QUICK REFERENCE

LabWindows™/CVI™

LabWindows/CVI is a proven test and measurement ANSI C development environment that increases the productivity of engineers and scientists. LabWindows/CVI streamlines application development with hardware configuration assistants, comprehensive debugging tools, and interactive execution utilities you can use to run functions at design time.
Use the built-in measurement libraries to rapidly develop complex applications such as multithreaded programs and ActiveX server/client programs. The flexibility of LabWindows/CVI optimizes data acquisition, analysis, and presentation in test and measurement applications.

System Requirements

- Personal computer using a Pentium 600 or higher microprocessor
- Microsoft Windows 2000/NT SP6/XP
- 800 x 600 resolution (or higher) video adapter
- Minimum of 128 MB of RAM, 256 MB recommended
- 150 MB free hard disk space
- Microsoft-compatible mouse
- Microsoft Internet Explorer 5.0 or later

Installation

1. Insert the CD into the CD drive. If the CD does not run automatically, open Windows Explorer, right-click the CD drive icon, and select **AutoPlay**.
2. Click **Install LabWindows/CVI** on the National Instruments LabWindows/CVI screen.
3. Continue to follow the instructions on the screen.

Product Resources

National Instruments provides extensive product resources for new and experienced LabWindows/CVI users.

Online Resources

For complete technical information, developer exchange opportunities, and the latest news about LabWindows/CVI, visit ni.com/cvi:

- Technical support
- Online community
- Sample programs
- Application notes and white papers
- Add-on products
- Training information
- Product tutorials

Sample Programs

Use the National Instruments Example Finder to browse and search installed examples and examples on NI Developer Zone. To launch the NI Example Finder from LabWindows/CVI, select **Help»Find Examples**.

Documentation Resources

- **LabWindows/CVI Help**—Use the *LabWindows Help* to access comprehensive information about LabWindows/CVI windows, functions, tools, and menus. To launch the *LabWindows/CVI Help* from LabWindows/CVI, select **Help»Contents**.
- **LabWindows/CVI Bookshelf**—Use the *LabWindows/CVI Bookshelf* to search PDF versions of the following LabWindows/CVI documents:
  - *LabWindows/CVI Release Notes*
  - *Getting Started with LabWindows/CVI*
  - *LabWindows/CVI Instrument Driver Developers Guide*
  - Application notes
  - White papers

  To launch the *LabWindows/CVI Bookshelf* from LabWindows/CVI, select **Help»LabWindows/CVI Bookshelf**.

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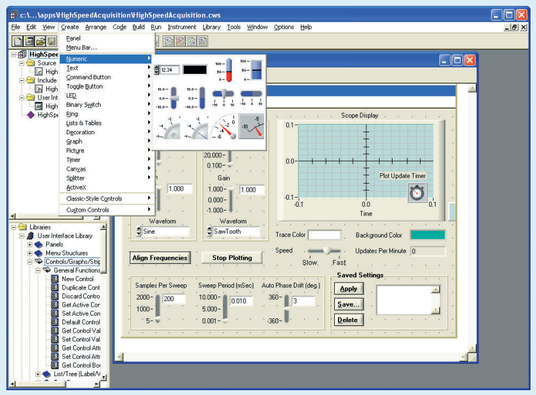
NATIONAL INSTRUMENTS™

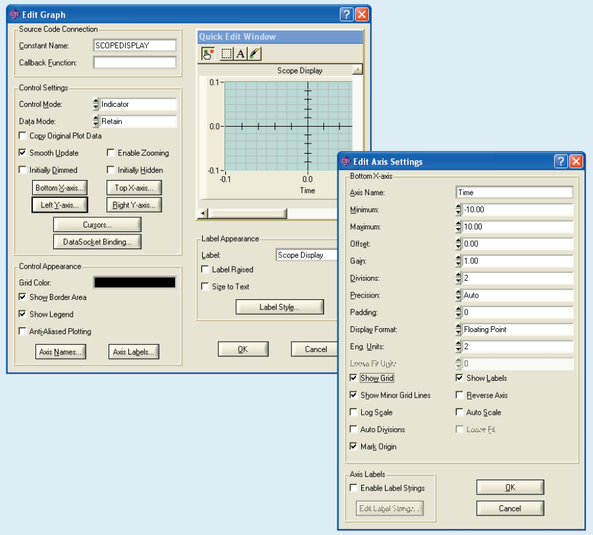
LabWindows/CVI

LabWindows/CVI meets the changing needs of test engineers with an interactive development environment designed for virtual instrumentation. With easy-to-use development tools, you can quickly create, configure, and display measurements during program design and verification. LabWindows/CVI automates much of the manual coding and compiling.

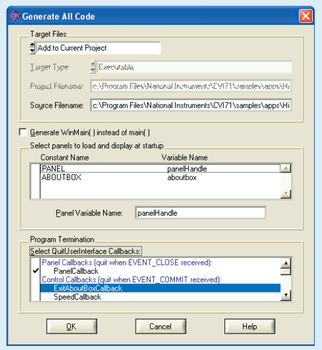
1 **Designing User Interfaces**
Design graphical user interfaces (GUIs) in the intuitive User Interface Editor. Select from controls designed specifically for instrumentation.



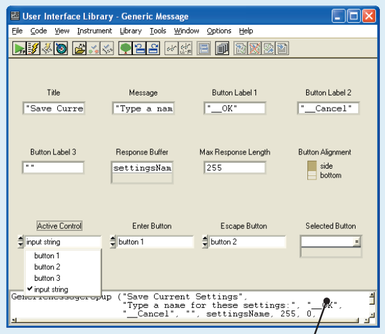
2 **Customizing Controls**
Customize each GUI control with easy-to-use dialog boxes.



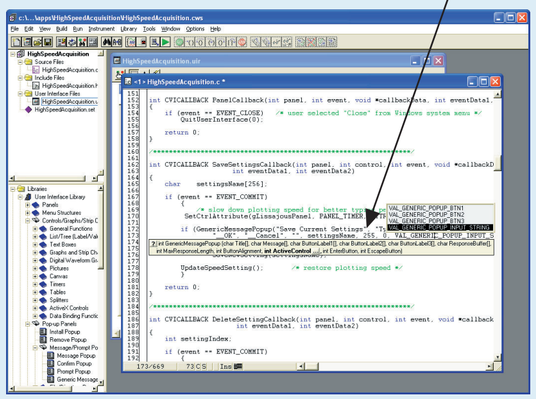
3 **Generating Code**
Automatically generate an ANSI C program based on the GUI with LabWindows/CVI CodeBuilder. CodeBuilder creates code that responds automatically to user events such as mouse clicks, key presses, and menu selections.



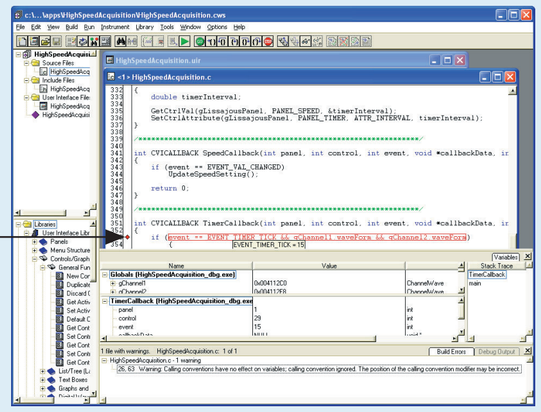
4 **Using Function Panels**
Use interactive function panels to generate library calls, test the calls, and insert them into the program. A function panel is a graphical representation of a LabWindows/CVI function and its parameters.



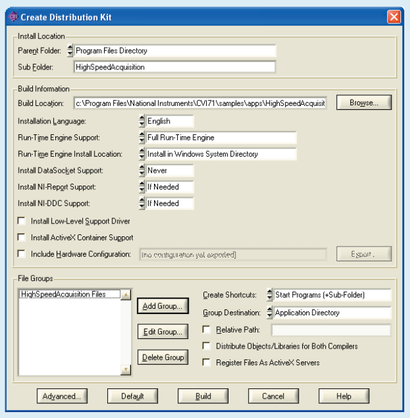
5 **Editing Source Code**
Complete your program using the built-in source editor. Use the source code completion options to view functions, variables, prototypes, and help within the Source window. You also can access input selection dialog boxes for parameters and declare parameter variables from within the Source window.



6 **Debugging**
Use LabWindows/CVI debugging tools to catch common programming mistakes. The patented User Protection feature automatically checks for invalid program behavior. Set breakpoints and use tooltips to pause program execution and view or modify variable values.



7 **Creating Installers**
Use the Create Distribution Kit command to make an installer for your application.



LabWindows/CVI Library Reference

LabWindows/CVI

Use built-in instrumentation libraries to interface test applications to the outside world. LabWindows/CVI includes a large set of run-time libraries for instrument control, data acquisition, analysis, and user interface creation. This chart illustrates classes in each library. To find specific functions, use <Ctrl-Shift-P> in the Source window. You also can use the Library Tree to browse to and search for functions.

User Interface Library

The User Interface Library contains functions that programmatically control the user interface.

- Panels
- Menu Structures
  - Menu Bars
  - Menus and Submenus
  - Menu Items
  - Control Menus
- Controls/Graphs/Strip Charts
  - General Functions
  - List/Tree (Label/Value) Controls
    - Trees
  - Text Boxes
  - Graphs and Strip Charts
    - Graph Plotting and Deleting
    - Graph Cursors
    - Graph Legend
    - Strip Chart Traces
    - Digital Waveform Graph Plotting
    - Axis Scaling
    - Axis Label Strings
  - Pictures
  - Canvas
    - Drawing
    - Batch Drawing
    - Pens
    - Clipping
    - Accessing Pixel Values
    - Miscellaneous
- Timers
- Tables
- Splitters
- ActiveX Controls
- Data Binding Functions
- Pop-up Panels
  - Message/Prompt Popups
  - File/Directory Popups
  - Graph Popups
  - Font Popups
- KeyPress Event Functions
- Callback Functions
  - Windows Interrupt Support
- User Interface Management
- Printing
- Mouse and Cursor
- Rectangles and Points
  - Creating and Modifying
  - Retrieving and Comparing Values
- Bitmaps
- Clipboard
- Miscellaneous
- LW DOS Compatibility Functions
- Monitors

IVI Library

The IVI Library contains functions that program and control IVI drivers. IVI-compliant drivers have a standard interface, so you can interchange similar instruments without changing your code.

- Instrument Driver Session
  - Locking
- Channels
- Repeated Capabilities
- Attribute Creation
  - Add Attribute
  - Add Repeated Attribute
  - Invalidation Lists
  - Comparison Precision
- Callbacks
  - Set Read Callback
  - Set Write Callback
  - Set Check Callback
  - Set Coerce Callback
  - Set Compare Callback
- Set/Get/Check Attribute
  - Set Attribute
  - Get Attribute
  - Check Attribute
- Caching/Status-Checking Control
- Range Tables
  - Range Table Entries
    - Get Range Table Num Entries
    - Get VInt32 Entry
    - Get ViReal64 Entry
  - Range Table Ptr
  - Dynamic Range Tables
- Error Information
  - Instrument Specific Error Queue
- Memory Allocation
- Helper Functions
  - Inherent Attribute Accessors
  - String Callbacks
  - Direct Instrument I/O
  - String/Value Tables
  - Value Manipulation
  - Default Callbacks
  - Attribute Information
  - Interchangeability Warnings
- Logical Names
- Configuration

DDE Support Library

The DDE Support Library contains functions that create an interface between other Windows applications using the DDE standard.

- Server Functions
- Client Functions

Advanced Analysis Library

The Advanced Analysis Library contains functions that simulate and analyze large sets of numerical data quickly and efficiently.

- Signal Generation
- Array Operations
  - 1D Operations
  - 2D Operations
- Complex Operations
  - Complex Numbers
  - 1D Complex Operations
- Signal Processing
  - Frequency Domain
  - Time Domain
  - IIR Digital Filters
    - Cascade Filter Functions
      - Filter Information Utilities
    - One-Step Filter Functions
    - Old-Style Filter Functions
  - FIR Digital Filters
  - Windows
- Measurement
- Statistics
  - Basics
  - Probability Distributions
  - Analysis of Variance
  - Nonparametric Statistics
- Curve Fitting
  - Old-Style Functions
- Interpolation
- Vector & Matrix Algebra
  - Real Matrices
  - Complex Matrices
- Additional Numerical Methods

Note The Advanced Analysis Library is part of the LabWindows/CVI Full Development System. The LabWindows/CVI Base Package includes the standard LabWindows/CVI Analysis Library. If you have the Base Package installed, refer to the Library Tree for a list of the standard Analysis Library classes.

VISA Library

The VISA Library provides a single interface library for controlling VXI, GPIB, USB, and serial instruments.

- Resource Template
- Resource Management
- Resource-Specific Operations
  - Basic Message-Based I/O
  - Formatted I/O
  - Memory-Based I/O (High Level)
  - Memory-Based I/O (Low Level)
  - Shared Memory
  - Interface-Specific Operations

ANSI C Library

The ANSI C Library contains standard ANSI C functions, which you can use in LabWindows/CVI.

- Character Handling
- Date and Time
- Localization
- Mathematics
- Nonlocal Jumping
- Signal Handling
- Input/Output
- General Utilities
- String Handling
- Low-Level IO
- Multibyte Characters

Utility Library

The Utility Library contains functions that perform various operations, including using the system timer, managing disk files, launching another executable, and using multiple threads.

- Timer/Wait
- Date/Time
- Keyboard
- File Utilities
- Directory Utilities
- Multithreading
  - Thread Pool
    - Call Scheduling Functions
    - Advanced Functions
      - Callbacks
  - Thread Safe Queue
    - General Functions
    - Reading/Writing
    - Callbacks
  - Thread Safe Variable
  - Thread Lock
  - Thread Local Variable
- External Modules
- Port IO
- Standard Input/Output Window
- Runtime Error Reporting
  - Old-Style Functions
- Interrupts
- Physical Memory Access
- Task Switching
- Launching Executables
  - Extended Functions
- Miscellaneous

GPIB/GPIB 488.2 Library

The GPIB/GPIB 488.2 Library contains functions that communicate with GPIB instruments, control GPIB boards, and acquire GPIB status information.

- Open/Close
- Configuration
- I/O
- Device Control
- Bus Control
- Board Control
- Callbacks
- Locking
- Thread-Specific Status
- GPIB 488.2 Functions
  - Device I/O
  - Trigger and Clear
  - SRQ and Serial Polls
  - Parallel Polls
  - Remote/Local
  - System Control
  - Low-level I/O

DIAdem Connectivity Library

The DIAdem Connectivity Library contains functions that directly transfer data between LabWindows/CVI and DIAdem.

- Object Management
  - Advanced
- Data Storage
- Data Retrieval
  - Enumeration
- Properties
  - File
  - Channel Group
  - Channel
- Miscellaneous

NI-DAQmx Library

The NI-DAQmx Library contains functions that communicate with and control data acquisition devices.

- Task Configuration/Control
  - Advanced
- Channel Creation/Configuration
  - Create Analog Input Channels
    - Position
  - Create TEDS Analog Input Channels
    - Position
  - Create Analog Output Channels
  - Create Digital Input Channels
  - Create Digital Output Channels
  - Create Counter Input Channels
    - Position
  - Create Counter Output Channels
- Timing
- Triggering
  - Start Trigger
  - Reference Trigger
  - Advance Trigger
- Read Functions
  - Advanced
- Write Functions
  - Advanced
- Export HW Signals
- Scale Configuration
- Internal Buffer Configuration
- Advanced
  - Switch Functions
  - Signal Routing
  - Device Control
    - Watchdog Timer
  - Calibration
    - External Calibration
    - DSA Calibration
  - TEDS
- System Configuration
- Error Handling

Note Refer to the Library Tree for a list of the Traditional NI-DAQ Library classes.

VXI Library

The VXI Library contains functions that communicate with and control VXI devices.

- System Configuration
- Commander Word Serial
- Servant Word Serial
- Low-Level VXIbus Access
- High-Level VXIbus Access
- Local Resource Access
- VXI Signals
- VXI Interrupts
- VXI Triggers
- System Interrupts
- VXIbus Extenders
- Backward Compatibility
  - Commander Word Serial
  - Servant Word Serial

TCP Support Library

The TCP Support Library contains functions that provide support for a platform-independent interface to the reliable, byte-stream oriented, network connection capabilities of TCP/IP.

- Server Functions
- Client Functions
- Support Functions

ActiveX Library

The ActiveX Library contains functions that create and control ActiveX servers. Use these functions in conjunction with the ActiveX Controller Instrument Drivers, which you can generate using the Create ActiveX Controller Wizard. Also use the ActiveX Library functions with ActiveX server code, which you can generate using the Create ActiveX Server Wizard.

- Variant Related Functions
  - Passing Values as Variants
  - Assigning Values to Variants
  - Querying the Type of a Variant
  - Retrieving Values from Variants
- Array Functions
  - C Array to SafeArray Conversion
  - SafeArray to C Array Conversion
  - Querying SafeArrays
- BSTR Functions
- Resource Management
- Error Processing
- Configuration
  - Locales
  - Multithreading
- Low-level Functions
  - Creating ActiveX Objects
  - Calling Methods and Properties
  - Events
- Server Creation Functions
  - Object Functions
  - Advanced Functions
    - Object Helper Functions
    - IUnknown Functions
    - IDispatch Functions
    - DLL Server Entry Points

Formatting and I/O Library

The Formatting and I/O Library contains functions that read from and write to disk files and manipulate the format of data in a program.

- File I/O
- String Manipulation
- Data Formatting
  - Formatting Functions
  - Scanning Functions
  - Status Functions

RS-232 Library

The RS-232 Library contains functions that control multiple RS-232 ports using interrupt-driven I/O.

- Open/Close
- Input/Output
- XModem
- Control
- Status
- Callbacks
- Extension

Internet Library

The Internet Library contains functions that communicate with and receive files and commands from remote servers.

- FTP (Client)
  - Low Level FTP
- Telnet (Client)
- POP3 (Client)

Note The LabWindows/CVI Base Package does not include the Internet Library.