### **QUICK REFERENCE**

# LabWindows <sup>™</sup>/CVI <sup>™</sup>

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.

National Instruments, NI, ni.com, and LabVIEW are trademarks of National Instruments Corporation. The mark LabWindows is used under a license from Microsoft Corporation. Refer to the Terms of Use section on ni.com/legal for more information about National Instruments trademarks. Other product and company names mentioned herein are trademarks or trade names of their respective companies. For patents covering National Instruments products, refer to the appropriate location: Help\*Patents in your software, the patents.txt file on your CD, or ni.com/patents. For copyright notices, conditions, and disclaimers regarding certain components used in USI (Xerces C++, ICU, HDF5, Citadel 5, b64 library, and Stingray), refer to the USICopyrights.chm.

© 2003–2007 National Instruments Corporation. All rights reserved. Printed in Ireland.



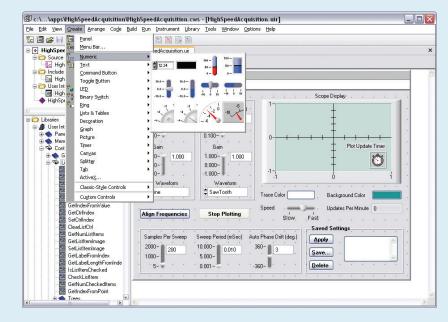
## LabWindows/CVI

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.

### 1

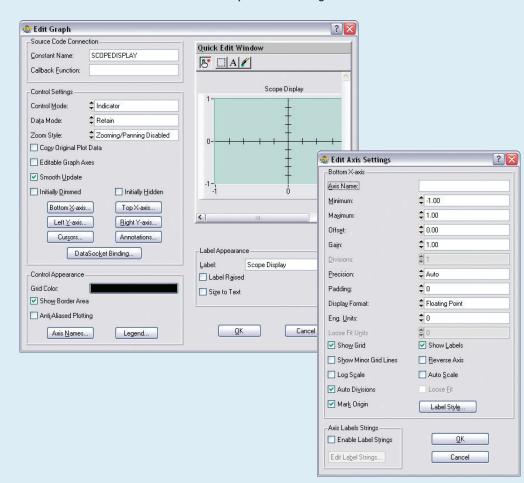
### **Designing User Interfaces**

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



2 Customizing Controls

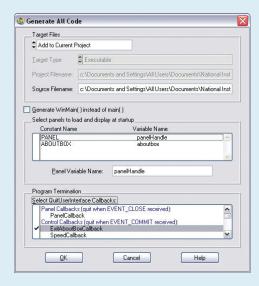
Customize each GUI control with easy-to-use dialog boxes.



3

### **Generating Code**

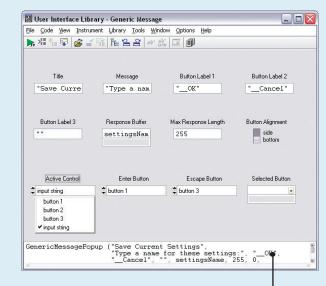
Automatically generate an ANSI C program based on the GUI with LabWindows/CVI CodeBuilder. CodeBuilder creates code that responds automatically to user events such as mouse clicks, key presses, and menu selections.



4

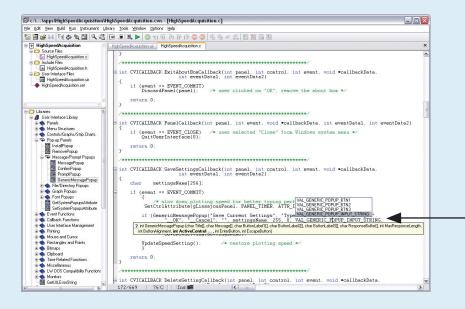
### **Using Function Panels**

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.



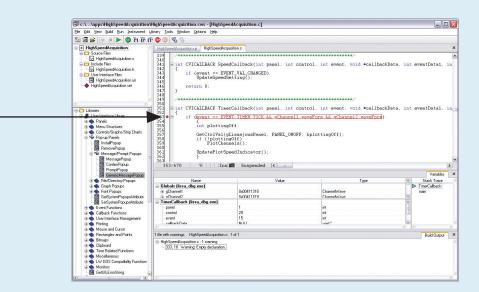
**5** Editing Source Code

Complete your program using the built-in source editor. Use the source code completion options to view functions, variables, prototypes, and 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.



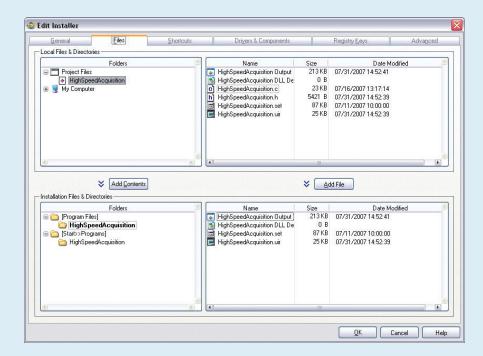
Debugging

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.



**7** 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.

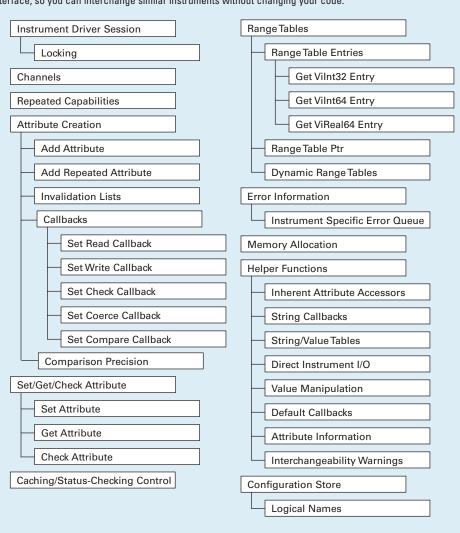
### **User Interface Library**

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  Windows Interrupt Support  User Interface Management  Printing  Mouse and Cursor  Rectangles and Points	
Graph Annotations		
Graph Legend		
Strip Chart Traces		
Digital Waveform Graph Plotting		
- Axis Scaling		
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		
Miscellaneous		

### **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.



### **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 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
Measurement
Statistics
Basics
Probability Distributions
Analysis of Variance
Nonparametric Statistics
Curve Fitting
Intervals
Old-Style Functions
Interpolation
Vector & Matrix Algebra
Real Matrices
Complex Matrices
Additional Numeric Functions
Special Functions

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

### **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.

### **Network Variable Library**

The Network Variable Library contains functions for reading from

tin	ig to	network variables.	
	Data Functions		
	Br	owser Functions	
	Сс	onfiguration Functions	
		Process Functions	]
		Variable Functions	

### .NET Library

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

emblies.
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.

T	Timer/Wait
С	Date/Time
k	Keyboard
F	ile Utilities
С	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
F	Port I/O
5	Standard Input/Output Window
F	Run-Time Error Reporting
	Old-Style Functions
F	Physical Memory Access
1	Task Switching
L	aunching Executables
	Extended Functions
N	Miscellaneous

### **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 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

### **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
AdvanceTrigger
Read Functions
Advanced
Write Functions
Advanced
Export HW Signals
Scale Configuration
Internal Buffer Configuration
Advanced
Switch Functions
Signal Routing
Device Control

Er	ror Han	dling
7	Nata	Refer to the

System Configuration

TEDS

Real-Time

Storage

─ Watchdog Timer

External Calibration

DSA Calibration

SCXI Calibration

Calibration

**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.

Open/Close
Input/Output
XModem
Control
Status
Callbacks
Extension

### **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
	Passing Values as Variants
	Assigning Values to Variants
	Querying the Type of a Variant
	Retrieving Values from Variants
Arra	ay Functions
	C Array to SafeArray Conversion
	SafeArray to C Array Conversion
L	Querying SafeArrays
BS	TR Functions
Res	ource Management
Erro	or Processing
Cor	figuration
	Locales
	Multithreading
Lov	v-Level Functions
	Creating ActiveX Objects
	Calling Methods and Properties
L	Events
Ser	ver Creation Functions
	Object Functions
	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, broadcast, and multicast capabilities of UDP.

Channel Management
Channel Configuration
Data Transfer
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.

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

### **Internet Library**

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

FTP (C	lient)	
	ow Level FTP	
Telnet	(Client)	
POP3 (	(Client)	



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



