NI DIAdem™

Getting Started with DIAdem

NATIONAL INSTRUMENTS

Worldwide Technical Support and Product Information

ni.com

Worldwide Offices

Visit ni.com/niglobal to access the branch office websites, which provide up-to-date
contact information, support phone numbers, email addresses, and current events.

National Instruments Corporate Headquarters

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

For further support information, refer to the *NI Services* appendix. To comment on NI
documentation, refer to the NI website at ni.com/info and enter the Info Code feedback.

Legal Information

Limited Warranty

This document is provided 'as is' and is subject to being changed, without notice, in future editions. For the latest version, refer to ni.com/manuals. NI reviews this document carefully for technical accuracy; however, NI MAKES NO EXPRESS OR IMPLIED WARRANTIES AS TO THE ACCURACY OF THE INFORMATION CONTAINED HEREIN AND SHALL NOT BE LIABLE FOR ANY ERRORS.

NI warrants that its hardware products will be free of defects in materials and workmanship that cause the product to fail to substantially conform to the applicable NI published specifications for one (1) year from the date of invoice.

For a period of ninety (90) days from the date of invoice, NI warrants that (i) its software products will perform substantially in accordance with the applicable documentation provided with the software and (ii) the software media will be free from defects in materials and workmanship.

If NI receives notice of a defect or non-conformance during the applicable warranty period, NI will, in its discretion: (i) repair or replace the affected product, or (ii) refund the fees paid for the affected product. Repaired or replaced Hardware will be warranted for the remainder of the original warranty period or ninety (90) days, whichever is longer. If NI elects to repair or replace the product, NI may use new or refurbished parts or products that are equivalent to new in performance and reliability and are at least functionally equivalent to the original part or product.

You must obtain an RMA number from NI before returning any product to NI. NI reserves the right to charge a fee for examining and testing Hardware not covered by the Limited Warranty.

This Limited Warranty does not apply if the defect of the product resulted from improper or inadequate maintenance, installation, repair, or calibration (performed by a party other than NI); unauthorized modification; improper environment; use of an improper hardware or software key; improper use or operation outside of the specification for the product; improper voltages; accident, abuse, or neglect; or a hazard such as lightning, flood, or other act of nature.

THE REMEDIES SET FORTH ABOVE ARE EXCLUSIVE AND THE CUSTOMER'S SOLE REMEDIES, AND SHALL APPLY EVEN IF SUCH REMEDIES FAIL OF THEIR ESSENTIAL PURPOSE.

EXCEPT AS EXPRESSLY SET FORTH HEREIN, PRODUCTS ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND AND NI DISCLAIMS ALL WARRANTIES, EXPRESSED OR IMPLIED, WITH RESPECT TO THE PRODUCTS, INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, TITLE OR NON-INFRINGEMENT, AND ANY WARRANTIES THAT MAY ARISE FROM USAGE OF TRADE OR COURSE OF DEALING. NI DOES NOT WARRANT, GUARANTEE, OR MAKE ANY REPRESENTATIONS REGARDING THE USE OF OR THE RESULTS OF THE USE OF THE PRODUCTS IN TERMS OF CORRECTNESS, ACCURACY, RELIABILITY, OR OTHERWISE. NI DOES NOT WARRANT THAT THE OPERATION OF THE PRODUCTS WILL BE UNINTERRUPTED OR ERROR FREE.

In the event that you and NI have a separate signed written agreement with warranty terms covering the products, then the warranty terms in the separate agreement shall 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.

National Instruments respects the intellectual property of others, and we ask our users to do the same. NI software is protected by copyright and other intellectual property laws. Where NI software may be used to reproduce software or other materials belonging to others, you may use NI software only to reproduce materials that you may reproduce in accordance with the terms of any applicable license or other legal restriction.

End-User License Agreements and Third-Party Legal Notices

You can find end-user license agreements (EULAs) and third-party legal notices in the following locations:

- Notices are located in the `<National Instruments>\_Legal Information` and `<National Instruments>` directories.
- EULAs are located in the `<National Instruments>\Shared\MDF\Legal\license` directory.
- Review `<National Instruments>\_Legal Information.txt` for information on including legal information in installers built with NI products.

U.S. Government Restricted Rights

If you are an agency, department, or other entity of the United States Government ("Government"), the use, duplication, reproduction, release, modification, disclosure or transfer of the technical data included in this manual is governed by the Restricted Rights provisions under Federal Acquisition Regulation 52.227-14 for civilian agencies and Defense Federal Acquisition Regulation Supplement Section 252.227-7014 and 252.227-7015 for military agencies.

Trademarks

Refer to the *NI Trademarks and Logo Guidelines* at ni.com/trademarks for more information on NI trademarks.

ARM, Keil, and μVision are trademarks or registered of ARM Ltd or its subsidiaries.

LEGO, the LEGO logo, WEDO, and MINDSTORMS are trademarks of the LEGO Group.

TETRIX by Pitsco is a trademark of Pitsco, Inc.

FIELDBUS FOUNDATION™ and FOUNDATION™ are trademarks of the Fieldbus Foundation.

EtherCAT® is a registered trademark of and licensed by Beckhoff Automation GmbH.

Patents

For patents covering NI products/technology, refer to the appropriate location: **Help»Patents** in your software, the patents.txt file on your media, or the *National Instruments Patent Notice* at ni.com/patents.

Export Compliance Information

Refer to the *Export Compliance Information* at ni.com/legal/export-compliance for the NI global trade compliance policy and how to obtain relevant HTS codes, ECCNs, and other import/export data.

WARNING REGARDING USE OF NATIONAL INSTRUMENTS PRODUCTS

YOU ARE ULTIMATELY RESPONSIBLE FOR VERIFYING AND VALIDATING THE SUITABILITY AND RELIABILITY OF THE PRODUCTS WHENEVER THE PRODUCTS ARE INCORPORATED IN YOUR SYSTEM OR APPLICATION, INCLUDING THE APPROPRIATE DESIGN, PROCESS, AND SAFETY LEVEL OF SUCH SYSTEM OR APPLICATION.

PRODUCTS ARE NOT DESIGNED, MANUFACTURED, OR TESTED FOR USE IN LIFE OR SAFETY CRITICAL SYSTEMS, HAZARDOUS ENVIRONMENTS OR ANY OTHER ENVIRONMENTS REQUIRING FAIL-SAFE PERFORMANCE, INCLUDING IN THE OPERATION OF NUCLEAR FACILITIES; AIRCRAFT NAVIGATION; AIR TRAFFIC CONTROL SYSTEMS; LIFE SAVING OR LIFE SUSTAINING SYSTEMS OR SUCH OTHER MEDICAL DEVICES; OR ANY OTHER APPLICATION IN WHICH THE FAILURE OF THE PRODUCT OR SERVICE COULD LEAD TO DEATH, PERSONAL INJURY, SEVERE PROPERTY DAMAGE OR ENVIRONMENTAL HARM (COLLECTIVELY, "HIGH-RISK USES"). FURTHER, PRUDENT STEPS MUST BE TAKEN TO PROTECT AGAINST FAILURES, INCLUDING PROVIDING BACK-UP AND SHUT-DOWN MECHANISMS. NI EXPRESSLY DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY OF FITNESS OF THE PRODUCTS OR SERVICES FOR HIGH-RISK USES.

Contents

Chapter 5
Creating Reports

Chapter 6
Automating Sequences

Chapter 7
Data Acquisition and Visualization

Appendix A
NI Services

About This Manual

You can use this manual to familiarize yourself with DIAdem functions and how to use them. Each chapter describes a DIAdem panel.

This manual contains exercises for finding, analyzing, and presenting data, and for automating each step of the process. These short exercises make it easier for you to get started with DIAdem. At the end of each chapter there is a summary of the most important contents.

Related Documentation

For more information on DIAdem, refer to the following documentation:

*   *DIAdem Help*

    You can open the DIAdem Help in every dialog box with the **Help** button, or in the menu **Help»Content**, or with <F1>. The DIAdem Help offers procedures and dialog box help for each panel, and references for programmers.

    The introduction to the DIAdem help explains the structure of DIAdem and how to use DIAdem to find data, to run analyses, to create reports, and to combine all functions in a script.

*   *SystemLink TDM Help*

    With SystemLink TDM, you handle data and evaluations centrally on a server. SystemLink TDM has applications for data indexing, data preparation, and analysis automation. The client user uses Data Navigation to navigate and search in indexed data and Data Analysis to check shared automation tasks.

    With DIAdem as your developing environment, you can create and test analysis scripts and automated report generation.

1

Introduction to DIAdem

DIAdem is the interactive National Instruments software for finding and managing technical data, for mathematically and graphically-interactively analyzing data, and for presenting data in reports. In a standardized environment, DIAdem offers a unique combination of tools that are tailored to the requirements of technicians, engineers, and scientists. You can adjust all the tools to your tasks and automate them in scripts, which reduce evaluation time substantially.

The DataFinder enables you to find test data quickly and easily, and to identify corresponding data. Using DataFinder does not require a database or IT support, but is ready to use immediately after installing DIAdem.

Working with DIAdem

DIAdem groups related functions in panels. Use the panel bar that is on the left of the DIAdem screen to switch panels. Each panel provides all the tools for one of the following tasks:

- Use DIAdem NAVIGATOR to find, to load, and to manage data. Use the DataFinder to search for data on your computer and in the network, and to navigate through the found data files and databases. You load the data into the Data Portal so that all DIAdem panels can work with the data, which is organized in channels.

- Use DIAdem VIEW to view, to analyze, and to edit data as curves in axis systems. In channel tables you can edit and delete the data as values and enter new data. You synchronize videos or the map display of a test drive with data. They represent 3D data in two-dimensional contour areas.

- Use DIAdem ANALYSIS to analyze data mathematically. You can apply predefined standard mathematical functions, including basic mathematics, curve fitting, signal analysis, and statistics. The dialog boxes for these standard functions guide you through the calculation, so you do not have to enter a formula. You select the input data and the settings. Use the DIAdem Calculator to define and calculate your own formulas.

- Use DIAdem REPORT to document data and present results. In 2D and 3D axis systems, you display your data as curves, bar diagrams, and surfaces. In 2D and 3D tables, you list channel contents. You can label your report with comments and text and illustrate the report with graphics and formulas.

- Use DIAdem SCRIPT to automate tasks in a script, which combines several work steps for recurring sequences such as standard calculations and serial evaluations. Scripts, which you can record interactively, use the functions of all DIAdem panels. You can add program structures and dialog boxes to scripts in the integrated script editor.

•   With DIAdem DAC and DIAdem VISUAL you acquire data, control processes, and visualize data. In DIAdem DAC you create block diagrams to acquire measured values, and to process and to output the data online. In DIAdem VISUAL you design the visualization screen, display the acquired and calculated measurement values, and influence the measurement with input instruments.

When you select a panel, the user interface changes so that you can quickly access the functions you want. Each DIAdem panel has, as shown in Figure 1-1, its own group bar to the right of the panel bar. Open a group bar, click a function group, and select a function. The workspace also changes with the DIAdem panel and displays a folder hierarchy or a worksheet. The toolbars and the context menus contain frequently used functions, which DIAdem also adapts to the selected panel.

Figure 1-1. The Elements of the DIAdem User Interface
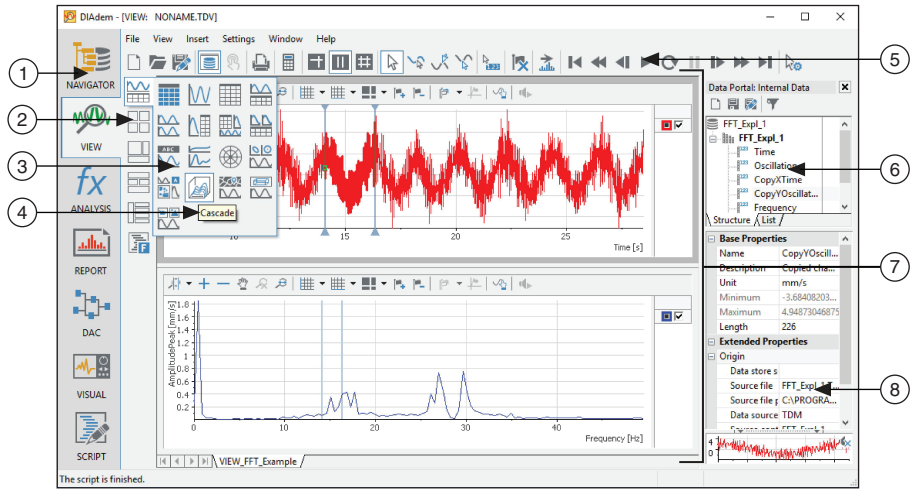
1 Panel bar
2 Group bar
3 Function group
4 Tooltip of the selected function
5 DIAdem VIEW toolbar
6 Data Portal
7 DIAdem VIEW workspace
8 Properties in the Data Portal

Introduction Screen

When you launch DIAdem, the DIAdem introduction screen appears.

Visit NI's DIAdem channel on YouTube to learn how to use DIAdem. Short videos show how to present data in a report, how to synchronize measurement data with a video of the experiment, or how to automate the many steps of an interactive evaluation.

Open the Examples Gallery to load and run examples in DIAdem or to use them as templates for your own applications. The table of contents of the ExampleFinder contains procedures which are step-by-step instructions for the solution of certain tasks.

Note If the introduction screen does not appear when DIAdem launches, select **Help»Introduction** to open the introduction screen.

Figure 1-2. The DIAdem Introduction Screen

2
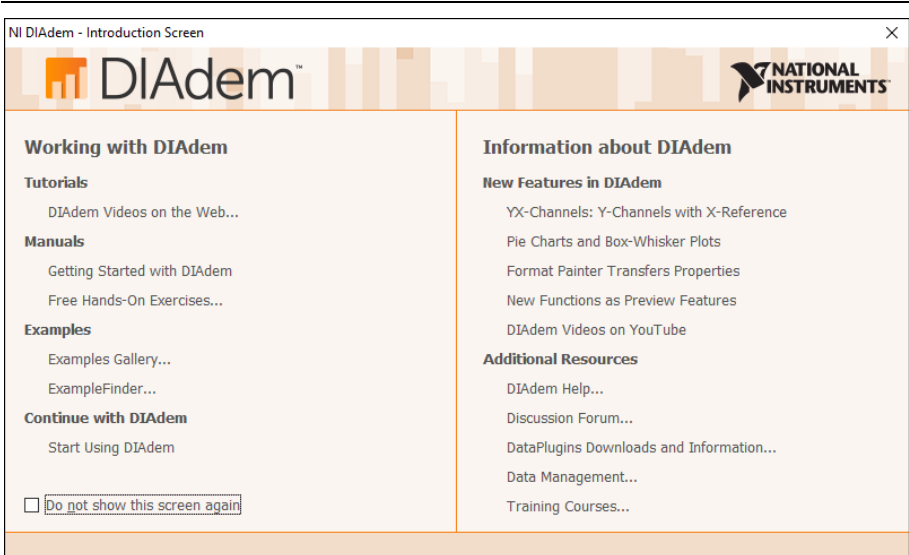
Finding Data

Use DIAdem NAVIGATOR to find, to load, and to manage data. Use DataFinder to search for data on your computer and in the network, and to navigate through the found data files and databases. You load the data into the Data Portal so that all DIAdem panels can work with the data, which is organized in channels.

Mining Data

Use the **Quick Search** to search for a term if you do not know whether the property belongs to a file, a group, or a channel. Use the **Advanced Search** to combine multiple search conditions and describe exactly what properties you are looking for.

Executing a Quick Search

To find data with a **Quick Search**, complete the following steps.

1. Select **DIAdem NAVIGATOR**.
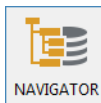
The file browser in the NAVIGATOR panel offers external data in a tree structure.

2. In the search input area, type `Weather` to find all data sets that contain the term `Weather`.

3. Click **Search**.

In the quick search DIAdem does not distinguish whether the data set contains the term as the name or the property of a file, of a channel group, or of a channel. DIAdem displays all files containing the term `Weather` or compound terms such as `Weather data` in the **search results**, as shown in Figure 2-1.

Figure 2-1. Search Results of the Quick Search
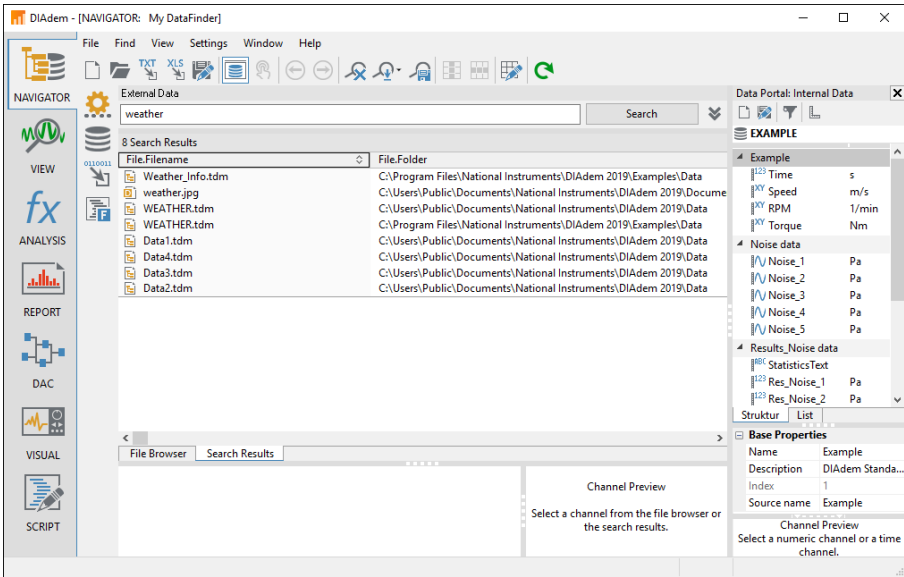
Executing an Advanced Search

To narrow down the results of the Quick Search with an **Advanced Search**, complete the following steps.

1. Click the **Advanced Search** button to specify the search result more precisely, as shown in Figure 2-2.

2. In the **Level** column of the first row, click **File** and select `Group`.

    a. Click **<Enter a property>** in the **Property** column of the first row and select `Name`.

    b. Click the button with the three dots at the end of the first line. DIAdem lists the names of all the groups found.

    c. Double-click the group name `Weather`.

Note If the list does not contain the term `Weather`, DIAdem has not yet indexed all sample files. Select **Settings»MyDataFinder»Configure»Indexer»StartNow** to start indexing.

Define another search condition in the second row to specify the search more accurately.

3. In the **Level** column of the second row, click **File** and select `Channel`.

   a. Click **<Enter a property>** in the **Property** column of the second row and select `Name`.

   b. Click the button with the three dots at the end of the second row. DIAdem lists the names of all the found channels, as shown in Figure 2-2.

   c. Double-click the channel name `Precipitation`.

Figure 2-2. Selection List with the Channel Names of the Indexed Data
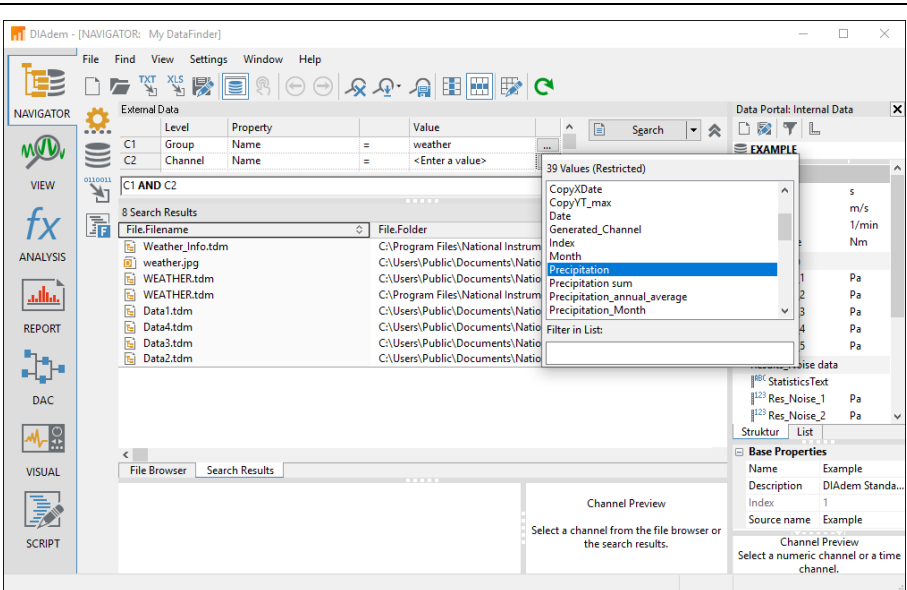
As you can see in the logical operations line below the search conditions, DIAdem connects several search conditions with the AND operator by default.

4. Replace `AND` with `OR` in the logical operations line for the following operation:

   `C1 OR C2`

5. Click **Search**.
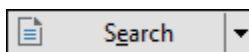
DIAdem displays the **Search Results** as shown in Figure 2-3. Each of the files found contains either a group called `Weather` or a channel called `Precipitation`.

Figure 2-3. Search Results of the Advanced Search
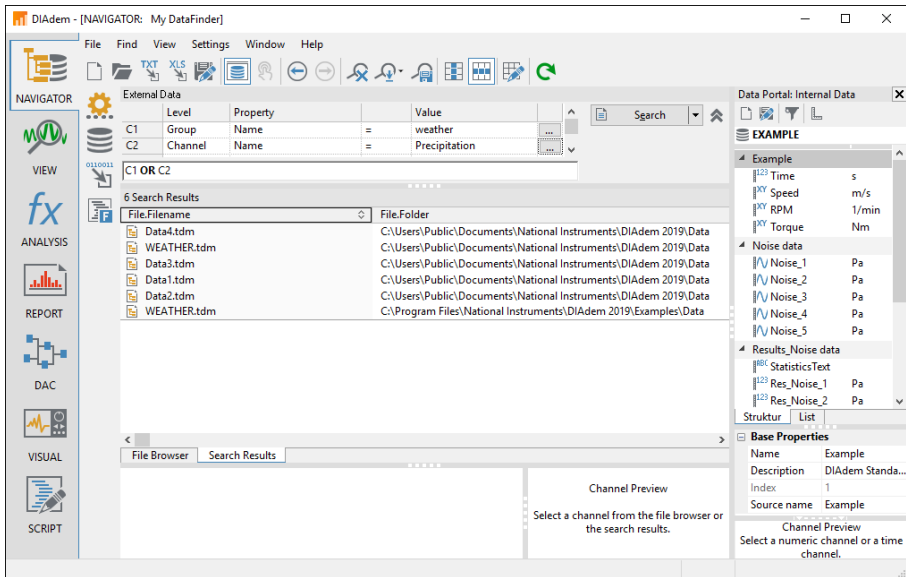
Browsing in Data Sets

Complete the following steps to open data files in the file browser in order to inspect search results.

1. In the search results, right-click the `Data1.tdm` file.

2. Select **Display in File Browser** from the context menu.

    DIAdem switches from the search results to the file browser and displays the file `Data1.tdm` in the tree view.

3. Click the plus sign in front of the file icon.

4. Click the plus sign in front of the `Weather` channel group icon.

5. Click the `Precipitation` channel.

    DIAdem lists all the channel groups and channels that are contained in a file, in a tree structure. You can browse the folders and files down to channel level if the data format allows you to browse. For more information about the selected file, channel group, or channel, refer to the **Properties** window below the **File Browser**, as shown in Figure 2-4. If you select a

channel, the channel preview to the right of the properties display shows the channel data as a curve.

Figure 2-4. Browsing the Found Files in the File Browser
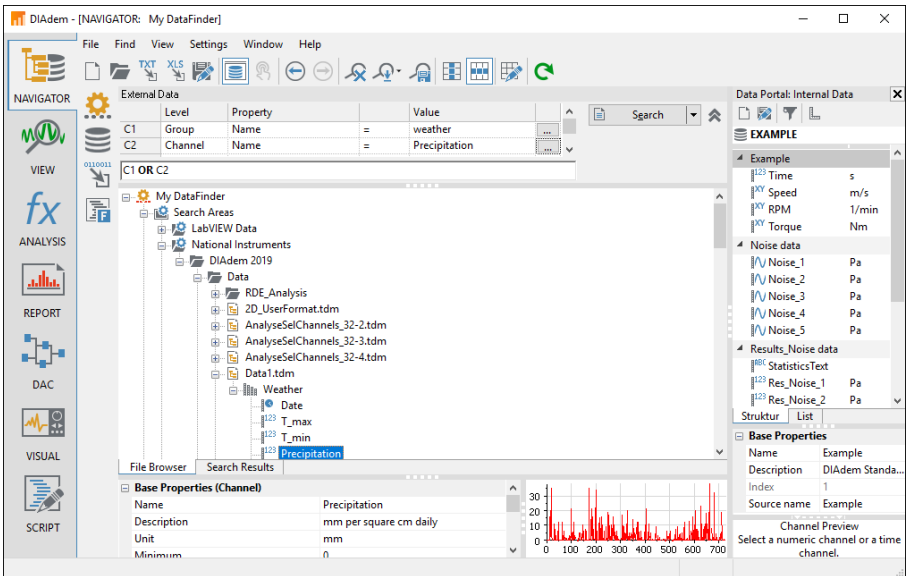
Loading and Managing Data

If you want to work with the data you found, you must load the data into the Data Portal. To load data and to remove unnecessary data, complete the following steps.

1. Click **Delete Internal Data** on the toolbar.
2. In the file browser, click the `Weather` channel group to select that channel group.

3. Drag and drop the selected channel group into the Data Portal.

    The Data Portal displays the new channel group `Weather` with all channels, as shown in Figure 2-5. If you select a channel, the channel preview of the Data Portal displays the channel data as a curve.

Figure 2-5. Loading Data from the File Browser to the Data Portal
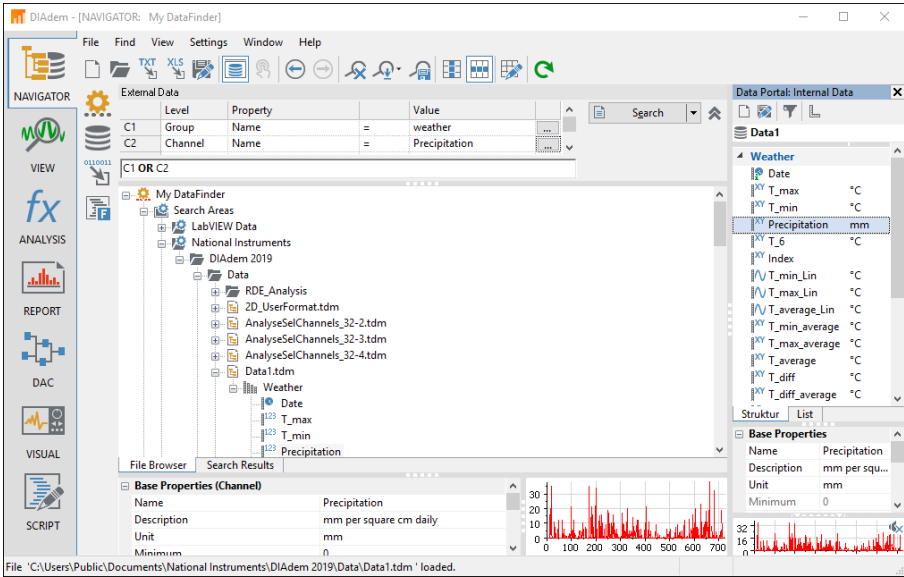
📝 **Note**   If you modify data in the Data Portal, DIAdem does not automatically save these changes. The changes are executed only in the memory and not in the data file from which you loaded the data. This enables you to experiment with data without modifying the original data.

Saving Data

In the Data Portal, click **Save** to overwrite the `Data1.tdm` file with the current data from the Data Portal. To save the data of the Data Portal in another location under a different name, carry out the following steps.

4. In the `National Instruments` folder, navigate to the DIAdem `Data` folder.

5. Select the `Weather` channel group in the Data Portal.

6. Drag and drop the `Weather` channel group onto the `Data` folder.

7. Enter `Weather data` in the **Save As** file name dialog box.

8. Change the file type to `National Instruments TDM Files (*.tdm)`.

9. Click **Save**.

Summary

The summary provides an overview of the topics discussed in this chapter. It also includes additional information.

DataFinder

In the search input area of the DataFinder, you enter search conditions to find your data. You can also drag and drop properties from the properties display of the Data Portal or of the file browser into the search input area. In the logical operations line, you connect the search conditions with AND and OR and use parentheses to specify queries more precisely. DIAdem lists the files found in the search areas on the **Search Results** tab.

SystemLink TDM

SystemLink TDM's DataFinder instances index data files on the network and allow multiple DIAdem users to access common search areas simultaneously. You can enable security settings and use archiving systems.

Search Areas

Search areas are folders of the file system, which the DataFinder indexes. Select **Settings»MyDataFinder»Configure** to modify the search areas of the DataFinder.

File Browser

The **File Browser** displays the files of the search areas in a tree structure. Right-click the empty space of the file browser to open the context menu and hide or show the folders of the local file system in a separate tree.

Internal Data in the Data Portal

DIAdem manages internal data in the Data Portal, which is visible in all panels. In all DIAdem panels you work with the channels of the internal data and their descriptive information. DIAdem saves result data in the Data Portal. You can display and edit the channel contents in DIAdem VIEW.

> 💡 **Tip** To highlight multiple channels in the Data Portal without using the <Shift> or <Ctrl> keys, click the icons next to the channel name. DIAdem displays a cursor with a plus sign.

Channel groups

Channel groups contain channels and descriptive properties of the channel groups. Use different channel groups to organize your data. You can define a channel group as a default group, for example, to automatically group together all the calculation results from DIAdem ANALYSIS. DIAdem displays the group name of the default group in bold type.

Channels

Channels contain data series which you either measured, loaded from an external data set, or calculated with DIAdem. DIAdem distinguishes numeric channels, xy-channels, waveform

channels, time channels, and text channels. Numeric channels contain numeric values, waveform channels contain numeric values and the associated x-channel, time channels contain time values, and text channels contain text.

Properties

Properties are information about the data, which DIAdem saves with the data series in a TDM file. The data set properties contain the name of the author and the storage date, the channel group properties contain the name of the measurement and comments, and the channel properties contain the data type and the channel unit. In addition to the standard properties, you can create your own custom properties for the data set, the channel group, and the channel. DIAdem displays the properties in the properties displays of the file browser and of the Data Portal.

Units Catalog

The channel unit is a special channel property because you can organize the channel units in the units catalog. Use the units catalog to assign a physical quantity and a unit to measurement values, for example, the quantity speed and the unit kilometers per hour. If you assign the unit mile per hour from the units catalog to the speed channel, DIAdem can convert the channel values.

3

Viewing and Evaluating Data

Use DIAdem VIEW to view, to analyze, and to edit data as curves in axis systems. In channel tables you can edit and delete the data as values and enter new data. You synchronize videos or the map display of a test drive with data.

Viewing Curves

To view the loaded data set in an axis system, complete the following steps.

Note If you did not complete the exercise in the previous chapter, delete the current data from the Data Portal and load the `Data1.tdm` data set from the DIAdem `Data` folder. You can find this folder in the DIAdem NAVIGATOR file browser in the **National Instruments** search area.

1. Select **DIAdem VIEW**.

2. Click **New Layout**.
3. Open the function group **Regular Worksheet Partitions** and select **Two Areas**.
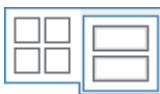
Note Each panel has its own group bar on the left. When you click a button on the group bar, DIAdem opens the function group where you can select a function.

4. In the Data Portal, select the numeric channels `T_max` and `T_min` by clicking the symbol in front of the channel name. The cursor changes its color and displays a plus sign.
5. Drag and drop the two channels selected in the Data Portal into the upper worksheet area.
6. Select **2D Axis System** in the selection dialog box.

DIAdem displays the axis system, as shown in Figure 3-1.

Figure 3-1. Viewing Temperature Data as Curves
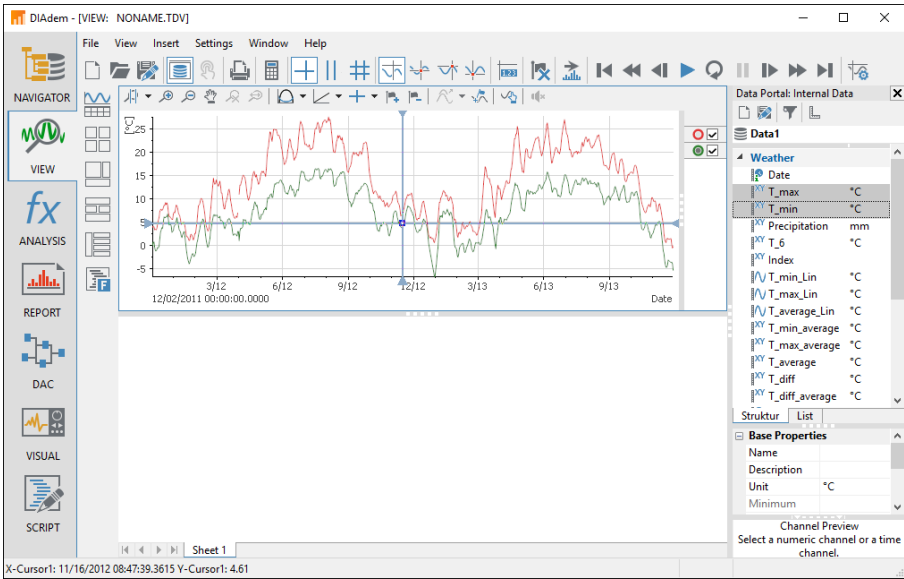
📝 **Note**   If you select multiple numeric channels in the Data Portal and drag them into an axis system, DIAdem assigns the first selected channel to the x-axis. If you select only one channel, DIAdem uses the index to display a numeric channel, and uses the x-channel to display an xy-channel and a waveform channel.

Editing Curves

In DIAdem VIEW you can measure curves, and copy, delete, and interpolate curve sections. Use the curve cursor, the maximum values cursor, or the minimum values cursor on the DIAdem VIEW toolbar to measure a curve. To edit curve sections, use the flag functions on the axis system toolbar. The functions on the toolbar of the axis system influence the curves in the associated axis system, whereas the functions on the DIAdem VIEW toolbar influence all areas.

Measuring Curves

To follow the curve points with the curve cursor in an axis system, complete the following steps.

1. Click **Curve Cursor** on the tool bar.

2. Click the axis system and move the curve cursor along the curve.

    DIAdem displays the x-values and the y-values of the curve points in a tooltip next to the crosshair cursor that follows the cursor.

3. Click the red circle in the legend at the right edge of the axis system to select the other curve as the leading curve.

📝 **Note** You can use the second check box next to the curve symbol to hide and show the curve in the axis system.

DIAdem displays the coordinates of the new leading curve in the tooltip.

Copying Curve Sections

To select a curve section and to copy the data of the curve section into the Data Portal, complete the following steps.

1. Click **Band Cursor** on the toolbar.
2. At the point 12.12, click into the axis system and drag the band cursor to 3.13.

   Click between the two lines to move the band cursor along the curves. Move the cursor lines individually to specify the width of the band cursor.

3. In the axis system toolbar, click **Set Flags** to flag all the curve points of the leading curve in the selected time period.

📝 **Note** If you press <Shift> at the same time, DIAdem flags the points of all curves in this period.

4. Click **Flags: Copy Data Points** in the toolbar of the axis system to copy the data of the selected curve points to new channels.

   In the Data Portal, DIAdem creates a time channel and a numeric channel with the values of the copied curve section.

5. Drag and drop the new channels into the bottom workspace.

6.   Select **2D Axis System**. DIAdem displays the copied curve section, as shown in Figure 3-2.

Figure 3-2. Selecting Curve Sections and Copying them into the Data Portal
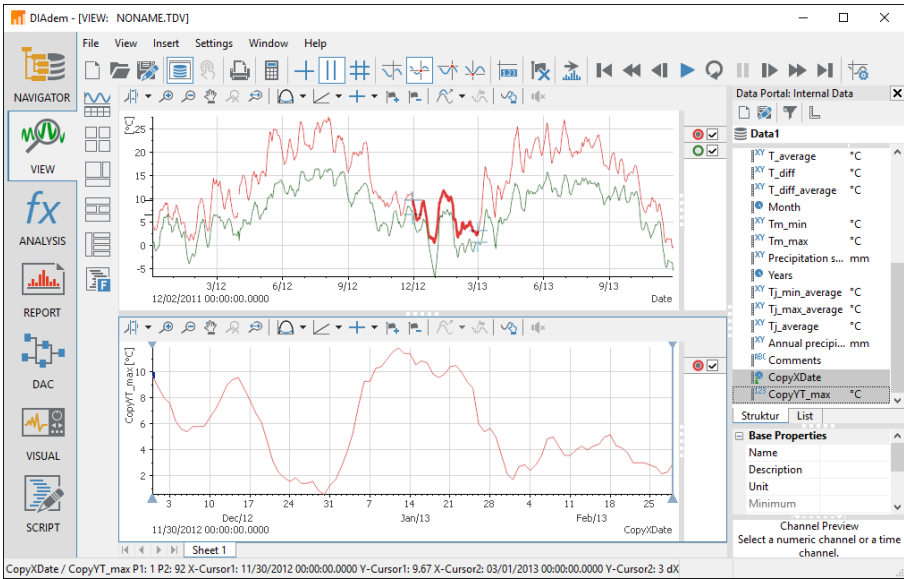
7.   On the DIAdem VIEW toolbar, click **Remove Flags from All Data** to disable the selection.

Editing Data in Channel Tables

In channel tables you can edit and delete data and add new data. You can enter or generate new data manually.

To edit values in a channel table and to generate new values, complete the following steps.

1.   Open the function group **Assigned Worksheet Partitions** and select **Channel Table**.

DIAdem creates a new worksheet with a channel table.

2.   Select the `Comments`, `CopyXDate` and `CopyYT_Max` channels in the Data Portal to drag and drop these channels into the channel table.

DIAdem displays the columns in the order in which you select the channels in the Data Portal.

3.   Click into the cell in row **10** of the **CopyYT_max** column.

4.   Enter the value `1` and press <Enter>.

DIAdem also displays the new value in the curve in the bottom axis system on the previous worksheet.

5. Right-click next to the channel table or into an empty column and select **Create New Channel** from the context menu.

   a. Enter the channel name `Generated_Channel`.

   b. Click **OK** to create the new channel in the channel table and display it in the Data Portal.

6. Right-click the first cell of the empty column **Generated_Channel** and select **Generate** from the context menu.

   a. Enter `0.5` as the step width and `100` as the number of values.

   b. Click **OK** to create the channel values.

   DIAdem displays the channel table, as shown in Figure 3-3.

Figure 3-3. Editing and Generating Data in Channel Tables

To use the layout with all worksheets as a template for similar data sets, click **Save Layout As** in the DIAdem VIEW toolbar.

Summary

The summary provides an overview of the topics discussed in this chapter. It also includes additional information.

Layouts

A layout can contain several worksheets. DIAdem saves layouts separately from the channels. You can reuse the layout as a template for data sets with a similar structure.

Areas

Partition worksheets into areas to insert axis systems, channel tables, videos, contours, maps, dialog boxes, text, and images. You can move the separating bars to resize any area in a worksheet. Use the **Assigned Worksheet Partitions** function group to add new worksheets with predefined areas to a layout.

Axis Systems

DIAdem VIEW provides 2D axis systems, polar axis systems, Bode axis systems, orbit axis systems, and shaft centerline axis systems which all display data as curves. In 2D axis systems you can display data as spikes or stair curves and add constants. To insert data into an axis system, drag and drop channels from the Data Portal into an axis system. Use the band cursor and the frame cursor to zoom curve sections. You open the legend on the right side of an axis system.

Graphics Cursor

DIAdem VIEW offers various graphics cursors for evaluating curves in axis systems. The free cursor moves freely in the axis system and the curve cursor follows the curve from curve point to curve point. Other graphics cursors determine the maximum values and the minimum values of a curve. If an axis system contains several curves, the graphics cursor follows the leading curve that you specify with the radio buttons in the legend. DIAdem synchronizes all cursors of a worksheet with each other and with videos.

Flags

Use the band cursor and the frame cursor to mark curve sections with flags, to delete, to copy, or to recalculate the marked curve points.

Channel Tables

In channel tables you view the individual values of all channel types, edit the values and add new values or channels. In the display properties of a channel table, you can specify whether a channel table only displays the channels that were dragged and dropped into the table or whether the channel table automatically displays all channels of a group or of the Data Portal.

Videos

In video areas you show videos. If you display the associated measured values as curves in an axis system, you can move a graphics cursor along the curves to display the video frame associated with each measurement value. Double-click an empty video area to insert a video.

Contours

In contour areas you display 3D data two-dimensionally by displaying the third dimension of the data as a color value and with isolines. You can use a contour display, for example, to display and to analyze characteristic diagrams. If you move the graphics cursor over a contour, DIAdem displays the associated isolines dynamically. You can save the data of every associated isoline and also the x-parallel and y-parallel intersection in the Data Portal.

Cascades

In cascade areas, for example, you can display oscillation data as a waterfall by mapping the oscillation amplitude over the frequency as a cascade in consecutive tracks. You can zoom into interesting areas and move over them with different measurement cursors. You can also show dynamic and static order lines, which help evaluate the rpm-related vibrations.

Maps

In map areas you display geographic data in map sections. For example, you can follow the route of a test drive when you move the graphics cursor in an axis system along the data, such as consumption, RPM, and torque, collected during the test drive. To do so, enter the recorded longitude and latitude and, for example, the time channel for synchronization.

Dialog Boxes

In dialog boxes you enter values, check settings, or start functions to change the displays in other areas of the layout during the analysis. You can include every user dialog box to which you added the `VIEWConnector` control in the dialog editor of DIAdem SCRIPT.

4

Analyzing Data with Mathematical Functions

Use DIAdem ANALYSIS to analyze data mathematically. You can apply predefined standard mathematical functions, including basic mathematics, curve fitting, signal analysis, and statistics. The dialog boxes for these standard functions guide you through the calculation, so you do not have to enter a formula. You select the input data and the settings. Use the DIAdem Calculator to define and calculate your own formulas.

Using Mathematical Standard Functions

DIAdem offers libraries with standard mathematical functions that you can use in DIAdem ANALYSIS in various function groups. The results of the calculations are displayed in new channels in the Data Portal.

📝 **Note** If you did not complete the exercise in the previous chapter, delete the current data from the Data Portal and load the `Data2.tdm` data set from the DIAdem `Data` folder. You can find this folder in the file browser of DIAdem NAVIGATOR in the **National Instruments** search area.

To create a new group for the calculation results, complete the following steps.

1. Select **DIAdem ANALYSIS**.

2. Right-click in the Data Portal and select **New»Group** from the context menu.
3. Enter `Results` as the **Name**. Enable the checkbox **Set default group**.
4. Click **OK**.

   DIAdem displays the name of the default group in blue font in the Data Portal.

Calculating the Sum of Channel Values

To total the precipitation for the year 2012, complete the following steps.

1. In the **Statistics** function group, select **Descriptive Statistics**.
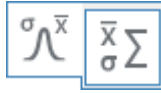
2. Select the `[1]/Precipitation sum` channel in the Data Portal.

   This notation refers to the channel `Precipitation sum` in the first channel group.

3. Use Drag&Drop to insert this channel into the **Channels** input field in the **Object to be evaluated** section.

4. Deactivate **Calculate over all rows** and enter the **rows** `2-13`.

   Tip   To check in which rows the precipitation of the year 2012 is located, switch to DIAdem VIEW and load the channels `Month` and `Precipitation sum` into a channel table. The `Month` channel contains the time values for the monthly precipitation totals.

5. Enable **Sums»Measured values** on the **Characteristic values 1** tab.

   Note   On the **Characteristic Values 2** tab, click `All off` if characteristic values have already been selected.

DIAdem displays the **Descriptive Statistics** dialog box, as shown in Figure 4-1. The dialog box displays the channel preview of the precipitation sum in the top right-hand corner and displays the result data below the channel preview.

Figure 4-1. Precipitation Summation in Sections
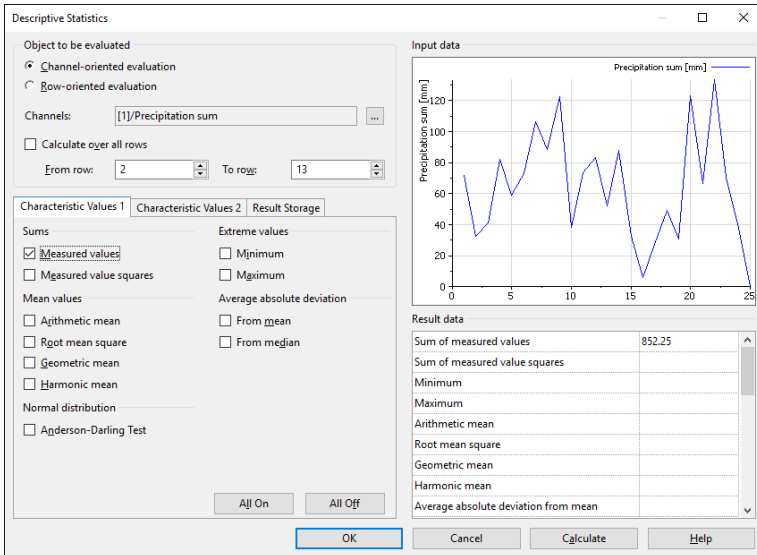
6. Click **OK** to calculate the sum and to close the dialog box.

   DIAdem stores the result in the custom properties of the channel `Precipitation sum`.

Note If you want to perform further calculations using this standard function, click **Calculate**. The dialog box remains open for further entries.

7. In the Data Portal, click `[1]/Precipitation sum` and open the property `Custom properties»ResultStatSum`.

8. Right-click `Sum` and choose **Rename**. Enter `Result~Precipitation_2012` as the property name and press <Enter>.

Averaging Channels

To calculate the average monthly temperatures, complete the following steps.

1. In the **Channel Functions** function group, select **Average Channels**.

2.   Select the channels `[1]/Tm_min` and `[1]/Tm_max` in the Data Portal.

3.   Use Drag&Drop to insert this channel into the **Channels** input field in the **Channels to be averaged** section.

DIAdem displays the dialog box, as shown in Figure 4-2.

Figure 4-2. Averaging Minimum and Maximum Temperatures
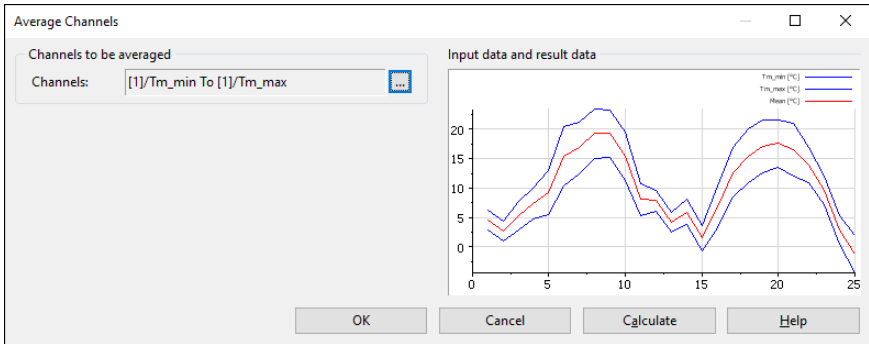
4.   Click **OK**.

5.   Right-click `Results/Mean` in the Data Portal and select **Rename**. Enter `Temperatures` as the channel name and press <Enter>.

Calculating with the Units Catalog

The DIAdem units catalog organizes physical quantities and the associated units. Use the units catalog to convert channels into other units.

To convert the calculated average monthly temperatures from degrees Celsius to degrees Fahrenheit, complete the following steps.

1.   In the **Channel Functions** function group, select **Convert Channel Unit**.

2.   The **Channel** input field in the **Channel to be calculated** section contains the `[2]/Temperatures` channel.

If you see a different channel, select `Results/Temperatures` and drag and drop the selected channel into the input field.

3.   Select **Unit»To** [°F] degree Fahrenheit, as shown in Figure 4-3.

Figure 4-3. Converting Channel Units with the Units Catalog

4.   Click **OK**.
5.   Right-click Results/UnitConverted in the Data Portal and select **Rename**. Enter the channel name Temperatures_F and press <Enter>.

Note   You can also convert channel data to another unit in the Data Portal. To do so, click the unit entry field in the properties display and click the button with the three dots to open the **Symbol Input Help** dialog box.

DIAdem ANALYSIS displays a record of the calculations, as shown in Figure 4-4, and the Data Portal displays new channels with the calculation results.

Note   Click **Export ANALYSIS Log** on the toolbar to save the calculation log as HTML file.

Figure 4-4. Calculations with Standard Functions Log
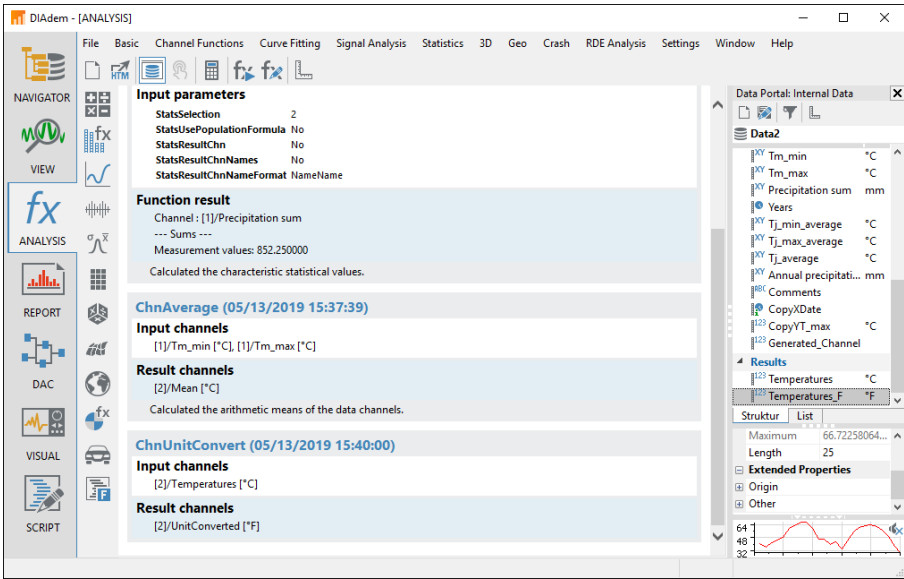
Refer to Figure 5-3 in the next chapter to view the curves of the average temperatures and the annual precipitation.

Calculating Formulas with the Calculator

Use the DIAdem Calculator to calculate your own mathematical formulas. In the Calculator you calculate with channels, variables, and values you enter. DIAdem stores the results in channels or variables.

To calculate the difference between maximum monthly temperatures and average temperatures, complete the following steps.

1.   Click **Calculator** on the toolbar.
2.   Enter the following formula in the Calculator entry field.

```
Ch("Results/TmMax_Diff")=Ch("[1]/Tm_max")-Ch("[2]/Temperatures")
```

Tip   Instead of typing in the entire formula, copy this line and paste it into the Calculator.

Figure 4-5. Calculating Formulas with the Calculator
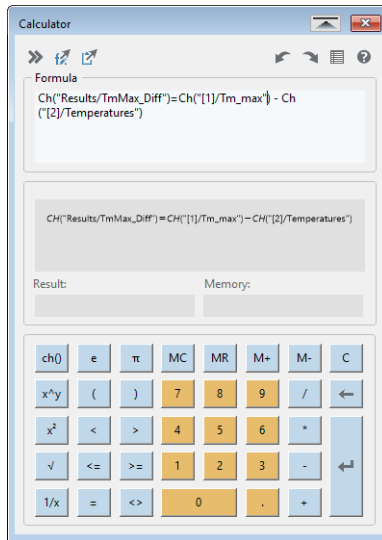
3. Click the **Calculate** button and exit the dialog box through the red close window button.

   DIAdem adds the new channel `TmMax_Diff` to the `Results` channel group in the Data Portal.

Summary

The summary provides an overview of the topics discussed in this chapter. It also includes additional information.

Mathematical Functions

DIAdem ANALYSIS offers a variety of standard functions for analyzing your data. You assign input channels to standard functions, set parameters, and execute the calculation. Click **OK** to execute a calculation once and to close the dialog box. Click **Calculate** to execute several calculations with the same standard function.

Result Channels

DIAdem ANALYSIS saves calculation results in new channels. This enables you to calculate new data without overwriting the existing channels. In most dialog boxes of the standard functions, you can select **Store result in original channel** to overwrite the existing channels.

Custom Properties

Some standard functions, such as descriptive statistics or approximation store the calculated characteristic values as custom properties in the result or input channels.

Default Group

DIAdem stores the result channels of a calculation in the default group in the Data Portal. In the context menu you can define a different group as the default group. DIAdem displays the group name of the default group in blue font.

Calculator

Use the Calculator to specify your own formulas for analyzing data. The Calculator has functions that range from simple arithmetic functions to advanced scientific and engineering functions. Use the Calculator to calculate channels, variables, and single values. DIAdem stores the results in channels or variables.

Units

If you assign units from the units catalog to the original channels, DIAdem automatically determines the unit of the result channels. Based on the physical quantities and units of the original channels, the division of distance by time results in a speed with the unit kilometers per hour, for example. **Settings»Units** allows you to add your own units and define unit sets with preferred units.

Calculation Manager

To execute recurring analysis sequences with a mouse-click you can define simple as well as complex calculations in the calculation manager. An analysis sequence can contain user-specific formulas and default functions and can combine calculations when one calculation step accesses the result from a different calculation step.

5

Creating Reports

Use DIAdem REPORT to document data and present results. In 2D and 3D axis systems, you display your data as curves, bar diagrams, and surfaces. In 2D and 3D tables, you list channel contents. You can label your report with comments and text and illustrate the report with graphics and formulas. You use the Chart Wizard to create and modify 2D axis systems and polar axis systems.

Creating Axis Systems

To create a new layout with the Chart Wizard, complete the following steps.

Note If you did not complete the exercise in the previous chapter, delete the current data from the Data Portal and load the `Data3.tdm` data set from the DIAdem `Data` folder. You can find this folder in the file browser of DIAdem NAVIGATOR in the **National Instruments** search area.

1. Select **DIAdem REPORT**.
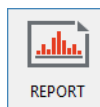
2. Click **New Layout**.
3. In the Data Portal, select the channel `Weather/Month` and then the channels `Weather/Precipitation sum` and `Results/Temperatures`.
4. Right-click a selected channel and select **Chart Wizard** from the context menu.

   DIAdem opens the Chart Wizard and creates a new worksheet with an axis system. In the axis system, DIAdem displays the channels that are selected in the Data Portal as curves. DIAdem assigns the first selected channel `Weather/Month` to the x-axis.

   In Step 1 you select the diagram type. In Step 2 you add or delete curves. In Step 3 you specify the diagram display on several tabs. The preview, as shown in Figure 5-1, directly displays how the diagram changes.

5. Select the **Lines** diagram type, and then click the **Lines with Multiple Y-Axes** subtype.

Figure 5-1. The Chart Wizard Displays the Preview in the Worksheet
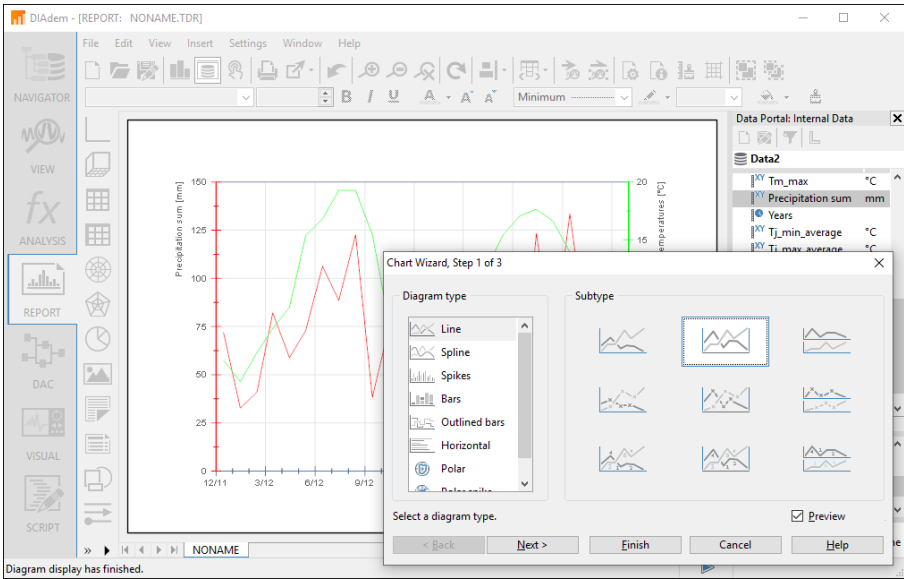
6. Click **Next** twice to open Step 3 of 3.

7. Select the **X-Axis** tab.

8. Enable **Manual from** for the value range and enter `01/01/2012` as the start and
    `12/31/2012` as the end.

9. Click **Finish** to create the axis system.

    In the axis system, DIAdem displays the monthly precipitation and the monthly average
    temperatures over the date.

> 💡 **Tip**   You can open the Chart Wizard from several locations in DIAdem REPORT. If
> you want to display curves with various x-channels, open the Chart Wizard on the
> toolbar. If you want to insert axis systems into the current worksheet, open the Chart
> Wizard from the **2D Axis Systems** function group or the **Polar Axis Systems**
> function group. If you want to edit an axis system, open the Chart Wizard from the
> context menu of the axis system.

Editing Axis Systems

You can move and resize axis systems or parts of an axis system. To make it easier for you to
see which objects you can select, DIAdem displays an object in a blue frame as soon as the
mouse cursor idles on the object. Double-click the object to open its settings.

Complete the following steps to display the precipitations as bars.

1. Double-click the red curve of the precipitation sum to open the associated curve parameter.
2. Select the `Bars` **Display type** and the `2D Bars` **Display mode**.
3. Select the **Filling color** `Blue` and a `Right diagonal` **Filling**.
4. Click **OK**.

   DIAdem displays the worksheet, as shown in Figure 5-2.

Figure 5-2. DIAdem Displays the Precipitation as Bars
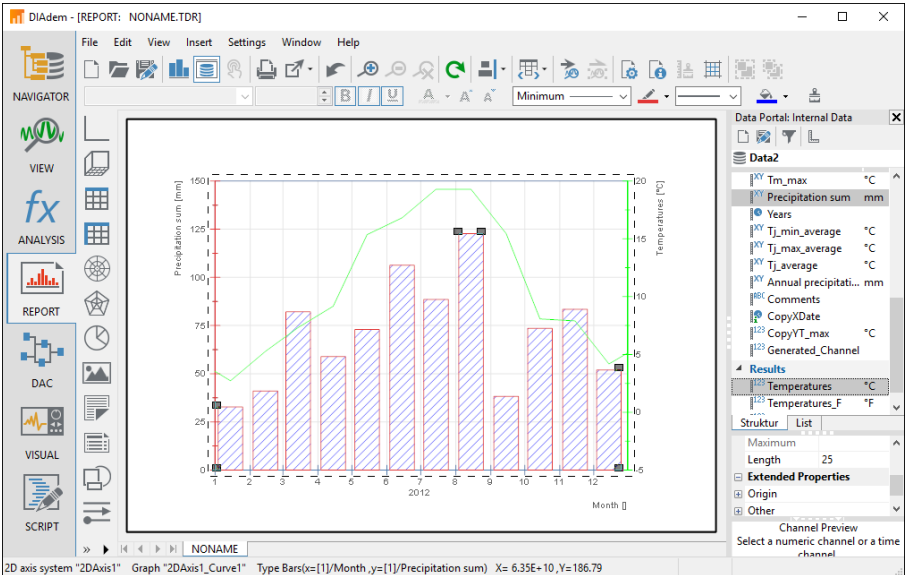
5. Click once into a free space in the axis system to select the axis system.
6. To reduce the width of the axis system, move the small square in the middle of the right edge of the selected axis system to the left.

Graphics and Lines

Illustrate reports with graphics and company logos. Use lines and rectangles to partition the worksheet through lines or to highlight a textbox.

To add a graphic to your worksheet, complete the following steps.

1. In the **Graphics** function group, select **Load Graphic**.

2. Select `Weather.jpg` in the DIAdem `Documents` folder and click **Open**.

3. Click and drag the graphic to the right edge of the workspace.

4. Resize the graphic by dragging the small squares at the corners of the graphic.

To prepare a description field on the right of the worksheet, complete the following steps.

1. Open the function group **Lines and Arrows** and select **Continuous Vertical Line**.

DIAdem inserts a vertical line on the right edge.

2. Move this line slightly to the left to widen the description field.

Using Text and Variables as Labels

Add text and variables to a report to explain the contents and highlight specific items. All texts can include formula expressions and DIAdem variables, which DIAdem updates along with the rest of the report. Double @ characters indicate to DIAdem which parts of the text to evaluate dynamically.

To add a text to your report, complete the following steps.

1. Click **Text** on the group bar and select **Text**. The cursor changes to a text cursor.

2. In the worksheet, click into the textbox at the top and type `Weather Report`.

3. Press <Enter> and enter `@@CurrDate@@` in the second row.

4. Click outside the text to conclude the entry.

5. Click the text. To resize the text, drag the small squares at the corners of the text with the mouse.

Adding and Formatting Channel Properties

In the dialog of the text editor, you edit the text and use variables and expressions that are available to you when you click the button with the three dots at the end of the input field. You can easily drag and drop channel properties from the Data Portal into the worksheet.

To add a channel property to your report and to edit the channel property, complete the following steps.

1. In the Data Portal, click `[1]/Precipitation sum` and open the property `Result»Precipitation_2012`.

2. Drag this custom property into the textbox.

3. Double-click the inserted text. The text editor displays the following text:

```
Result~Precipitation_2012: @@Str(Data.GetChannel("[1]/
Precipitation sum").Properties("Result~Precipitation_2012").
Value,"AutoAdj")@@
```

   a. Replace the first term `Result~Precipitation_2012` with the description `Annual precipitation`.

   b. Press <Enter> to position the value below the text.

   c. Enter `mm` at the end of the text.

4. Click the **Position** tab and select `Centered` as the **Relative position**.

5. Click **OK**.

6. Select both texts and the graphic.

7. Click **Orientation** on the group bar and select **Vertical**.

   DIAdem displays the worksheet, as shown in Figure 5-3.

Figure 5-3. Using Text and Variables as Labels
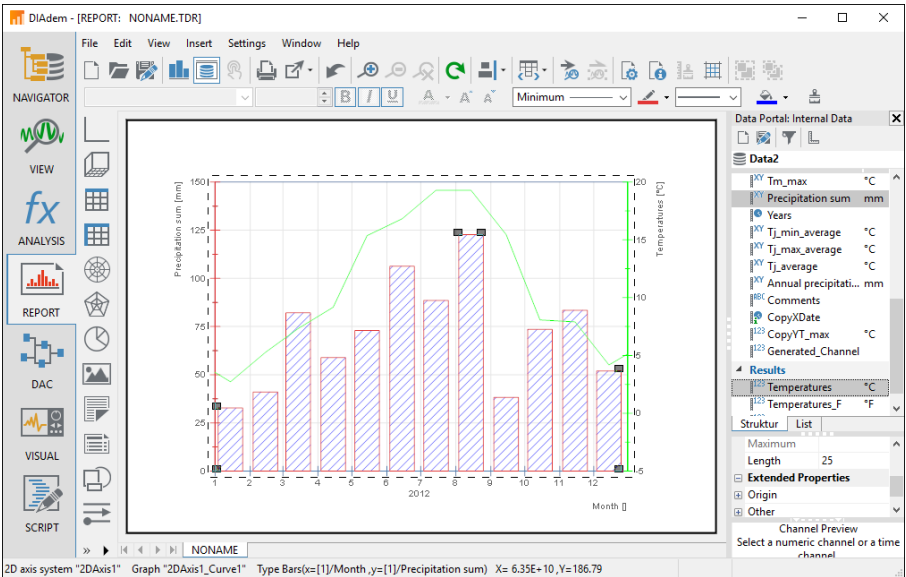
To use the layout as a template for similar data sets, click **Save Layout As**.

Summary

The summary provides an overview of the topics discussed in this chapter. It also includes additional information.

Layouts

A layout can contain several worksheets. DIAdem saves layouts separately from the channels. You can reuse layouts as templates for data sets with a similar structure.

Worksheets

Worksheets contain axis systems, tables, text, formulas, and graphics. To add data to the worksheet, drag and drop channels from the Data Portal into axis systems and tables. In addition to selecting data channels from the Data Portal, you also can add data channels by double-clicking an axis system or a table.

Select **Settings»Layout Setup»Worksheet Parameters** to change the page format of a worksheet so that, for example, the table of contents is in portrait format, whereas the diagrams remain in the landscape format.

Export your report as PDF, XPS, and HTML files or individual pages as graphics in various formats, such as PNG, JPG, GIF, TIF, and EMF. Under **Settings»Layout Setup»Layout Parameters** you can add custom properties to a report, for example, the name of a test sequence, in order to search for this property with DataFinder.

Master Layout

Use a master layout to create a uniform appearance for reports. The master layout remains unchanged in the background of all worksheets and consists of a landscape master and a portrait master. To create a master layout, select **File»Master Layout»New**.

Chart Wizard

You can use the Chart Wizard to create and to modify 2D axis systems and polar axis systems. The preview function displays each changed setting in the worksheet.

Axis Systems

Use axis systems to display channels as curves, as bars, and as surfaces. You double-click an axis system to edit the displayed curves, to add new curves, and to delete existing curves. To zoom curve sections, change the scaling of the x-axis and the y-axis with the mouse wheel as soon as you position the cursor over the respective axis.

Tables

Use tables to list the contents of numeric channels and also text channels. Double-click into table to edit the displayed columns, to add new columns, and to delete existing columns.

Text

Use text to label worksheets. Use **Add Curve Coordinates** in the context menu of a curve to add comments to values. Text also can include variable information, such as filenames or the current date. For DIAdem, the `@@` characters indicate a variable expression. Click **Refresh** on the DIAdem REPORT toolbar to display the current variable contents.

Formulas

Use formulas to display calculation instructions in graphics. DIAdem uses the formula syntax of the Mathematical Markup Language (MathML) used in word processing.

Graphics

Use graphics and logos to illustrate worksheets. DIAdem supports numerous different graphic formats including PNG, BMP, JPG, TIF, and WMF.

6

Automating Sequences

Use DIAdem SCRIPT to automate tasks in a script, which combines several work steps for recurring sequences, such as standard calculations and serial evaluations. Scripts, which you can record interactively, use the functions of all DIAdem panels. You can add program structures and dialog boxes to scripts in the integrated script editor.

Creating Scripts

The recording mode is the easiest way to create scripts. If you enable the recording mode, DIAdem creates a new script in the Script Editor and logs your actions in this script. To create a new script in the recording mode, complete the following steps.

1. Select **DIAdem SCRIPT**.

2. On the toolbar, click **Enable Recording Mode** to start recording a script.

    a. In the dialog box that opens, enter DIAdem User as the **Author** and Manual Example as the **Comment**.

       DIAdem writes this information directly into the script code to help you identify the script in the future.

    b. Click **OK**.

3. Select **DIAdem NAVIGATOR**.
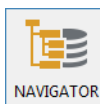
4. Click **Delete Internal Data** to delete the data in the Data Portal.

    DIAdem asks if you want to save the data you modified in the Data Portal.

5. In the search input area of the quick search, type Weather and click **Search**.

6. Drag and drop the Data1.tdm file into the Data Portal.

7.   Select **DIAdem ANALYSIS**.
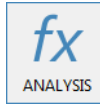
8.   In the **Channel Functions** function group, select **Average Channels**.

    a.   Select the channels `[1]/Tm_min` and `[1]/Tm_max` in the Data Portal.

    b.   Use Drag&Drop to insert this channel into the **Channels** input field in the **Channels to be averaged** section.

    c.   Click **OK** to calculate the mean values and to close the dialog box.

9.   Select **DIAdem REPORT**.
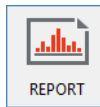
10.   Click **Load Layout**.

    a.   Select `Report2.tdr` and click **Load**.

    DIAdem updates the screen display and displays the loaded data set.

11.   Select **DIAdem SCRIPT**.

12.   Click **Disable Recording Mode**.

DIAdem displays the recorded script in the script editor, as shown in Figure 6-1.

Figure 6-1. Recording Actions in the Script Editor

After the commenting header, DIAdem declares the `MyFolders` path variable and assigns to this variable the paths to the data folder and to the document folder. If you want the script to load the data file or the layout file from another folder, just change the paths at this point in the script.
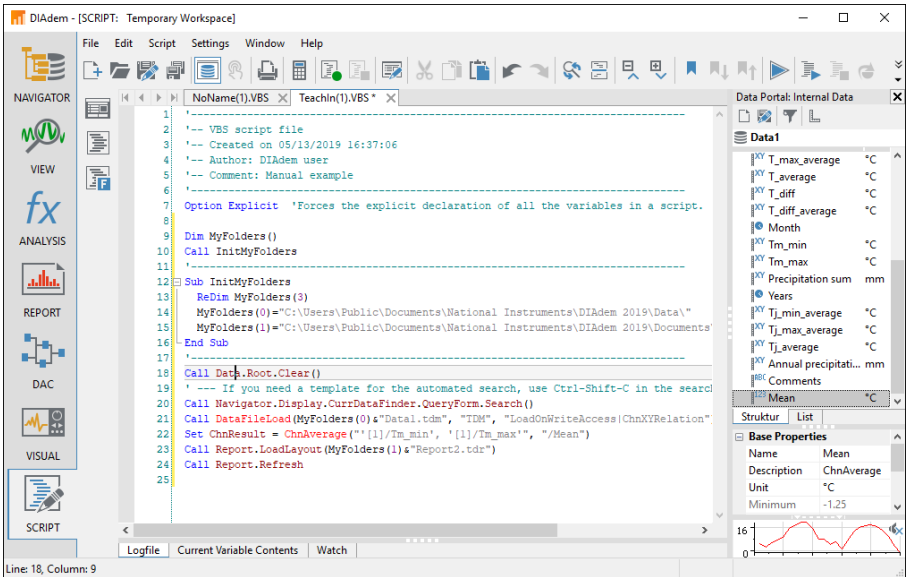
Editing Scripts

In the recording mode you have recorded the search for weather data, loaded a data set, and created a report. Expand the recorded script to evaluate further weather data.

To select data interactively complete the following steps.

1. Replace the script line for loading the data file `Data1.tdm`

   ```
   Call DataFileLoad(MyFolders(0)&"Data1.tdm","TDM",
   "LoadOnWriteAccess|ChnXYRelation")
   ```

   with the following script lines:

   ```
   Call WndShow("NAVIGATOR","OPEN")
   Call InteractionOn("Load Data4.tdm")
   ```

   The first script line opens the NAVIGATOR panel and the second line stops the script so that you can load data interactively.

2.   After the last script line, enter the statement to hide the Data Portal and use CodeCompletion.

   a.   Enter `Portal..`

      As soon as you enter the dot behind the `Portal` object, DIAdem offers the methods and properties available for this object for selection, as shown in Figure 6-2.

Figure 6-2. CodeCompletion and SmartInfo Make Editing Objects Easier
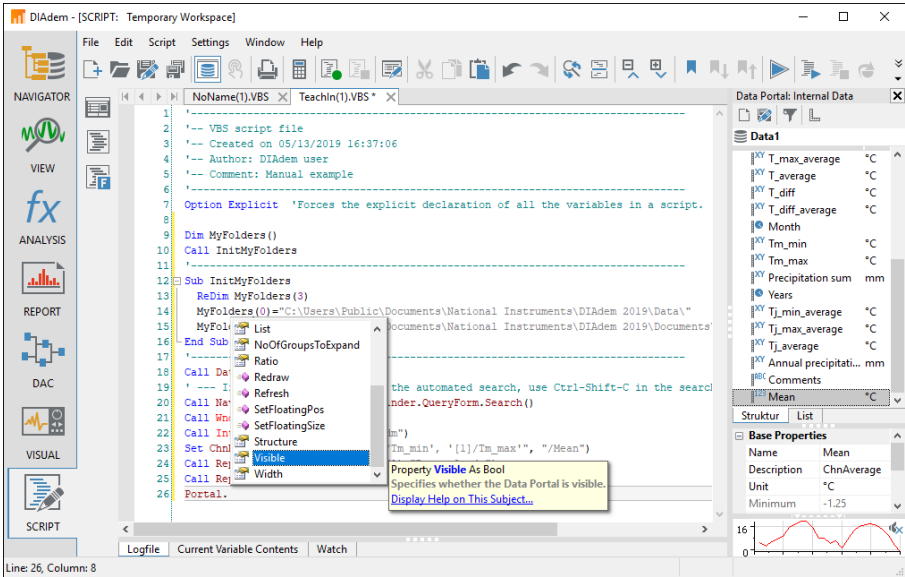
   b.   Double-click `Visible` to insert this property into the script.

   c.   Complete the script line as follows:

```
Portal.Visible = False
```

DIAdem displays the respective SmartInfo for every element in the selection list. Click **Display Help on this Subject** to open the help page on this object.

Testing Scripts

To test the modified script, complete the following steps.

1. Click **Run Script**.

    The script opens the NAVIGATOR panel and displays in the **Search Results** all the data files that contain the search term `Weather`.

2. Select `Data4.tdm` to drag&drop the file into the Data Portal.

3. Click the `Load Data4.tdm` message box to end the interaction.

    The script opens the REPORT panel. DIAdem updates the date displayed in the heading and hides the Data Portal, as shown in Figure 6-3.

Figure 6-3. Report Created with the Script
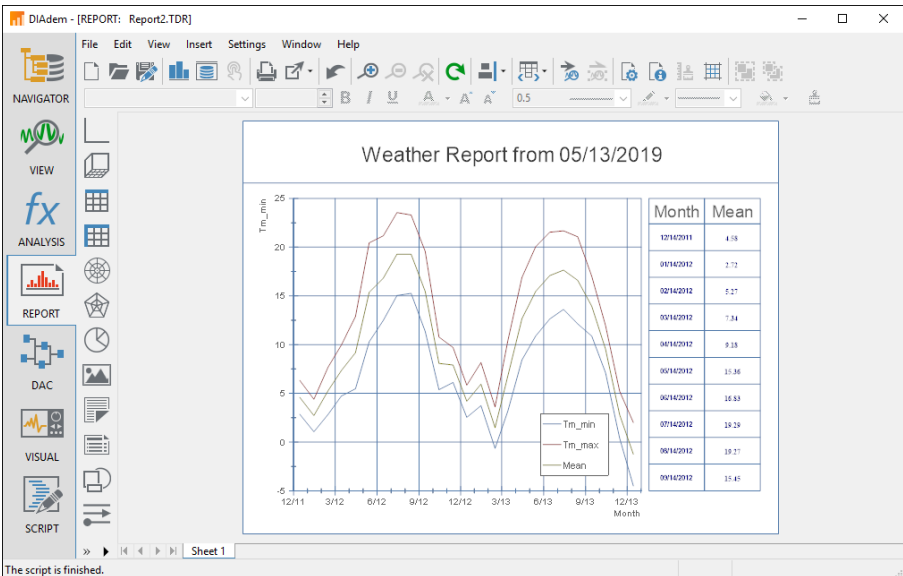
4. Click **Data Portal** to re-enable the Data Portal for further actions.

To save the script, select **DIAdem SCRIPT** and click **Save File As**.

Summary

The summary provides an overview of the topics discussed in this chapter. It also includes additional information.

Scripts

Scripts allow you to execute a series of commands for finding data, loading data, analyzing data, and creating reports. Scripts provide the VBS functionality and DIAdem functions. You can integrate the standard dialog boxes in scripts or you can create your own dialog boxes.

Recording Scripts

In the recording mode DIAdem records the command for every action that you execute interactively, in a script.

<Ctrl-Shift-C>

In the recording mode, DIAdem does not usually record the value assignment for object properties and variables. Press <Ctrl-Shift-C>, for example, in a DIAdem REPORT dialog box, to record the values of properties and variables. If DIAdem is not in the recording mode, also copy the assignment of values with <Ctrl-Shift-C>, but this time to the Windows clipboard. Then insert these assignments into a script and modify the required properties and variables.

Script Editor

The script editor displays the program code of scripts. While you record actions in the recording mode, DIAdem records the commands directly in the script editor. Use functions such as go to line, bookmarks, restoring, and find and replace, to make script editing easier.

If you click a command, a property, a method, or a variable, the SmartInfo displays the parameters of the command, the property, the method, or the value range of the variable. For further information click **Display Help on this Topic**.

CodeCompletion

If you enter the name of an object and complete the entry with a dot, the script editor offers the subobjects, events, properties, and methods that are available for this object. Add your selection to the object in the script with a double-click.

When you enter the first characters of a command, for example, and press <Ctrl-Spacebar>, the script editor automatically completes the command. If several commands start with these characters, the script editor offers a selection list of all the possible objects, commands, and procedures.

Interaction Mode

When you use the interaction mode, you can stop your script and work interactively with DIAdem. Use the `InterActionOn` command to enable the interaction mode in scripts. You end the interaction mode with the **End interaction** button in the toolbar of each panel or in a message box.

User Commands

To add commands to DIAdem, you can define user commands in a script. For example, you use user commands to run calculations in the calculator, to format axis systems in DIAdem REPORT, or to extend the range of functions in scripts.

User Dialog Boxes

Create user dialog boxes with the dialog editor of DIAdem SCRIPT in order to enter values, search for settings, or start functions. Use events to connect elements from user dialog boxes and specify how the script proceeds depending on the previously specified settings.

7

Data Acquisition and Visualization

With DIAdem DAC and DIAdem VISUAL you acquire data, control processes, and visualize data. In DIAdem DAC you create block diagrams to acquire measurement values and to process and output the measurement values during the measurement. In DIAdem VISUAL you design the visualization to display the acquired and calculated measurement values and to influence the measurement with input instruments.

Acquiring Measurement Data

In DIAdem DAC you select functions blocks from the various function groups and connect them with signal buses, to create block diagrams. The measurement data is transferred from data sources to processing blocks, display instruments, and output blocks.

To create a block diagram with a simulated signal source, complete the following steps:

📝 **Note** You can later replace the simulated signal with measured data.

1. Select **DIAdem DAC**.
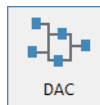
2. Click **New Block Diagram**.
3. In the **Simulation Inputs** function group, select **Function Generator**.

4. In the **Display Instruments** function group, select **Numeric Display**.

   DIAdem inserts every new block in the top left corner of the workspace in DIAdem DAC.

5. Move the block **Digits1** to the right of **Generator1**.

6. Click the output on the right side of **Generator1**. Drag the green line to the input on the left side of the **Digits 1** block. As soon as OK appears on the cursor, you can release the mouse button.

    The data source and the display instrument are now linked with a green data bus similar to Figure 7-1.

Figure 7-1. Block Diagram with Function Generator and Digits Display
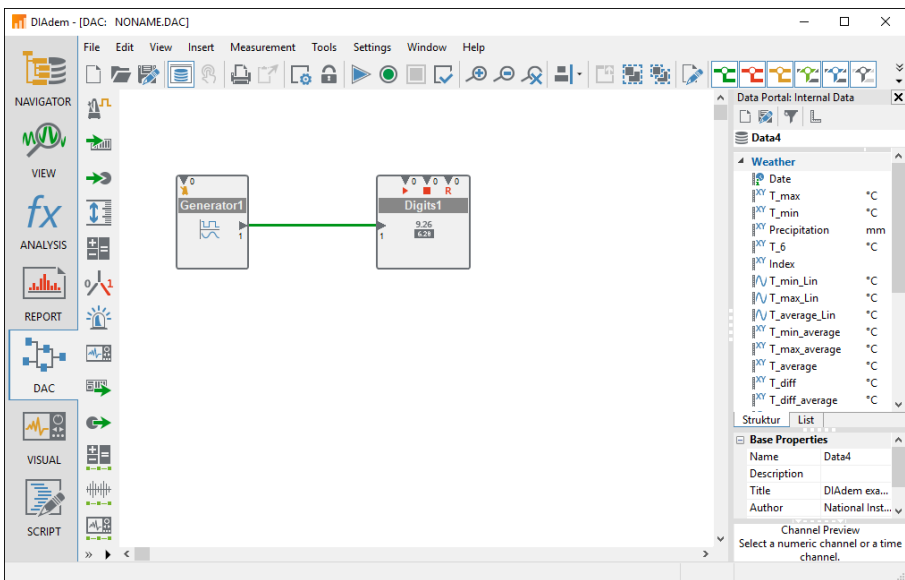
7. Click **Start Display** on the toolbar.

    DIAdem opens the DIAdem VISUAL panel and displays the simulated sine values in a Digits display.

8. Click **Stop Measurement**.

Saving Measurement Data

Until now you have displayed the signal values, but the values are not yet saved. To document processes and to check results, DIAdem must save measurement values.

To save the measurement data, complete the following steps.

1. Select **DIAdem DAC**.
2. In the **System** function group, select **Save Data with Trigger**.

3. Place the **Save1** block below the numeric display.
4. Click the green data bus and drag the bus to the data input of the Save block as shown in Figure 7-2.
5. Double-click the **Save1** block.
   a. Choose **Parameters**.
   b. Enter `1000 values` for **Cycle»Save**.
   c. Click **OK**.
6. Click **Start Measurement**.

   DIAdem stops the measurement as soon as 1,000 values are saved.
7. Switch to **DIAdem DAC**.

   The new channels `Time1` and `Generator1_1` are now visible in the default group of the Data Portal.

Figure 7-2. Extended Block Diagram with Data Storage
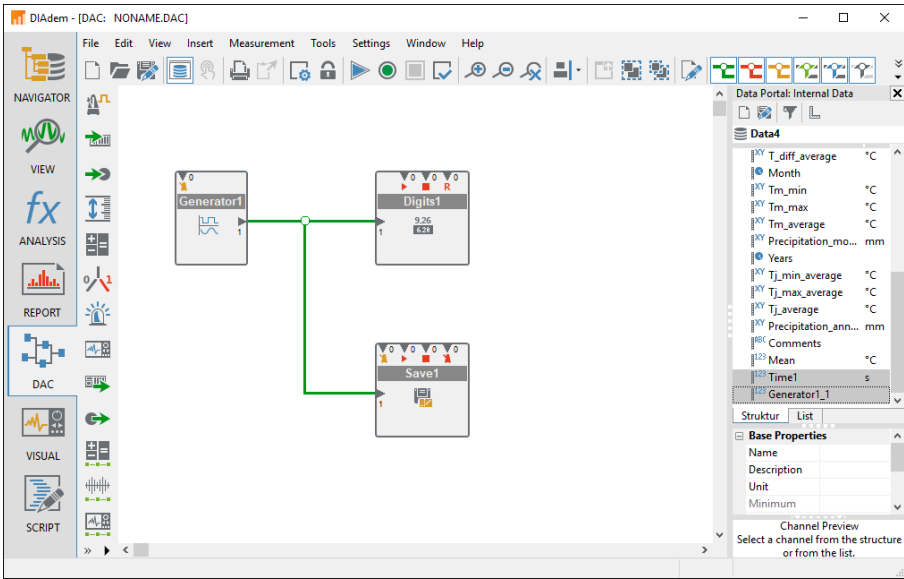
Monitoring Measurement Signals

In control blocks you define conditions for monitoring and controlling measurements.

To save measurement values in relation to a condition, complete the following steps.

1.   In the **Simulation Inputs** function group, select **Slider Control**.

2.   Place the **Slider1** block below the function generator.
3.   In the **Control** function group, select **Window**.
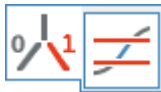
4.   Place the **Window1** block next to the slider.
5.   Drag a green bus from the output on the Slider control to the input on the Window condition.
6.   Double-click the **Window1** block.

a. Enter the lower limit -5 and the upper limit 5 in the signal list, as shown in Figure 7-3.

b. Select `Window exit` as the **Window Type**.

Figure 7-3. Setting the Window Condition

c. Click **OK**.

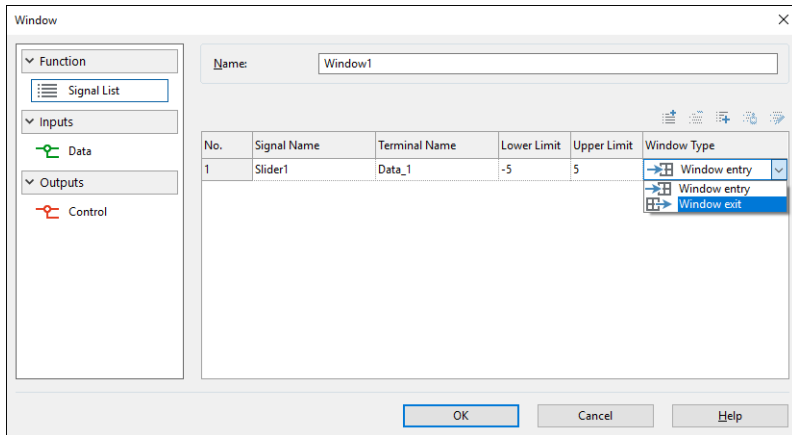7. Click the data bus between the **Slider1** and **Window1** blocks and drag a new bus onto the green bus between the **Generator1** and **Digits1** blocks.

The 2 at the input of the numeric display indicates that two signals now reach the block on this data bus.

8. As shown in Figure 7-4, drag a line from the output at the bottom of **Window1** to the input with the red triangle at the top of the **Save1** block.

This creates a red control bus that DIAdem uses to trigger data storage. Always connect control buses at the top or at the bottom of a block.

Figure 7-4. Extended Block Diagram with Slider Control and Window Condition

Visualizing Measurements

You can arrange the input instruments and display instruments, which are integrated in the block diagram, in DIAdem VISUAL and you can con each instrument individually.

To design the visualization complete the following steps.

1.   Switch to **DIAdem VISUAL**.

The instruments Slider Control and Digit Display are positioned on top of each other at the top left of the display area of DIAdem VISUAL.

2.   Position the two instruments next to each other.

3. Select both instruments.

    a. Click **Orientation** on the group bar and select **Vertical**.

    b. Click in the workspace to deselect it.

4. Click **Start Measurement**.

5. Drag the slider control up and down.

    As soon as you leave the specified window range between −5 and +5 with the slider, DIAdem starts to save the measured values. Figure 7-5 shows the visualization.

Figure 7-5. Visualization with Input Instruments and Display Instruments
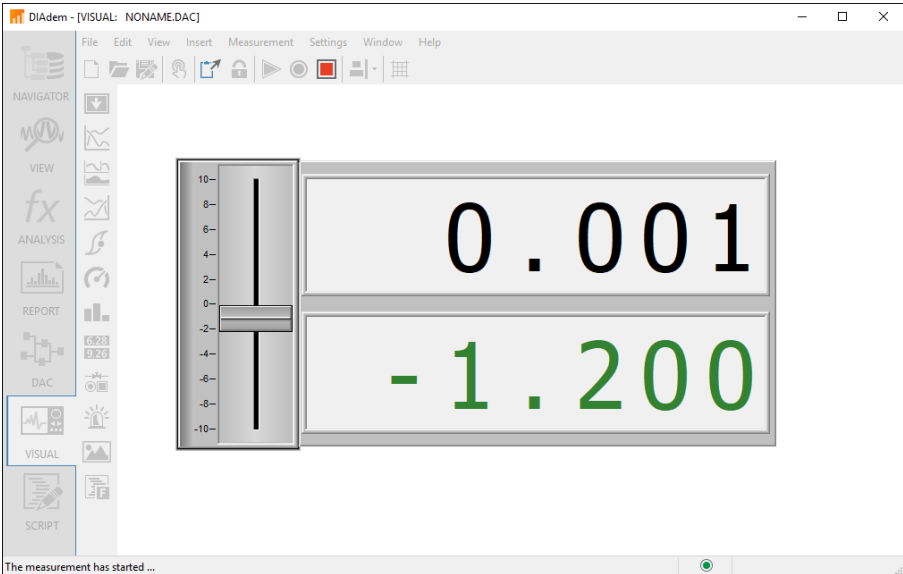
6. Click **Stop Measurement** or wait until DIAdem has recorded the specified 1,000 values and created new channels in the Data Portal.

To save the block diagram, click **Save Block Diagram As**.

Summary

The summary provides an overview of the topics discussed in this chapter. It also includes additional information.

DIAdem DAC

You use DIAdem DAC to describe measurement and control tasks in a block diagram. Select function blocks from the various function groups and connect the function blocks with the mouse. When you start a measurement, DIAdem opens the VISUAL panels and runs the visualization.

Data Acquisition

The blocks on the **Inputs** function group represent data sources in DIAdem DAC, such as A/D converter boards, front-end devices, and other external measuring devices. You register the corresponding drivers in DIAdem DAC and con the signal inputs and signal outputs. Additional data sources can be input instruments, data files, and calculation results.

Signal Buses

Signal buses connect the function blocks and transport signals. Connect signal buses to the signal inputs and to the signal outputs on a function block. You can connect these buses with other blocks an also with other buses. To delete a bus, select the bus and press <Del>. DIAdem distinguishes between system buses, control buses, data buses, alarm buses, and text buses.

DIAdem VISUAL

Select instruments such as gauges, digits, bar display, recorders, or wipers to display the measurement values from the DIAdem VISUAL library. You use input instruments such as switches, dials, or slider controls, to trigger events and control functions during a measurement. When you design a visualization, you can align and con instruments as you like.

A

NI Services

NI provides global services and support as part of our commitment to your success. Take advantage of product services in addition to training and certification programs that meet your needs during each phase of the application life cycle; from planning and development through deployment and ongoing maintenance.

To get started, register your product at `ni.com/myproducts`.

As a registered NI product user, you are entitled to the following benefits:

- Access to applicable product services.
- Easier product management with an online account.
- Receive critical part notifications, software updates, and service expirations.

Log in to your MyNI user profile to get personalized access to your services.

Services and Resources

- **Maintenance and Hardware Services—**NI helps you identify your systems' accuracy and reliability requirements and provides warranty, sparing, and calibration services to help you maintain accuracy and minimize downtime over the life of your system. Visit `ni.com/services` for more information.
    - **Warranty and Repair—**All NI hardware features a one-year standard warranty that is extendable up to five years. NI offers repair services performed in a timely manner by highly trained factory technicians using only original parts at an NI service center.
    - **Calibration—**Through regular calibration, you can quantify and improve the measurement performance of an instrument. NI provides state-of-the-art calibration services. If your product supports calibration, you can obtain the calibration certificate for your product at `ni.com/calibration`.
- **System Integration—**If you have time constraints, limited in-house technical resources, or other project challenges, National Instruments Alliance Partner members can help. To learn more, call your local NI office or visit `ni.com/alliance`.

- **Training and Certification**—The NI training and certification program is the most effective way to increase application development proficiency and productivity. Visit `ni.com/training` for more information.
  - The Skills Guide assists you in identifying the proficiency requirements of your current application and gives you options for obtaining those skills consistent with your time and budget constraints and personal learning preferences. Visit `ni.com/skills-guide` to see these custom paths.
  - NI offers courses in several languages and formats including instructor-led classes at facilities worldwide, courses on-site at your facility, and online courses to serve your individual needs.
- **Technical Support**—Support at `ni.com/support` includes the following resources:
  - **Self-Help Technical Resources**—Visit `ni.com/support` for software drivers and updates, a searchable KnowledgeBase, product manuals, step-by-step troubleshooting wizards, thousands of example programs, tutorials, application notes, instrument drivers, and so on. Registered users also receive access to the NI Discussion Forums at `ni.com/forums`. NI Applications Engineers make sure every question submitted online receives an answer.
  - **Software Support Service Membership**—The Standard Service Program (SSP) is a renewable one-year subscription included with almost every NI software product, including NI Developer Suite. This program entitles members to direct access to NI Applications Engineers through phone and email for one-to-one technical support, as well as exclusive access to online training modules at `ni.com/self-paced-training`. NI also offers flexible extended contract options that guarantee your SSP benefits are available without interruption for as long as you need them. Visit `ni.com/ssp` for more information.
- **Declaration of Conformity (DoC)**—A DoC is our claim of compliance with the Council of the European Communities using the manufacturer's declaration of conformity. This system affords the user protection for electromagnetic compatibility (EMC) and product safety. You can obtain the DoC for your product by visiting `ni.com/certification`.

For information about other technical support options in your area, visit `ni.com/services`, or contact your local office at `ni.com/contact`.

You also can visit the Worldwide Offices section of `ni.com/niglobal` to access the branch office websites, which provide up-to-date contact information, support phone numbers, email addresses, and current events.