## **QUICK REFERENCE**

# LabWindows / CVI

National Instruments 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 1GHz or higher microprocessor
- Microsoft Windows Vista/XP or Windows 2000 Service Pack 3 or later
- 1024 x 768 resolution (or higher) video adapter
- Minimum of 128 MB of RAM, 256 MB recommended
- 200 MB free hard disk space
- · Microsoft-compatible mouse

#### **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
- Example programs
- Application notes and white papers
- Add-on products
- Training information
- Product tutorials

#### **Example 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/CVI 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.
- Guide to Documentation—Use the Guide to LabWindows/CVI Documentation topic to find resources that can help you develop applications in LabWindows/CVI. The Guide to LabWindows/CVI Documentation contains information about context-sensitive help, directions for searching installed PDFs, and links to PDFs of the following documents:
- LabWindows/CVI Release Notes
- Getting Started with LabWindows/CVI
- LabWindows/CVI Instrument Driver Developers Guide
- Application notes
- White papers

To access the Guide to LabWindows/CVI Documentation, select Guide to Documentation in the LabWindows/CVI Help table of contents.

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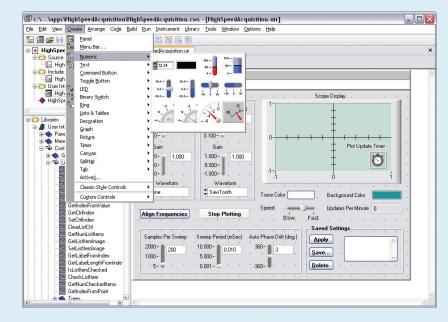


## **LabWindows/CVI**

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, verification, and testing LabWindows/CVI automates much of the manual coding and compiling.

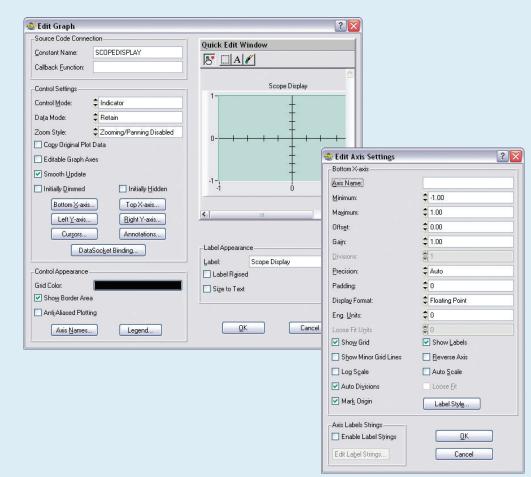
#### **Designing User Interfaces**

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



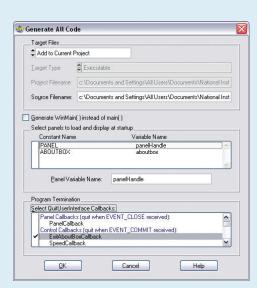
#### **Customizing Controls**

Customize each GUI control with easy-to-use dialog boxes.



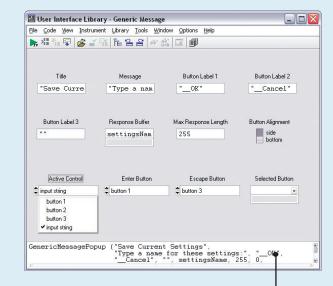
#### **Generating Code**

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.



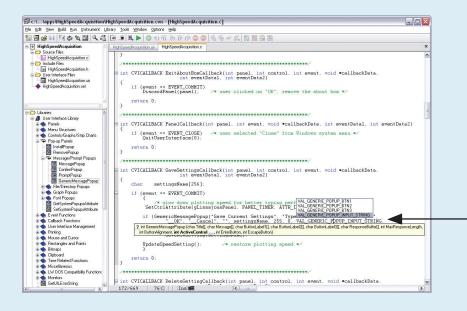
#### **Using Function Panels**

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.



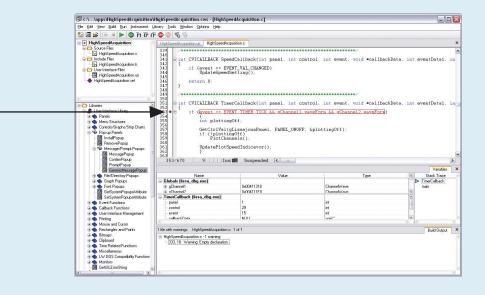
**Editing Source Code** 

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



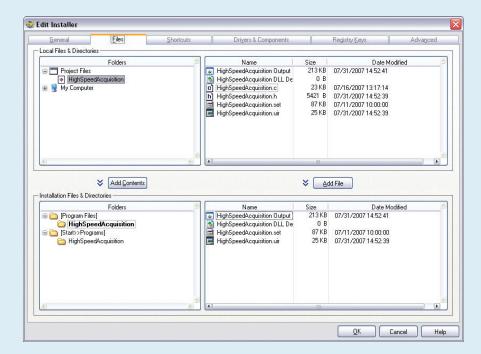
Debugging

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.



**Distributing Applications** 

Create a distribution to package your LabWindows/CVI application and all of its dependencies so that you can distribute your application to another computer.



# 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 the classes in each library. To find specific functions, press <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	Timers
Menu Structures	Tables
Menu Bars	Splitters
Menus and Submenus	Tabs
Menu Items	ActiveX Controls
Control Menus	Data Binding Functions
Controls/Graphs/Strip Charts	Color Ramp Functions
General Functions	Pop-Up Panels
List/Tree (Label/Value) Controls	Message/Prompt Popups
Trees	File/Directory Popups
Text Boxes	Graph Popups
Graphs and Strip Charts	Font Popups
Graph Plotting and Deleting	Event Functions
Graph Cursors	Callback Functions
Graph Annotations	Windows Interrupt Support
Graph Legend	User Interface Management
Strip Chart Traces	Printing
Digital Waveform Graph Plotting	Mouse and Cursor
Axis Scaling	Rectangles and Points
Axis Label Strings	Creating and Modifying
Date/Time Axis Formatting	Retrieving and Comparing Values
Pictures	Bitmaps
Canvas	Clipboard
Drawing	Time Related Functions
Batch Drawing	Miscellaneous
Pens	LW DOS Compatibility Functions
Clipping	Monitors
Accessing Pixel Values	IVIOTIILOTS
Miscellaneous	
IVIISCEIIAIIECUS	

#### VI 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	Range Tables
Locking	Range Table Entries
Channels	Get Vilnt32 Entry
Repeated Capabilities	Get Vilnt64 Entry
Attribute Creation	Get ViReal64 Entry
Add Attribute	Range Table Ptr
Add Repeated Attribute	Dynamic Range Tables
Invalidation Lists	Error Information
Callbacks	Instrument Specific Error Queue
Set Read Callback	Memory Allocation
Set Write Callback	Helper Functions
Set Check Callback	Inherent Attribute Accessors
Set Coerce Callback	String Callbacks
Set Compare Callback	String/Value Tables
Comparison Precision	Direct Instrument I/O
Set/Get/Check Attribute	Value Manipulation
Set Attribute	Default Callbacks
Get Attribute	Attribute Information
Check Attribute	Interchangeability Warnings
Caching/Status-Checking Control	Configuration Store
	Logical Names

#### **Advanced Analysis Library**

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

Sig	nal Generation
Arra	ay Operations
H	1D Operations
	2D Operations
Cor	nplex Operations
	Complex Numbers
L	1D Complex Operations
Sig	nal Processing
	Frequency Domain Analysis
	FFT Tables
	Time Domain Analysis
	IIR Digital Filters
	Cascade Filter Functions
	Filter Information Utilities
	One-Step Filter Functions
	Old-Style Filter Functions
	FIR Digital Filters
	Windows
Mea	asurement
Sta	tistics
H	Basics
	Probability Distributions
	Analysis of Variance
	Nonparametric Statistics
Cur	ve Fitting
	Intervals
	Old-Style Functions
Inte	rpolation
Vec	tor & Matrix Algebra
	Real Matrices
L	Complex Matrices
Add	litional Numeric Functions
L	Special Functions

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## **Real-Time Utility Library**

The LabWindows/CVI Real-Time Module includes the Real-Time Utility Library, which contains functions for replicating a real-time (RT) system, configuring timing, creating and configuring trace sessions, and configuring RT targets.

**Note** If you have the LabWindows/CVI Base Package, refer to the Library Tree for a list of the

standard Analysis Library classes.

System Query
System Configuration
System Replication
Microsecond Wait Functions
Execution Trace
Symmetric Multi-Processing

#### **Network Variable Library**

The Network Variable Library contains functions for reading from

#### .NET Library

The .NET Library contains functions that facilitate calling into .NET assemblies.

semblies.
Assembly Management
Creating and Calling Objects
Resource Management
Array Functions
System.Object Methods
Miscellaneous

#### **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.

Т	imer/Wait
	Date/Time
K	Keyboard
F	ile Utilities
	Directory Utilities
N	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
E	External Modules
P	Port I/O
S	Standard Input/Output Window
F	Run-Time Error Reporting
	Old-Style Functions
Р	Physical Memory Access
Т	ask Switching
4	aunching Executables
l	Extended Functions

#### **GPIB/GPIB 488.2 Library**

Open/Close

Configuration

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

I/O	
Device C	Control
Bus Con	trol
Board Co	ontrol
Callbacks	s
Locking	
Thread-S	Specific Status
GPIB 488	3.2 Functions
Dev	vice I/O
Trig	ger and Clear
SRO	2 and Serial Polls
Para	allel Polls
Ren	note/Local
	tem Control
	v-Level I/O
LOV	V LOVO! 1/O

#### **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 I/O
Multibyte Characters

#### **NI-DAQmx Library**

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

Task Configuration/Control
Advanced
Events
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
Timestamp
Create Counter Output Channels
Analog Input Channel Calibration
Timing
Advanced
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

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

#### **RS-232 Library**

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

External Calibration

DSA Calibration

PXI-42xx Calibration

SCXI Calibration

TEDS

Real-Time

System Configuration

Storage

Error Handling

Open/Close	
Input/Output	
XModem	
Control	
Status	
Callbacks	]
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Extension	I

#### **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 ActiveX Controller instrument drivers, which you can generate using the ActiveX Controller Wizard. Also use the ActiveX Library functions with ActiveX server code, which you can generate using the Create ActiveX Server Wizard.

Vari	ant Related Functions	
H	Passing Values as Variants	
Assigning Values to Variants		
H	Querying the Type of a Variant	
Ч	Retrieving Values from Variants	
Arra	y Functions	
H	C Array to SafeArray Conversion	
SafeArray to C Array Conversion		
Ц	Querying SafeArrays	
BST	R Functions	
Res	ource Management	
Erro	or Processing	
Con	figuration	
H	Locales	
Ц	Multithreading	
Low	-Level Functions	
H	Creating ActiveX Objects	
Calling Methods and Properties		
Ч	Events	
Serv	ver Creation Functions	
H	Object Functions	
Ч	Advanced Functions	
	Object Helper Functions	
	IUnknown Functions	
	IDispatch Functions	
	DLL Server Entry Points	

#### **UDP Support Library**

The UDP Support Library contains functions that provide support to a platform-independent interface to the unicast,

ıs	t, and multicast capabilities of UDP.
	Channel Management
	Channel Configuration
	Data Transfer
ĺ	Advanced

#### **TDM Streaming Library**

The TDM Streaming Library contains functions that store and retrieve test and measurement data using the .tdms file format. This file format is optimized for high performance data streaming.

OI	oject Management
L	Advanced
Da	ata Storage
Da	ata Retrieval
L	Enumeration
Pr	operties
-	File
-	Channel Group
L	Channel
М	iscellaneous

#### **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.



