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Find the *National Instruments LabVIEW 7 Express* at our website: *Click HERE*

# LabVIEW Graphical Development Environment

## NI LabVIEW

- Intuitive graphical development for test, measurement, and control
- Complete programming language with built-in tools for data acquisition, instrument control, measurement analysis, report generation, communication, and more
- Application templates, thousands of example programs
- Compiled for fast performance

### LabVIEW Real-Time Module
- Graphical development for real-time control, deterministic performance, reliability, and embedded execution

### LabVIEW FPGA Module
- Graphical development for creating custom I/O boards with FPGA technology

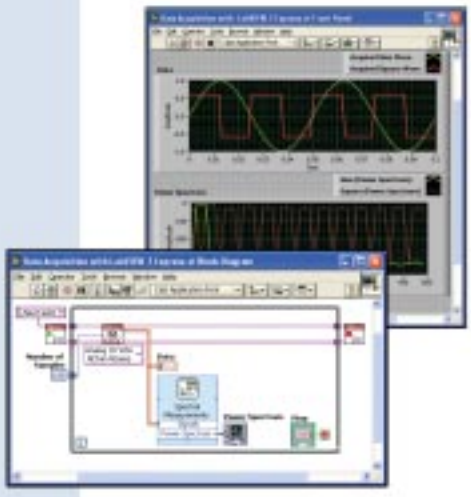
### LabVIEW PDA Module
- Graphical development for portable, handheld devices

### LabVIEW Datalogging and Supervisory Control Module
- Graphical development for monitoring and distributed applications

### LabVIEW Vision Development Module
- Graphical development for high-level machine vision and image processing

### LabVIEW Add-On Tools
- See page 44 for a full listing

### Operating Systems
- Windows 2000/NT/XP
- Mac OS X
- Linux
- Solaris



## Overview

National Instruments LabVIEW is a powerful development environment for signal acquisition, measurement analysis, and data presentation, giving you the flexibility of a programming language without the complexity of traditional development tools.

Typically, measurement and automation applications can be broken up into three primary pieces – acquiring data, analyzing it, and then presenting it to the enterprise. LabVIEW, designed specifically for scientists and engineers, has built-in tools to rapidly design these applications.




### Acquire

Whether you are taking temperature measurements with a low-cost plug-in board, analyzing waveforms on a stand-alone oscilloscope, or measuring strain with a sophisticated signal conditioning system, LabVIEW is the ideal development environment for your application. From data acquisition to instrument control, and image acquisition to motion control, LabVIEW provides the tools to rapidly develop your acquisition system.

***See page 48 for more information on acquiring data with LabVIEW.***

### Analyze

Raw data is typically not the desired end result of a measurement and automation application. Powerful, easy-to-use analysis functionality is a must for your software application. LabVIEW has more than 400 built-in functions designed specifically for extracting useful information from any set of acquired data and for analyzing measurements and processing signals. Functions such as FFT and frequency analysis, signal generation, mathematics, curve fitting and interpolation, and time and frequency-domain analysis give you the power to derive meaningful information from your data.

***See page 49 for more information on analyzing data with LabVIEW.***

### Present

Presentation of your data encompasses visualization, report generation, data management, and connectivity. LabVIEW supplies a wide array of tools to make your data presentation powerful and simple to create.

***See page 51 for more information on presenting data with LabVIEW.***

## The LabVIEW Family

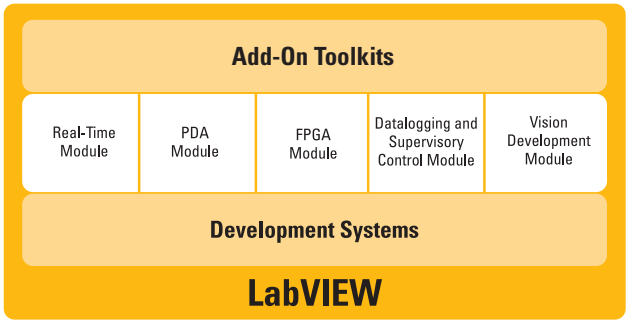
In addition to the LabVIEW development systems, National Instruments offers a variety of add-on modules and toolkits which extend the functionality of LabVIEW. These tools save you valuable development time and help you efficiently meet your application challenges.





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# The LabVIEW Family




*The LabVIEW Product Family*

## LabVIEW Add-On Modules

### LabVIEW Real-Time Module

For applications that require real-time, deterministic performance, National Instruments offers the LabVIEW Real-Time Module. LabVIEW Real-Time downloads standard LabVIEW code to a dedicated embedded hardware target running a real-time operating system independent from Windows. Graphical programming and automatic code generation make time-critical applications much easier to develop.

***See page 56 for more information.***

### LabVIEW PDA Module

The LabVIEW PDA Module extends LabVIEW development to applications for handheld PDA devices. With this module, engineers develop in LabVIEW and easily download applications to portable targets. LabVIEW automatically compiles VIs created on the development machine to run on the selected PDA target and downloads the completed application to the PDA. With LabVIEW PDA technology, NI delivers tools for user-defined portable solutions for a wide spectrum of applications, such as field test systems, remote control and monitoring systems, and portable data acquisition systems.

***See page 59 for more information.***

### LabVIEW FPGA Module

With the LabVIEW FPGA Module, you can create custom I/O hardware by programming the FPGA on National Instruments reconfigurable I/O hardware (PXI-7831R) simply by creating a LabVIEW block diagram. Because your block diagram executes in hardware, you have direct, immediate control over all of the I/O signals on the reconfigurable board. You can achieve high-performance, user-configurable timing and synchronization and onboard decision making. With LabVIEW FPGA technology, NI delivers user-defined hardware for a wide spectrum of applications, such as custom discrete and analog control, simulation, digital protocol emulation and other applications that require precise timing and control.

***See page 57 for more information.***

### LabVIEW Datalogging and Supervisory Control Module

The NI LabVIEW Datalogging and Supervisory Control (DSC) Module offers tools to help you monitor your distributed systems. Designed so you can focus on acquiring data, the LabVIEW DSC Module has many built-in tools to increase your productivity, including automatic data logging, full alarm management and event logging, and real-time and historical trending. The module includes a networked database which features built-in security and OPC connectivity, as well as over 4,000 graphics for sophisticated user interface design. Designing a distributed system is now easier than ever.

***See page 60 for more information.***

### LabVIEW Vision Development Module

The LabVIEW Vision Development Module is for scientists, automation engineers, and technicians who are developing machine vision and scientific imaging applications. The LabVIEW Vision Development Module includes IMAQ Vision, a library of vision functions, and NI Vision Assistant, an interactive environment for vision applications. Unlike any other vision products, NI Vision Assistant and IMAQ Vision work together to simplify vision software development so that you can rapidly apply vision to your measurement and automation applications.

***See page 62 for more information.***

## LabVIEW Add-On Toolkits

For specialized measurement and automation applications, National Instruments offers a wide range of add-on software tools to speed your system development. The table below lists these tools:


| LabVIEW Add-On Toolkits | Page |
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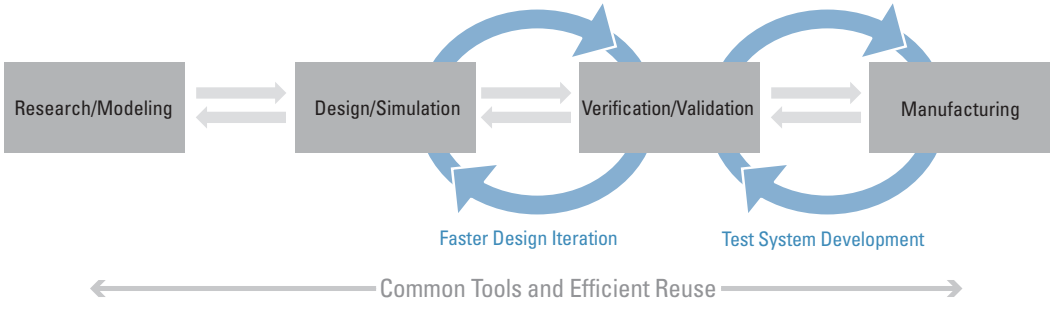

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# Where is LabVIEW Used?



## Countless Applications

Engineers and scientists implement NI LabVIEW applications in many industries worldwide, including automotive, telecommunications, aerospace, semiconductor, electronic design and production, process control, biomedical, and others. The flexibility and scalability of LabVIEW make it well-suited for initial research and design phases all the way up to large scale manufacturing test processes. By using the single, integrated LabVIEW environment throughout the phases of the design cycle to interface with real-world signals, analyze data for meaningful information, and share results and applications, you can boost productivity throughout your organization.




*With NI software and hardware, you can achieve shorter time-to-market by being more efficient at each stage of the design to manufacturing process.*

### Test and Measurement

LabVIEW is an industry-standard development tool for test and measurement applications. With more than 1,400 instrument drivers, LabVIEW leads the industry in instrument control software solutions, giving you a consistent development and execution environment for your entire system. In addition to LabVIEW, National Instruments TestStand test management software reduces test development time and simplifies maintenance. NI designed TestStand to automate a wide variety of test systems. TestStand is a ready-to-run test executive that organizes, controls, and executes your automated prototype, validation, or production test systems. TestStand is completely customizable, so you can modify and enhance it to match your specific functional test, electronic test, and automated test needs.

### Process Control and Factory Automation

In process control and factory automation applications, many engineers look to LabVIEW for high-speed, high-channel-count measurement and control. For large, sophisticated industrial automation and control applications, the LabVIEW family includes the LabVIEW DSC Module, designed specifically for monitoring large numbers of I/O points, communicating with industrial controllers and networks, and providing PC-based control.

### Machine Monitoring and Control

LabVIEW is ideal for machine monitoring and predictive maintenance applications that need deterministic control, vibration analysis, vision and image processing, and motion control. With the LabVIEW platform of products, including the LabVIEW Real-Time Module for real-time deterministic control and the LabVIEW DSC Module, you can create powerful machine monitoring and control applications quickly and accurately.

### Research and Analysis

The built-in LabVIEW measurement analysis library provides everything you need in an analysis package. Scientists and researchers use LabVIEW to analyze and compute real results for research applications in the biomedical, aerospace, and energy industries, among others. Some of the available functions for signal generation and processing, digital filtering, windowing, curve fitting, and limit mask testing are listed on page 50. For specialized analysis, such as joint time-frequency analysis, wavelets, and model-based spectral analysis, LabVIEW offers the specially designed Signal Processing Toolset.

### Control Design

The product development cycle from design to production can be reduced using LabVIEW. By integrating LabVIEW closely with top design software and hardware, it is easier to take real-world measurements throughout all phases of the design process. In creating a new product, iteration on models, prototypes, and tests is necessary before arriving at a finished design. Reducing time spent in this iterative process results in shorter time to market. With the integration of LabVIEW tests into the modeling and prototyping stages of development, real-world data can be compared to theoretical models earlier and more easily, resulting in fewer design iterations to achieve the final product.

### Academic

Just as LabVIEW revolutionizes industry, it also dramatically affects traditional academic research and teaching. A LabVIEW-based laboratory makes researchers more productive and improves the way students learn. Rather than focusing on sometimes-tedious methods of gathering data, educators and students can focus on results and concepts. Students still learn methodology, but spend the majority of their time executing their experiments instead of building them.

***See page 30 for more information.***





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# LabVIEW Graphical Development Environment

## Draw Your Solution with LabVIEW

LabVIEW is at heart a programming language with all the features and functionality of a traditional, text-based language, but with intuitive, graphical development and high-level tools to make development fast for measurement applications.

The basic building block of a LabVIEW application is a virtual instrument (VI), which consists of a front panel and block diagram.

### Dataflow Programming

NI LabVIEW uses a patented dataflow programming model that frees you from the linear architecture of text-based programming languages. Because the execution order in LabVIEW is determined by the flow of data between nodes and not by sequential lines of text, you can easily create block diagrams that execute multiple operations in parallel.

### Modularity

LabVIEW VIs are modular in design, so any VI can run by itself or as part of another VI.

### Compiled Execution

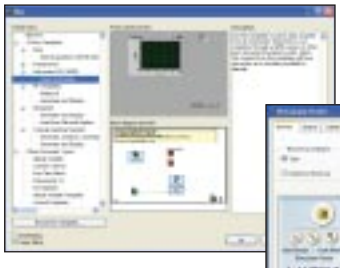
In many applications, execution speed is critical. LabVIEW is the only graphical programming system with a compiler that generates optimized code with execution speeds comparable to compiled C programs. You even can use the LabVIEW profiler to analyze and optimize time-critical operations. LabVIEW increases your productivity without sacrificing execution speed.

## 1. Get Started

Select from more than 500 example programs, 19 VI templates, and six design patterns.

**Getting Started Resources**

- 19 VI templates
- 6 design patterns
- 500+ Web-linked Example Finder
- LabVIEW Zone: ***ni.com/labviewzone***



**Template Browser –** *Choose from VI templates and design patterns.*



**Example Finder –** *Search 500+ VI examples included in LabVIEW and thousands more on the Web.*

## 2. Create a User Interface

Drop engineering-specific controls and data indicators from the Controls palette onto the front panel.

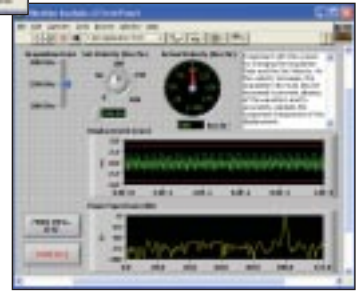
**Front Panel Resources**

- Property pages for object configuration
- Buttons/switches/LEDs
- Slides/digital displays
- Gauges/dials/knobs
- Tanks/thermometers
- Graphs/charts (analog and digital)
- Tables/arrays
- Menus/lists/rings
- Decorations
- .NET and ActiveX controls+
- Tab controls
- Subpanels
- Tree controls
- 3D surface, line, and contour plots*
- Intensity plots

*Included in the Full and Professional Development Systems.
+Windows only



**Controls Palette.** *Choose engineering-specific UI objects to place on front panel.*



**Front Panel.** *The user interface of your VI.*



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# LabVIEW Graphical Development Environment



## 3. Draw Graphical Code

Define functionality by placing VIs onto the block diagram and wiring them together.

**Block Diagram Resources**
- Interactive Express VIs
- Custom probes/conditional breakpoints
- Intelligent error checking
- Step into/over/out debugging
- Execution highlighting mode
- DAQ Assistant
- Instrument I/O Assistant
- .NET assembly execution
- Wire clean-up
- Wire auto-routing
- Static/dynamic/user-defined events
- Feedback node

**Programming Fundamentals**
- Numeric computations
- Boolean logic
- Array/string manipulation
  Time and date functions
- Multi-data type structures
  Custom subroutines
- Event-driven development

**Math**
- Text-based formula nodes**
- Ordinary differential equations**
- Optimization methods**
- Root solving**
- Linear algebra
- Probability and statistics
- Gamma/Bessel/Jacobi/Beta, etc.**

**Programming Structures**
- While Loops/For Loops
- Case structures
- Sequence structures
- Event structures

**Optimization and Applications Management**
- True compiled performance on all platforms
- Profiling of memory usage/execution speed***
- Multithreading
- Source code control/complexity metrics***
- Hierarchy window
- Full printed and online documentation set
- Advanced report generation**

**Debugging Tools**
- Supplied and custom probes
- Conditional breakpoints
- Single-stepping modes
- Error feedback
- Execution highlighting
- Graphical differencing tools***

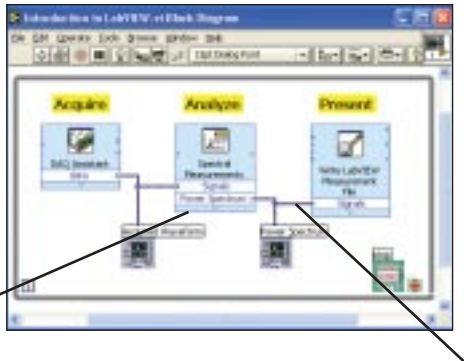
*Included in the LabVIEW Vision Development Module.
**Included in the Full and Professional Development Systems.
***Included in the Professional Development System.



**Functions Palette** – *Choose measurement VIs and functions to create your graphical code.*

**Context Help Window** – *Immediate assistance on every object in LabVIEW.*



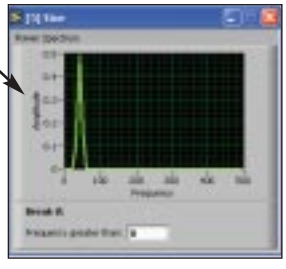



**Block Diagram** – *The home for your graphical code.*



**Express VI Configuration Dialog Box** – *Rapidly configure measurement tasks with no programming.*

**Probes** – *Probes, debugging tools, and highlight execution ensure easy debugging of VIs.*







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# Acquire with LabVIEW




*The DAQ Assistant enables you to define complex and simple data acquisition tasks with no programming.*

LabVIEW is designed to make interfacing with real-world signals as powerful and productive as possible. With interactive assistants, code generation, and connectivity to thousands of devices, LabVIEW provides the most comprehensive instrumentation software in the industry with the most intuitive development interface. Following are several examples of signal acquisition possible with LabVIEW.

## Data Acquisition

With LabVIEW, you can get up and running quickly to acquire and generate signals from plug-in boards, USB devices, and Ethernet-based systems. The data acquisition functionality includes:

- Interactive, configuration-based data acquisition development with the DAQ Assistant
- High-performance, modular DAQmx programming interface with automatic LabVIEW code generation
- Built-in channel configuration for scaling raw data
- High-speed waveform acquisition and generation (single-shot and continuous)
- Accurate and fast single-point analog and digital I/O
- High-speed digital pattern generation and acquisition
- Counter/timer I/O for pulse generation, event counting, and duration measurements

These I/O capabilities, combined with special data types and measurement analysis VIs, are specifically designed to get the data or measurement you need from your physical sensors as quickly and easily as possible.

***See page 180 for more information on data acquisition.***

## Motion Control

National Instruments offers a complete selection of motion control software, motion controllers, and power drives that quickly and seamlessly integrate into your automated test and machine motor control applications.

***See page 626 for more information on motion control.***

## Instrument Control

LabVIEW simplifies the task of connecting to and communicating with a wide variety of instruments. With LabVIEW, you can quickly acquire data from GPIB, serial, Ethernet, PXI, USB, and VXI instruments using the built-in instrument I/O libraries or existing LabVIEW instrument drivers.

- Easily integrate GPIB, serial, PXI , Ethernet, USB, and VXI instruments into your test application
- Communicate with more than 1,400 instruments from more than 150 vendors with LabVIEW instrument drivers. See page 81 for a list of available drivers.
- Increase performance and portability with industry-standard, device-driver software
- Use the Instrument I/O Assistant to interactively create instrument control applications and automatically generate LabVIEW code

***See page 650 for more information on instrument control.***



*Use the Instrument I/O Assistant to interactively create your instrument control routines – LabVIEW auto-generates the communication and string parsing code for you.*

## Image Acquisition and Machine Vision

National Instruments also offers a complete line of image acquisition and machine vision tools for integration into your total measurement solution.

***See page 588 for more information on image acquisition and machine vision.***

## Distributed Monitoring and Control

NI Compact FieldPoint is a modular, distributed I/O system with industrial-grade performance and unmatched software integration designed for distributed applications in field or industrial environments. With Compact FieldPoint I/O, you can easily configure, build, and maintain reliable, distributed I/O solutions.

***See page 508 for more information on distributed monitoring and control.***

## And More

LabVIEW is a multiplatform, open environment that can connect to your distributed monitoring, real-time, desktop, and custom instrumentation systems with ease.





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# Analyze with LabVIEW

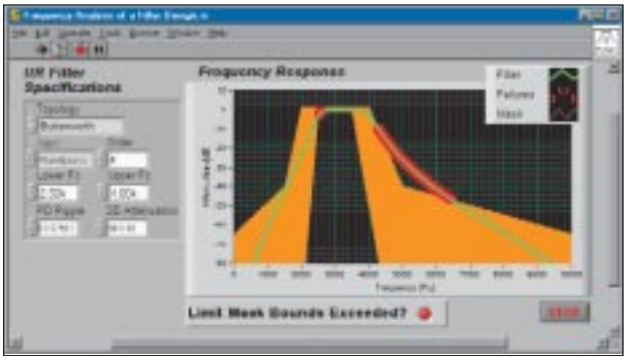


## Built-In Measurement Analysis and Digital Signal Processing

With National Instruments LabVIEW, you have the built-in digital signal processing, analysis, and visualization capabilities you need for your measurement applications.

High-level measurement analysis tools simplify development of applications that require common measurement analysis routines such as spectral analysis, filtering, and statistics. At the same time, you have the flexibility to construct custom analysis algorithms using lower-level tools such as linear algebra, FFT, and curve fitting.

The following describes a few highlights of the measurement analysis capabilities of LabVIEW. Visit ***ni.com/analysis*** for a complete list and more details; a partial listing appears on page 50.




*This graph shows the frequency response of a bandpass IIR filter designed with NI LabVIEW. Limit mask testing checks the design that the controls on the left side of the front panel specify.*

## Measurements and Mathematics

NI LabVIEW includes a variety of other measurement analysis tools. Examples include curve fitting, signal generation, peak detection, and probability and statistics. Measurement analysis functions can determine signal characteristics such as DC/RMS levels, total harmonic distortion (THD/SINAD), impulse response, frequency response, and cross-power spectrum. Using LabVIEW, you can also employ numerical tools for solving differential equations, optimization, root finding, and other mathematical problems.

Additionally, you can integrate the following mathematics applications into your LabVIEW VIs:

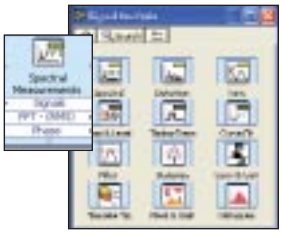
- Wolfram Research Mathematica
- MathSoft Mathcad
- The MathWorks MATLAB

### Complex Measurements Made Easy

Despite the complexity of the underlying algorithms that implement these functions, you will find LabVIEW analysis tools easy to use. For example, a set of built-in measurement functions uses the waveform data type to accept real-world, time-domain signal inputs directly from DAQ hardware and reports results ready for charting, graphing, or additional stages of signal processing. More than 10 Express VIs further reduce the complexity of implementing measurement analysis in your application through interactive configuration dialogs in which you can preview analysis results immediately.

## Measurement Analysis in LabVIEW with Express VIs

### Select an analysis Express VI



Select from more than 400 measurement analysis functions ranging from spectral analysis to statistics to histograms to filtering, and more.

### Configure your analysis function



Interactively configure analysis functions, advanced algorithms, and display parameters using configuration dialogs. See the effects of your analysis immediately with preview panes.

### Integrate analysis into your application



Easily wire in acquired data to your configured analysis VI. Wire out to additional analysis functions, graphs, spreadsheet files, and so on.

For additional signal processing and analysis functionality, see these other National Instruments toolkits:


| LabVIEW Add-Ons for Analysis | Page |
|---|---|
| Signal Processing Toolset | 69 |
| Sound and Vibration Toolkit | 71 |
| Order Analysis Toolkit | 73 |
| Spectral Measurements Toolkit | 74 |
| Digital Waveform Editor | 75 |
| NI DIAdem | 113 |






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# Analyze with LabVIEW

## LabVIEW Data Analysis and Math Libraries

The analysis tools available for LabVIEW are listed below. For additional information on LabVIEW add-on tools for analysis, please visit ***ni.com/analysis.***

### Measurement

**Waveform-Based****

- Averaged DC-rms
- Cycle average and rms
- Pulse transition (rise, slew, overshoot)
- Pulse width/period/duty
- Pulse amplitude and levels
- Signal noise and distortion (SINAD) analyzer
- Harmonic distortion analyzer
- Cross spectra
- Sine tone measurement
- FFT spectrum
- Frequency response function
- Power spectrum
- Power spectral density

**Array-Based**

- AC and DC Estimator
- Amp and frequency estimate
- Amp and phase spectrum
- Auto power spectrum
- Cross power spectrum
- Harmonic analyzer
- Impulse response
- Network functions (avg)
- Power and frequency estimate
- Power spectrum
- Scaled time-domain window
- Spectrum unit conversion
- Transfer function

### Signal Monitoring/ Triggering

**Waveform-Based****

- Basic level trigger detection
- Limit testing
- Limit specification
- Limit specification by function
- Waveform peak detection

**Array-Based**

- Peak detection
- Pulse parameters
- Threshold peak detector

### Signal Generation

**Waveform-Based****

- Basic multitone
- Basic multitone with amplitudes
- Function generator
- Formula waveform
- Triangle waveform
- Square waveform
- Sawtooth waveform
- Multitone generator
- Inverse f noise
- Gamma noise
- Poisson noise
- Binomial noise
- Bernoulli noise
- Uniform white noise
- Gaussian white noise
- MLS sequence

**Array-Based**

- Arbitrary wave
- Chirp pattern
- Impulse pattern
- Periodic random noise
- Gamma noise
- Poisson noise
- Binomial noise
- Bernoulli noise
- Pulse pattern
- Ramp pattern
- Sawtooth wave
- Sinc pattern
- Sine pattern
- Sine wave
- Square wave
- Triangle wave
- Uniform white noise
- Gaussian white noise
- Binary MLS

### Windowing

**Waveform/Array-Based**

- Blackman
- Blackman-Harris
- Cosine tapered
- Exact Blackman
- Exponential
- Flat top
- Force
- General cosine
- Hamming
- Hanning
- Kaiser-Bessel
- Triangle

### Digital Filters

**Waveform-Based****

- FIR/IIR

**Array-Based**

- Bessel
- Butterworth
- Cascade
- Chebyshev
- Elliptic
- Equiripple
- FIR/IIR
- Inverse Chebyshev
- Inverse f
- Inverse f filter coefficients
- Median
- Parks-McClellan

### Statistics

- 1D, 2D, and 3D ANOVA
- Chi square distribution
- Contingency table
- erf(x) and erfc(x)
- F distribution
- T distribution
- General histogram
- Histogram*
- Inverse chi square Distribution
- Inverse F distribution
- Inverse normal distribution
- Inverse T distribution
- Mean*
- Median*
- Mode*
- Moment about mean
- Mean squared error (MSE)
- Normal distribution
- Polynomial interpolation
- Rational interpolation
- Root mean square (rms)
- Spline interpolant/interpolation
- Standard deviation*
- Variance

### Signal Processing

**Autocorrelation**

- Convolution
- Cross power
- Cross correlation
- Decimate
- Deconvolution
- Derivative x(t)
- Fast Hilbert transform
- Fast Hartley transform
- Integral x(t)
- FFT/Inverse FFT (Re + Im)
- Inverse fast Hilbert transform
- Unwrap phase
- Y[i]=Clip{X[i]}
- Y[i]=X[i-n]

### Curve Fitting

- Exponential fit
- General least squares linear fit
- General polynomial fit
- Linear fit
- Nonlinear Lev-Mar fit
- 1D and 2D linear evaluation*
- 1D and 2D polynomial evaluation*
- Numeric integration
- Polar to rect/rect to polar
- Scale 1D/2D
- Find polynomial roots

**Linear Algebra**

- Real/Complex A X B*
- Real/Complex A X vector*
- Determinant*
- Dot product*
- Inverse matrix*
- Linear equations
- Normalize matrix/vector
- Outer product*
- Trace
- Unit vector
- LU factorization
- Cholesky factorization
- QR factorization
- SVD factorization
- Eigenvectors/eigenvalues
- Matrix condition number
- Matrix norm and rank
- Pseudoinverse matrix
- Complex factorization
- Complex inverse matrix
- Complex linear equations
- Complex eigenvectors/values
- Complex determinant
- Complex matrix condition number
- Complex matrix norm and rank
- Complex pseudoinverse matrix
- Complex dot product
- Complex outer product
- Complex vector norm
- Generate special matrix
- Test positive definite matrix

### Mathematics/Numerical Methods

- Ordinary differential equations
- Optimization
- Root solving
- 36 HiQ functions added to
  - Special and Numeric
  - Functions Palette

### Digital Waveform Analysis

- Digital signal subset
- Invert digital signal
- Uncompress digital signal
- Compress digital signal
- Digital signal size
- Search for digital pattern
- Compare digital signals
- Append digital signals
- Append digital samples
- Digital waveform to Boolean array
- Boolean array to digital waveform

### Waveform Conditioning

- Align waveforms
- Resample waveforms

**Denotes VIs that are shipped with the Base package of LabVIEW for Windows 2000/NT/XP.*

***Waveform VIs input a time-domain signal and output a scaled measurement.*



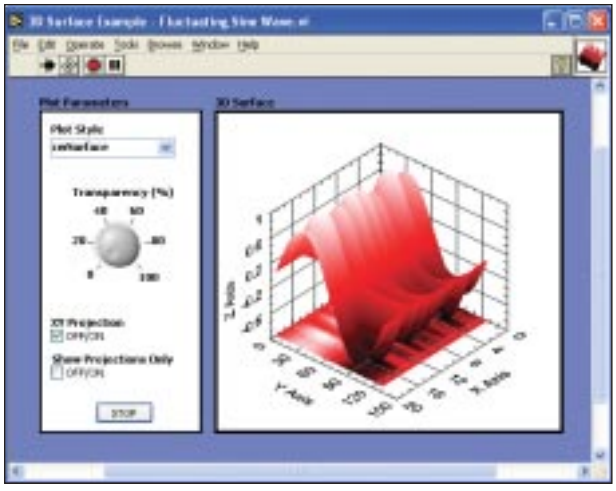


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# Present with LabVIEW



Presentation of your data encompasses visualization, report generation, data management, and connectivity. LabVIEW supplies a wide array of tools to make your data presentation powerful and simple to create.



*The data visualization and presentation tools in LabVIEW give you the ability to present your data through reports, graphs, and even Web publishing.*

## Visualize Your Data

LabVIEW includes a wide array of visualization tools to present data on the user interface of your application. These include tools for charting and graphing, as well as built-in 2D and 3D visualization tools. You can instantly reconfigure attributes of your data presentation, such as colors, font size, graph types, and more, as well as dynamically rotate, zoom, and pan these graphs with the mouse.

## Publishing Information to the Web

LabVIEW also includes the ability to publish any application you have developed in LabVIEW to the Web with Remote Panels. Instead of creating an HTML report by hand, you can simply make your application accessible as a Web page. This option requires no programming and has the added benefit of giving you direct access to view and control your application across the Web. Your customers and colleagues can use their Web browser (Netscape Navigator and Internet Explorer are recommended) to open a link to you application to control it or view generated data as it runs.

## Generate Professional Reports Quickly

LabVIEW delivers the ability to instantly create text and HTML reports with little or no programming. With the report-generation tools included in LabVIEW, you can build your own reports in HTML format. These VIs can take the data from your application and format it into an HTML report so you can publish your results on the Web, creating an easy addition to any LabVIEW application.

## Report Generation with Microsoft Office Tools

You create applications that acquire data, perform online analysis, and present the results on your user interface as the application runs. However, you may want to share the results of your application with colleagues or just store these results in a file format that can be easily shared, such as Microsoft Word or Excel. For this purpose, National Instruments offers the LabVIEW Report Generation Toolkit for Microsoft Office as a library of flexible, easy-to-use VIs for programmatically creating and editing Microsoft Word and Excel reports from LabVIEW. Whether you need to generate reports summarizing test results or compile other statistics to track processes, the LabVIEW Report Generation Toolkit speeds up development of custom, professional reports.

***See page 66 for more information.***

## Interactively Manage Data

If you acquire large amounts of data, you may want to interactively analyze that data after the system has executed, creating a report to share data and information. If you find yourself storing megabytes of data to your hard disk, either in a standard file or a database, you should consider an offline data management and analysis tool. National Instruments DIAdem, a configuration-based software package, performs post-acquisition, interactive data management, analysis, and report generation. With DIAdem, you efficiently extract information from acquired data after the acquisition has taken place. DIAdem integrates tightly with LabVIEW, so you can easily pass data from your LabVIEW application to DIAdem, and control DIAdem execution from within the LabVIEW environment.

***See page 113 for more information.***




*Publish VIs to the Web with Remote Panels for viewing and remote control with no additional programming. Use simple menu selections to publish custom Web pages from your desktop.*





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# Which LabVIEW Development System is Right for You?

## Development System Options

National Instruments offers a number of LabVIEW development systems and programming tools to help you build professional applications. Choose from three development system options (Base, Full, Professional). Additionally, if you are in need of functionality supplied by other NI software, such as TestStand, LabVIEW Real-Time Module, or add-on toolkits, consider the popular NI Developer Suite software bundles, which combine LabVIEW development systems with other NI software for the best value.

Use the following questions to help guide your selection of a development system.

**Do you want to perform data acquisition, instrument control, image acquisition, motion control, distributed monitoring, etc.?**
All LabVIEW development systems (Base, Full, Professional) provide this functionality. Also, consider the NI Motion Assistant and the Vision Development Module add-on software packages, on pages 63 and 62.

**Do you want to perform measurement analysis or signal processing?**
Consider the LabVIEW Full or Professional Development Systems, which include measurement analysis and signal processing functionality.

**Do you want to deploy stand-alone executables?**
Consider adding the LabVIEW Application Builder to a Base Package or Full Development System. Additionally, the LabVIEW Application Builder is included with the Professional Development System. See page 55 for more information on the Application Builder.

**Do you want to design powerful user interfaces with event-driven programming?**
Consider the LabVIEW Full and Professional Development Systems, which include sophisticated user interface design tools such as the Event structure, subpanels, and more.

**Do you want project management tools such as source code control, graphical differencing and deployable stand-alone executables?**
Consider the LabVIEW Professional Development System, designed for large project design and management.

## LabVIEW Professional Development System

Designed for the professional LabVIEW developer, the LabVIEW Professional Development System includes all the functionality of the Full Development System, with additional tools for large project management and application deployment. LabVIEW Application Builder is included with the system for the creation of stand-alone executables and shared libraries (DLLs). Source code control, complexity measurement tools, and graphical differencing are included for debugging, quality control, and optimization. Also included are five remote connection licenses for viewing and remote control over the Web.



### Summary of Features:

- All features in Full Development System
- LabVIEW Application Builder
- Complexity metrics
- Source code control integration with VSS and Perforce
- Graphical differencing
- Five Remote Panel licenses

## LabVIEW Full Development System

The LabVIEW Full Development System is the solution for systems needing I/O, measurement analysis, and reporting functionality. It contains all of the functionality of the Base Package and adds all of the tools you need to develop instrumentation systems, such as measurement analysis, event-driven programming, and advanced user interface design tools.

### Summary of Features:

- All features in Base Package
- Signal processing/measurement analysis function libraries
- Event-driven programming tools with dynamic and user defined events
- Advanced user interface design tools: native tree control, subpanel, 3D graphics



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# LabVIEW Development Systems

## LabVIEW Base Package*

Use the LabVIEW Base Package, the minimum LabVIEW configuration, for developing basic data acquisition, instrument control, and data presentation applications. It includes GPIB, VISA, VXI, RS-232, data acquisition, and instrument driver libraries for data acquisition and instrument control.

### Summary of Features:

- Engineering-specific user interface design tools
- Fundamental programming structures/data types
- Instrument control (including Instrument I/O Assistant)*
- Data acquisition (including DAQ Assistant)*
- Configuration-based Express VIs
- Property pages for front panel objects
- Automatic wire routing and wire cleanup
- Multithreading
- Probes, conditional breakpoints
- Web publishing tools
- File I/O and simple report generation
- .NET*, ActiveX*, TCP/IP, UDP, XML support

*Available only on Windows platforms.

## Debug License for LabVIEW

If you deploy LabVIEW applications, including LabVIEW tests for use with TestStand, consider the LabVIEW debug license. With it, you can install the LabVIEW development system on the target machines so you can step into your test code for complete test debugging. This license cannot be used for program development.



## NI Developer Suite

NI Developer Suite is the complete, comprehensive LabVIEW package and subscription program that bundles the Professional Development System and a wide range of add-on LabVIEW toolsets. You will receive quarterly updates of our software for a year, keeping you current with the latest powerful, industry-standard software.

***See page 39 for more information on NI Developer Suite.***

| | LabVIEW Professional Development System | LabVIEW Full Development System | LabVIEW Base Package |
|---|---|---|---|
| Engingeering-specific controls and indicators | ✓ | ✓ | ✓ |
| Programming structures and fundamentals | ✓ | ✓ | ✓ |
| Instrument control (including Instrument I/O Assistant*) | ✓ | ✓ | ✓ |
| Data acquisition (including DAQ Assistant* and code generation) | ✓ | ✓ | ✓ |
| Image acquisition and motor control | ✓ | ✓ | ✓ |
| Configuration-based Express VIs | ✓ | ✓ | ✓ |
| Property pages for front panel objects | ✓ | ✓ | ✓ |
| Automatic wire routing and wire cleanup | ✓ | ✓ | ✓ |
| Multithreading | ✓ | ✓ | ✓ |
| Translation tools | ✓ | ✓ | ✓ |
| Large project documentation tools | ✓ | ✓ | ✓ |
| Supplied and custom probes; breakpoints, including conditional breakpoints | ✓ | ✓ | ✓ |
| Web publishing tools | ✓ | ✓ | ✓ |
| File I/O and simple report generation | ✓ | ✓ | ✓ |
| NET*, ActiveX*, TCP/IP, UDP, XML support | ✓ | ✓ | ✓ |
| Signal processing/measurement analysis** | ✓ | ✓ | |
| Event-driven programming tools with dynamic and user-defined events | ✓ | ✓ | |
| Call MATLAB scripts* | ✓ | ✓ | |
| Advanced user interface design tools: native tree control, subpanel, 3D graphs | ✓ | ✓ | |
| Complexity metrics | ✓ | | |
| Source code control integration with Microsoft Visual Source Safe and Perforce | ✓ | | |
| LabVIEW Application Builder | ✓ | | |

*Available only on Windows platforms. **Go to ***ni.com/analysis*** for a complete list of functions.





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# LabVIEW Development Systems

## System Requirements[1]

You can use National Instruments LabVIEW with the operating system of your choice without sacrificing portability or reusability because LabVIEW applications are transferable across platforms. You can share LabVIEW VIs on any of the platforms listed below.

| | Minimum | Recommended |
|---|---|---|
| **Windows** | | |
| OS | 2000/NT/XP/Me/98, (NT 4.0 SP 6 or later) | 2000/NT/XP/Me/98, (NT 4.0 SP 6 or later) |
| Processor | Pentium III, Celeron 600 MHz, or equivalent | Pentium 4 or equivalent |
| Memory | 128 MB | 256 MB |
| Disk space | 130 MB | 550 MB |
| **Mac OS X*** | | |
| OS | Mac OS X (version 10.2) | Mac OS X (version 10.2) |
| Processor | G3 | G4 |
| Memory | 128 MB | 256 MB |
| Disk space | 280 MB | 350 MB |
| **Linux** | | |
| OS | Any Linux distribution with GNU C Library Version 2.1.3 or later, including RedHat Linux 7.0, SuSE Linux 7.1, Debian Linux 3.0, or later | |
| Processor | Pentium III, Celeron 600 MHz or equivalent | Pentium 4 or equivalent |
| Memory | 64 MB | 256 MB |
| Disk space | 200 MB | 300 MB |
| Additional | XWindows System server | |
| **Solaris** | | |
| OS | Solaris 2.5.1 or later | Solaris 2.5.1 or later |
| Processor | SPARC processor (Sun SPARCstations), 500 MHz | 650 MHz or greater |
| Memory | 64 MB | 256 MB |
| Disk space | 200 MB | 300 MB |
| Additional | XWindows System server | |

## Localized Versions – Japanese, French, German, and Korean

Localized versions of LabVIEW give engineers and scientists from around the world a more natural development environment for creating applications in their native language. National Instruments offers versions of LabVIEW specifically designed for Japanese, French, German, and Korean speakers.

The LabVIEW Japanese, French, and German versions feature translated documentation and software and work with Windows 2000/NT/XP. The LabVIEW Korean version features translated documentation. In addition, the LabVIEW 7 Real-Time Module is available in Japanese. All LabVIEW development systems have built-in tools to help simplify the process of translating applications from one language to another. National Instruments remains committed to the continued success of LabVIEW programmers worldwide.

For a FREE evaluation version or ordering information, please contact your local National Instruments office or visit ***ni.com/labview***

[1]Visit ***ni.com/labview*** for complete system requirements for LabVIEW, including Mac OS 8.5-9.x.



## Ordering Information

NI LabVIEW for Windows 2000/NT/XP
- Full Development System .....776670-03
- Full Development System w/SSP .....776670-09
- Professional Development System .....776678-03
- Professional Development System w/SSP .....776678-09
- Base package.....776671-03
- Debug license .....900866-01

NI LabVIEW for Mac OS X
- Professional Development System .....776698-03
- Full Development System.....776690-03

NI LabVIEW for Linux
- Full Development System.....777756-03
- Professional Development System .....778249-03

NI LabVIEW for Solaris
- Full Development System.....776680-031
- Professional Development System .....776688-03

NI Developer Suite for Windows 2000/NT/XP
- Standard Edition.....777901-03
- Professional Edition.....777902-03
- Standard Test Edition .....777903-03
- Professional Test Edition .....777904-03
- Standard Control Edition.....777905-03
- Professional Control Edition.....777906-03

See page 39 for information on Developer Suite editions.

LabVIEW Software Subscription Program (SSP)
- Windows 2000/NT/XP .....930000-02
- Mac OS X*.....930000-02
- Linux.....930000-02
- Solaris .....930000-03

*Visit ***ni.com/mac*** for the latest Mac OS information.

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## Ordering Information

### NI LabVIEW for Windows 2000/NT/XP

**Development Systems**

Full Development System ....776670-03
Full Development System w/ Support ....776670-09
Professional Development System ....776678-03
Professional Development System w/ Support ....776678-09
Base Package ....776671-03
Application Builder ....776675-01
Debug License ....900866-01

**Modules**

LabVIEW Datalogging and Supervisory Control Module ....778311-03
LabVIEW Real-Time Module ....777844-03
LabVIEW PDA Module for
Palm OS ....778595-03
Pocket PC OS ....778596-03
LabVIEW FPGA Module ....778694-03
LabVIEW Vision Development Module ....777859-03

**Add-On Toolkits**

Enterprise Connectivity Toolkit ....777871-03
Report Generation Toolset for Microsoft Office ....778406-03
Express VI Development Toolkit ....778594-03
State Diagram Editor Toolkit ....778741-03
Signal Processing Toolkit ....777136-01
Sound and Vibration Toolkit ....777970-03
Order Analysis Toolset ....778392-03
PID Control Toolkit ....777874-03
Simulation Interface Toolkit ....778552-03
DSP Test Integration Toolkit for TI DSP ....778648-03
Database Connectivity Toolkit ....776975-01
Internet Developers Toolkit ....777343-01
SPC Toolkit ....776954-01
IVI Driver Toolset ....777855-03
Spectral Measurements Toolkit ....778453-03
Digital Waveform Editor ....778724-03

### NI LabVIEW for Mac OS X*

**Development Systems**

Full Development System ....776690-03
Professional Development System ....776698-03

**Modules**

LabVIEW Real-Time Module ....777842-03

**Add-On Toolkits**

Application Builder ....776695-01
Express VI Development Toolkit ....778594-03
Enterprise Connectivity Toolkit ....777871-23
Internet Developers Toolkit ....777343-01
SPC Toolkit ....776954-01
PID Control Toolkit ....777874-23
State Diagram Toolkit ....778741-03

### NI LabVIEW for Linux

**Development Systems**

Full Development System ....777756-03
Professional Development System ....778249-03

**Add-On Toolkits**

Application Builder ....777755-03
Express VI Development Toolkit ....778594-03
Internet Developers Toolkit ....777343-01
SPC Toolkit ....776954-01

### NI LabVIEW for Solaris

**Development Systems**

Full Development System ....776680-031
Professional Development System ....776688-03

**Add-On Toolkits**

Application Builder ....776685-01
Express VI Development Toolkit ....778594-03
Internet Developers Toolkit ....777343-01
SPC Toolkit ....776954-01

### NI LabVIEW Service and Support

**Software Subscription Program (SSP)**

Windows 2000/NT/XP ....930000-02
Mac OS X* ....930000-02
Linux ....930000-02
Solaris ....930000-03

### Training

Basics I Training Course ....910013-xx†
Basics II Training Course ....910017-xx†
Advanced Performance and Communication Course ....910514-xx†
Advanced Application Development ....910607-xx†
Data Acquisition and Signal Conditioning ....910010-xx†

NI Developer Suite offers many of these products bundled with other NI software tailored for test or control applications. See page 39 for more information.

Part numbers listed denote single-user licenses. For multi-user licenses, contact National Instruments.

†Please refer to the Training Services section on page 758 to complete the part number.
*Visit ni.com/mac for the latest Mac OS information.

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*Visit ni.com/info and enter labview.*





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