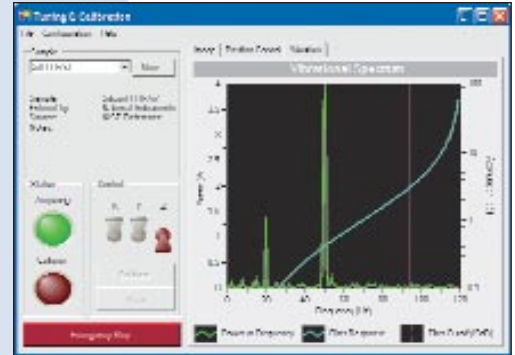# Measurement Studio – Development Tools for Visual Basic, Visual C#, and Visual C++

NI Measurement Studio

- Native measurement and automation classes and controls
- Native user interface controls
- Integrated wizards and object-oriented .NET and C++ measurement classes
- Powerful measurement tools for:
  - Scientific user interface development
  - Data acquisition
  - Instrument control
  - Advanced measurement analysis
  - Live data network connectivity
  - Distributed I/O
  - Modular instrumentation

System Requirements
- Visual Studio .NET development
  - Windows 2000/XP
  - Visual Studio .NET 2003
- Visual Basic 6.0 Development
  - Visual Basic 6.0
  - Windows 2000/XP
- Visual C++ 6.0 Development
  - Windows 2000/XP
  - Visual C++ 6.0, Service Pack 3 or later

Overview

National Instruments Measurement Studio is an integrated suite of native measurement and automation controls, tools, and class libraries for Visual Studio. NI Measurement Studio dramatically reduces application development time with ActiveX and .NET controls, object-oriented measurement hardware interfaces, advanced analysis libraries, scientific user interface controls, measurement data networking, wizards, interactive code designers, and highly extensible classes.

Building on more than 15 years of measurement programming expertise, National Instruments created Measurement Studio with tools designed specifically for Microsoft Visual Basic, Visual C#, and Visual C++ to bring you simplified integration with data acquisition and instrument control interfaces for easier hardware integration. With Measurement Studio, you use your Visual Studio programming knowledge to get measurements started quickly and create a complete measurement solution.

Measurement Studio for Microsoft Visual Basic and Visual C#

Measurement Studio provides a collection of ActiveX and .NET controls tightly integrated within the Visual Studio environment that are designed specifically for engineers and scientists building virtual instrumentation systems. With Measurement Studio, you can configure plug-in data acquisition devices, GPIB instruments, and serial devices from interactive property pages or collection editors. With scientific user interface controls, you can interactively configure graphs, knobs, meters, gauges, dials, tanks, thermometers, binary switches, and LEDs. In addition, Measurement Studio delivers powerful networking components so you can easily share live measurement data between applications via the Internet.

Measurement Studio for Microsoft Visual C++

Measurement Studio delivers an interactive design approach for developing measurement and automation systems inside Visual C++. Because the tools for Visual C++ integrate into the environment, you can use them exactly as you would native Microsoft tools. You can use the Measurement Studio AppWizard together with controls and class libraries to easily create your C++ measurement system. The AppWizard creates a project according to your specifications and includes a code template and the measurement tools you need to design your application. These tools include C++ classes for instrument control, data acquisition, data analysis, and live data transfer across the Internet. In addition, custom controls are included for creating your measurement user interface. Data object classes, which seamlessly encapsulate and pass data from acquisition to analysis to presentation, link the measurement classes to the interface controls.

Measurement Studio – Development Tools for Visual Basic, Visual C#, and Visual C++

Efficient Development

With shorter project development time and diverse developer skills, you often do not have time to train the team to learn a new development language. Measurement Studio provides the tools in one package to take advantage of existing programming knowledge and to target the language you know. You have the flexibility to choose Visual Basic 6.0, Visual C++ 6.0, Visual Basic .NET, Visual C++ .NET, or Visual C#. Regardless of the language you choose, Measurement Studio provides the reusable tools to make your programming tasks easier.

Extensible Components and Classes

The architecture of off-the-shelf components is critical in determining the amount of customization possible with a control or class library. The Measurement Studio classes and user interface controls were designed to maximize their customization. By using the Measurement Studio component base classes as a foundation for extensibility, you can easily inherit from and extend the classes to create customized classes and controls such as a custom graph or proprietary I/O bus communication.

The user interface controls, for example, enable full customization of plot drawing, point and line styles, and graph borders. The Boolean controls allow style and behavior extensions. For hardware customization, you can easily derive from the GPIB, VISA, or DAQ interfaces to create your own custom hardware interfaces while using the robust Measurement Studio hardware base classes.

Accurate Measurements

National Instruments software – including Measurement Studio – ensures accurate measurements through virtual instrumentation. By providing robust interfaces to hardware, you can use the full power of flexible, modular hardware devices that take advantage of the latest innovations in commercial technologies such as processors, memory, and A/Ds that deliver highly competitive price-to-performance gains. In using NI software with modular hardware devices, engineers can achieve higher performance and more accurate instrumentation than by using vendor-defined stand-alone instruments that are difficult or impossible to customize. Using flexible software such as Measurement Studio to define high-performance hardware helps engineers build extremely competitive solutions that not only cost less in the short term, but are flexible enough through software to adapt to changing needs for the long term.

The Measurement Studio data acquisition interface, for example, has a wizard-like, interactive interface, the DAQ Assistant, for selecting sampling rates, triggering, timing, clock selection, scaling,

signal types, and other robust configurations, while at the same time providing optimal single-point acquisition and multithreaded performance. These new optimizations deliver 10 to 20 times greater performance than previous data acquisition interfaces. The tight integration between Measurement Studio and I/O hardware drivers yields the most efficient, productive way for engineers performing acquisition and instrumentation applications to take measurements and significantly decrease development time.

Interactive Configuration

Measurement Studio streamlines data acquisition and instrument connectivity capabilities with interactive measurement tools. The DAQ Assistant and Instrument I/O Assistant are native .NET designers that include step-by-step guides for configuring, testing, and programming measurement tasks; they automatically generate code for low-level customization. With the DAQ Assistant, you can quickly configure your data acquisition tasks to include custom timing, scaling, and triggering with no programming. With the Instrument I/O Assistant, you can communicate directly with your GPIB, Ethernet, USB, serial, PXI, and VXI instruments. Use this interactive wizard to prototype your instrument control system, take quick measurements, automatically parse data, generate code, and even develop simple instrument drivers.
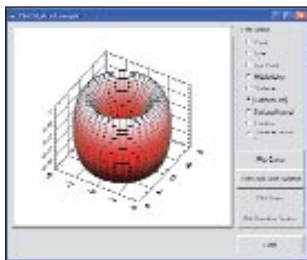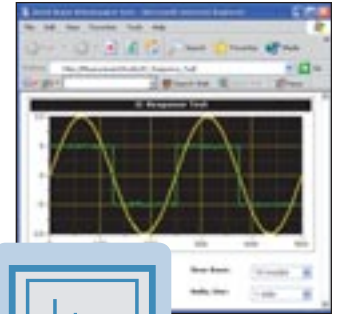
Measurement Studio – Development Tools for Visual Basic, Visual C#, and Visual C++
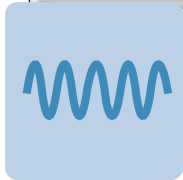
Acquire
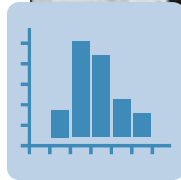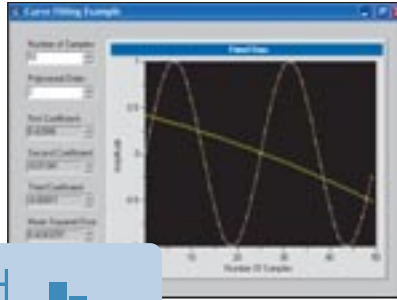
Analyze

Present

Data Acquisition and Instrument Control

Whatever you use to acquire your data – a GPIB, Ethernet, or serial instrument, plug-in DAQ device, PXI measurement module, embedded automation device, modular instrument, or image acquisition device – Measurement Studio provides the high-level interface native to your development language. You select Visual Basic, Visual C#, or Visual C++ to build high-speed, device-independent measurement and automation applications and Measurement Studio delivers ActiveX and .NET controls, tools, and object-oriented classes to help you do it more efficiently.

The data acquisition functionality includes:
- Built-in channel configuration of scaling raw data
- High-speed waveform acquisition and generation for single shot and continuous
- Accurate and fast single-point analog and digital I/O
- Counter/timer I/O for pulse generation, event counting, and duration measurements

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

Measurement Studio simplifies the task of connecting to and communicating with a wide variety of instruments. With the Measurement Studio interfaces, you can quickly acquire data from GPIB, USB, serial, Ethernet, PXI, and VXI instruments using the built-in instrument I/O libraries or using built-in instrument drivers.
- Easily integrate GPIB, serial, PXI, Ethernet, and VXI instruments into your test application
- Communicate with hundreds of instruments from more than 150 vendors with instrument drivers
- Increase performance and portability with device-driver software

Data Analysis

Measurement Studio delivers a full spectrum of analysis functions to convert raw data into meaningful information. With Measurement Studio analysis interfaces, you can employ a wide variety of signal processing and data analysis tools, such as curve fitting, spectral analysis, statistics, and visualization. Because you can perform analysis inside your application, you can integrate more intelligent data processing before storing or presenting the information.

Presentation

Create a professional measurement and automation graphical user interface (GUI) without spending months on development. Measurement Studio delivers measurement-specific user interface components that you can drag, drop, and extend to create a custom interface to your measurement applications. These controls include buttons, knobs, and graphs. Because the Measurement Studio controls are extensible, the UI components empower you to present data in a more informative manner than vendor-defined box instruments.

Measurement Studio – Presentation and Networking Capabilities
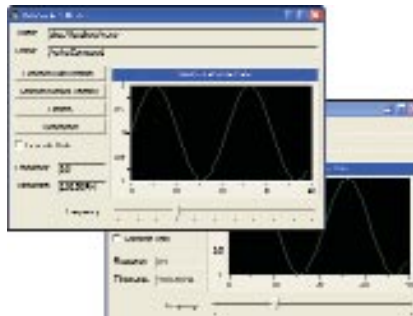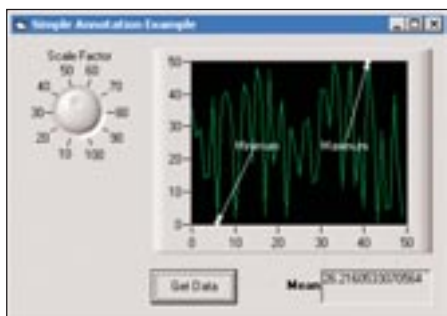
User Interface Controls for Instrumentation

Save months of development time by choosing built-in Measurement Studio user interface controls to present a professional interface for your applications. Measurement applications require 2D and 3D graphs, knobs, meters, gauges, and more. Measurement Studio delivers flexible and extensible measurement-focused user interface components to simplify development and save you time including:

• .NET and ActiveX binary switches/LEDs
• .NET and ActiveX 2D graphs
• .NET legend control
• 3D ActiveX graph
• ActiveX knobs/meters/gauges/dials
• ActiveX slides/tanks/thermometers

Easy Interactive User Interface Configuration

You can easily configure Measurement Studio ActiveX controls through intuitive property pages, and .NET controls through interactive collection editors. In Visual Basic, Visual C#, and Visual C++, you can set the appearance, default state, and behavior of each Measurement Studio control in the property pages or editors and quickly apply the style. You can save configurations, import, and export the control styles to quickly configure new controls or apply a different configuration during run time.

2D and 3D Visualization

With fully customizable, interactive ActiveX and .NET 2D and ActiveX 3D graphs, Measurement Studio gives you the ability to effectively visualize, monitor, and analyze data. For example, you can display waveforms acquired from a DAQ device, distributed I/O module, modular or GPIB instrument, and either chart slowly changing data such as temperature, pressure, and strain or plot high-speed acquisition data.

Networking/Internet Connectivity

Whether you are passing data between applications or passing data over the Internet, Measurement Studio makes sharing measurement data easy. With NI DataSocket, a programming tool designed specifically for publishing and subscribing to live data in measurement and automation applications, you can share live data with one or more client applications on a network without worrying about data formats or network protocols.

The Measurement Studio user interface controls include built-in DataSocket connectivity. You can connect to remote data sources over the Internet and read from or write to them. With Measurement Studio, you can create a simple and powerful Visual Studio program to visualize measurements or publish them from your PC, and you can do it without writing code.
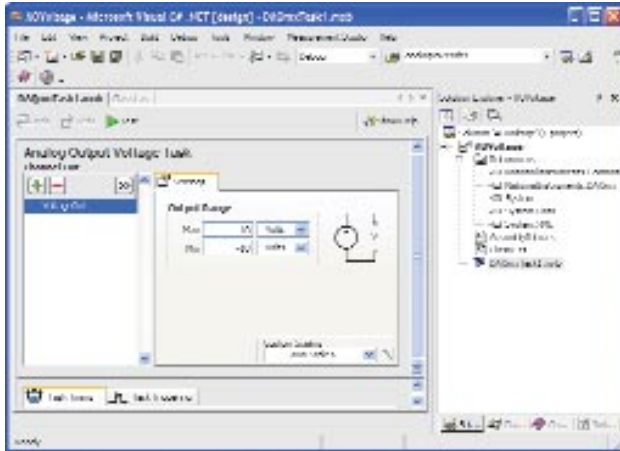
Data Servers

• DataSocket Transfer Protocol (DSTP)
• OLE for Process Control (OPC)
• HTTP
• FTP
• File

Client Examples

• Visual Basic, Visual C++, and Visual Studio .NET applications
• LabVIEW applications
• LabWindows/CVI applications
• Web browsers
• Microsoft Office applications
• Java or ActiveX applications

Measurement Studio – Data Acquisition and Instrument Control

Data Acquisition and Instrument Control

Measurement Studio provides environment-specific tools for collecting data from plug-in, embedded, and stand-alone measurement devices. Measurement Studio presents complete interfaces to DAQ devices whether they are PXI, PCI, or embedded. You also can control instrumentation – stand-alone or modular – through a multitude of hardware buses. Using Measurement Studio, you can connect to today's many measurement devices with tools that eliminate low-level development to communicate with hardware.

Data Acquisition Functionality and Components

With the Measurement Studio DAQ controls and classes, you can easily perform analog, digital, and timing I/O operations on all National Instruments DAQ devices – either through ActiveX controls, .NET libraries, or C++ interfaces. With these interfaces, easily configure your DAQ operations by setting properties in the intuitive property pages, using the interactive DAQ Assistant designer, or calling functions from the DAQ library. No low-level programming or deep understanding of driver-level software is required to configure acquisition routines or transfer buffers from your board to your computer – the Measurement Studio controls, assistants, and libraries handle the details for you.

Single-Point Analog Input – acquire a single analog measurement
Waveform Analog Input – acquire buffered analog waveforms
Single-Point Analog Output – output a single analog voltage
Waveform Analog Output – generate buffered waveforms
Single-Point Digital Input/Output – input/output a single digital voltage
Digital Waveform Input – acquire buffered digital waveforms
Digital Waveform Output – generate buffered digital patterns
Counter/Timer – count events; measure time, period, frequency, and pulse width

Pulse Generation – generate single, finite, and continuous pulses
Double-Buffered Data Acquisition and Waveform Generation – sample and process data, or generate waveforms at maximum sampling rates
SCXI – control channel scanning with SCXI modules, and convert voltages measured from thermocouples, RTDs, thermistors, and strain gauges to appropriate units
Self-Calibration – with self-calibration circuitry hardware, adjust the gain and offset for the device within specified accuracies to eliminate adjustment to calibrate the device

Instrument Control

The Measurement Studio Instrument I/O Assistant saves you time through interactive design technology. The Instrument I/O Assistant helps you define reusable acquisition tasks, easily handle string data parsing, and automatically generate code modules. Then, continue to connect your application to instrumentation devices through native Measurement Studio instrumentation functions, classes, and controls:

GPIB – built-in functions, .NET and C++ class libraries, and ActiveX controls for communicating with instruments through industry-standard protocols

VISA – built-in function libraries, .NET and C++ classes, and ActiveX controls for configuring and controlling serial, GPIB, PXI, USB, and VXI instruments through a single interface

IVI – ActiveX controls and C++ classes for oscilloscopes, digital multimeters (DMMs), arbitrary waveform/function generators, switches, and DC power supplies. IVI, which works in much the same way as traditional instrument drivers, uses an attribute-based approach to instrument control, delivering interchangeable instrumentation, and additional instrument driver capabilities, including state caching, configurable range checking, configurable status query, simple simulation, and multithread safety. See *ni.com/ivi* for details.

Instrument Drivers – Hundreds of National Instruments instrument drivers are available on the Web for your GPIB, USB, PXI, VXI, and serial instruments. Use the Instrument Driver Network as your resource for finding and downloading an instrument driver. Visit the Instrument Driver Library at *ni.com/idnet* to browse through all NI instrument drivers by instrument type, manufacturer, or development language.

For more information on instrument drivers, please see page 80.

Measurement Studio – Analysis

Measurement Studio Analysis

The Measurement Studio Advanced Analysis Library offers a powerful and comprehensive set of functions for analyzing data. With these powerful analysis routines, you can convert raw data into meaningful information and build true virtual instruments. For more complete analysis information, visit *ni.com/analysis*

DSP Measurements
AC and DC estimator*
Amplitude and phase spectrum*
Auto power spectrum*
Cross power spectrum*
Harmonic analyzer*
Impulse response function*
Network functions (avg)*
Power and frequency estimate*
Scaled time domain window*
Spectrum unit conversion*
Transfer function*

Signal Generation
Arbitrary wave*
Chirp pattern*
Gaussian white noise*
Impulse pattern*
Pulse pattern*
Ramp pattern*
Sawtooth wave*
Sinc pattern*
Sine pattern*
Sine wave*
Square wave*
Triangle wave*
Uniform white noise*
Waveform generation*

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

Filters
Bessel*
Butterworth*
Cascade*
Chebyshev*
Elliptic*
Equiripple
FIR*
FIR windowed*
IIR cascade*
IIR*
Inverse Chebyshev*

Statistics
1D, 2D, and 3D ANOVA
Chi square distribution
Contingency table
erf(x) and erfc(x)
F distribution
General histogram
Histogram*
Inv chi square distribution
Inv F distribution
Inv normal distribution
Inv T distribution
Mean*
Median and mode*
Moment about mean*
Normal distribution
Polynomial interpolation
Rational interpolation
Root mean square (rms)*
Spline interpolant
Spline interpolation
Standard deviation*
T distribution
Variance

Signal Processing
Autocorrelation*
Convolution*
Cross power*
Cross correlation*
Decimate*
Deconvolution*
Derivative x(t)*
Fast Hilbert transform*
Fast Hartley transform*
Integral x(t)*
Inverse real and complex
    Fast Fourier transform (FFT)*
Inverse fast Hilbert transform*
Inverse fast Hartley
    transform (FHT)*
Peak detection*
Power spectrum*
Pulse parameters*
Real and complex FFT*
Threshold peak detector*
Unwrap phase*

Curve Fitting
Exponential fit*
General LS linear fit*
General polynomial fit
Linear fit*
Nonlinear Lev-Mar fit

Array and Numeric
1D and 2D array arithmetic*
1D and 2D linear evaluation*
1D and 2D*
    polynomial evaluation
1D polar to rectangular*
1D rectangular to polar*
Quick scale 1D and 2D
    rectangular to polar*
Scale 1D and 2D*
Find polynomial roots
Complex number arithmetic*
ID complex array arithmetic*

Linear Algebra
Backward substitution
Cholesky factorization
Complex Cholesky factorization
Complex determinant*
Complex dot product*
Complex eigenvectors
    and eigenvalues
Complex inverse matrix
Complex LU factorization
Complex matrix
    condition number*
Complex matrix norm*
Complex matrix rank*
Complex outer product*
Complex pseudoinverse matrix*
Complex QR factorization
Complex SVD factorization
Complex vector norm
Determinant*
Dot product*
Forward substitution
General determinant
Generate a special matrix*
Inverse matrix*
Linear equations
LU factorization
Matrix condition number*
Matrix multiplication*
Matrix norm*
Matrix rank*
Outer product*
Pseudo inverse matrix*
QR factorization
Complex linear equations*
SVD factorization
SVDS
Test positive definite matrix*
Trace*
Transpose*

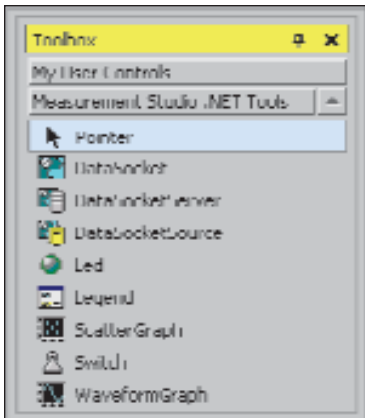*Included in Measurement Studio
Professional Edition
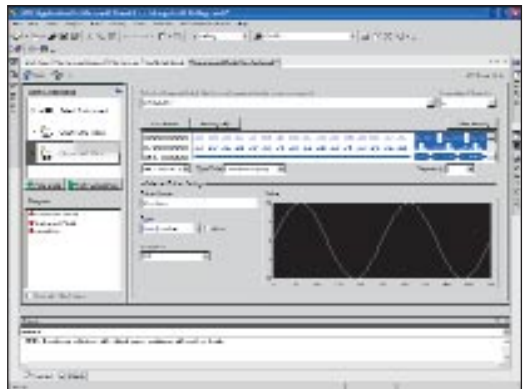
Measurement Studio for Visual Studio .NET
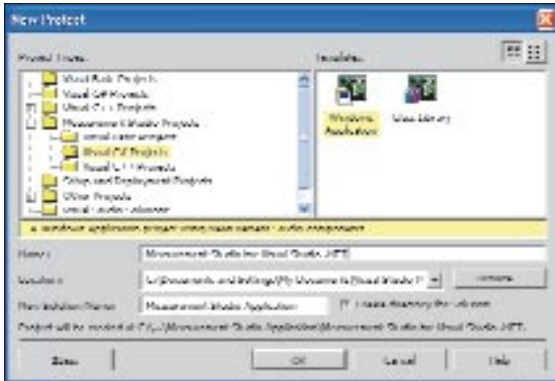
Step 1. Choose an NI Measurement Studio project template to automatically load user interface controls and add analysis and I/O references to your project.
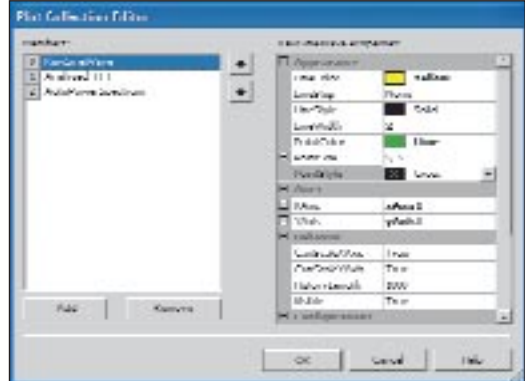
Step 3. Use the collection editors to set up behaviors for the user interface controls.

Step 2. Design your user interface with the Measurement Studio controls.

Step 4. The DAQ and Instrument I/O Assistants are .NET designers that include a step-by-step guide for configuring, testing, and programming measurement tasks which can automatically generate code for low-level customization.

Measurement Studio for Visual Studio .NET

Measurement Studio is an integrated suite of native classes and controls for Visual Studio .NET. These integrated tools help engineers and scientists rapidly perform the fundamentals of any measurement – acquisition, analysis, and presentation.

Acquire

Native .NET hardware interfaces enable rapid configuration and seamless connectivity with measurement hardware. Measurement Studio connects to any measurement device, including plug-in data acquisition (DAQ) devices, stand-alone instruments through GPIB, serial, Ethernet, or VISA, programmable logic controllers (PLCs) through distributed I/O, image acquisition systems, and motion controllers. Measurement Studio also works with hundreds of instrument drivers from more than 150 vendors. Instrument drivers simplify instrument control and reduce test program development time by eliminating the need to learn programming protocols for each instrument. In addition to robust .NET hardware interfaces, Measurement Studio also delivers an

innovative, interactive approach for defining reusable acquisition tasks and automatically generating code with the DAQ and Instrument I/O Assistants. These tools eliminate the need for low-level programming to set up acquisition routines or to transfer buffers from the device to the computer.

Analyze

Measurement Studio provides powerful algorithms and functions designed specifically for measurement analysis and signal processing. You can easily integrate these tools into Visual Studio .NET to create powerful virtual instruments by turning raw data into critical information. The comprehensive library of native .NET assemblies for measurement analysis, signal processing, and mathematical analysis extract information from acquired data and unique measurements, generate, modify, process, and analyze signals, and add intelligence and decision-making capabilities to your applications. The inline and offline analysis capabilities produce informative results quickly.
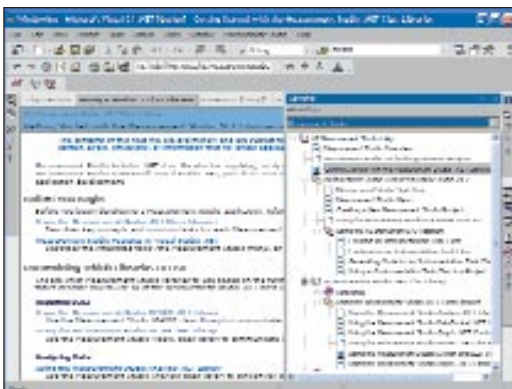
Measurement Studio for Visual Studio .NET
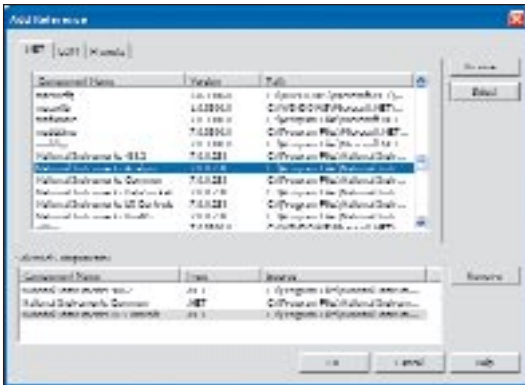
Step 5. Add references to the appropriate .NET class libraries.
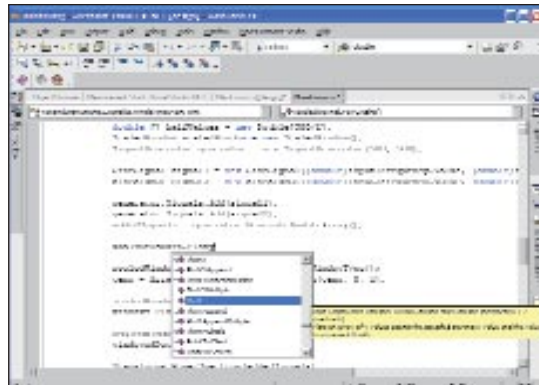
Step 7. Increase your productivity by using the Intellisense capabilities of Visual Studio .NET with Measurement Studio classes.

Step 6. Click the help button to launch the Measurement Studio Reference, which provides complete information about controls, properties, methods, and events.

Present

Extensible .NET user interface (UI) controls deliver unparalleled flexibility through customizable features. This flexibility combined with measurement-specific UI controls such as real-time 2D graphs, binary switches, and LEDs empower the creation of intuitive front panels for virtual instrument applications.

In addition to taking advantage of professional presentation capabilities, you can bind any user interface component – both NI components and other native .NET components – to live data across the Internet without writing code, through the built-in capabilities of the NI DataSocket architecture.

Measurement Studio ActiveX controls

You will also receive Measurement Studio support for Visual Basic 6.0 in the Professional and Enterprise Editions. This support includes a collection of ActiveX controls designed for engineers and scientists building virtual instrumentation systems inside Visual Basic 6.0 or any ActiveX control container.

Acquire

With the Measurement Studio ActiveX DAQ controls, you can configure plug-in data acquisition hardware and easily perform analog, digital, and timing I/O operations on all National Instruments DAQ boards through intuitive property pages. You can use ActiveX GPIB, serial, and NI-VISA I/O controls to easily configure communications through property pages. Measurement Studio also includes ActiveX controls for communicating with IVI instrument classes. These controls provide a less complicated programming interface to the hardware and enforce interchangeability.

Analyze and Present

A complete set of ActiveX analysis controls provides a powerful set of algorithms to analyze your measurement data. With these routines, you can easily convert your raw signals to meaningful information inside your measurement application. With scientific user interface components, you can configure real-time 2D and 3D graphs, knobs, meters, gauges, dials, tanks, thermometers, binary switches, and LEDs to create professional instrument front panels in your computer-based measurement applications.

These Measurement Studio ActiveX controls facilitate the creation of true virtual instruments.
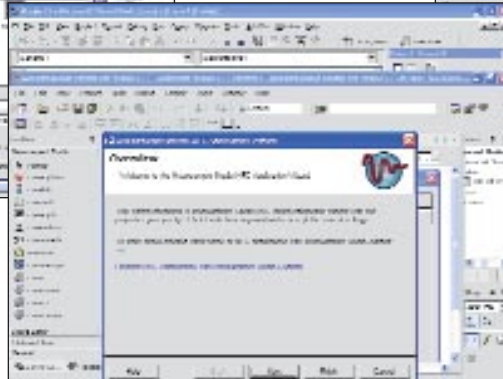
Measurement Studio for Visual C++

Begin your application with the NI Measurement Studio AppWizard.

Use the NI Measurement Studio AppWizard to configure your MFC application.

Choose between creating a new measurement application or dynamic link library (DLL), based on Microsoft Foundation class (MFC).

Measurement Studio for Visual C++

Measurement Studio includes a Visual C++ application wizard and a full set of C++ class libraries for creating measurement applications. Because of their object-oriented nature, class libraries are the natural way to deliver functionality to C++. Through the Visual Studio Integration Program (VSIP) with Microsoft, NI delivers native integration into the Visual Studio environment. This integration includes specialized classes and data types, an application wizard, and IntelliSense integration. NI integrated Measurement Studio into Visual C++ so that you can easily start and quickly complete your measurement application. Measurement Studio defines data types that simplify C++ programming for measurement applications and uses these data types across the various class libraries, from acquisition, to analysis, to visualization. Furthermore, the Measurement Studio class libraries work in combination with the proven Microsoft Foundation Class (MFC) libraries so you can easily build standard Windows applications.

Application Wizard

To simplify the development of measurement applications in Visual C++, Measurement Studio features an application wizard. The Measurement Studio AppWizard walks you through building a measurement application and automatically generates an MFC project with the Measurement Studio components you selected. This wizard also can add components to or remove components from existing projects at any time in the development cycle.

Acquisition and Instrument Control

Interface your application to the outside world using Measurement Studio hardware interface classes. In addition to using the following libraries to send and receive commands to and from instruments, you can use NI-VISA, an industry-standard I/O library, to communicate with instruments. With NI-VISA, you can control GPIB, VXI, PXI, serial, or Ethernet devices using the same set of classes. Because Measurement Studio also provides C++ classes for communication with Interchangeable Virtual Instrument (IVI) classes of instruments, you can remove hardware dependence from your code. (For more information on IVI, see *ni.com/ivi*)

In addition to the GPIB and NI-VISA communication capabilities, you also can use Measurement Studio to acquire data from data acquisition (DAQ) devices, NI modular instruments, and FieldPoint Platform distributed I/O devices.

The Measurement Studio DAQ interface for Visual C++ uses the NI-DAQmx libraries and the DAQ Assistant for optimized data acquisition measurements. These libraries give you the capabilities to perform the following types of tasks:
• Analog signal measurement
• Analog signal generation
• Digital input and output
• Counting and timing
• Pulse generation
• Signal switching

Measurement Studio also includes a set of Visual C++ class libraries that you can use to program NI modular instruments such as DMMs, oscilloscopes, power supplies, function generators, and

Measurement Studio for Visual C++
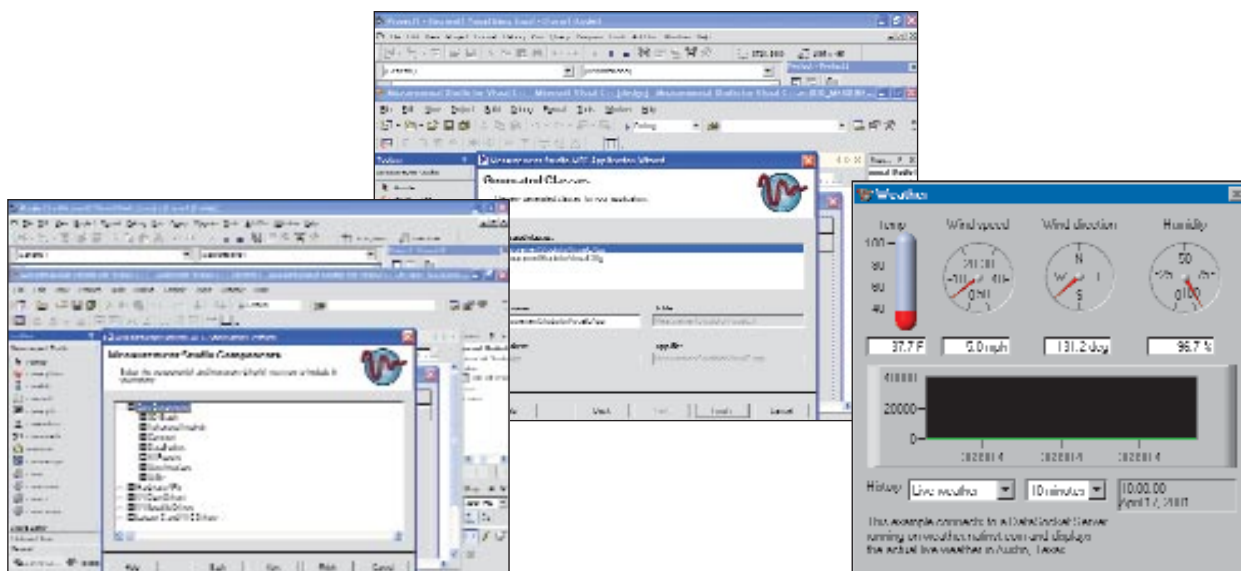
Select the components to include in your project with Measurement Studio Add/Remove Class Libraries Wizard.

Design your graphical user interface (GUI) in the Visual C++ dialog editor using intuitive measurement-specific controls, such as graphs, knobs, and buttons.

switches. These Visual C+ classes provide native C++ interfaces to instrument driver class libraries for automatic data type translation and organized properties and methods. Use the instrument drivers to quickly and easily access hardware functionality with no programming – increasing your productivity to create more powerful measurement applications.

NI Compact FieldPoint and FieldPoint is a modular industrial I/O systems for measurement, control, and data logging applications that demand industrial-grade hardware with easy installation and configuration. With the Measurement Studio FieldPoint interface, you can create distributed robust Visual C++ applications through object-oriented interfaces to programmatically configure and control Compact FieldPoint and FieldPoint modules over Ethernet. This API integrates with the rest of Measurement Studio, using the common classes, wizards, and help documentation. The Measurement Studio interface provides programmatic access to all channel characteristics including channel scales, power-up settings, and watchdog settings.

Internet Connectivity

With the DataSocket classes, you can easily communicate measurement data with numerous protocols, such as OPC, HTTP, FTP, and DataSocket Transfer Protocol (DSTP), across any network, including the Internet. The client/server architecture optimizes the data transfer across the network and makes user interaction to live data across the Internet a reality. You can view test information or control your system from anywhere in the world.

User Interface Display

Because measurement applications require real-time 2D and 3D graphs, knobs, meters, gauges, and more, Measurement Studio provides these flexible measurement-focused user interface controls to simplify development and save you time.

You also can programmatically modify control properties during the execution of the program to give you complete programming flexibility. Measurement Studio presents its virtual instrumentation controls seamlessly in Visual C++ as multithread-safe MFC class controls.

Analysis

Measurement Studio includes a powerful and comprehensive set of classes for analyzing data in Visual C++. You can use these functions to condition and transform your signal using smoothing windows, digital filters, frequency-domain transforms, or other measurement functions. With these powerful analysis routines, you can convert raw data into meaningful information and build robust virtual instruments.

Backward Compatibility with LabWindows/CVI

You can benefit from National Instruments 15-year record of upward code mobility by using the Measurement Studio AppWizard to preserve your legacy code. You can compile any application developed in LabWindows/CVI to Visual C++ without changing a single line of code.

Measurement Studio Modules and Add-On Tools
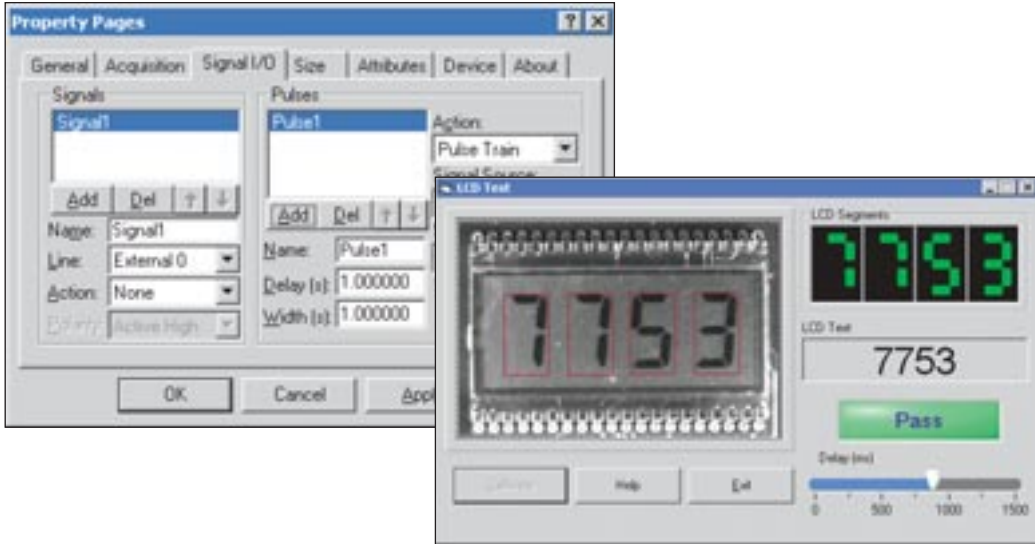
Vision Development Module

National Instruments Vision Development Module includes NI IMAQ Vision, a library of ActiveX vision controls, and NI Vision Assistant, an interactive environment for configuring vision applications. The Vision Development Module is for scientists, automation engineers, and technicians who build machine vision and scientific imaging applications. NI Vision Assistant is for developers who need to quickly prototype vision applications without programming.

Engineers, scientists, and technicians use the NI Vision Development Module in an ever-widening array of industrial process and inspection applications. Vision can gauge the distance between a hard disk read/write head and the magnetic medium, test for flaws in semiconductor wafers, and look for flaws in home insulation during manufacturing. Use vision to improve your manufacturing process, as well as to monitor quality.

IMAQ Vision
• Inspection and
• Pattern matching (color/black and white)
• Blob analysis and morphology
• Measurement and gauging
• Image enhancement and quantitative analysis
• Color image processing and frequency domain processing

NI Vision Assistant
• Interactive environment
• Scripting and batch processing
• Visually managed image

Measurement Studio Modules and Add-On Tools
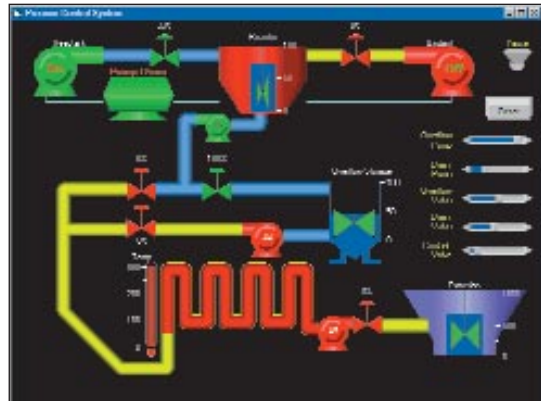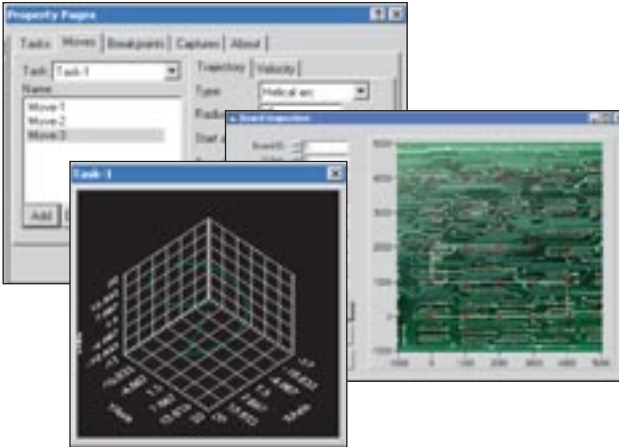
Motion Control Module

The Motion Control Module for Measurement Studio gives you an intuitive way to control the motors, drives, and encoders that make up your motion system. First, configure and verify your hardware within NI Measurement & Automation Explorer. Then, use the interactive property pages of the Motion ActiveX controls to configure a set of axes and a sequence of moves that are executed on those axes. Specify the criteria for the transition from one move in the sequence to the next – you can easily merge moves or specify a dwell time between moves. Finally, your application executes moves depending on the current criteria; so you can focus on your motion system rather than developing the required movements.

- Compatible with NI 7350, NI 7340, and NI 7330 Series controllers
- Motion sequence configured with interactive property pages
- Sequence of moves executed with a single command
- Simplified trajectory moves (arcs, point-to-point), contour moves, and velocity profiling
- Included single and buffered breakpoint outputs
- Single and buffered high-speed capture inputs
- Event notification for trajectory, axis, and motion I/O operations

Automation Symbols Toolkit

National Instruments offers a collection of ActiveX controls for building graphical interfaces for industrial monitoring and control applications. You can use these tools to convert many standard ActiveX control container user interfaces into powerful HMI applications. Applications for industrial automation and process control often require user interfaces that use symbols standardized by the International Society for Measurement and Control. Engineers and operators universally recognize these automation symbols as standard representations of process equipment.

PID Control Toolkit

With the PID ActiveX control tools, you can add advanced process control algorithms to your application. In addition to implementing the standard PID algorithm, these tools include the Autotuning Wizard to help you optimize the PID parameters for your specific system. You can use PID tools with any kind of physical input and output options, including DAQ devices and PLCs.

Measurement Studio Ordering Information

Measurement Studio	Standard Edition	Professional Edition	Enterprise Edition
Project templates	✓	✓	✓
User interface controls	✓	✓	✓
GPIB interfaces	✓	✓	✓
VISA interfaces	✓	✓	✓
NI-DAQmx interfaces	✓	✓	✓
C++ FieldPoint interface	✓	✓	✓
Signal generation	✓	✓	✓
C++ LabVIEW Real-Time connectivity	✓	✓	✓
UI DataSocket binding		✓	✓
DataSocket server		✓	✓
Filtering		✓	✓
Statistics		✓	✓
Parameter assistant		✓	✓
Instrument I/O assistant integration		✓	✓
Instrument I/O assistant code generation		✓	✓
Data acquisition assistant integration		✓	✓
Data acquisition assistant code generation		✓	✓
ActiveX controls for Visual Basic 6.0		✓	✓
Visual C++ 6.0 classes		✓	✓
NI-Reports			✓
C++ Microsoft Office interface (Word & Excel)			✓
3D graph for Visual C++			✓
DSP measurements			✓
Curve fitting			✓
Signal processing			✓
Windowing			✓
NI TestStand .NET and C++ integration			✓
NI LabWindows/CVI FDS			✓

Enterprise Edition

For high-end applications, the Measurement Studio Enterprise Edition has everything you need. The Enterprise Edition adds digital signal processing (DSP) and advanced analysis capabilities, signal generation, report generation, NI LabWindows/CVI complete ANSI C development environment, and NI TestStand connectivity to the Professional Edition.

Professional Edition

The Professional Edition includes DAQ Assistant, Instrument I/O Assistant, .NET and C++ user interface controls, and base analysis. The package also adds DataSocket networking technology for developing distributed virtual instrumentation systems.

Standard Edition

The NI Measurement Studio Standard Edition includes the base set of controls needed to build a measurement application. It includes acquisition controls (DAQ, GPIB, serial, and VISA), and standard user interface controls.

NI Developer Suite

NI Developer Suite is a subscription program that includes the software tools you need for building a complete measurement system. From making measurements to analyzing and presenting results, NI Developer Suite puts the latest powerful, industry-standard software at your fingertips and provides you with regular quarterly updates of National Instruments application and driver software and other software resources to keep you up to date with the very latest development tools (see page 39).

Services and Support

As a complement to your Measurement Studio product, consider the following services and visit *ni.com/services*:

Measurement Studio SSP – Software upgrades and priority support for one year – *ni.com/ssp*

Technical Support – through Applications Engineers worldwide, Web resources, and Premier Support – *ni.com/support*

Alliance with Microsoft

To integrate efficiently into the Microsoft Visual Studio development environment, National Instruments formed an alliance with Microsoft through the Visual Studio Integration Program (VSIP). Measurement Studio tools integrate tightly into Visual Studio and are used in exactly the same way as standard Microsoft tools.

Optimized for

Microsoft **Visual Studio** .net

Ordering Information

NI Measurement Studio
  Development systems
    Enterprise Edition* 778800-03
    Professional Edition* 778801-03
    Standard Edition 778802-03
  Modules
    Motion Control Module 778804-03
    Vision Development Module 777860-03
  Add-on tools
    Automation Symbols Toolkit 777607-01
    PID Control Toolkit...777757-01
  Software subscription service 930800-01
*Includes Visual Studio 6.0 tools

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.

BUY ONLINE!
Visit *ni.com/info* and enter mstudio.