

# ***DIAdem™***

---

## **Getting Started with DIAdem**

## **Worldwide Technical Support and Product Information**

ni.com

## **National Instruments Corporate Headquarters**

11500 North Mopac Expressway Austin, Texas 78759-3504 USA Tel: 512 683 0100

## **Worldwide Offices**

Australia 03 9879 5166, Austria 0662 45 79 90 0, Belgium 02 757 00 20, Brazil 011 3262 3599,  
Canada (Calgary) 403 274 9391, Canada (Montreal) 514 288 5722, Canada (Ottawa) 613 233 5949,  
Canada (Québec) 514 694 8521, Canada (Toronto) 905 785 0085, China 86 21 6555 7838,  
Czech Republic 02 2423 5774, Denmark 45 76 26 00, Finland 09 725 725 11, France 01 48 14 24 24,  
Germany 089 741 31 30, Greece 01 42 96 427, Hong Kong 2645 3186, India 91 80 4190000,  
Israel 03 6393737, Italy 02 413091, Japan 03 5472 2970, Korea 02 3451 3400, Malaysia 603 9596711,  
Mexico 001 800 010 0793, Netherlands 0348 433466, New Zealand 09 914 0488, Norway 32 27 73 00,  
Poland 22 3390 150, Portugal 210 311 210, Russia 095 238 7139, Singapore 65 6 226 5886,  
Slovenia 3 425 4200, South Africa 11 805 8197, Spain 91 640 0085, Sweden 08 587 895 00,  
Switzerland 056 200 51 51, Taiwan 02 2528 7227, United Kingdom 01635 523545

For further support information, see the *Technical Support and Professional Services* appendix. To comment on the documentation, send email to [techpubs@ni.com](mailto:techpubs@ni.com).

# Important Information

---

## Warranty

The media on which you receive National Instruments software are warranted not to fail to execute programming instructions, due to defects in materials and workmanship, for a period of 90 days from date of shipment, as evidenced by receipts or other documentation. National Instruments will, at its option, repair or replace software media that do not execute programming instructions if National Instruments receives notice of such defects during the warranty period. National Instruments does not warrant that the operation of the software shall be uninterrupted or error free.

A Return Material Authorization (RMA) number must be obtained from the factory and clearly marked on the outside of the package before any equipment will be accepted for warranty work. National Instruments will pay the shipping costs of returning to the owner parts which are covered by warranty.

National Instruments believes that the information in this document is accurate. The document has been carefully reviewed for technical accuracy. In the event that technical or typographical errors exist, National Instruments reserves the right to make changes to subsequent editions of this document without prior notice to holders of this edition. The reader should consult National Instruments if errors are suspected. In no event shall National Instruments be liable for any damages arising out of or related to this document or the information contained in it.

EXCEPT AS SPECIFIED HEREIN, NATIONAL INSTRUMENTS MAKES NO WARRANTIES, EXPRESS OR IMPLIED, AND SPECIFICALLY DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. CUSTOMER'S RIGHT TO RECOVER DAMAGES CAUSED BY FAULT OR NEGLIGENCE ON THE PART OF NATIONAL INSTRUMENTS SHALL BE LIMITED TO THE AMOUNT THEREOF PAID BY THE CUSTOMER. NATIONAL INSTRUMENTS WILL NOT BE LIABLE FOR DAMAGES RESULTING FROM LOSS OF DATA, PROFITS, USE OF PRODUCTS, OR INCIDENTAL OR CONSEQUENTIAL DAMAGES, EVEN IF ADVISED OF THE POSSIBILITY THEREOF. This limitation of the liability of National Instruments will apply regardless of the form of action, whether in contract or tort, including negligence. Any action against National Instruments must be brought within one year after the cause of action accrues. National Instruments shall not be liable for any delay in performance due to causes beyond its reasonable control. The warranty provided herein does not cover damages, defects, malfunctions, or service failures caused by owner's failure to follow the National Instruments installation, operation, or maintenance instructions; owner's modification of the product; owner's abuse, misuse, or negligent acts; and power failure or surges, fire, flood, accident, actions of third parties, or other events outside reasonable control.

## Copyright

Under the copyright laws, this publication may not be reproduced or transmitted in any form, electronic or mechanical, including photocopying, recording, storing in an information retrieval system, or translating, in whole or in part, without the prior written consent of National Instruments Corporation.

## Trademarks

Citadel™, DIAdem™, LabVIEW™, National Instruments™, NI™, and ni.com™ are trademarks of National Instruments Corporation.

Product and company names mentioned herein are trademarks or trade names of their respective companies.

## Patents

For patents covering National Instruments products, refer to the appropriate location: **Help»Patents** in your software, the `patents.txt` file on your CD, or [ni.com/patents](http://ni.com/patents).

## WARNING REGARDING USE OF NATIONAL INSTRUMENTS PRODUCTS

(1) NATIONAL INSTRUMENTS PRODUCTS ARE NOT DESIGNED WITH COMPONENTS AND TESTING FOR A LEVEL OF RELIABILITY SUITABLE FOR USE IN OR IN CONNECTION WITH SURGICAL IMPLANTS OR AS CRITICAL COMPONENTS IN ANY LIFE SUPPORT SYSTEMS WHOSE FAILURE TO PERFORM CAN REASONABLY BE EXPECTED TO CAUSE SIGNIFICANT INJURY TO A HUMAN.

(2) IN ANY APPLICATION, INCLUDING THE ABOVE, RELIABILITY OF OPERATION OF THE SOFTWARE PRODUCTS CAN BE IMPAIRED BY ADVERSE FACTORS, INCLUDING BUT NOT LIMITED TO FLUCTUATIONS IN ELECTRICAL POWER SUPPLY, COMPUTER HARDWARE MALFUNCTIONS, COMPUTER OPERATING SYSTEM SOFTWARE FITNESS, FITNESS OF COMPILERS AND DEVELOPMENT SOFTWARE USED TO DEVELOP AN APPLICATION, INSTALLATION ERRORS, SOFTWARE AND HARDWARE COMPATIBILITY PROBLEMS, MALFUNCTIONS OR FAILURES OF ELECTRONIC MONITORING OR CONTROL DEVICES, TRANSIENT FAILURES OF ELECTRONIC SYSTEMS (HARDWARE AND/OR SOFTWARE), UNANTICIPATED USES OR MISUSES, OR ERRORS ON THE PART OF THE USER OR APPLICATIONS DESIGNER (ADVERSE FACTORS SUCH AS THESE ARE HEREAFTER COLLECTIVELY TERMED "SYSTEM FAILURES"). ANY APPLICATION WHERE A SYSTEM FAILURE WOULD CREATE A RISK OF HARM TO PROPERTY OR PERSONS (INCLUDING THE RISK OF BODILY INJURY AND DEATH) SHOULD NOT BE RELIANT SOLELY UPON ONE FORM OF ELECTRONIC SYSTEM DUE TO THE RISK OF SYSTEM FAILURE. TO AVOID DAMAGE, INJURY, OR DEATH, THE USER OR APPLICATION DESIGNER MUST TAKE REASONABLY PRUDENT STEPS TO PROTECT AGAINST SYSTEM FAILURES, INCLUDING BUT NOT LIMITED TO BACK-UP OR SHUT DOWN MECHANISMS. BECAUSE EACH END-USER SYSTEM IS CUSTOMIZED AND DIFFERS FROM NATIONAL INSTRUMENTS' TESTING PLATFORMS AND BECAUSE A USER OR APPLICATION DESIGNER MAY USE NATIONAL INSTRUMENTS PRODUCTS IN COMBINATION WITH OTHER PRODUCTS IN A MANNER NOT EVALUATED OR CONTEMPLATED BY NATIONAL INSTRUMENTS, THE USER OR APPLICATION DESIGNER IS ULTIMATELY RESPONSIBLE FOR VERIFYING AND VALIDATING THE SUITABILITY OF NATIONAL INSTRUMENTS PRODUCTS WHENEVER NATIONAL INSTRUMENTS PRODUCTS ARE INCORPORATED IN A SYSTEM OR APPLICATION, INCLUDING, WITHOUT LIMITATION, THE APPROPRIATE DESIGN, PROCESS AND SAFETY LEVEL OF SUCH SYSTEM OR APPLICATION.

# Conventions

---

The following conventions are used in this manual:

» The » symbol leads you through nested menu items and dialog box options to a final action. The sequence **File»Page Setup»Options** directs you to pull down the **File** menu, select the **Page Setup** item, and select **Options** from the last dialog box.



This icon denotes a tip, which alerts you to advisory information.



This icon denotes a note, which alerts you to important information.



This icon denotes a caution, which advises you of precautions to take to avoid injury, data loss, or a system crash.

**bold**

Bold text denotes items that you must select or click on in the software, such as menu items and dialog box options. Bold text also denotes parameter names.

*italic*

Italic text denotes variables, emphasis, or a cross reference.

monospace

Text in this font denotes text or characters that you should enter from the keyboard, sections of code, programming examples, and syntax examples.

**monospace bold**

Bold text in this font denotes the messages and responses that the computer automatically prints to the screen. This font also emphasizes lines of code that are different from the other examples.

# Contents

---

## Chapter 1

### DIAdem

The DIAdem Modules .....	1-1
The DIAdem Screen .....	1-2

## Chapter 2

### Generating Your First Report

Selecting Data .....	2-1
Defining Graphs.....	2-2
Selecting a Layout .....	2-3

## Chapter 3

### Loading and Managing Data with DIAdem DATA

DIAdem and Other Data Formats .....	3-1
Working with DIAdem DATA .....	3-2
Viewing Individual Channel Contents .....	3-3
Experimenting with Your Data without Risk.....	3-3

## Chapter 4

### Viewing Data Interactively with DIAdem VIEW

Defining a Graph .....	4-2
Analyzing Data with Graph Cursors.....	4-3
Selecting the Cursor Mode .....	4-4
Creating a New View .....	4-5
Toggling Cursor Types.....	4-5
Creating Detailed Views.....	4-6
Displaying Legend Information in DIAdem VIEW .....	4-7

## Chapter 5

### Applying Mathematical Functions with DIAdem CALC

Using Mathematical Functions .....	5-2
Displaying Calculation Results.....	5-3

## Chapter 6

### Creating Reports with DIAdem GRAPH

Creating a New Layout.....	6-1
Choosing a Graph Layout .....	6-1
Adding Data to an Axis System.....	6-3
Adding Graphics to Your Layout.....	6-3
Labelling Your Report.....	6-5
Making a Template.....	6-7

## Chapter 7

### Automating Tasks with DIAdem AUTO

Creating an Autosequence.....	7-1
Recording Your Autosequence .....	7-2
Running an Autosequence .....	7-4
Autosequence Code.....	7-4
Editing Autosequence Code.....	7-5
Testing Your New Autosequence .....	7-6
Additional Autosequence Capabilities .....	7-6

## Chapter 8

### Evaluating Data and Videos with DIAdem CLIP

Generating Scenes with Videos.....	8-2
Evaluating Videos .....	8-3

## Chapter 9

### Projecting Data onto Measurement Objects with DIAdem INSIGHT

Generating Scenes with 3D Models .....	9-2
Evaluating 3D Models.....	9-3

## Appendix A

### Technical Support and Professional Services

---

# DIAdem

National Instruments DIAdem gives you functions for performing tasks with technical data. DIAdem has modules for data management, mathematical and graphical data analysis, and for generating professional test reports. You can automate all the DIAdem functions in Autosequences with Visual Basic Script.

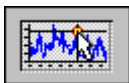
## The DIAdem Modules

---

DIAdem is modular. You can purchase DIAdem with the modules and toolsets you need for your tasks.



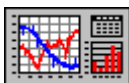
DIAdem DATA is for managing and editing your data and can process large amounts of data, with over two billion values. DIAdem can exchange data with other programs like NI LabVIEW or Microsoft Excel, and read and save data in ASCII or binary format. DIAdem communicates with databases using Microsoft ADO, SQL/ODBC, or ASAM/ODS.



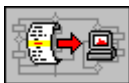
DIAdem VIEW offers you functions for graphically analyzing and viewing data. With various kinds of graphics cursors you can measure graphs and graphically extract data areas and copy them into new data channels.



DIAdem CALC provides a wide range of options for mathematical data analysis. From simple channel calculations, through statistics, signal and curve analysis, to crash test analysis, DIAdem CALC provides engineers and scientists with mathematical solutions.



DIAdem GRAPH is the module for generating flexible, reusable test reports, that include any combinations of 2D and 3D axis systems, polar displays, tables, and texts with variables. By using variables, and storing layouts and data separately, you can reuse your layouts any number of times.



DIAdem AUTO automates recurring sequences. With the Visual Basic Script language used in DIAdem, you modify the user interface and include your own functions in the program. Automate your recurring sequences from data import, through mathematical analysis, to printing your evaluations.

When working with video sequences or 3D models, you can extend DIAdem to include the external modules DIAdem CLIP or DIAdem INSIGHT.



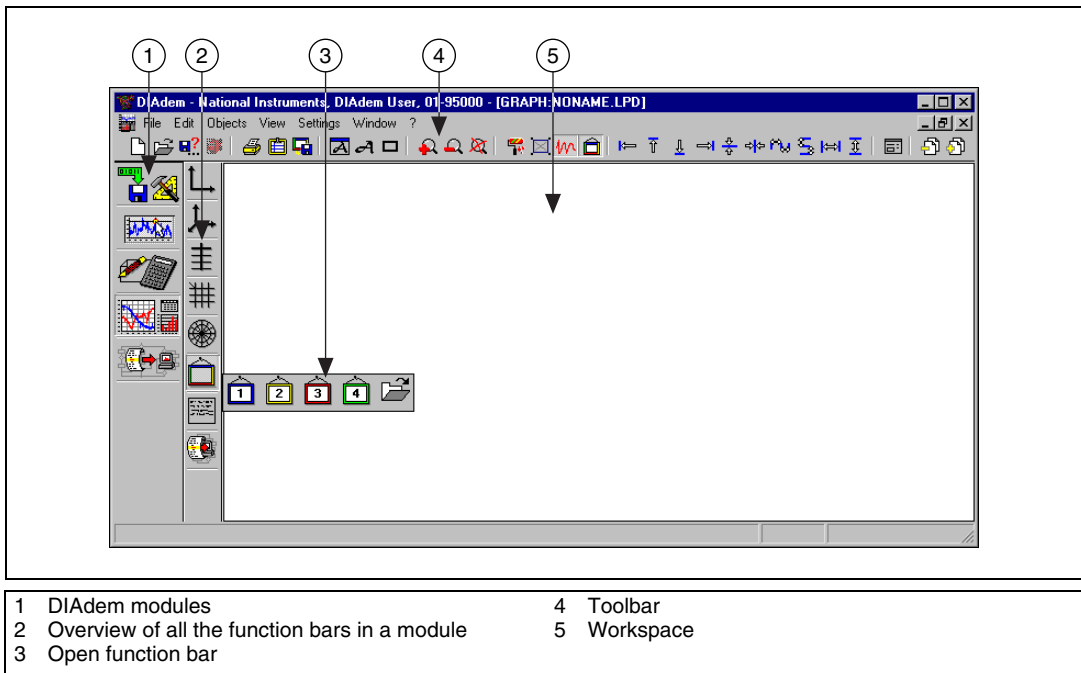
DIAdem CLIP analyzes measured values and videos that you acquired simultaneously from one test. Run videos and measured values synchronously or click any measured value in the graph display to view the related video frame.



DIAdem INSIGHT projects measured data onto a model of your measurement object as color shading or deformation. You link the measurement signals to the point on the model where you acquired the data.

## The DIAdem Screen

As you see in Figure 1-1, the DIAdem modules are always on the left of the screen. If you switch among the modules, the functions in the toolbars and function bars change.



**Figure 1-1.** DIAdem GRAPH Overview





**Note** You can start a variety of examples from the DIAdem Help. You access the examples by clicking **Help»Examples**. If you have not installed the examples, you can do so with a user-defined installation.

# Generating Your First Report

The Report Wizard appears when you launch DIAdem and when you click **File New** in DIAdem DATA and DIAdem GRAPH. Use the Report Wizard to generate a report in three steps:

1. Selecting data
2. Defining graphs
3. Selecting a layout

You can move back and forth among the three steps to change your settings. You can finish your report at each step. DIAdem uses standard settings for steps you leave out.

## Selecting Data

To select data, specify the data source that has the data you want to load, as shown in Figure 2-1.

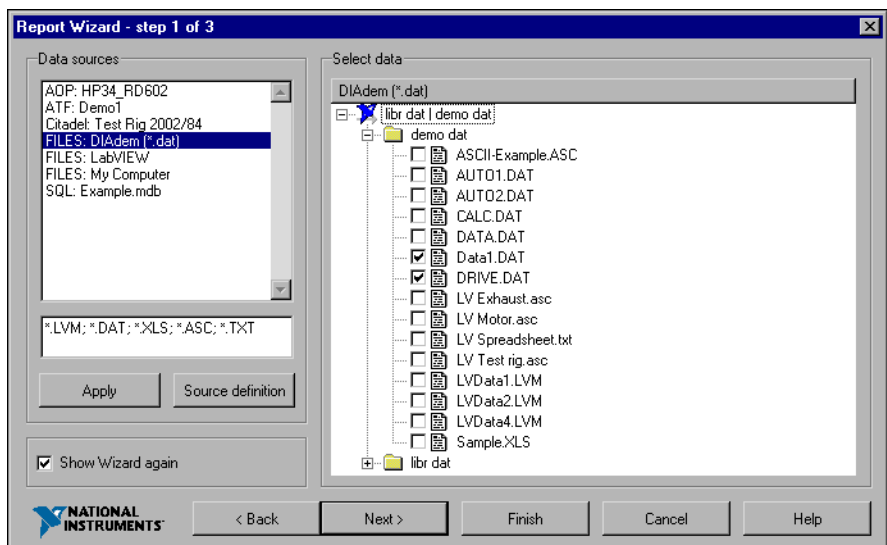


Figure 2-1. Selecting Data for the Report

The simplest type of data source is a directory with data files. The **My Computer** data source provides all the directories on your PC. Use **Source definition** to extend the list of available data sources.

1. Select one of the following data sources:
  - Files
  - Citadel databases
  - VI Logger
  - SQL databases
  - AOP databases
  - ATF files
2. Enter the file extensions of the desired files:
  - DIAdem data (\*.DAT)
  - ASCII data (\*.ASC, \*.TXT)
  - Excel data (\*.XLS)
  - LabVIEW data (\*.LVM, \*.TXT)
  - ASAM data (\*.ATF)
3. Click **Apply** to refresh the tree.

## Defining Graphs

---

To define graphs, the Report Wizard analyzes the data set, and recognizes time and frequency channels as x-channels. The Report Wizard assigns these x-channels to the other channels as shown in Figure 2-2. Select one row in this graph overview and assign a different x-channel to change the suggested channel combination. Disable graphs that you do not want to display in the *Use* column.

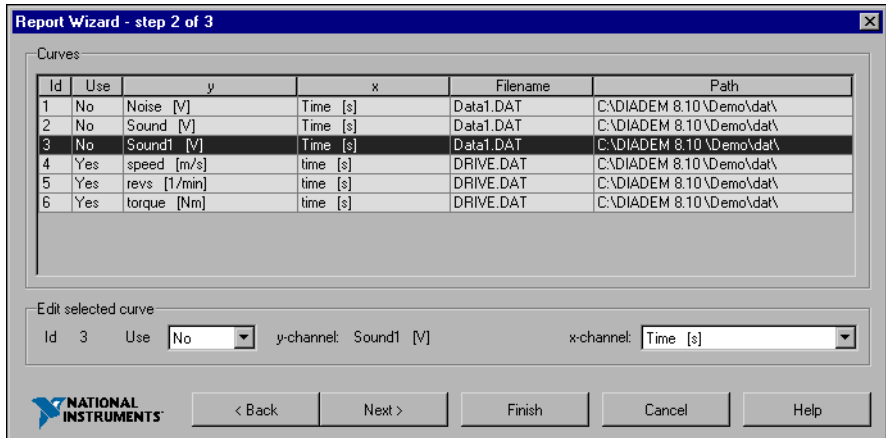
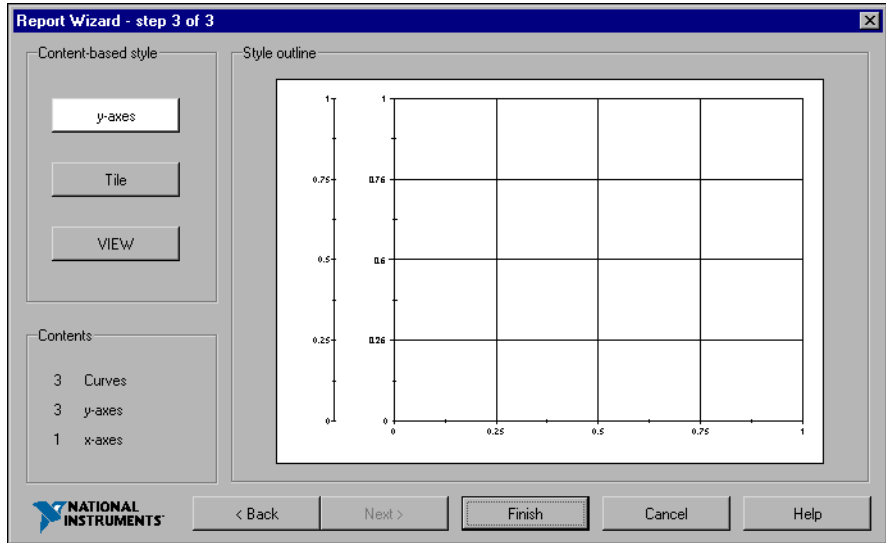


Figure 2-2. Specifying X- and Y-Channel Pairs for the Graph Definition

## Selecting a Layout

You can select a layout for your graph, as shown in Figure 2-3.

1. To select a layout, choose one of the following:
  - **Y-axes**—Displays several graphs with the same x-axis in one axis system with several y-axes in DIAdem GRAPH.
  - **Tile**—Displays each graph in its own axis system in DIAdem GRAPH.
  - **VIEW**—Displays the graphs in DIAdem VIEW.



**Figure 2-3.** Selecting a Layout for the Graph Display

2. Click **Finish** to generate your report. The Report Wizard generates the report automatically.

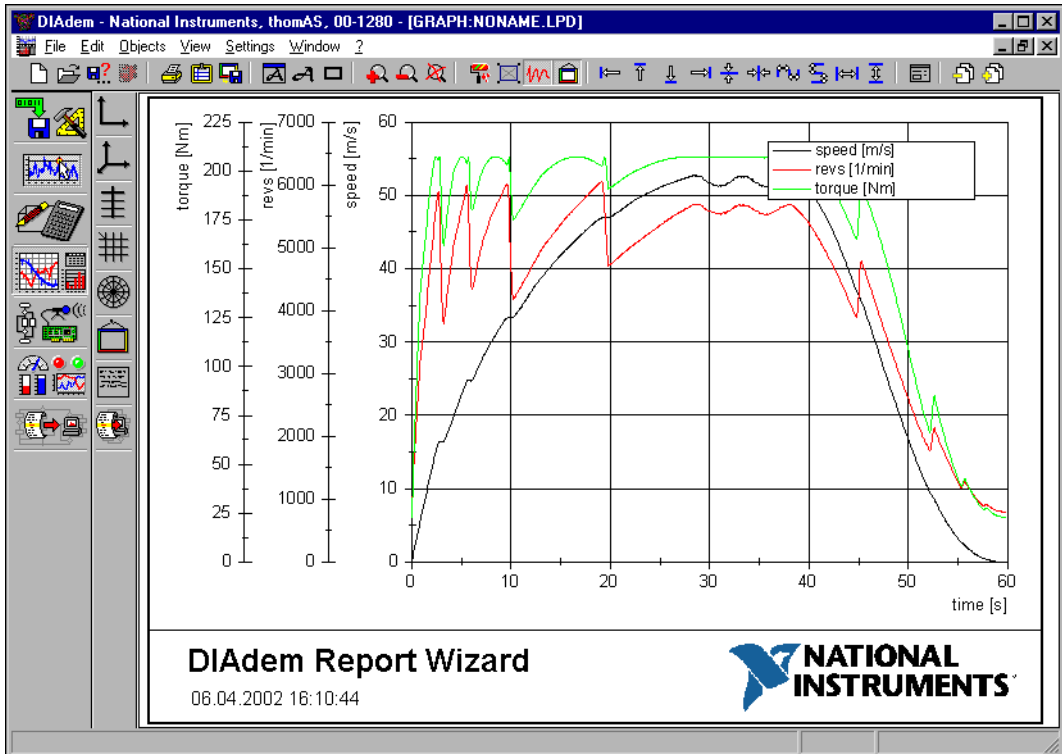


Figure 2-4. Example of an Automatically Generated Report



**Note** To disable the Report Wizard, select **Settings»Desktop parameters»General»Report Wizard**.

---

# Loading and Managing Data with DIAdem DATA

DIAdem DATA helps you process and manage data and load and view your data.

The amount of data one channel can contain is virtually unlimited. Several thousand channels of data can be handled and processed simultaneously (a theoretical maximum 65,536 channels with more than 2 billion values).



**Tip** For further information, press <F1> while in DIAdem DATA.

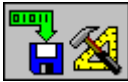
## DIAdem and Other Data Formats

---

DIAdem can read data files from office applications, ASCII, and various binary formats. DIAdem also functions with NI LabVIEW, which has VIs that write the DIAdem native data file format for easy data exchange. With DIAdem, you can also connect to databases using the SQL/ODBC or the ASAM standards. You can create DLLs for DIAdem to import customer-specific data files into the program as well. These DLLs can be created using the DLL toolkit included with DIAdem or using a pre-built one from NI Consulting Services or an NI Alliance Partner.

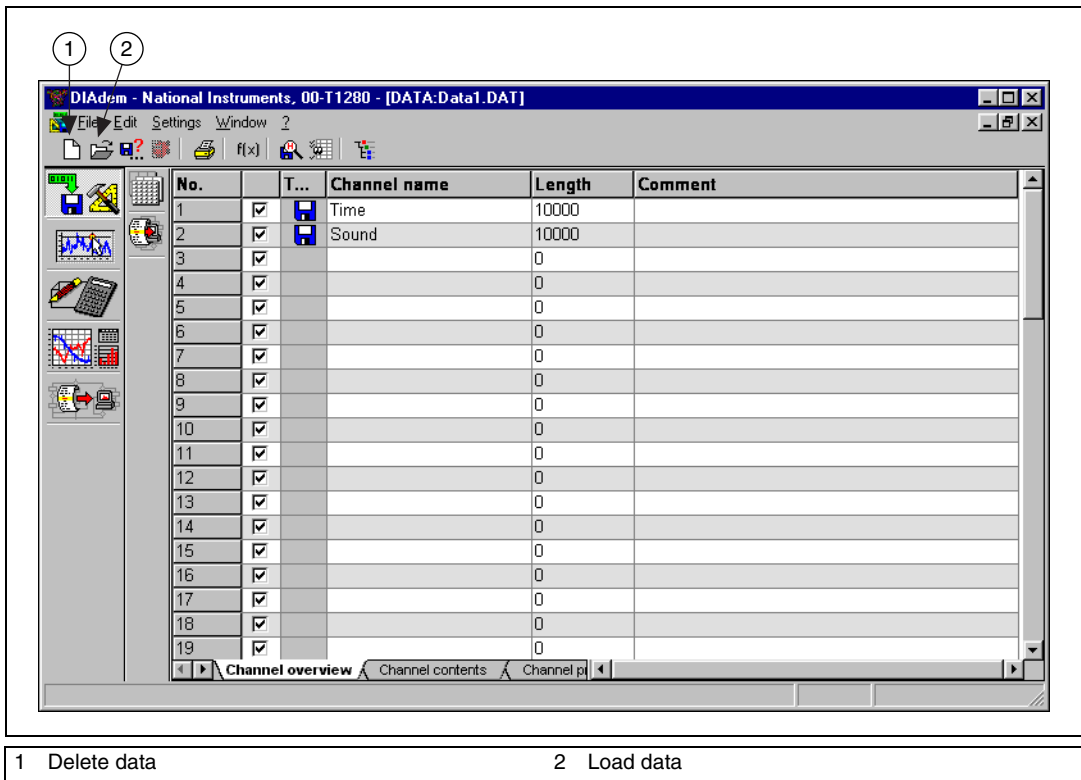
# Working with DIAdem DATA

Now you can explore the different aspects of the DIAdem DATA module.



1. Click **DIAdem DATA**.
2. Click **Load Data** at the top of the screen, as shown in Figure 3-1.
3. Choose the data set `Data2.DAT`.

The channel names *Time* and *Sound* in Figure 3-1 represent the signal from one sensor of the measurement or the result of a calculation performed in DIAdem.



**Figure 3-1.** DIAdem DATA Channel Overview Screen



## Viewing Individual Channel Contents

With DIAdem DATA, you can see and edit individual data points. The Channel attributes section of the Channel contents screen shows the header information, as shown in Figure 3-2, of each individual channel, such as the channel name, comments, and unit of measurement.

Click the **Channel contents** tab at the bottom of your screen to view this information.

Channel name	Time	Sound			
<b>Channel attributes</b>					
Channel no.	1	2	3	4	5
Type	read in	read in			
Comment					
Unit	s	V			
Length	10000	10000	0	0	0
<b>Channel contents</b>					
1	0.00000	0.03158	0.00000	0.00000	0.00000
2	0.00011	0.01556	0.00000	0.00000	0.00000
3	0.00020	0.01648	0.00000	0.00000	0.00000
4	0.00031	0.01175	0.00000	0.00000	0.00000
5	0.00040	0.01450	0.00000	0.00000	0.00000
6	0.00050	0.01480	0.00000	0.00000	0.00000
7	0.00060	0.01342	0.00000	0.00000	0.00000
8	0.00070	0.01068	0.00000	0.00000	0.00000
9	0.00079	0.00901	0.00000	0.00000	0.00000
10	0.00090	0.01236	0.00000	0.00000	0.00000
11	0.00101	0.01144	0.00000	0.00000	0.00000
12	0.00110	0.01358	0.00000	0.00000	0.00000

Figure 3-2. DIAdem DATA Channel Contents Screen

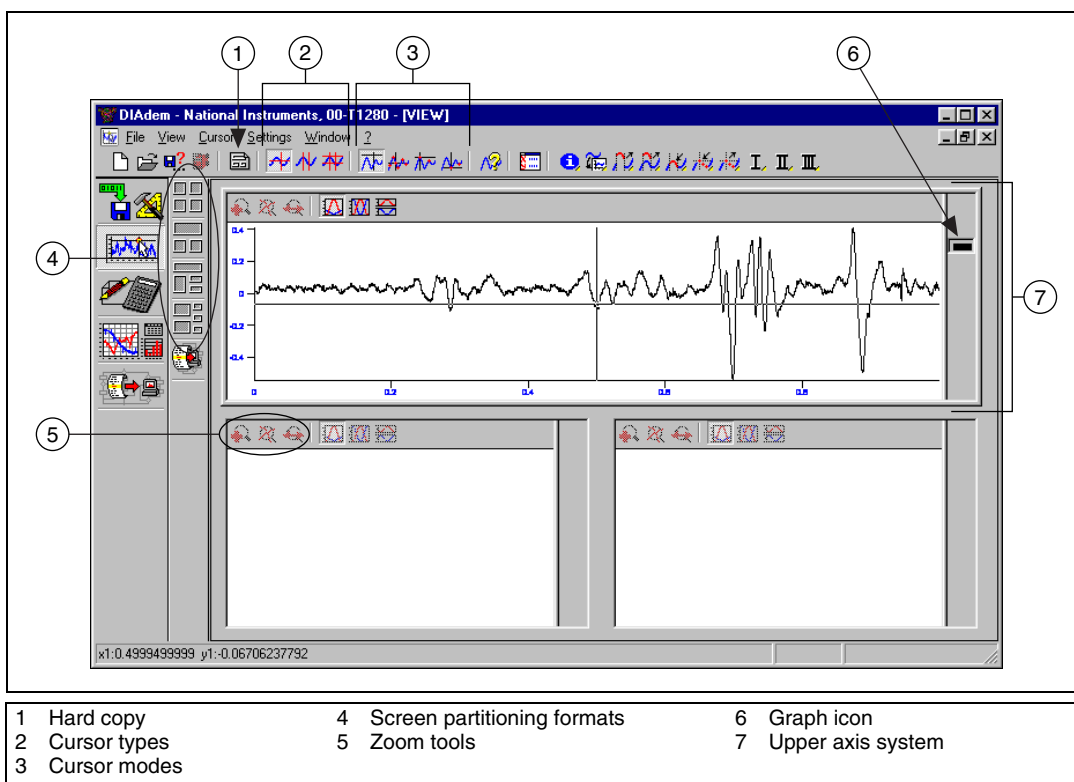
## Experimenting with Your Data without Risk

DIAdem does not assign formulas to individual cells. Also, it will not automatically change the contents of a cell when other data in this view is modified. This helps avoid accidental modifications to your data and results.

If you process or modify the data file currently loaded, it affects *only* the data in the memory, not the source file from which the data was loaded. DIAdem also inserts your new data in a separate data channel. So, with DIAdem you can experiment with your data without worrying about the risks of destroying the original file.

# Viewing Data Interactively with DIAdem VIEW

With DIAdem VIEW, you view and analyze data graphically in predefined screen layouts. DIAdem VIEW is mainly for viewing your data quickly. DIAdem GRAPH is a more powerful module for creating reports.

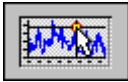


**Figure 4-1.** DIAdem VIEW Overview



**Tip** For further information, press <F1> while in DIAdem VIEW.

# Defining a Graph

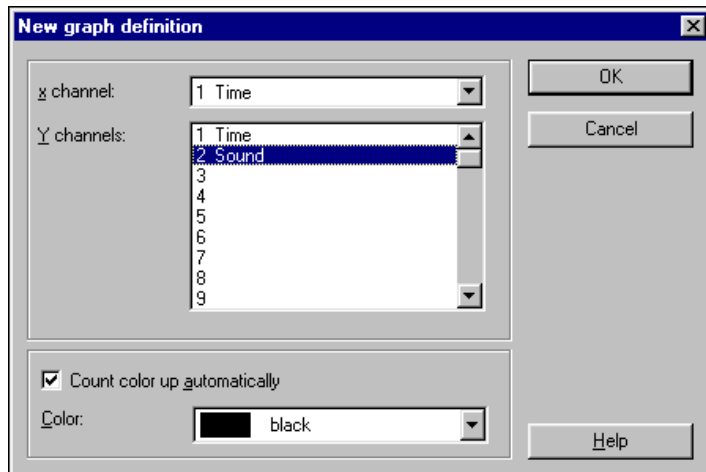


Try viewing some sound frequency data with DIAdem VIEW:

1. Click **DIAdem VIEW**.
2. Select the first icon from the **Screen partitioning** bar as shown in Figure 4-1.
3. Select the **Two axis systems** icon (the second icon on the toolbar) that gives you two full width windows.
4. Double-click inside the top axis system window of DIAdem VIEW. This opens the **Graph definition** dialog box that allows you to configure the data that can be displayed in it.

Each xy set of data channels appears as a line in this dialog box. It also displays the color that each of the xy channels will be displayed in. Each window in DIAdem VIEW can display up to 20 xy channel combinations.

5. Select **New entry** to add a graph to the display.
6. From the resulting **New graph definition** dialog box, shown in Figure 4-2, select **Time** as x- and **Sound** as y-channel, and select the color **black** at the bottom of the dialog. If multiple y channels are selected, each channel will automatically receive a new color if the box **Count color up automatically** is checked.



**Figure 4-2.** New Graph Definition Dialog Box

7. Select **OK** on both dialog boxes. Figure 4-3 shows the results of the exercise.

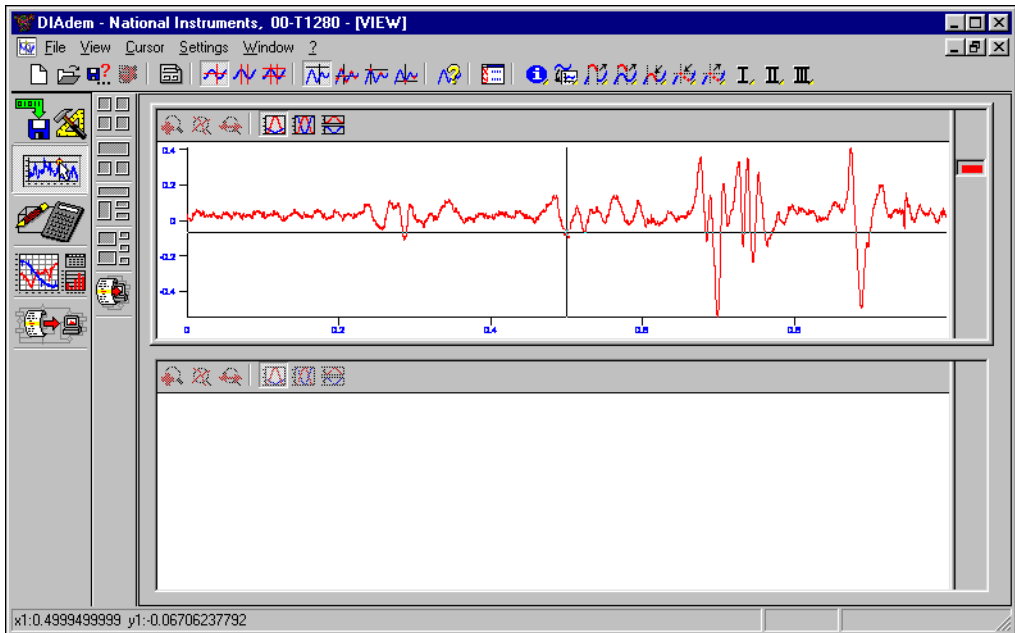


Figure 4-3. Visual Results of Data in DIAdem VIEW

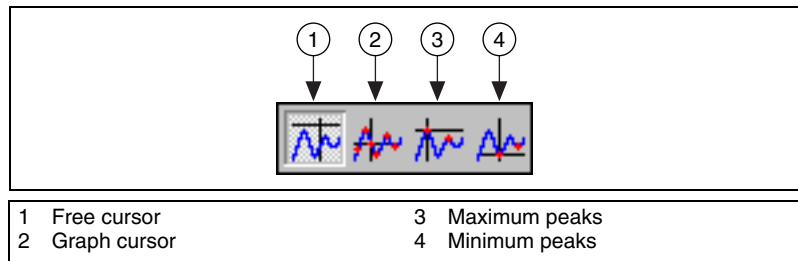
## Analyzing Data with Graph Cursors

DIAdem VIEW provides a variety of graph cursors and graph modes to analyze your data. With graph cursors, you can scroll along a graph and analyze individual values. You can also use graph cursors to locate minima and maxima within a graph.

Other features in DIAdem VIEW allow you to concentrate on specific portions of data. You can zoom in on specific areas of data and even drag and drop them into different graphs. The x- and y-values of the cursor location appear in the lower left corner of the screen. When using the cursor mode, DIAdem VIEW also displays the row in the data table for individual data points in the axis system along with the x- and y-values of the cursor location.

## Selecting the Cursor Mode

The buttons in Figure 4-4 let you select the cursor mode.



**Figure 4-4.** Cursor Modes

The first icon in Figure 4-4 is the Free cursor and is the default cursor mode. In this mode, the cursor can be moved anywhere within the window.

The second cursor mode is the Graph cursor. In this mode, a crosshair follows the graph and displays the data values of the graph.

The last two cursor modes locate Minimum peaks and Maximum peaks. These cursors jump from local minimum to local minimum or local maximum to local maximum.

With the Free cursor, you can move the x- and y-axes of the Free cursor independently along the x- and y-axes of the graph.

1. Select the **Free cursor**. As you move your mouse cursor over the x- and y-axes, arrows appear indicating the directions you can move the cursor.
2. Click the y-axis **Free cursor** and move it up and down.
3. As you move the **Free cursor** along the y-axis, notice that at the bottom of the screen, values for y change.

You can use the Graph cursor to follow the specific values of a curve in a graph.

1. Select the **Graph cursor**.
2. Move your mouse cursor over the **Graph cursor** axes or on the crosshairs of the **Graph cursor**. Arrows appear indicating the directions you can move the cursor.
3. Click and drag the mouse cursor over the crosshairs of the **Graph cursor** along the graph. As you move the **Graph cursor**, the x- and y-values displayed at the bottom of the screen show their location along the x- and y-axes.

## Creating a New View

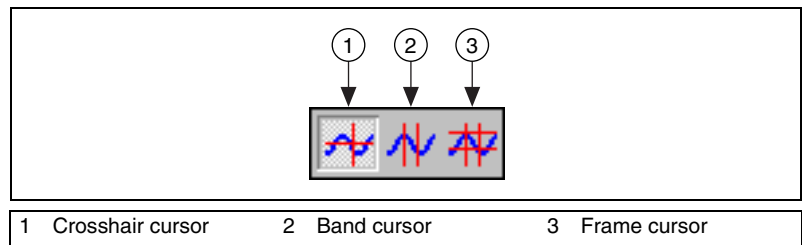
Creating a view in another window requires either double-clicking on an axis system window or dragging and dropping an existing graph into the new view.

1. Using the mouse cursor, select the **Graph icon**, as shown in Figure 4-1, located in the legend at the right of the top graph.
2. Drag and drop the selected **Graph icon** into the lower window.

Notice the graph of the channel **Sound** appears in the bottom window, too.

## Toggling Cursor Types

The three icons in Figure 4-5 represent different cursor types.



**Figure 4-5.** Cursor Types

The icon with perpendicular lines selects the Crosshair cursor, the icon with parallel lines selects the Band cursor, and the icon that looks like a # selects the Frame cursor.

Using the Band and Frame cursors, you can display and analyze specific parts of your data.

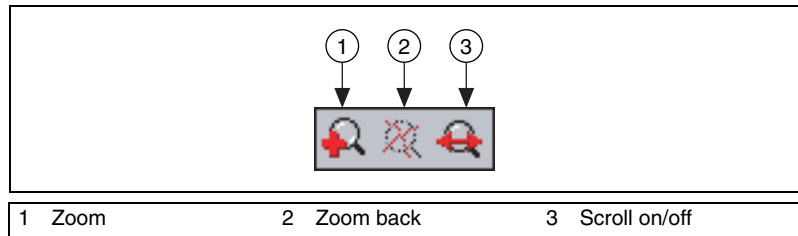
Try adjusting the cursor to look at a specific section of the graph.

1. Select the **Band cursor** icon.
2. Adjust the width of the band by moving the mouse cursor over one of the **Band cursor** elements. The cursor changes to a double-sided arrow.

As you change the data displayed in the lower window, the numerical values in the bottom left part of the screen reflect the values of the main graph, as well as those of your new view.

## Creating Detailed Views

Now that you have adjusted the size of the band, you can adjust and zoom in on the graph to create a more detailed view.



**Figure 4-6.** Zoom Features

In the lower window, which displays the same graph, a set of icons like those in Figure 4-6 allows you to zoom in or scroll along the graph within a specific range.

1. Select the **Scroll on/off** icon (the magnifying glass with the arrow pointing left and right). The lower window will only display the range of data contained within the band in the window view.
2. Move the **Band cursor** in the top window. Then, click and drag your mouse cursor over the crosshairs of the graph cursor to the segment of the graph that you want to focus on.
3. Drag and drop the **Band cursor** to select a portion of the graph that you want to examine in closer detail. Figure 4-7 shows the magnified portion of the graph.

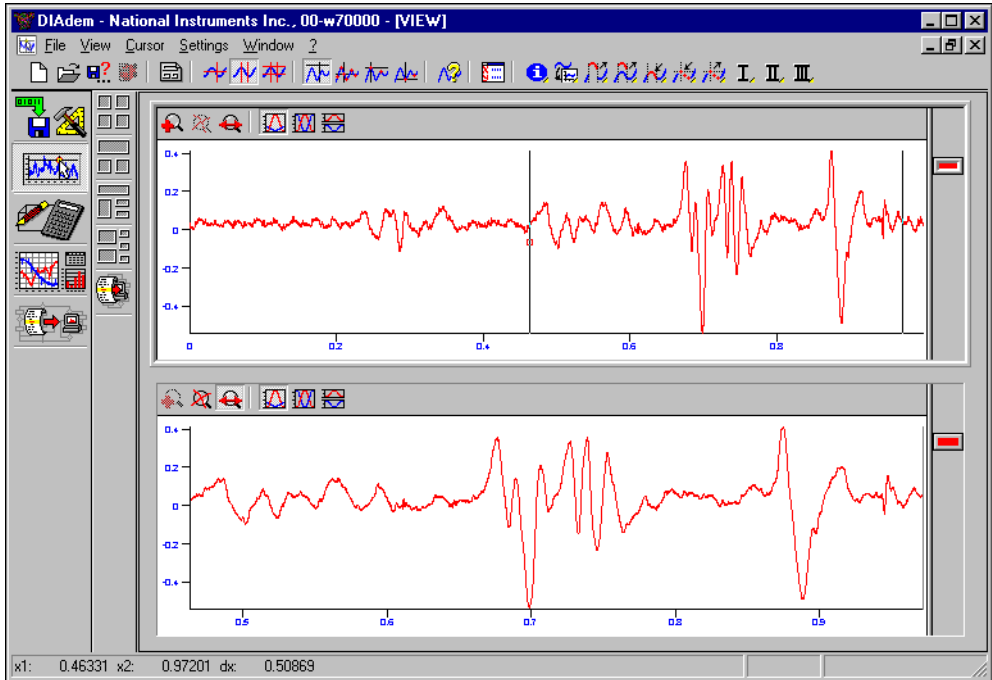


Figure 4-7. Magnified Graph

## Displaying Legend Information in DIAdem VIEW

For each graph you create, DIAdem VIEW automatically generates a legend that labels the name, units, coordinates, and graphs of your data views.

1. Move the mouse cursor in the top window to the right border of the graph window.



As you move the mouse cursor over the right edge of the graph, it will change to a symbol of a two-way arrow bracketing a set of parallel lines.

2. Click your mouse button on the right edge.
3. Drag out the legend by moving your mouse to the left.

You can also configure the legend for your graph. By default it already displays the name, unit, and xy values of each channel displayed in the graph window. Figure 4-8 shows DIAdem VIEW displaying legend information.



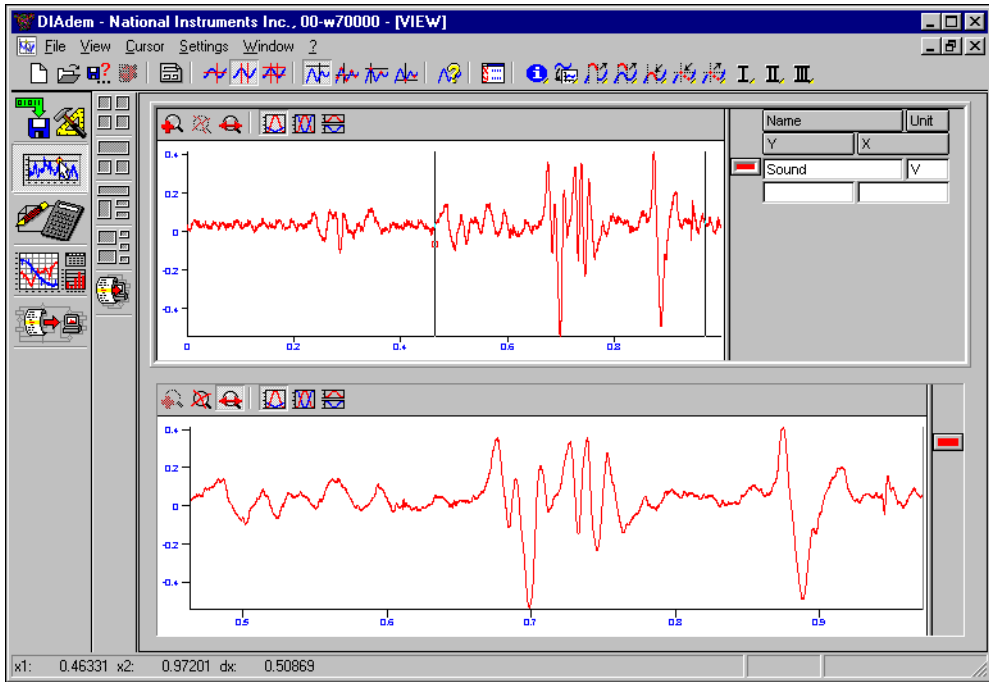


Figure 4-8. Legend Information

# Applying Mathematical Functions with DIAdem CALC

With DIAdem CALC, you apply predefined mathematical functions, including basic math, curve fitting functions, signal analysis, and statistics. Each icon expands to display an icon bar representing the different functions available for data processing.

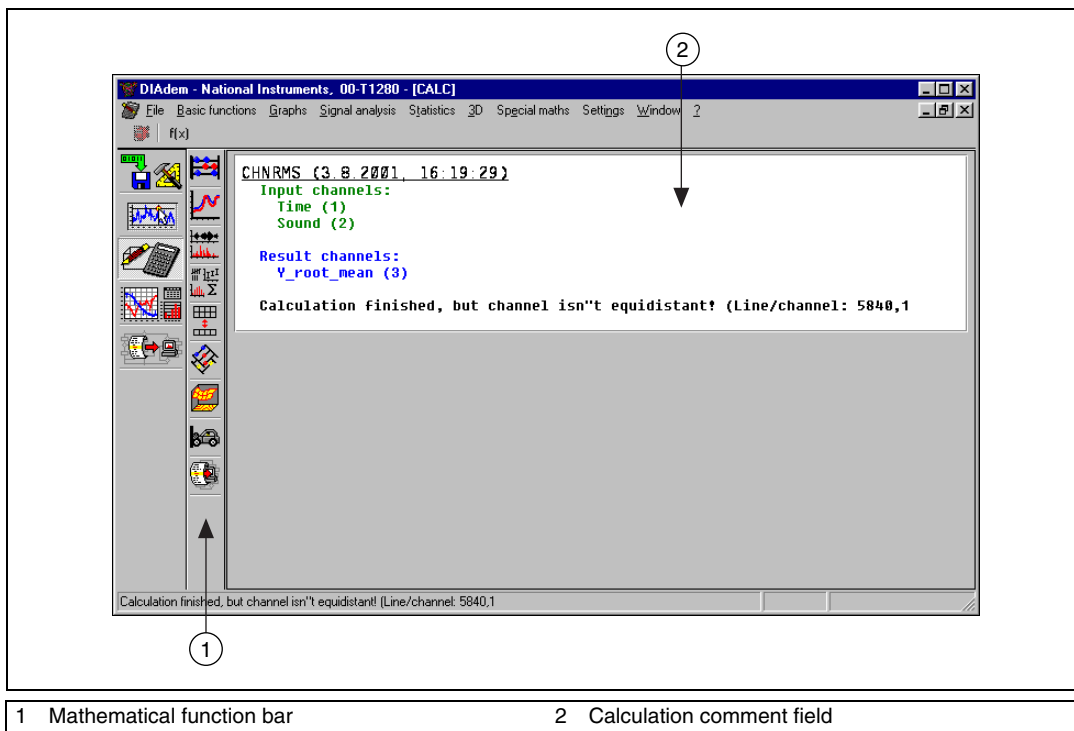


Figure 5-1. DIAdem CALC Overview



**Tip** Holding the mouse cursor over the icons will give you *Tool Tips*, which briefly explain the functions assigned to each individual icon.



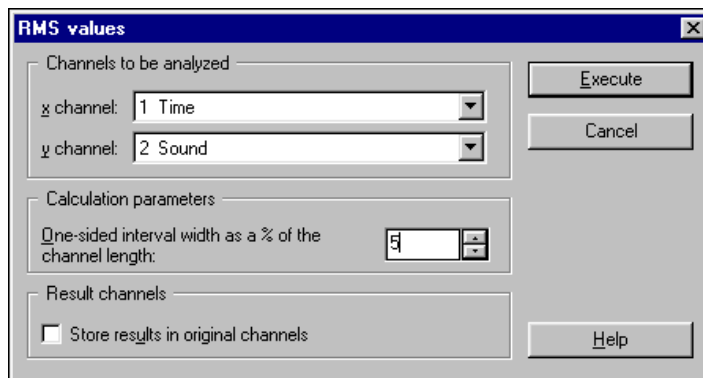
**Tip** For further information, press <F1> while in DIAdem CALC.

## Using Mathematical Functions

With DIAdem CALC, you can perform mathematical functions on your data. Using dialog boxes, you can choose which parameters to use and which channels to analyze.



1. Click **DIAdem CALC**.
2. Select the **Basic mathematics** icon from the Mathematical Function bar.
3. Select the **Root Mean Square (RMS)** function.



**Figure 5-2.** RMS Values Dialog Box

4. Choose **1 Time** for the x-channel; choose **2 Sound** for the y-channel.
5. Enter 5 for the Calculation parameters.
6. Click **Execute**.



**Note** After you click **Execute**, DIAdem displays a message informing you that the calculation is complete. Because the example waveform is irregular, DIAdem CALC informs you that the channel values are *not* equidistant.

The **RMS Values** dialog box in Figure 5-2 represents an example of the interface for the mathematical functions available in DIAdem CALC. By simply selecting parameters, you can process the data. This particular dialog has the following three parameters:

- data channel to be processed
- parameter for the mathematical function (in this case the interval width)
- way the result will be stored

You can either store it in a new channel or replace the original data channel by overwriting it. By default, the data will be put into a new channel.

The RMS function approximately calculates floating square integral mean values. This means that a window with a determined interval width is moved along a specified graph. For each point, the integral is calculated over the corresponding interval. If the specified interval width corresponds exactly to a period of time, then the resulting data likewise corresponds to the RMS values of the signal.

The interval width of the RMS calculation, specified as a percentage of the channel length, determines the number of values to the right and left of the data point that are used for the integral calculation.

## Displaying Calculation Results

---



Switch to DIAdem DATA. To view the Y-root\_mean channel results for the RMS calculation you just made, click **DIAdem DATA**.

A new data channel with the results from the RMS math function has been added to the data overview. The comment for that data channel refers to the data channels that were used in the calculation.



**Caution** DIAdem creates a new data channel each time a math function is executed, unless the **Store result in original channel** box is selected. This is also the case if the function only returns a single value as a result, as happens with some statistics functions like standard deviation.

Figure 5-3 shows the new data channel created.



**Note** In DIAdem, when a new data channel is created, the comment field in DIAdem DATA indicates the number of channels involved in the calculation, as is the case in Figure 5-3. For example, **Time** and **Sound** were the input parameters for the **Y\_root\_mean** channel.

No.	T...	Channel name	Length	Comment
1	<input checked="" type="checkbox"/>	Time	10000	
2	<input checked="" type="checkbox"/>	Sound	10000	
3	<input checked="" type="checkbox"/>	Y_root_mean	10000	Input: Time (1), Sound (2)
4	<input checked="" type="checkbox"/>		0	
5	<input checked="" type="checkbox"/>		0	
6	<input checked="" type="checkbox"/>		0	
7	<input checked="" type="checkbox"/>		0	
8	<input checked="" type="checkbox"/>		0	
9	<input checked="" type="checkbox"/>		0	
10	<input checked="" type="checkbox"/>		0	
11	<input checked="" type="checkbox"/>		0	
12	<input checked="" type="checkbox"/>		0	
13	<input checked="" type="checkbox"/>		0	
14	<input checked="" type="checkbox"/>		0	
15	<input checked="" type="checkbox"/>		0	
16	<input checked="" type="checkbox"/>		0	
17	<input checked="" type="checkbox"/>		0	
18	<input checked="" type="checkbox"/>		0	
19	<input checked="" type="checkbox"/>		0	

Figure 5-3. Results of Channel Creation in DIAdem DATA

---

# Creating Reports with DIAdem GRAPH

With DIAdem GRAPH, you create vivid reports for your data. Different objects can be added to a page in DIAdem GRAPH, including two-dimensional and three-dimensional axis systems and tables, polar coordinate plots, texts and variables, as well as graphics files. With DIAdem GRAPH, you can make colorful, informative reports and presentations.



**Tip** For further information, press <F1> while in DIAdem GRAPH.

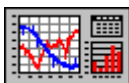


**Note** Do *not* save any changes to the data files (.DAT) in this chapter. Later sections of this manual require the original data files.

---

## Creating a New Layout

A default layout appears after you select DIAdem GRAPH. You can delete this layout to start with a blank screen.



1. Click **DIAdem GRAPH**.
2. Click the **Delete picture definition** button in the upper left-hand corner of the screen as shown in Figure 6-1. Alternatively, choose **File»New** from the menu.

You now have a blank, landscape-format page in front of you.

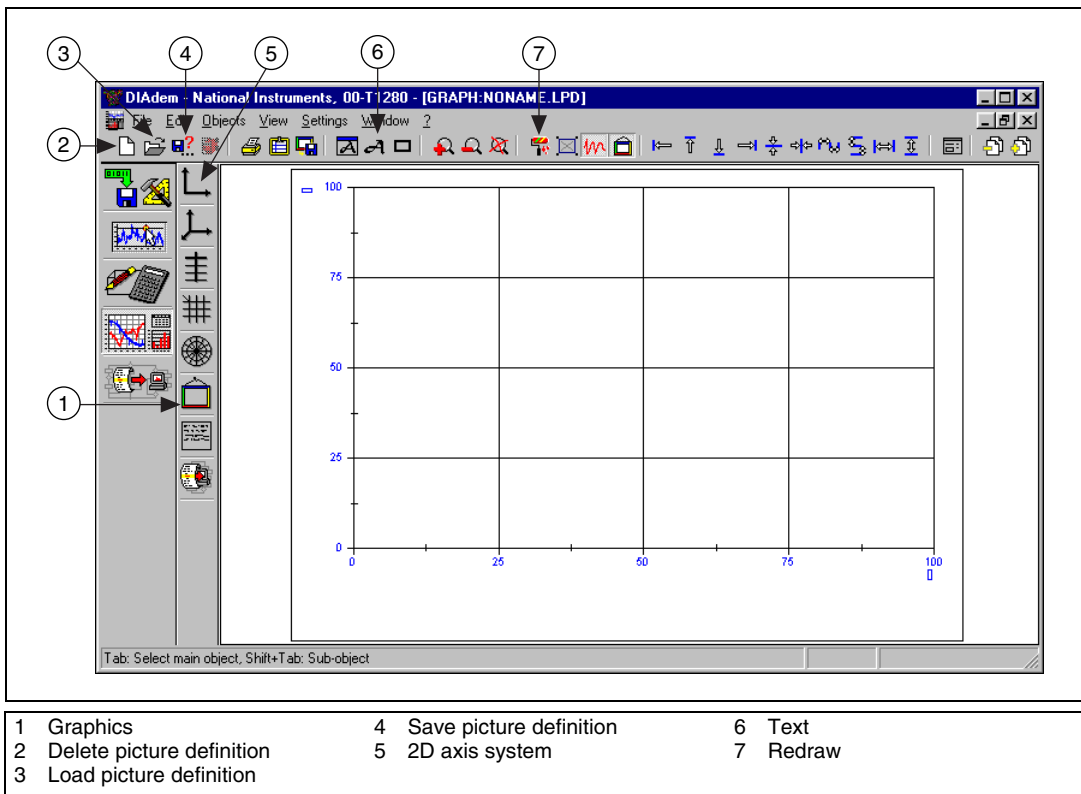
## Choosing a Graph Layout

The icon bar on the left side of the DIAdem GRAPH screen lists the various objects available. Each icon represents a group of functions and allows access to a set of pre-defined objects that you can modify. For example, the two-dimensional axis system templates include predefined axis systems with logarithmic scaling or with multiple y-axes.



1. Select the **2D axis system** from the object bar.
2. Choose the fifth icon from the 2D axis system templates.
3. Size the graph by dragging any of the small square blocks on the edges of the graph with your mouse cursor.
4. Extend the axis system on your screen to the full width of DIAdem GRAPH.

In Figure 6-1, you see the layout that you just completed.



**Figure 6-1.** DIAdem GRAPH Overview



**Tip** You can also move and position most objects in DIAdem GRAPH by placing your mouse cursor over them and dragging and dropping them where you want them to be. This includes text, graph elements, and graphics.

## Adding Data to an Axis System

You add data to an axis system in DIAdem GRAPH the same way you add it to a DIAdem VIEW window—simply double-click in the axis system. DIAdem GRAPH offers more features than DIAdem VIEW to customize the appearance of your reports. For example, you can display data in bar graphs, add constants, and add a legend to your graph to provide additional information.

1. Double-click inside the axis system.
2. Select the **New entry** button inside the **Graph and axis definition** dialog box.
3. Select channel 2 in the **New graph definition** dialog box to the graph, using channel 1 as the x-axis. Click **OK**.
4. Select the **New entry** button.
5. Select channel 3, using channel 1 as the x-axis. Click **OK**.
6. Click **OK**.

## Adding Graphics to Your Layout

Up to 80 axis systems can be put onto a page, and each axis system can accommodate more than 120 graphs. You can also personalize your layouts with company logos. DIAdem supports a number of different graphics formats including GIF, JPEG, and TIFF.

Add a graphic to your layout.



1. Click the **Graphics** button shown in Figure 6-1.
2. Then, click the **Load background graphics** button.
3. Choose `...\DIADEM\Libr\gra\example1.wmf`, and click **OK**.



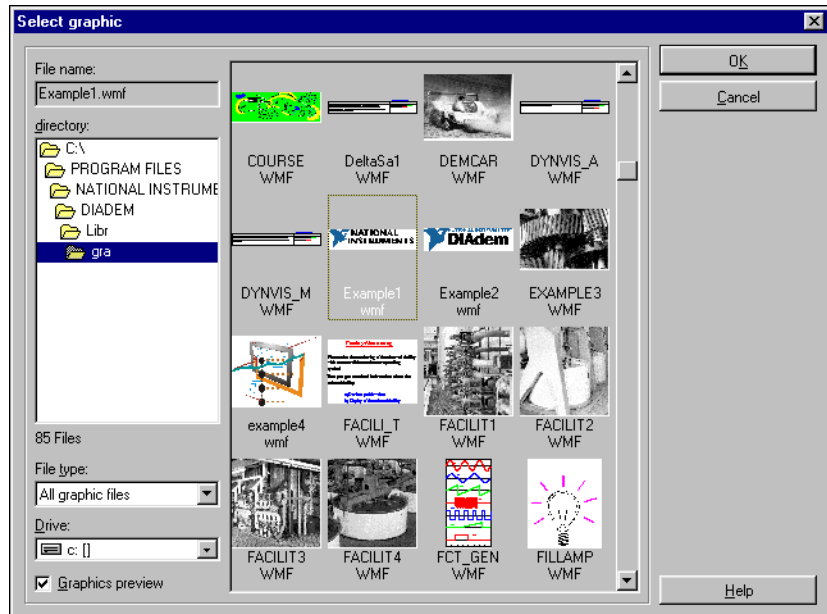


Figure 6-2. Selecting a Graphic.

The resulting graph in Figure 6-3 shows how your graph should appear.

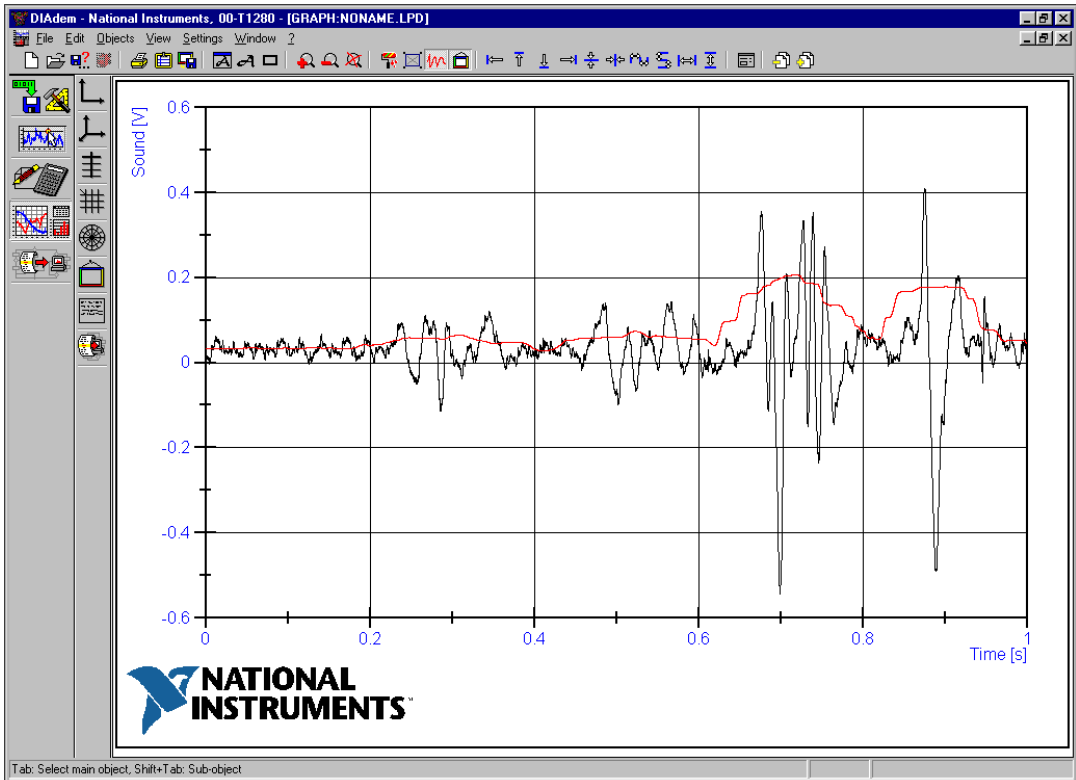


Figure 6-3. Adding a Graphic to a Layout

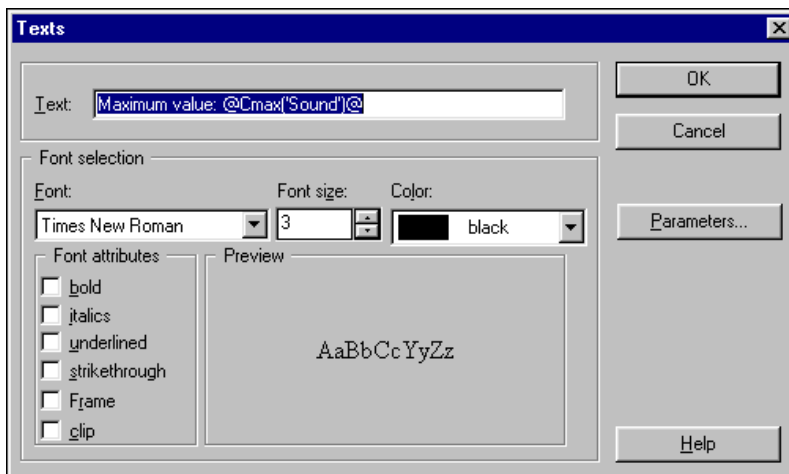
## Labelling Your Report

You can also add text to your graphs. Use DIAdem variables such as the date, time, and data file name to update the text of your layout automatically. It is also possible to add information such as the minimum or maximum value of a data set or any other information that is stored in a DIAdem variable.

You can now add text to the diagram explaining the information shown on the report.

1. Click the **Text (A)** button on the toolbar on top of the screen as shown in Figure 6-1. The cursor changes to the text mode.
2. Click the position on the screen where you want to add your text input.
3. Enter the following text: Data file name: @DatFile@ and press <Enter>.

4. Click the **Text** button and enter a second line of text: Report date: @CurrDate@ and press <Enter>.
5. Click the **Text** button and enter a third line of text: Maximum value: @Cmax('Sound')@ and press <Enter>.
6. To limit the values after the decimal place, double-click that text and edit the input in the **Texts** dialog box as shown in Figure 6-4.



**Figure 6-4.** Text Formatting Dialog Box

7. Edit the text to read as follows:  
Maximum value: @str(Cmax('Sound'),'d.dd')@

This rounds the maximum value of the **Sound** channel with two decimal places behind the decimal point as Figure 6-5 shows.

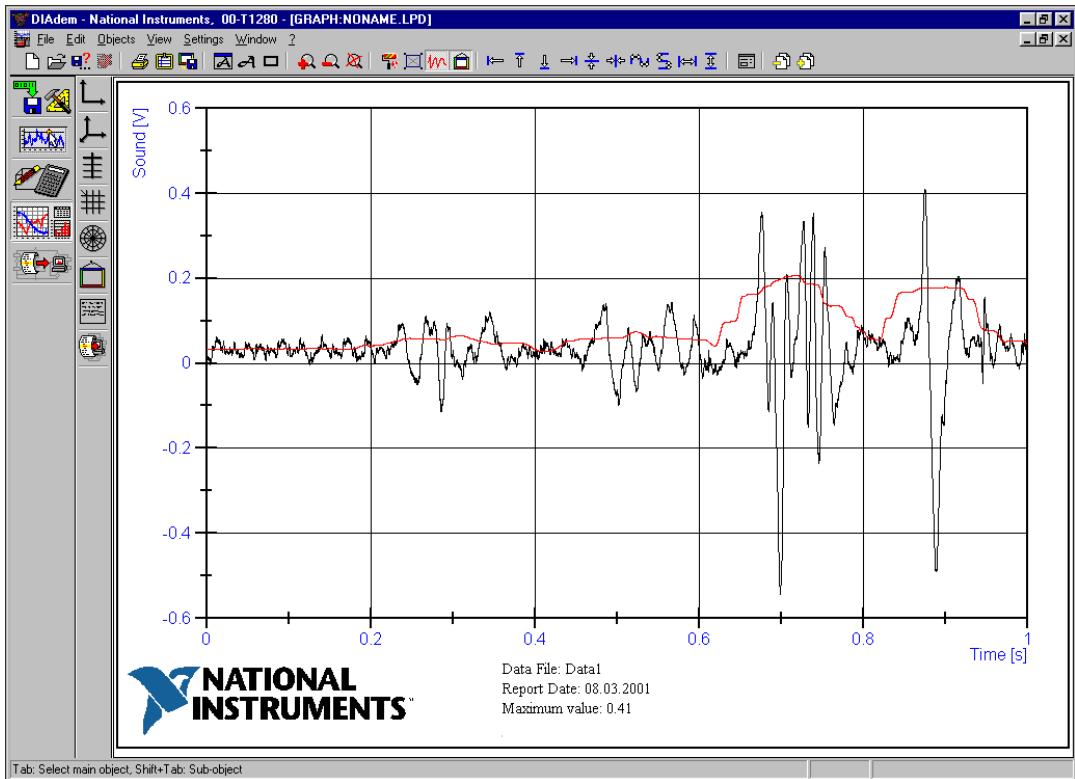


Figure 6-5. Adding Text to a Layout

## Making a Template

Assume this is the layout you want to use for all your other reports. Here is how you can apply the template to other data sets.



1. Select the **Save as** icon from the toolbar to store this layout template.
2. Enter the filename `Template1.LPD` and click **Save**. After storing the template, you can use it with any data file that has a similar structure.

# Automating Tasks with DIAdem AUTO

With DIAdem AUTO, you can automate sequences of commands and put them into an Autosequence. An Autosequence is basically a macro that you can extend to include programming structures, user-defined variables, and dialogs.

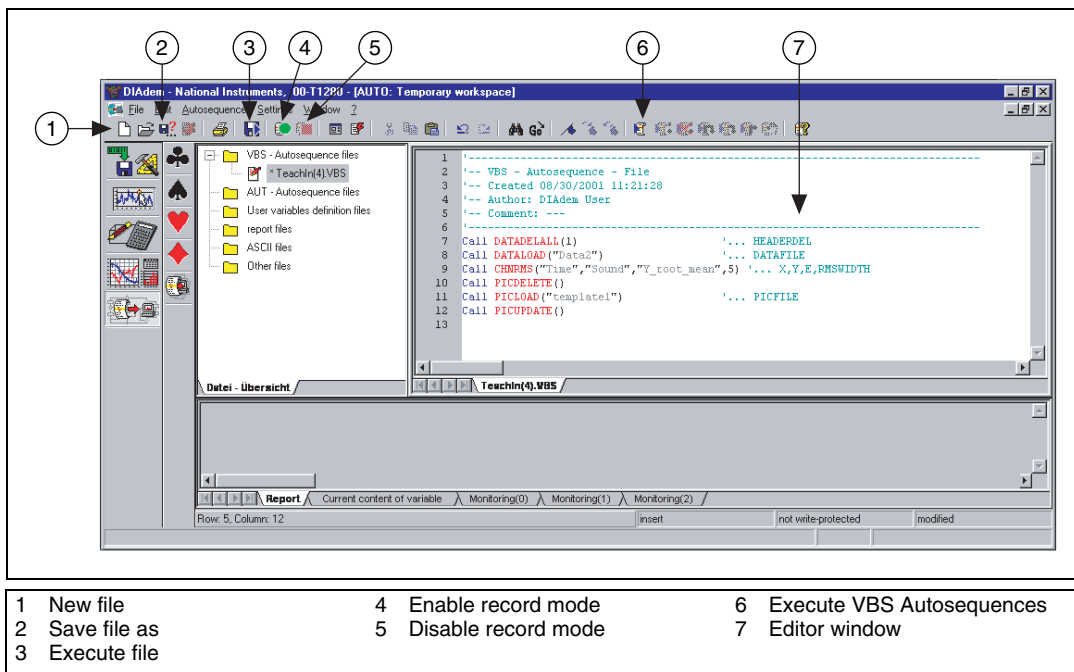
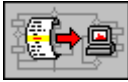


Figure 7-1. DIAdem AUTO Overview

## Creating an Autosequence

In order to create an Autosequence, you just have to start recording. As you perform the various tasks using different DIAdem modules, DIAdem encodes your actions using Visual Basic Script (VBS).

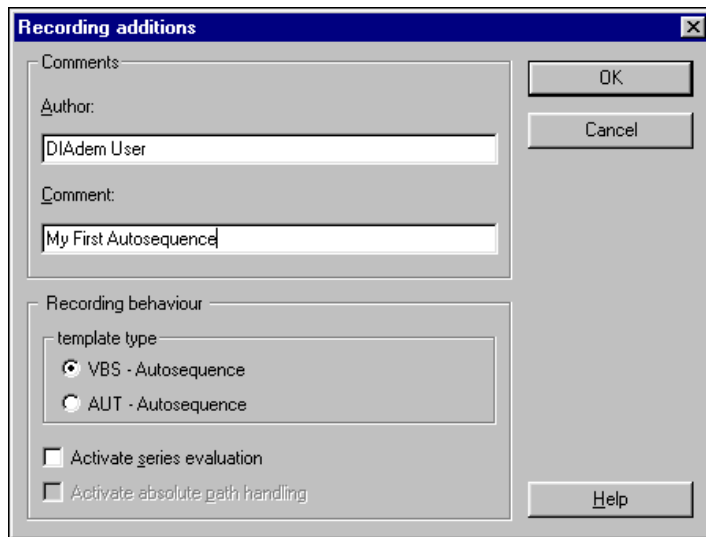


1. Click **DIAdem AUTO**.
2. Click the Autosequence **Record on** icon to start recording the Autosequence.

DIAdem AUTO prompts you to enter the Autosequence author and comments. It places these items directly into the Autosequence code to help you identify it in the future.

In the **Recording additions** dialog box, you can enter the author name and make brief comments about an Autosequence, as shown in Figure 7-2.

3. Enter the **Author** and any **Comments**.
4. Choose **VBS - Autosequence** for the template type.
5. Click **OK**.



**Figure 7-2.** Documenting Recording Additions in Autosequences

## Recording Your Autosequence

After you click **OK** in the **Recording additions** dialog box, notice that a **Record on** symbol appears at the bottom of the screen. This indicates that you have successfully started recording your Autosequence. Every DIAdem function you perform while the green dot displays in the status bar will be recorded in the Autosequence file.

The text editor appearing on the right part of the screen displays header information and code for your Autosequence. Notice in the header, the information that you entered in the **Recording additions** dialog box appears in the Autosquence code.

Now perform the following exercises. The Autosequence records them during the Teach-In mode.



1. Click **DIAdem DATA**.



2. Click the **Delete data** icon to clear DIAdem DATA. If prompted to save changes to the data, choose **No**.



3. Click the **Load data** icon.

4. Choose the data set `Data2.DAT`, and click **Open**.

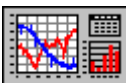


5. Click **DIAdem CALC**.



6. Click the **Basic mathematics** icon, then click the **Root Mean Square** calculation icon.

7. Set the **RMS Values** (Channel 1, Time; Channel 2, Sound; Calculation parameters, 5), and click the **Execute** button.



8. Click **DIAdem GRAPH**.



9. Click the **Delete picture definition** icon. Do not save changes to the data.



10. Click the **Load picture definition** icon. Select the layout you created in DIAdem GRAPH exercise called `Template1.LPD`. The screen automatically updates to show the data set you have just loaded.



11. Click **DIAdem AUTO**.



12. Click the **Autosequence record off** icon.



13. Click the **Save file as** button. Enter the name `Auto.VBS`.

## Running an Autosequence

Now that you recorded an Autosequence, test its results.



Click the **Execute VBS - Autosequence** icon.

As soon as the Autosequence starts running, it performs all the actions you performed during the Teach-In mode.

## Autosequence Code

---

After recording an Autosequence, DIAdem AUTO displays the Autosequence code. You can change the code directly in the text editor. Here is the code from the Autosequence you just created.

```
-----
-- VBS - Autosequence - File
-- Created 07/30/2001 11:42:16
-- Author: DIAdem User
-- Comment: My First Autosequence
-----
Call DATADELALL(1)           '... HEADERDEL
Call DATALOAD("Data2")      '... DATAFILE
Call CHNRMS("Time","Sound","Y_root_mean",10) '... X,Y,E,RMSWIDTH
Call PICDELETE()
Call PICLOAD("template1")    '... PICFILE
Call PICUPDATE()
```

The code contains automatically generated comments enclosed in brackets as well as commands and parameters. Your Autosequence contains six lines of code.

- `DATADELALL()` deletes all the data currently contained in the DIAdem data matrix.
- The `DATALOAD()` command loads the data file. In the example, it has a fixed parameter, which you will learn how to change in order to make this Autosequence useful for loading other data files.
- The `CHNRMS()` command creates a new data channel that contains the root mean square of your original data.
- The `PICDELETE` command deletes the default layout.
- The `PICLOAD()` command loads a layout.
- The `PICUPDATE()` command ensures that this layout is filled with the current data and updated correctly.



## Editing Autosequence Code

Now you can edit this Autosequence to make it work with any data set.

1. Insert a line with a new command after the `DATADELALL` command:

```
Call FileNameGet ("DATA", "FileRead")
```

`FileNameGet()` opens a standard Windows dialog for loading or saving files. The parameter `DATA` tells the software to look only for DIAdem data files (in contrast to all files such as a layout definition). The parameter `FileRead` lets the software know to load the file. Make sure to include `Call` with each command to let DIAdem know a new line has started.

2. Edit the `DATALOAD("FileName")` command to include the variable that will contain the file name selected in the `FileNameGet` command. The variable is called `FileDlgFile`. This is how the line should look after you have modified it:

```
Call DATALOAD(FileDlgFile)
```

3. Save your new Autosequence and select the same name, `Auto.VBS`.



Here is the Autosequence you changed:

```
-----
-- VBS - Autosequence - File
-- Created on 07/30/2001 11:42:16
-- Author: DIAdem User
-- Comments: My First Autosequence
-----
```

```
Call DATADELALL(1)           '... HEADERDEL
Call FileNameGet("Data", "FileRead")
Call DATALOAD(FileDlgFile)      '... DATAFILE
Call CHNRMS("Time", "Sound", "Y_root_mean", 10) '... X, Y, E, RMSWIDTH
Call PICDELETE()
Call PICLOAD("template1")      '... PICFILE
Call PICUPDATE()
```



**Tip** For more information about specific commands, press <F1> to access the DIAdem Help. Using the index or search feature, you can find detailed information about special commands to use in your Autosequences.

## Testing Your New Autosequence



1. Run the modified Autosequence by clicking the **Execute File** icon.
2. Select `Auto.VBS`. As soon as the Autosequence starts running, a dialog box appears and prompts you to select a data file.
3. Select `Data3.DAT`. The Autosequence will automatically calculate the root mean square and bring up the final report with all relevant information.

## Additional Autosequence Capabilities

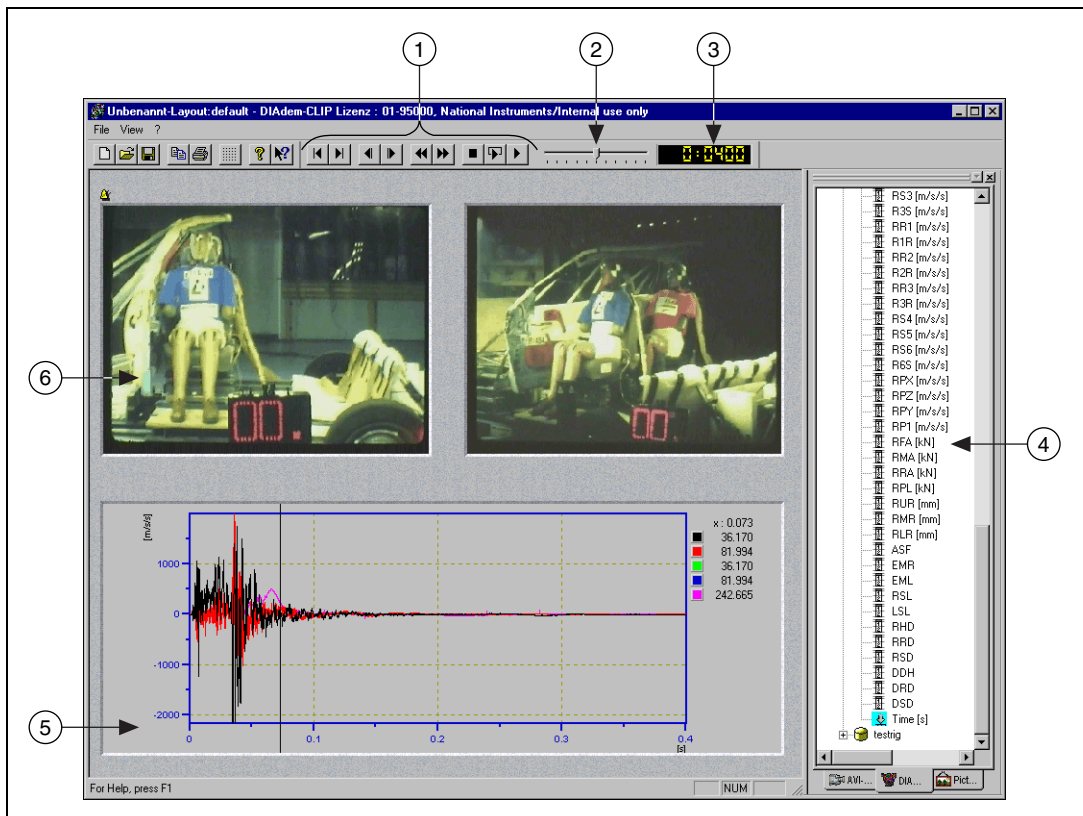
---

Your Autosequences can also contain commands to send your report to a printer, to a graphics file, or to the clipboard to insert it into other programs.

Autosequences can also include programming commands such as `IF . . THEN . . ELSE`, `WHILE . . DO`, `REPEAT . . UNTIL`, or `CASE . . OF . . ELSE`. Autosequences can be used to automatically detect events in data sets and react to these by branching out into different subroutines of an Autosequence. DIAdem also provides functions for creating user interfaces, custom dialog boxes, and variables.

# Evaluating Data and Videos with DIAdem CLIP

With DIAdem CLIP, you can simultaneously analyze test data and videos you have recorded. In DIAdem CLIP scenes, you combine video windows with axis systems that display measurement data in graphs.



- 1 Console for running sequences
- 2 Setting the playback speed
- 3 Time stamp for current videos

- 4 Data overview
- 5 Axis system
- 6 Video window

Figure 8-1. DIAdem CLIP Overview



**Note** DIAdem CLIP is an external module you must install separately.

## Generating Scenes with Videos

---

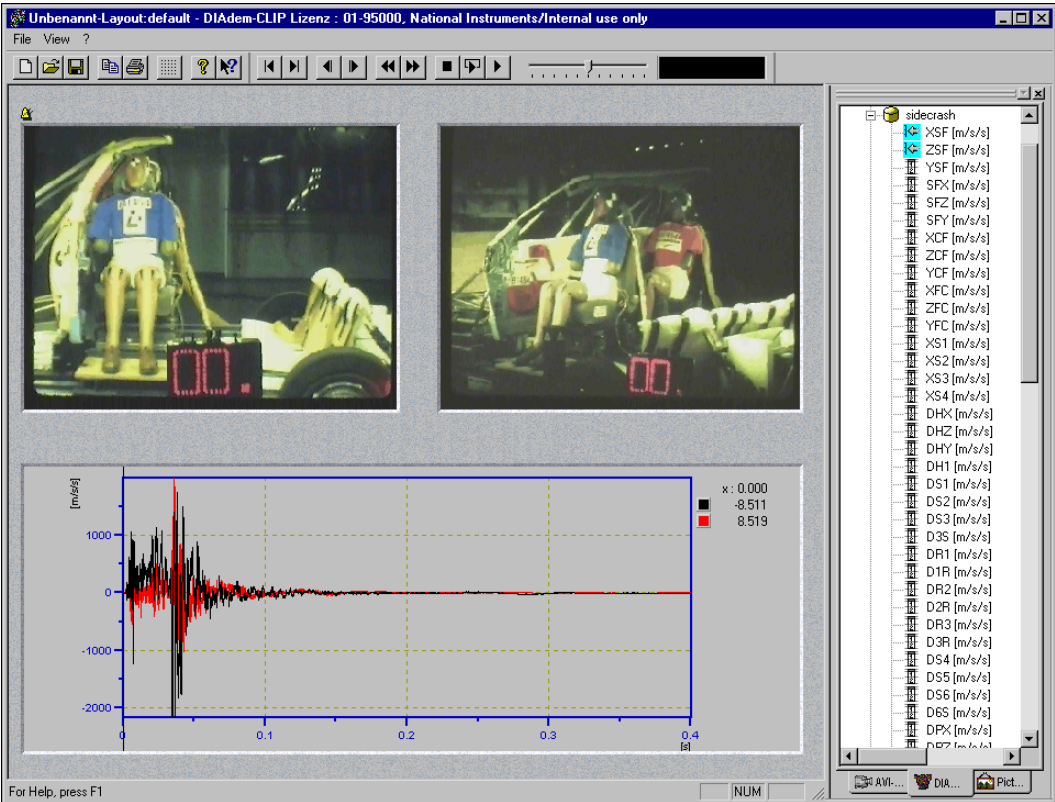
All the available data types are in the data overview on the right of the DIAdem CLIP screen. In the workspace on the left, you create scenes using videos, DIAdem data, and axis systems.



1. Start **DIAdem CLIP**.

A prepared layout appears in the workspace with two video windows and one axis system.

2. Select the **Videos** tab in the data overview.
3. Drag and drop the `sidecrash1.AVI` video to the left video window.
4. Drag and drop the `sidecrash2.AVI` video to the right video window.  
The two recordings show a crash test from two different angles.
5. Select the **DIAdem Data** tab in the data overview.
6. Click the **+** to open the `sidecrash` data set.
7. Click a data channel. If you want to select more data channels, press **<Ctrl>**. A turquoise square with an arrow pointing to the axis system appears in front of each data channel.
8. Insert the selected data channels in the axis system. Figure 8-2 displays the scene.



**Figure 8-2.** Two Different Videos and Measurement Data from a Crash Test



**Note** Click the object frame to move the video window and the axis system. Use the corner markers to zoom the window in and out.

## Evaluating Videos

Once you have created the scene, you can compare the measurement data and the videos. DIAdem CLIP offers two ways to perform your evaluation:

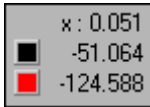
- Automatically—using the player bar. By running through the complete time channel, you get an overview of the test.
- Manually—using the crosshair cursor in the axis system. You can move from point to point in your graph to check critical or unclear ranges. DIAdem CLIP shows the video pictures relating to each graph point.



1. Click **Start** in the player bar to run the whole evaluation.



2. For a detailed examination, click in the axis system and move the crosshair cursor.



The axis system legend shows the measurement values you point to with the crosshair cursor.



**Tip** You can use the legend to delete curves from the axis system. Click the appropriate color square and press <Del>.

# Projecting Data onto Measurement Objects with DIAdem INSIGHT

With DIAdem INSIGHT, you project your measurement data onto a model of the measurement object. Link the measurement signals to the corresponding point on the model where you acquired the data. You display the measured values on the model as color shading or deformation.

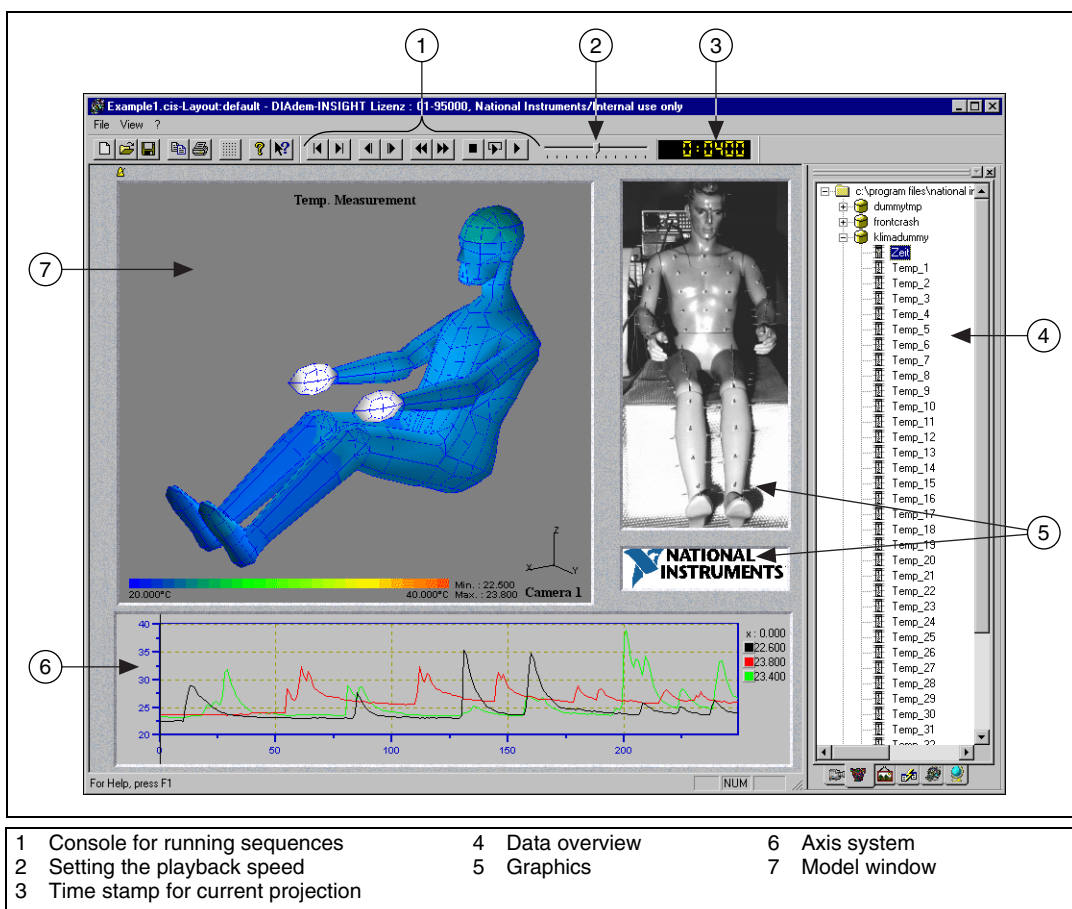


Figure 9-1. DIAdem INSIGHT Overview



**Note** DIAdem INSIGHT is an external module you must install separately.

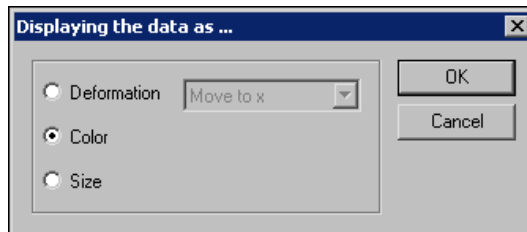
## Generating Scenes with 3D Models

You generate scenes as described in Chapter 8, *Evaluating Data and Videos with DIAdem CLIP*. In addition to the video windows and axis systems, DIAdem INSIGHT has model windows for projecting measured data onto grid models. You can assign each model point to the data channel you acquired at that point. You also specify whether the measured values are displayed as color shading or deformation.

In the following exercise, you assign data for a metal plate with 28 temperature sensors mounted at regular intervals. Temperature sensors measured the temperature as a lighter heated the metal plate and liquid nitrogen cooled it.



1. Start **DIAdem INSIGHT**.  
In the workspace, you see a prepared layout with a model window.
2. Select the **Models** tab in the data overview.
3. Drag and drop the `plate.MOD` model into the model window.
4. Select the **DIAdem files** tab in the data overview.
5. Click the **+** to open the `plate1` data set.
6. Click a data channel and drag the data channel to a model point.
7. As soon as you release the mouse button, the dialog shown in Figure 9-2 appears. Select **Color**.



**Figure 9-2.** Model Point Definition as Color Shading

8. Click **OK**.



9. Connect other data channels to model points. Figure 9-3 displays the scene.

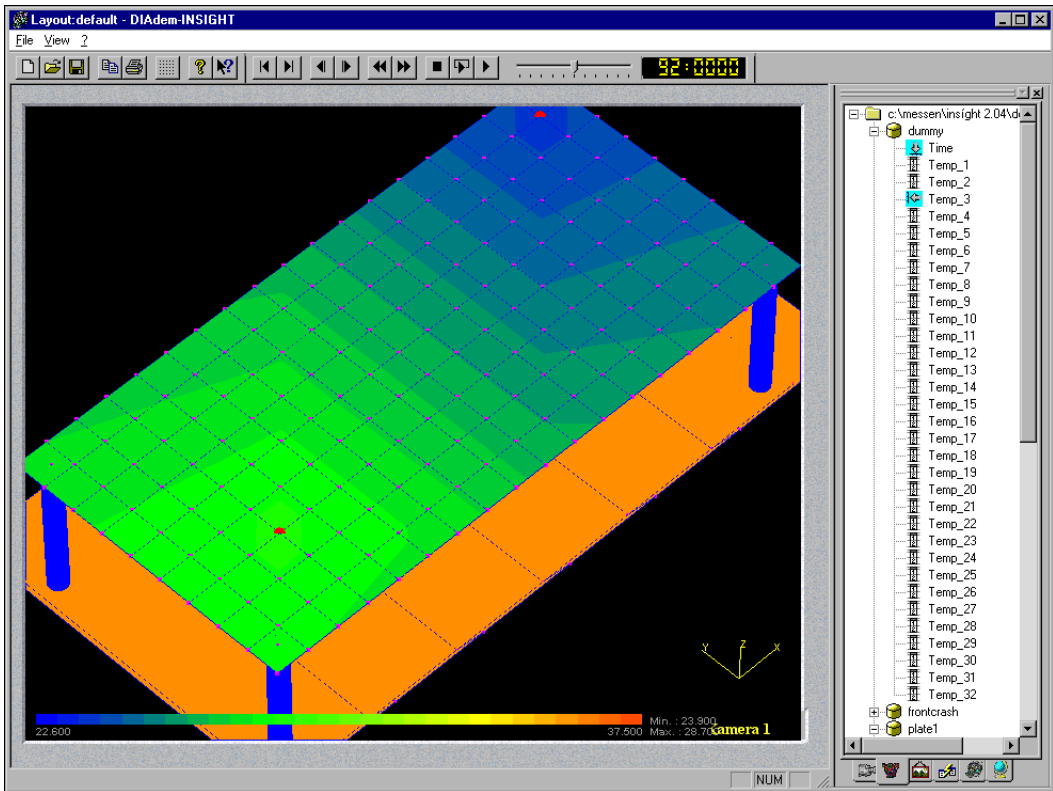


Figure 9-3. Large Red Points Show Model Points with Assigned Data Channels

## Evaluating 3D Models

Now that you have completed the scene, run the evaluation as described in Chapter 8, *Evaluating Data and Videos with DIAdem CLIP*. You can zoom, move, and rotate the model in the model window.

- Zoom the model with the right mouse button, moving the mouse horizontally at the same time:
  - Move the mouse to the right to enlarge the model
  - Move the mouse to the left to reduce the model
- Move the model along the coordinate axis with the right mouse button, pressing <x>, <y>, or <z> to specify the axis. You will see the coordinate axes at the bottom right in the model window.

- Rotate the model with the left mouse button:
  - Move the mouse horizontally to rotate the model around the vertical axis
  - Move the mouse vertically to rotate the model around the horizontal axis
  - Move the mouse diagonally to rotate the model around both axes
  - Move the mouse horizontally and press <x>, <y>, or <z> to rotate the model around the x, y, or z coordinate axis



---

# Technical Support and Professional Services

Visit the following sections of the National Instruments Web site at [ni.com](http://ni.com) for technical support and professional services:

- **Support**—Online technical support resources include the following:
  - **Self-Help Resources**—For immediate answers and solutions, visit our extensive library of technical support resources available in English, Japanese, and Spanish at [ni.com/support](http://ni.com/support). These resources are available for most products at no cost to registered users and include software drivers and updates, a KnowledgeBase, product manuals, step-by-step troubleshooting wizards, hardware schematics and conformity documentation, example code, tutorials and application notes, instrument drivers, discussion forums, a measurement glossary, and so on.
  - **Assisted Support Options**—Contact NI engineers and other measurement and automation professionals by visiting [ni.com/ask](http://ni.com/ask). Our online system helps you define your question and connects you to the experts by phone, discussion forum, or email.
- **Training**—Visit [ni.com/custed](http://ni.com/custed) for self-paced tutorials, videos, and interactive CDs. You also can register for instructor-led, hands-on courses at locations around the world.
- **System Integration**—If you have time constraints, limited in-house technical resources, or other project challenges, NI Alliance Program members can help. To learn more, call your local NI office or visit [ni.com/alliance](http://ni.com/alliance).

If you searched [ni.com](http://ni.com) and could not find the answers you need, contact your local office or NI corporate headquarters. Phone numbers for our worldwide offices are listed at the front of this manual. You also can visit the Worldwide Offices section of [ni.com/niglobal](http://ni.com/niglobal) to access the branch office Web sites, which provide up-to-date contact information, support phone numbers, email addresses, and current events.