS File.
BTS Files

BTS Workspace

The workspace of the application for BTS Files is built like a Tree. The first item (or root) of the tree is the name of the file. It has the following branches shown below. Each item can be selected (or deselected) by double clicking on it.

**NOTE** - The export of the BTS file is always done in raw (un scaled) from irrespective of the option that you have chosen.

**Header Information**

This is the part which contains some general information about the BTS File. The following elements will be exported:

- Number of Analog Channels
- The Sampling Frequency in Hz.
- The Start Time of sampling in seconds.
- The End Time of sampling in seconds.

**Parameters**

This section lists all the Parameters. The only parameter that is created is the ANALOG parameter. If you double click on Parameter, the selection states all of all its sub items will be toggled. The same is not true when you double click on a Group - only the selection state of the Group will be toggled.

**Data**

This section has all the data collected in the file. There is only one type of data, namely Analog Data. If you double click on Data, the selection state of all the Analog channels will be toggled.

**Analog Data**

This lists all the Analog Channels that are present in the file. If you double click on Analog Data, the selection state of all the channels will be toggled.

When a data file is opened, the application looks through the list in the BTS Selection Page (See Page BTS Selection Property Page) to decide which items
should be selected by default. You should make changes on that page if you want some particular selection scheme.

**Default BTS Parameter Creation**

The application creates a default set of parameters for you. Listed below are the parameters that are created for you.

- **Analog** - This is a Group which contains all the parameters related to the Analog data.

**Analog Parameters**

- **Setup File** - This is the name of the setup file.
- **Used** - This is the number of Analog Channels that are present in the BTS File. This information is obtained from the BTS File header.
- **Scale** - This is the scale factor. Each analog channel has a scale factor associated with it.
- **Gain** - This is the gain factor. Each analog channel has a gain factor associated with it.
- **Hpfreq** - This is the high pass cut off frequency in Hz.
- **Lpfreq** - This is the low pass cut off frequency in Hz.
- **Rectification** - This is a flag (one for each channel), which shows if the data is raw(0) or if it is rectified(1).
- **Integral** - This is the integral value of the signal - one for each channel.
- **Rate** - This is the analog sampling rate in Hz.
- **Labels** - This is the label given to each analog channel.
- **Units** - This is the unit of measurement for each channel.
- **Execution** - This is the execution method.
- **FSWPresent** - This shows if foot switches are present (1) or not(0).

**BTS Selection Property Page**

This page can be used by you to decide which items in an BTS File should be selected by default. This page has a List Control with two columns, the first one shows you the **File Element** and the second one shows you the **Output?**. Those options, which contain Yes/No values, can be modified by just double clicking on the option.
The following elements will be present:

- **Header Information** - If selected, the general information pertaining to an BTS file will be exported.

- **Analog Data** - If selected, all the analog channels in the file will be selected.

The two items shown will always be present in the List. Following these will be the names of Groups that are created for the BTS file. Selecting a Group will mean that all parameters belonging to that Group will be selected by default. At present only one group - ANALOG is created for the BTS file.

When you run the application the first time and see this page, there might not be any Groups here, if no BTS File is open. To start populating the list, open this page from a BTS File, which contains parameters that are usually present in your file. Then you will see the Groups in the List. These Groups will always be remembered by the Application - from this point on.
Glossary of Terms

C3D
The C3D format provides a convenient and efficient means for storing 3D coordinate and analog data, together with all associated parameters, for a single measurement trial. The essential idea behind the C3D format is that all 3D coordinate and numeric data for any recorded measurement is stored in a single file, together with the various parameters that describe the data.

CAMARC
CAMARC is an acronym for Computer Aided Movement Analysis in a Rehabilitation Context and is an EEC (European Economic Community) program that, in their own words:

"CAMARC-II is aimed at establishing a European network of clinical and research centres, strictly interconnected with the main manufacturers of the relevant instrumentation and with important "end-users" like national and private insurance companies, which will allow a standardised approach to the Functional Assessment (FA) of the (dis)-ability of the motor impaired and/or the elderly.

The CAMARC-II projects is a continuation of CAMARC from the AIM Exploratory Action. The Consortium collects 8 EC and 2 EFTA countries, 6 industries, 12 outstanding Clinical Centres, 18 universities and research institutions, taking into account contractors, Associate Contractors and Subcontractors."

DST format
This is a file format proposed by CAMARC for the storage and exchange of data although it has been slow to gain widespread acceptance. The specification has been given the acronym DST, Data Storage and Transfer. The DST specification defines a syntax for a file, but does not define its contents. The rules covering DST file contents are contained in a series of companion documents, known as DST lexicons.
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