Software for Test, Measurement, and Control

- Faster development with interactive configuration and graphical programming
- Tighter integration of real-world I/O, measurement analysis, and data presentation
- Highly flexible engineering tool from desktop to handheld and embedded devices
Industry-Leading Graphical Development Environment

“LabVIEW 7 Express shortens the development time of the data analysis procedures... by a factor of three with respect to other software packages. Its multi-platform availability is a real plus in our environment, where we have a mix of Solaris, Windows, and Macintosh.”

— Adriaan Rijllart

CEMV

National Instruments LabVIEW is an industry-leading software tool for designing test, measurement, and control systems. Since its introduction in 1986, engineers and scientists worldwide have relied on LabVIEW graphical development for projects throughout the product design cycle, gaining improved quality, faster time to market, and greater engineering and manufacturing efficiency. By using the integrated LabVIEW environment to interface with real-world signals, analyze data by meaningful information, and share results and applications, you can boost productivity throughout your organization.

Because LabVIEW has the flexibility of a programming language combined with built-in tools designed specifically for test, measurement, and control, you can create applications that range from simple temperature monitoring to sophisticated simulation and control systems. No matter your project, LabVIEW has the tools necessary to make you successful quickly.

Integrated I/O for Test

With LabVIEW, engineers in validation can quickly create, execute, and modify tests. LabVIEW analysis capabilities give you measurements not typically available with traditional solutions, and interactive, configuration-based tools streamline your connection to stand-alone instruments, PXI and PCI instruments, and data acquisition hardware.

Rapid Prototyping for Design

New product design requires constant iteration on models, prototypes, and tests. LabVIEW makes it easy to connect to I/O and integrate with leading math and design software so you can compare real-world data to theoretical models earlier. The result is faster design iterations, reduced design time, and shorter time to market.

Research/Modeling

Design/Simulation

Verification/Validation

Manufacturing

Interactive Analysis for Research

Researchers and scientists need adaptable software to control instruments and collect, analyze, and share data. Configuration-based development in LabVIEW eliminates the need to program, yet provides capabilities similar to any traditional text-based programming language. In research applications, LabVIEW reduces development time and increases accuracy for acquiring data, analyzing it, and creating reports.

High Performance for Manufacturing

For manufacturing test, engineers can quickly build automated test sequences with LabVIEW instrument connectivity and analysis features. In process control and industrial automation, LabVIEW gives you large numbers of I/O points, communication with networks, and control. Additionally, LabVIEW provides deterministic control and vibration analysis for machine monitoring and control applications.

Common Tools and Efficient Reuse from Design to Production

Integrated I/O for Test

Interactive Analysis for Research

Rapid Prototyping for Design

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“Companies in the highly competitive printer market rely on high-volume production and short time-to-market cycles... By upgrading to the NI 5122, NI 6552, and LabVIEW 7 Express, we improved the quality of our products while increasing our test performance with minimal development expense.”

— Ed Coleman

Lexmark International

National Instruments Tel: (512) 683-0100 • Fax: (512) 683-9300 • info@ni.com • ni.com/labview

“LabVIEW 7 FPGA Module... we exceeded our specifications and saved 90 percent of the cost.”

— Matthew Viele

Woodward Governor

“The versatility of LabVIEW graphical development combined with the new PXI-5421 Arbitrary Waveform Generator allows us to adapt to our customers’ constantly changing demands while saving over 1 million dollars in estimated design and ongoing support costs.”

— John Meade

Telebryn International

“Companies in the highly competitive printer market rely on high-volume production and short time-to-market cycles... By upgrading to the NI 5122, NI 6552, and LabVIEW 7 Express, we improved the quality of our products while increasing our test performance with minimal development expense.”

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The LabVIEW Environment

NI LabVIEW is the graphical development environment designed specifically for engineers and scientists who need to create flexible and scalable test, measurement, and control applications rapidly and at minimal cost. LabVIEW is a fully functional graphical programming language with the flexibility of a traditional, text-based language. With interactive Express VIs and a graphical user interface, you can focus on solving the measurement or control problem at hand rather than the programming necessary to implement it.

Virtual Instruments
The basic building block of a LabVIEW application is a virtual instrument (VI), which consists of a front panel, where you design a user interface, and a block diagram, where you create graphical code.

Modularity and Hierarchy
LabVIEW VIs are modular in design, so you can reuse any VI by itself or as a subVI. As a result, your LabVIEW programs can easily scale from simple data logging applications to highly sophisticated control systems depending on your needs.

Dataflow Programming
NI LabVIEW uses a patented dataflow programming model that frees you from the sequential architectures of text-based programming languages. The graphical code is highly intuitive for engineers and scientists familiar with block diagrams and flowcharts. 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. Additionally, the parallel nature of LabVIEW makes multitasking and multithreading simple to implement. You can easily assign thread priorities from a menu selection with no programming.

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

Open Environment
LabVIEW is an open environment that provides easy connectivity to third-party software. Connect to your existing applications through LabVIEW with .NET assemblies, ActiveX, DLLs, and a wide array of networking protocols. You also can create stand-alone executables and shared libraries in LabVIEW to call from other software environments.

Getting Started
Don’t start from scratch. Select from 19 VI templates, six sophisticated VI architectures, more than 900 included example programs, and thousands of example programs on the Web to start your application.

Creating Your Application
Use interactive LabVIEW development tools to start developing immediately and finish projects faster.

Debugging Your Application
Verify that your program is robust and accurate with built-in debugging tools.

The LabVIEW Environment

Front Panel – The user interface of your virtual instrument.

Block Diagram – The graphical code that defines the behavior of your virtual instrument.

Functions Palette – Define functionality by dragging VIs, constants, and programming structures onto the block diagram and wiring them together.

Controls Palette – Drag and drop engineering-specific controls and indicators onto the front panel to quickly create a fully-customized user interface.

Template Browser – Choose from VI templates and architectures.

Example Finder – Search more than 500 VI examples included with LabVIEW and thousands more on the Web.

Express VIs – Point and click to configure measurement tasks with minimal programming.

Probes – Use built-in probes to design custom probes to easily debug your data.

Assistant and Code Generation – Use the interactive VGA Assistant to generate a virtual instrument interface, and automatically generate code from it for reuse and modification.

Highlight Execution and Step Into/Out of/Over – Use Highlight execution to visualize the flow of data through your VI and enable debugging features.
Acquiring Data with LabVIEW

Most measurement applications can be divided into three areas: interfacing with or acquiring real-world data, analyzing that data to extract meaningful information, and presenting the information to an end user.

LabVIEW is an open environment designed to make interfacing with any measurement hardware simple. With interactive assistants, code generation, and connectivity to thousands of devices, LabVIEW makes gathering data as simple as possible. Because LabVIEW provides connectivity to virtually any measurement device, you can easily incorporate new LabVIEW applications into existing systems without losing your hardware investment. Regardless of your hardware requirements, LabVIEW provides an interface to make connecting to your I/O easy.

Data Acquisition on Any Platform

With LabVIEW, you can quickly acquire and generate signals from plug-in boards, USB devices, and Ethernet-based systems. These I/O capabilities, combined with special data types and measurement analysis tools, are specifically designed to get the measurement you need from your physical sensors as quickly and easily as possible.

Instrument Control and Connectivity

LabVIEW simplifies connecting to and communicating with thousands of instruments from hundreds of vendors. With LabVIEW, you can quickly acquire data from GPIB, serial, Ethernet, PXI, USB, and VXI instruments using instrument drivers, the interactive Instrument I/O Assistant, and built-in instrument I/O libraries.

Find drivers for your instrument at ni.com/idnet.

Machine Vision

Easily add best-of-class machine-vision components to your measurement application and rapidly develop software with automatic code generation and built-in image analysis libraries. Integrate image acquisition with NI data acquisition and motion control devices for a complete system. Deploy embedded real-time machine vision systems using the LabVIEW Real-Time Module.

Motion Control

LabVIEW integrates easily with a wide variety of motion control software, motion controllers, and power drives in your automated test and machine control applications. From simple, repetitive motion control to coordinated multi-axis motion control, and from the laboratory benchtop to the factory floor, LabVIEW provides solutions for prototyping and programming your application.

Modular Instruments

Develop mixed-signal applications using the latest PC and commercial technology. Speed your time to market by investing in a flexible, open-definition instrumentation platform that empowers RF instruments, high-speed digitizers, signal generators, multimeters, high-speed digital I/O, and more.

Industrial Monitoring and Control

LabVIEW provides powerful tools for distributed monitoring systems, with connectivity to a wide variety of distributed I/O devices, including PLCs and NI Compact FieldPoint. Compact FieldPoint provides industrial-grade performance and unatched software integration with LabVIEW Real-Time, so you can easily configure, build, and maintain reliable distributed I/O solutions.

Switching Solutions

LabVIEW integrates with a wide variety of quality switching solutions, including general-purpose relays, multiplexers, and matrices.

Quickly Connect to Measurement Hardware with Interactive Measurement Assistants

DAQ Assistant

Step-by-step guidance for building data acquisition applications and automatic code generation

The DAQ Assistant is a wizard-like interface for configuring and testing data-acquisition tasks without programming. You can use the DAQ Assistant to configure tasks—such as analog acquisition, digital waveform generation, and frequency measurement—to include custom timing, triggering, and scaling. If you prefer low-level customization, prototype your system with the DAQ Assistant, and click a button to automatically generate code.

Instrument I/O Assistant

Interactive connectivity to your GPIB, USB, Ethernet, serial, and VXI instruments

Prototype your instrument control system, take quick measurements, and even develop simple instrument drivers with this interactive wizard. The Instrument I/O Assistant is a point-and-click method for writing commands, reading responses, and automatically parsing data, saving you up to 80% of your development time.
Typically you need more than raw data as the end result of a measurement—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 sort of acquired data and for analyzing measurements and processing signals. Functions such as frequency analysis, signal generation, mathematics, curve fitting, and interpolation give you the power to derive meaningful statistics from your data.

**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/AC levels, total harmonic distortion (THD/SNDR), impairment response, frequency response, and cross-power spectrum. Using LabVIEW, you can employ numerical tools for solving differential equations, optimization, root finding, and other mathematical problems. Additionally, you can integrate industry standard mathematics applications with LabVIEW, including NI Math, MathSoft Mathcad, and The MathWorks MATLAB®, as well as offline analysis tools like NI DIAdem.

**Complex Measurements Made Easy**

Despite the complexity of the underlying algorithms, LabVIEW analysis tools are easy to use. For example, a set of built-in measurement functions accepts real-world, time-domain signals directly from DAQ hardware and provides results ready for charting, graphing, or signal processing. More than 15 analysis Express VIs further reduce the complexity of implementing measurement analysis in your application through interactive configuration dialogs in which you can preview your analysis results immediately.

View a complete listing of LabVIEW analysis functions at ni.com/analysis.

"Use the signal-processing capabilities of LabVIEW to implement a technique known as lock-in amplification. Compared to hardware lock-in amplifiers, the LabVIEW approach yields excellent price/performance, increased functionality, superior flexibility, and the ability to inspect the signal at all stages of processing..."

– Philip F. Kraner and Roger D. Bengtson, Department of Physics, University of Texas at Austin

**Interactive Express VIs**

More than thirty-eight configurable Express VIs ship with LabVIEW so you can rapidly design measurement applications regardless of your programming experience. Characterized by an interactive configuration dialog, Express VIs package the most commonly used acquisition, analysis, and presentation functions in LabVIEW into easily customizable VIs.

**Spectral Measurements Express VI**

The Spectral Measurements Express VI packages key spectral measurement functions—such as peak spectrum, auto-power spectrum, and power spectral density—with multiple windowing, averaging, and weighting options. View the effects on the data immediately in the preview windows.

**Filter Express VI**

The Filter Express VI provides filtering options with data previews for low, high, and bandpass filters, as well as bandstop and smoothing filters. You can customize filter specifications such as cutoff frequency, FIR and IIR filters, order, and viewing mode with radio button selections.

View a complete listing of LabVIEW analysis functions at ni.com/analysis.
Presenting Data with LabVIEW

The third piece of a typical measurement application is presentation, which encompasses data visualization, user interface design, Web publishing, report generation, data management, and software connectivity.

Visualize Your Data
NI LabVIEW includes a wide array of visualization features, including tools for charting and graphing and built-in 2D and 3D visualization, so you can present data on the user interface of your application. You can reconfigure attributes of your data presentation, such as colors, font size, and graph types, as well as dynamically rotate, zoom, and pan these graphs with no programming.

Design Professional Interfaces
Because NI designed LabVIEW specifically for engineers and scientists, you can take advantage of measurement-specific user interface design tools instead of creating them from scratch. Simply drag and drop the buttons, controls, and indicators from the controls palette and then point and click to customize behavior and appearance with interactive property pages.

Reuse Existing Code and Easily Distribute Applications
The open LabVIEW environment provides superior connectivity to third-party software to make transitioning or coexisting simple. Use LabVIEW to access proprietary C code, make ActiveX calls, and call .NET assemblies. Create standalone executables or shared libraries (DLLs) for distributing your applications, with no additional licensing fees for most applications.

Generate Professional HTML Reports Quickly
Create HTML reports quickly with little or no programming in LabVIEW. With the included report generation tools, you can take the data from your application and format it into an HTML report to publish the results on the Web.

Create Reports with Microsoft Office Tools
If you often create reports using Microsoft Office tools such as Excel and Word, rather than HTML, you can use LabVIEW to customize these reports to share with colleagues and customers. Use the LabVIEW Report Generation Toolkit for Microsoft Office to quickly create custom, professional reports using standard tools.

Thinking of switching to LabVIEW? Are you considering a switch to LabVIEW from another software package, but still need more details? Visit ni.com/labview/switch to find technical resources on:
- LabVIEW as a technology and programming language
- How to use your existing code in LabVIEW
- How to transition to programming graphically
- How LabVIEW increases productivity and saves money

Interactively Learn from and Manage Your Data with NI DIAdem
If you find yourself storing large amounts of data in a standard file or database, consider adding an offline data management and analysis tool to LabVIEW. National Instruments DIAdem, a configuration-based software package, performs offline processing, interactive data management, analysis, and report generation. 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 ni.com/diadem for more information.
Selecting Your Development System

LabVIEW Development System Options

National Instruments offers a number of LabVIEW development systems and programming tools to help you build professional applications. Choose from these development system options: Professional, Full, and Basic. The LabVIEW Student Edition is also available for students and educators. LabVIEW is available on Windows, Macintosh, Linux, and Sun Solaris operating systems, giving you the flexibility to work across platforms easily. 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 language users.

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. This system includes the LabVIEW Application Builder for the creation of stand-alone executable and shared libraries (DLL). It also includes source code control, complexity measurement tools, and graphical debugging for debugging, quality control, and program optimization. Finally, it provides five remote panel connection licenses so you can view and remotely control your VIs over the Web.

LabVIEW Full Development System

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

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, RS-232, data acquisition, and instrument driver libraries for data acquisition and instrument control.

NI Developer Suite

If you need functionality supplied by other NI software, such as LabVIEW add-on modules, add-on toolkits, or NI TestStand, consider the popular NI Developer Suite software bundle which combines LabVIEW development systems with other NI software for the best value. NI Developer Suite is the comprehensive LabVIEW subscription program that bundles a LabVIEW development system with a wide range of add-on LabVIEW toolkits and NI software. With NI Developer Suite, you receive FREE quarterly updates of NI software for a year, keeping you current with the latest industry-standard measurement and automation software. See ni.com/labviewsuite for more information.

Which LabVIEW development system is right for you?

Call HMI LAKEVIEW to speak with an NI technical specialist to determine which version of LabVIEW is appropriate for your application.

LabVIEW in Education

Just as LabVIEW is revolutionizing 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 concepts and results. Students still learn methodology, but spend the majority of their time learning from their experiments instead of performing them. By using LabVIEW in the classroom, you benefit from a modular solution that easily integrates into your existing systems and readily adapts to your changing requirements.

National Instruments understands your needs as an educator and continuously develops new products and resources to increase your effectiveness in the lab and classroom. We understand the issues of computing, software design, measurement and control hardware, resources, and customer support, and we provide an integrated solution that is unrivaled in the industry.

Student Benefits:

• Focus on the engineering, not the programming
• Gain exposure to leading industry software
• Prepare for a professional career

Use the full-featured LabVIEW Student Edition at home.

Instructor Benefits:

• Choose from available courseware across multiple engineering and science disciplines
• Access the worldwide academic directory
• Use the full-featured LabVIEW Student Edition at home

For more information on using LabVIEW in education, visit ni.com/academic.

Available for Windows platforms only.
LabVIEW Add-On Software

 NI offers add-on modules and toolkits to extend the LabVIEW development environment for a variety of specific applications.

LabVIEW Real-Time Module
- Develop robust and reliable applications with graphical programming
- Implement visual and direct deterministic performance
- Deploy LabVIEW code on dedicated hardware running a real-time operating system

LabVIEW FPGA Module
- Create custom I/O hardware with FPGA technology
- Implement advanced timing and triggering, on-chip decision making, custom digital I/O with 25 nanosecond resolution
- Execute tasks simultaneously and deterministically in hardware

LabVIEW PDA Module
- Develop handheld applications for PDAs running Microsoft Pocket PC or Palm operating systems
- Create portable data acquisition systems with Pocket DAQ devices
- Communicate with RS-232 or RS-422 protocols

LabVIEW Toolkits

Control and Simulation Toolkits

Simulation Interface - Integrate LabVIEW with The MathWorks Simulink to verify control models
PID and Control - Add PID, fuzzy logic, and advanced control algorithms to your development

Analysis, Image, and Signal Processing Toolkits

Sound and Vibration - Incorporate audio measurements, fractional octave analysis, and swept sine analysis
DSP Test Integration - Design and build DSP test systems easily with TI Code Composer Studio
Order Analysis - Add order tracking, order extraction, and tachometer signal processing
Spectral Measurements - Include common spectral measurement functions such as in-band power and adjacent-channel power
Signal Processing - Add functions for HHT, wavelets, and more
Modulation - Create, process, and analyze analog and digital modulation schemes
Machine Vision - Acquire, process, and display images

Professional Development Toolkits

Express VI Development - Create custom Express VIs to distribute to colleagues and customers
VI Analyzer - Improve and document code quality by analyzing coding practices
State Diagram - Generate LabVIEW code interactively based on state machine architectures

Data Management and Distribution Toolkits

Report Generation - Create reports programmatically in Microsoft Word and Excel
Datalogging and Supervisory Control - Implement alarms, security, and data logging for large numbers of I/O points. Choose from thousands of industrial control graphics and take advantage of OPC drivers
Database Connectivity - Connect to databases with Microsoft ADO technology and complete SQL functionality

LabVIEW Companion Products

NI-DAQ 7
LabVIEW 7 Express includes NI-DAQ 7, the most advanced data acquisition driver software available.
- Reduce programming time and wiring with interactive tools and automatic LabVIEW code generation
- Conduct single-point measurements 20X faster
- Perform multi-threaded measurements

LabVIEW 7 Express, the latest release of the widely adopted graphical programming language, adds more than 100 new features to further expand the power of the environment while making it easier than ever to use. To upgrade to LabVIEW 7 or to access the complete list of new features, visit ni.com/labview.

New in LabVIEW 7 Express

- Control and Simulation Toolkits
- Analysis, Image, and Signal Processing Toolkits
- Professional Development Toolkits
- Data Management and Distribution Toolkits

Upgrade Today!
ni.com/upgrade
Services and Support

Professional Services

Our professional services team consists of National Instruments applications engineers, NI Consulting Services, and a worldwide Alliance Partner Program of more than 700 independent consultants and integrators. Services range from basic start-up assistance to turnkey system integration. Visit ni.com/alliance for more information.

Software Maintenance with Automatic Upgrades

Our Standard Software Service provides maintenance services for one year. Program benefits include regular and automatic software upgrades and updates, one-to-one email or phone support, and a 10 percent discount on individual training courses. We also offer volume pricing with our Volume License Program, which equips your group or organization with software asset management tools, access to technical support, and current versions of NI software. Visit ni.com/services.

Special pricing options are available for academic and volume orders. Please call (512) 683-0100 for more information.

LabVIEW Books and Publications

Numerous books in multiple languages are available covering topics such as:

- Basic LabVIEW programming
- Data acquisition and instrument control techniques
- LabVIEW power programming and software architectures

LabVIEW Technical Resource (LTR) is an independent quarterly publication devoted to LabVIEW development techniques and code sharing. Available at ltrpub.com.

Training and Certification

NI offers a variety of training alternatives, from self-paced tutorials and interactive CDs, to worldwide hands-on courses taught by experienced instructors—including our LabVIEW Basics I and II courses. NI also offers LabVIEW Developer and Architect certifications acknowledging expertise in LabVIEW programming. Visit ni.com/training for detailed information.

Let LabVIEW Zone be your portal to the LabVIEW online community. Stay up-to-date with the latest LabVIEW information; find technical tips you can apply to your LabVIEW development; share code and ideas with other LabVIEW users; and more. Visit ni.com/labviewzone.

Local Sales and Technical Support

In offices around the globe, our staff is local to the country, giving you access to field engineers who speak your language. National Instruments delivers industry-leading technical support through online knowledge bases, our staff of applications engineers, and access to 14,000 worldwide measurement and automation professionals within the NI Developer Exchange Discussion forums. Find immediate answers to your questions at ni.com/support.

Professional Services

Our professional services team consists of National Instruments applications engineers, NI Consulting Services, and a worldwide Alliance Partner Program of more than 700 independent consultants and integrators. Services range from basic start-up assistance to turnkey system integration. Visit ni.com/alliance for more information.

Software Maintenance with Automatic Upgrades

Our Standard Software Service provides maintenance services for one year. Program benefits include regular and automatic software upgrades and updates, one-to-one email or phone support, and a 10 percent discount on individual training courses. We also offer volume pricing with our Volume License Program, which equips your group or organization with software asset management tools, access to technical support, and current versions of NI software. Visit ni.com/services.

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Let LabVIEW Zone be your portal to the LabVIEW online community. Stay up-to-date with the latest LabVIEW information; find technical tips you can apply to your LabVIEW development; share code and ideas with other LabVIEW users; and more. Visit ni.com/labviewzone.

Local Sales and Technical Support

In offices around the globe, our staff is local to the country, giving you access to field engineers who speak your language. National Instruments delivers industry-leading technical support through online knowledge bases, our staff of applications engineers, and access to 14,000 worldwide measurement and automation professionals within the NI Developer Exchange Discussion forums. Find immediate answers to your questions at ni.com/support.

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Worldwide Offices:

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