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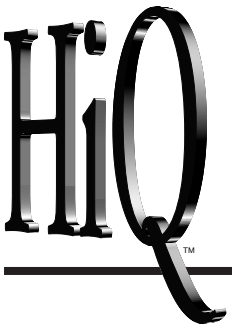
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# Getting Results with HiQ™ Reader



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# 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 **Help»HiQ Reader Help Topics** directs you to pull down the **Help** menu and select the **HiQ Reader Help Topics** item. |
| ☞ | This icon denotes a note, which alerts you to important information. |
| **bold** | Bold text denotes the names of menus and dialog box buttons or options. |
| *italic* | Italic text denotes emphasis, a cross reference, or an introduction to a key concept. |
| `monospace` | Text in this font denotes text or characters that you should literally enter from the keyboard, sections of code, programming examples, and syntax examples. This font is also used for the proper names of disk drives, paths, directories, parameters, functions, variables, filenames and extensions, and for statements and comments taken from programs. |

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# Contents


## Chapter 1
## Getting Started with HiQ Reader

About HiQ Reader ..... 1-1
System Requirements ..... 1-1
Installing HiQ Reader ..... 1-2
Getting Started with HiQ Reader ..... 1-3
- Launching and Exiting HiQ Reader ..... 1-3
- Opening and Closing HiQ Reader Notebooks ..... 1-3

Getting Help ..... 1-5
- HiQ Reader Online Help ..... 1-5
- Current Notebook ..... 1-5

## Chapter 2
## Getting Results with HiQ Reader Notebooks

About HiQ Reader Notebooks ..... 2-1
- Notebook Objects ..... 2-1
- Scripts ..... 2-2
- Working with Multiple Windows ..... 2-3
- Interacting with a Notebook ..... 2-3

Notebook Example: Expression Evaluator ..... 2-3
- Opening the Notebook ..... 2-3
- Entering Data and Running Scripts ..... 2-4

More Reader Notebooks: Problem Solvers ..... 2-5

## Appendix A
## Technical Support Resources

## Glossary

## Figures

Figure 1-1. HiQ Reader Environment ..... 1-4

Figure 2-1. Expression Evaluator Problem Solving Scripts ..... 2-2
Figure 2-2. Evaluating Expressions with the Expression Evaluator Notebook ..... 2-4




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# 1

# Getting Started with HiQ Reader

This chapter introduces the HiQ Reader application, lists system requirements and installation instructions, and explains how to get started with HiQ Reader.

## About HiQ Reader

The HiQ Reader enables you to interact with HiQ Professional Notebooks. You can open HiQ Professional Notebooks, run scripts, view the analysis and visualization results, and print and save the Notebooks. Refer to Chapter 2, *Getting Results with HiQ Reader Notebooks*, for information about Notebooks and extracting the data you need from it.

☞ **Note** ***HiQ Reader can open only Notebooks saved in HiQ Professional version.***

The HiQ Reader is available for free from either your HiQ Professional CD or from the National Instruments Web site at `www.natinst.com/hiq`.

## System Requirements

HiQ Reader requires the following minimum system configuration:

- Windows 95 or Windows 98/NT 4.0
- 486 CPU with coprocessor
- 8 MB RAM with Windows 95, 16 MB RAM with Windows 98/NT
- 256-color, 800 by 600 VGA display
- 20 MB free disk space

The following specifications are the recommended system configuration for HiQ Reader:

- Windows NT 4.0
- Pentium 90 or higher
- 16 MB RAM with Windows 95, 32 MB RAM with Windows 98/NT
- Accelerated True Color, 1024 by 768 display
- 20 MB free disk space



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# Installing HiQ Reader

HiQ Reader is part of the HiQ Professional edition. Use one of the following procedures to install the HiQ Reader application:

- If you purchased HiQ Professional:
  1. Insert the HiQ Professional CD in the CD-ROM drive of your computer.
  2. Follow the *Setup* instructions you see on your screen. Be sure to select the HiQ Reader option.
- If you do not have HiQ Professional:
  1. Visit the National Instruments Web site at www.natinst.com and follow the links to HiQ.
  2. Click **Download HiQ Reader** and save the file to your computer.
  3. Double click on the `.EXE` file that you downloaded.
  4. Follow the *Setup* instructions you see on your screen.

By default, the HiQ Reader installation program creates a new folder, `C:\Program Files\National Instruments\HiQReader`, that contains the following items:

- `Program` folder—`HiQReader.exe`, HiQ Reader help files, and related files
- `Problem Solvers` folder—Example Problem Solver Notebooks
- `Readme.txt` file—Late-breaking information about HiQ, known limitations, and corrections
- `Manuals` folder—PDF version of this manual



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# Getting Started with HiQ Reader

## Launching and Exiting HiQ Reader

Use one of the following methods to launch HiQ Reader:

- Use the **Start** Button.
  1. Click on the Windows **Start** button and select the **Programs** menu.
  2. Select the **National Instruments HiQ** submenu.
  3. Click on **HiQ Reader**.
- Use Windows Explorer.
  1. Locate the HiQ Reader executable, `HiQReader.exe`, in Windows Explorer.
  2. Double click `HiQReader.exe`.

Use the following step to exit HiQ Reader:

1. Save the Notebook if you have made any changes to any objects.
2. Select **File»Exit**.

## Opening and Closing HiQ Reader Notebooks

Use the following steps to open and close HiQ Reader Notebooks:

1. Launch HiQ Reader.
2. Select **File»Open**.
3. Navigate to the file you want to open, select the file, and press **Open**.
4. Interact with the Notebook. You can run scripts and print and save the Notebook. You cannot create new objects, delete objects, or modify the format of the Notebook. Refer to Chapter 2, *Getting Results with HiQ Reader Notebooks*, for more information about Notebooks and interacting with them.

☞ **Note** ***HiQ Reader can open all Notebooks saved as HiQ Reader Notebooks (*`.HQR`*) and HiQ Notebooks saved in HiQ Professional. HiQ Professional Notebooks are saved with the same extension as those created in the base version of HiQ (*`.HIQ`*). HiQ Reader displays an error message if you try to open an Notebook that was not saved in HiQ Professional.***



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Figure 1-1 shows the Filtering Problem Solver Notebook, which you can find in the `\Problem Solvers` folder. This figure labels important parts of the HiQ Reader and some of the elements on the Notebook page. For more information about getting results with a Problem Solver, see *Notebook Example: Expression Evaluator* in Chapter 2, *Getting Results with HiQ Reader Notebooks*.

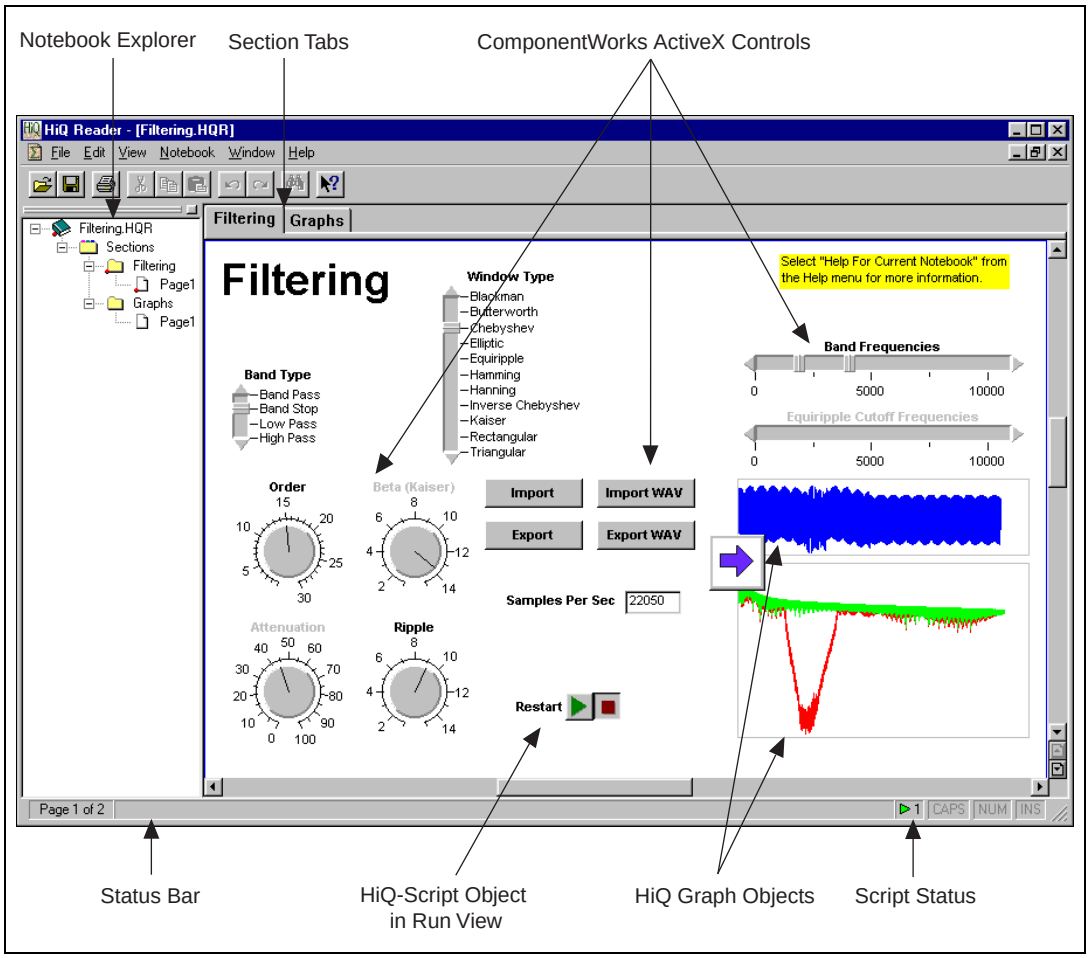



**Figure 1-1.** HiQ Reader Environment

5. To close the Notebook, select **File»Close**.



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# Getting Help

## HiQ Reader Online Help

HiQ Reader offers tooltips, context-sensitive help, and online help that you can access in the following ways.

- You can access the HiQ Reader online help by selecting **HiQ Reader Help Topics** from the **Help** menu. There you find information not available in this manual, such as complete function reference and answers to *How Do I...?* questions.
- Tooltips appear when you move the mouse cursor over a button in any toolbar. The text of the tooltip indicates the function of the button.
- A help topic appears in the status bar at the bottom of a HiQ Notebook as you move the mouse pointer over the menu items.
- You can click on the Help button, **?**, in other areas of the HiQ user interface, such as dialog boxes, to access context-sensitive help for the next item on which you click.



**Note** ***Use the <F1> key to access context-sensitive help for a selected item or for an area where the cursor is located. For example, when your cursor is located in a script within the name of a HiQ built-in function, help for that function appears when you press <F1>.***

## Current Notebook

Notebook developers can create and distribute help for the Notebooks they create. Help files can have any of the formats in the following table:

| File Extension | File Type | Description |
|---|---|---|
| `.hlp`, `.cnt` | WinHelp | Windows standard help file that looks and behaves similar to the HiQ Reader online help |
| `.chm`, `.chh` | HTML Help | Microsoft Compiled HTML Help |
| `.htm`, `.html` | Web page | HTML page that opens in your default Web browser |
| `.doc` | Word document | Microsoft Word document |
| `.txt` | Text file | Plain text file that opens in your default text editor |



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If you receive any files with these extensions with a HiQ Reader Notebook, place all files in the same directory. When the Notebook is open in the HiQ Reader, you can access the help by selecting **Help»Help for Current Notebook**.



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# 2

# Getting Results with HiQ Reader Notebooks

This chapter introduces the features of the HiQ Notebook interface and shows you how to interact with HiQ Reader Notebooks in HiQ Reader.

## About HiQ Reader Notebooks

HiQ uses a notebook as the basic interface metaphor. The HiQ *Notebook* has features that you normally associate with a real engineering or scientific Notebook, such as pages, sections, and tabs.

The following sections describe the elements you might encounter as you interact with Notebooks. To see example Notebooks, browse through the Notebooks installed in the `Problem Solvers` folder. Refer to *Notebook Example: Expression Evaluator* later in this chapter for information about Problem Solvers and interacting with them.

### Notebook Objects

Notebook developers can arrange information in a free-form manner on Notebook pages. Each piece of information that the developer places on a Notebook page is known as an *object*. As with a real notebook, many types of objects can be placed on a page, including text, numerics, and graphs.

You can interact with some objects on a Notebook page. For example, you can edit text in text objects, and you can rotate, zoom, and pan three-dimensional graphs. The Notebook developer also might include controls that allow you to modify the properties of an object. For example, they might include an option that allows you to select the plot style for a graph.



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## Scripts

The HiQ Notebook includes an object known as the HiQ-Script object. *HiQ-Script* is the built-in programming language that accesses the HiQ library of analysis and visualization functions.

In most Notebooks, you will see scripts in *Run View*. Run View is a special view of the script object that hides the script that performs the analysis or visualizes the data. Figure 2-1 shows the Expression Evaluator Notebook, which contains two scripts in Run View: **Evaluate** and **Clear**. When you press the run button (arrow) for the Evaluate script, the expression is plotted on the graph. When you press the run button for Clear, the plots are removed from the graph. If you receive a Notebook with a script that is not in Run View, right click on the script object and select **Run** to execute the script.

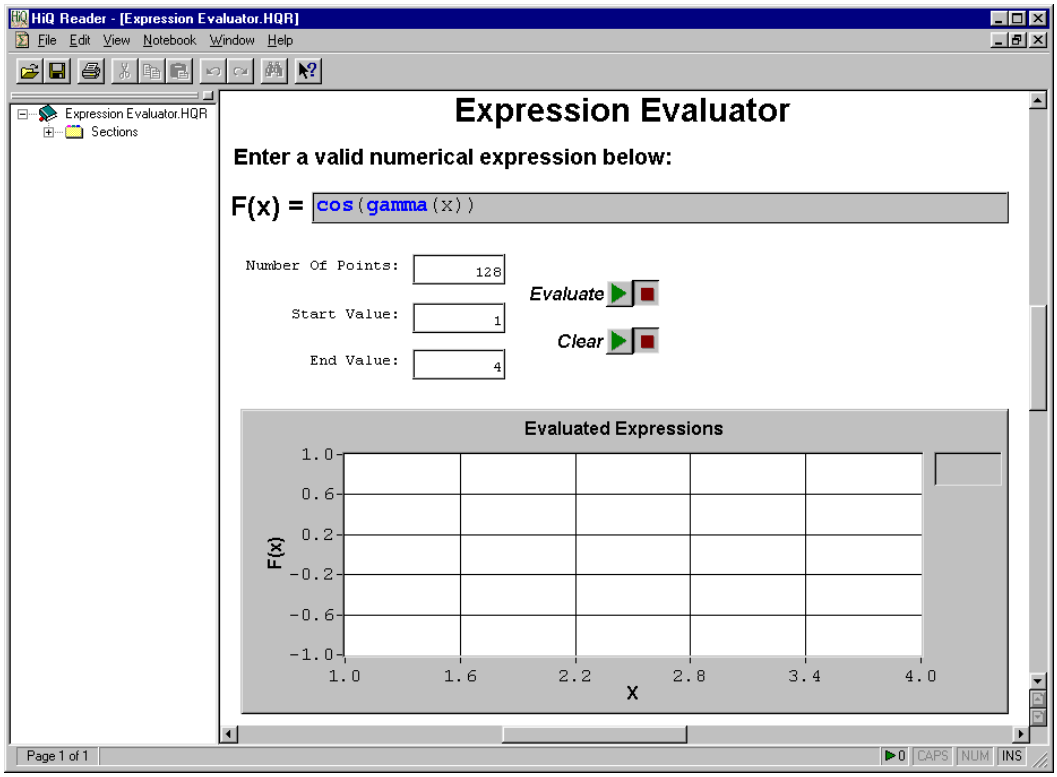



**Figure 2-1.** Expression Evaluator Problem Solving Scripts



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## Working with Multiple Windows

HiQ products use the standard Multiple Document Interface (MDI) that Microsoft Office products like Word and Excel use. A main window exists within which multiple HiQ Notebooks may reside. From the **Windows** menu, you can maximize, overlay, or tile the Notebook windows you open.

## Interacting with a Notebook

A well designed Notebook should be self-documenting, describing how to interact with the Notebook. Interaction might be as simple as entering a start time and a stop time for simulation of a system of differential equations. Or a Notebook might instruct you to select a data file to import in order to calculate and graph the amount of rainfall in a particular area.

Most Notebooks include scripts that you can run to solve the type of mathematical or visualization problem the Notebook was designed to handle.

# Notebook Example: Expression Evaluator

This section presents the Expression Evaluator Problem Solver to demonstrate how you can interact with HiQ Reader Notebooks. Problem Solvers are HiQ Notebooks designed to interact with users to analyze or solve a wide range of problems belonging to a certain class. In a Problem Solver, you can enter a different set of data or analysis problems without having to modify script.

Perform the following steps to learn more about the Expression Evaluator Notebook.

## Opening the Notebook

1. Launch HiQ Reader from the Windows **Start** menu (**Start»Programs»National Instruments HiQ»HiQ Reader**).
2. Select **File»Open**.
3. Open the `Problem Solvers` folder within the `HiQReader` folder.
4. Select `Expression Evaluator.HiQ` and click **Open**. The Expression Evaluator Notebook opens.



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## Entering Data and Running Scripts

This Notebook can evaluate any mathematical expression and display its behavior graphically.

1. Click the **Evaluate** button to evaluate the expression. The Notebook evaluates the default expression over 128 points, starting at 1 and ending at 4. The graph displays the result.
2. Enter the mathematical expression `sin(x)*cos(x)` into the text object labeled **F(x)** =.
3. Click the **Evaluate** button to evaluate the expression. Figure 2-2 shows the Expression Evaluator Problem Solver after it has evaluated two expressions.

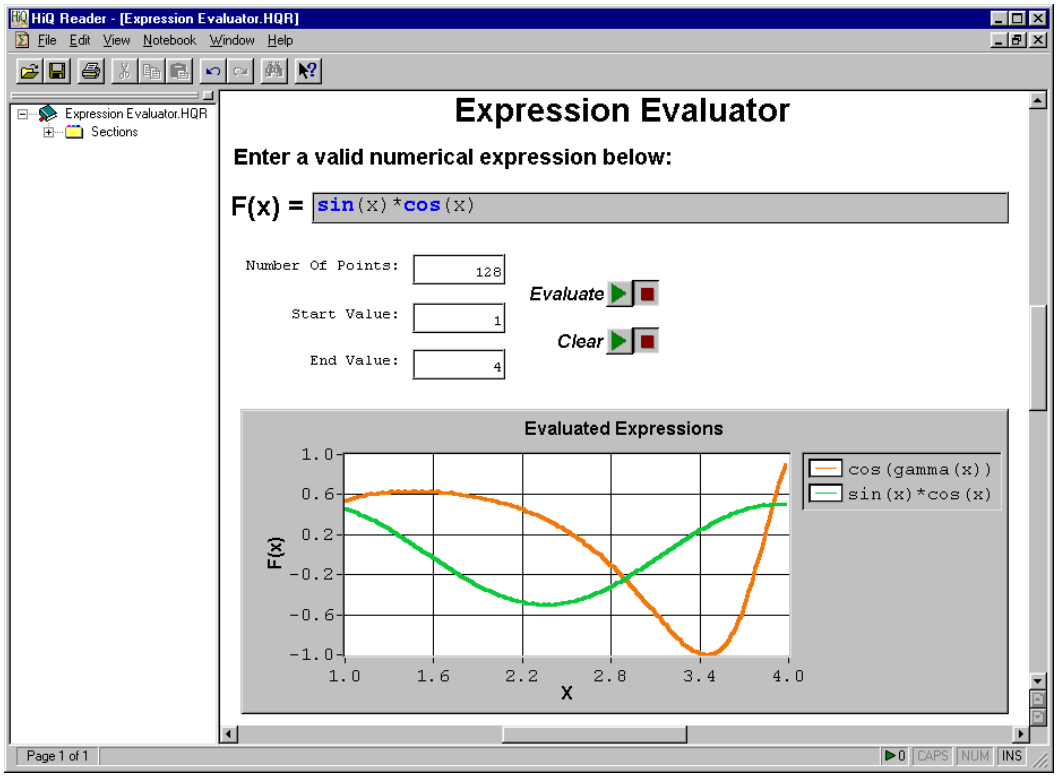



**Figure 2-2.** Evaluating Expressions with the Expression Evaluator Notebook

4. Evaluate your own expression, varying the domain interval and number of points plotted to see how this Problem Solver behaves. You can press the **Clear** button to remove all plots.



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The expression you entered is fed into the numerical algorithm in the script. The plot that appears when you run the script is a graphical representation of the mathematical expression that you entered.

☞ **Note** ***You must use valid operators and valid HiQ built-in functions. In this example, your expression must be in terms of x. Refer to the HiQ Reader online help by selecting* Help»HiQ Reader Help Topics *for complete descriptions of operators and built-in functions.***

# More Reader Notebooks: Problem Solvers

HiQ Reader comes with several other problem solvers that address various areas in science and engineering. Check the `\Problem Solvers` directory for Notebooks that solve the following types of problems:

- Filtering
- Windowing
- Data Fitting
- Optimization
- Root Finding
- Differential Equations
- Integration
- Nonlinear Systems



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# A

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| Austria | 0662 45 79 90 0 | 0662 45 79 90 19 |
| Belgium | 02 757 00 20 | 02 757 03 11 |
| Brazil | 011 284 5011 | 011 288 8528 |
| Canada (Ontario) | 905 785 0085 | 905 785 0086 |
| Canada (Québec) | 514 694 8521 | 514 694 4399 |
| Denmark | 45 76 26 00 | 45 76 26 02 |
| Finland | 09 725 725 11 | 09 725 725 55 |
| France | 0 1 48 14 24 24 | 0 1 48 14 24 14 |
| Germany | 089 741 31 30 | 089 714 60 35 |
| Hong Kong | 2645 3186 | 2686 8505 |
| India | 91805275406 | 91805275410 |
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| Spain (Madrid) | 91 640 0085 | 91 640 0533 |
| Spain (Barcelona) | 93 582 0251 | 93 582 4370 |
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| Switzerland | 056 200 51 51 | 056 200 51 55 |
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# Glossary

| Prefix | Meanings | Value |
|---|---|---|
| p- | pico- | $10^{-12}$ |
| n- | nano- | $10^{-9}$ |
| µ- | micro- | $10^{-6}$ |
| m- | milli- | $10^{-3}$ |
| k- | kilo- | $10^{3}$ |
| M- | mega- | $10^{6}$ |
| G- | giga- | $10^{9}$ |
| t- | tera- | $10^{12}$ |

## A

ActiveX (Microsoft ActiveX) — A programming system and user interface that lets you work with interactive objects. Formerly called OLE.

ActiveX control — A standard software tool that adds additional functionality to any compatible ActiveX container.

## B

built-in function — One of many programming utilities in HiQ-Script that perform analysis, graphical, or utility operations.

## C

compiled script — A HiQ object containing HiQ-Script language that has been converted to code that a computer uses to execute the program.

ComponentWorks — A collection of 32-bit ActiveX controls designed for building virtual instrumentation systems.



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## E

| | |
|---|---|
| error message | An information box that appears when HiQ cannot complete an action due to an internal error, compile error, run-time error, or user error. |
| Explorer | *See* HiQ Explorer. |
| expression | A mathematical operator and its operands. |

## H

| | |
|---|---|
| HiQ Explorer | An interactive window displaying the objects, sections, and pages of an open Notebook. |
| HIQ extension | Extension for a HiQ base or professional version Notebook. Only Notebooks saved in HiQ Professional can be opened in HiQ Reader. |
| HiQ Professional | Professional version of HiQ, which includes the following elements: HiQ, HiQ Signal Processing Toolkit, ComponentWorks User Interface ActiveX controls, ComponentWorks DataSocket ActiveX control, ComponentWorks 3D Graph ActiveX control, Serial Interface ActiveX control, and HiQ Reader. |
| HiQ Reader | HiQ product that enables HiQ Professional users to distribute their Notebooks. HiQ Reader users can view and interact with Notebooks but cannot modify the format of the Notebook, create new objects, or create new notebooks. |
| HiQ-Script | The intuitive HiQ programming language for mathematics. |
| HQR extension | Extension for a HiQ Reader Notebook. |

## N

| | |
|---|---|
| Notebook | The workspace in HiQ that stores, organizes, and displays all the components of an analysis and visualization problem. |



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## O

| | |
|---|---|
| object | An entity in a HiQ Notebook that contains data of a specific type, for example, numeric, graphic, text, or HiQ-Script. Objects work together in a Notebook to generate and display solutions to analysis and visualization problems. Objects are always stored in a Notebook, but are not always visible on a Notebook page. *See* object view. |
| object view | A HiQ object that is visible on a Notebook page. |
| operand | An object (or objects) modified by an operator. |
| operator | Code in HiQ-Script that is specific to basic mathematical operations and structure of HiQ-Script language. Often represented as a symbol, for example, "/" represents division. |

## P

| | |
|---|---|
| pop-up menu | A context-sensitive menu that you can access by right clicking with your mouse on an object or on the Notebook. |
| Problem Solver | A HiQ Notebook containing objects, including HiQ-Script, that allows you to interactively perform analysis of data and display results for a broad class of problems. For example, the Expression Evaluator Problem Solver can display the results of any expression. |

## R

| | |
|---|---|
| Reader | *See* HiQ Reader. |
| Run View | View of the script object that displays 2 buttons—one to run the script and the other to stop the script—and hides the script source. |

## S

| | |
|---|---|
| script | A block of code that performs a certain task. *See* HiQ-Script and compiled script. |
| script object | A HiQ object type containing HiQ-Script and from which you compile and execute your program. |



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| | |
|---|---|
| section tabs | An organizing tool in a HiQ Notebook that lets you label and quickly access different parts of your Notebook. |
| Standard toolbar | Site on the user interface of HiQ that contains basic utility tools, for example, **Save**, **Open**, **Cut**, **Paste**, and, **Print**. Depending on your preference, the toolbar can appear on any edge of the interface, or as a floating window. |
| status bar | A region, usually the bottom of a window, containing information about HiQ and any selected object. |

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|---|---|
| toolbar | Site on an application interface that contains various buttons and other controls. Depending on your preference, a toolbar can appear on any edge of the interface, or a floating window. |
| tooltip | A small, descriptive pop-up window that appears when you position the mouse cursor over a toolbar icon. |



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