QUICK REFERENCE GUIDE

Measurement Studio™ Visual C++ Class Hierarchy Chart

Measurement Studio is an integrated suite of measurement and automation tools and class libraries for Microsoft Visual Studio .NET 2003 and Visual Studio 2005. Measurement Studio dramatically reduces application development time with wizards, simplified data networking, and ActiveX user interface controls. Code designers interactively define reusable acquisition tasks and automatically generate code. Advanced analysis libraries and rich object-oriented hardware APIs–for performing tasks such as data acquisition and instrument control–enable the development of sophisticated measurement applications.

Legend

- Measurement Studio Class
- MFC Class
- Abstract Base Class
- Multiple Inheritance
- <> Template Class
- Type Definitions
- **bold** Bold text denotes a top-level class that you frequently create

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DataSocket

The DataSocket class library includes a set of classes that encapsulates the NI-DataSocket interfaces, which simplify the exchange of data between clients and servers across a wide variety of transport protocols.

- CNiDispatch
  - CNiDataSocketData
  - **CNiDataSocketServer**
- **CNiDataSocket**
- CNiDataSocketAttributeList
- CNiOpcQuality

NI-488.2

The NI-488.2 class library includes a set of classes that encapsulates the NI-488.2 (GPIB) interface. Use `CNi4882Device` to control IEEE-488.*x* devices, such as oscilloscopes and digital multimeters. Use `CNi4882Board` to control NI-488.2 interface boards such as PCI-GPIB+.

- CNi4882
  - **CNi4882Board**
  - **CNi4882Device**
- CNi4882Address
- CNi4882AddressList

Exception

The Exception classes describe various exceptions that Measurement Studio Visual C++ libraries generate. The exception classes are defined in various Measurement Studio Visual C++ class libraries.

- CException
  - CNiException
    - CNiExceptionT<>
      - CNiIviException
      - CNiMathException
      - CNiSystemException
      - CNiVisaException
    - CNi4882Exception
    - CNiControlVersionException
    - CNiDAQmxException
    - CNiDataInitializationException
    - CNiIndexException
    - CNiMatrixAccessException
    - CNiNotSupportedException
    - CNiObjectNotInUsableStateException
    - CNiTimerException
    - CNiVectorAccessException
  - COleException
    - CNiOleException

Utility

The Utility class library includes a set of classes that encapsulates various interfaces such as file I/O, asynchronous timers, sound generation, and system services.

- CStdioFile
  - CNiFile
    - CNiTempFile
- CNiThreadLocalVarBase<>
  - CNiThreadLocalVar<>
- CNiRegKey
- CNiRegKeys
- CNiRegValue
- CNiRegValues
- CNiSound
- CNiSystem
- CWnd
  - CNiSystemTrayIcon
- CNiTimer

Microsoft Excel

The Microsoft Excel class library includes a set of classes that encapsulates the ActiveX Automation interface to the Microsoft Excel application. Use this class library to create and open Excel worksheets and workbooks, create graphs, import images, and format your spreadsheets using formulas and functions.

- CNiExcelWebOptions
- CNiInterface
  - CNiDispatch
    - **CNiExcelApplication**
    - CNiExcelCellRange
    - CNiExcelChart
    - CNiExcelWorkbook
    - CNiExcelWorksheet

Microsoft Word

The Microsoft Word class library includes a set of classes that encapsulates the ActiveX Automation interface to the Microsoft Word application. Use this class library to create or open Word documents, add tables and images, modify a document's appearance, and close the Word application.

- CNiWordWebOptions
- CNiInterface
  - CNiDispatch
    - **CNiWordApplication**
    - CNiWordDocument
    - CNiWordImage
    - CNiWordTable

NI-VISA

The NI-VISA class library includes a set of classes that encapsulates the NI-VISA interface. Use `CNiVisaSession` to control an IEEE-488.2, serial, VXI, PXI, or TCP/IP device. Use `CNiVisaEvent` and derived classes to respond to VISA events such as triggers and interrupts.

- CNiVisaObject
  - CNiVisaEvent
    - CNiVisaClearEvent
    - CNiVisaExceptionEvent
    - CNiVisaGpibCicEvent
    - CNiVisaGpibListenEvent
    - CNiVisaGpibTalkEvent
    - CNiVisaIoCompletionEvent
    - CNiVisaPxiInterruptEvent
    - CNiVisaSerialAnyCharReceivedEvent
    - CNiVisaSerialBreakEvent
    - CNiVisaSerialCtsEvent
    - CNiVisaSerialDcdEvent
    - CNiVisaSerialDsrEvent
    - CNiVisaSerialRIEvent
    - CNiVisaSerialTermCharReceivedEvent
    - CNiVisaServiceRequestEvent
    - CNiVisaTriggerEvent
    - CNiVisaVxiInterruptEvent
    - CNiVisaVxiSignalEvent
    - CNiVisaVxiSysFailEvent
    - CNiVisaVxiSysResetEvent
    - CNiVisaUsbInterruptEvent
  - **CNiVisaSession**
    - CNiVisaResourceManager
- CNiVisaEventHandlerId
- CNiVisaJobId
- CNiVisaResourceList

LabVIEW Real-Time Module

The LabVIEW Real-Time Module class library includes a set of classes you use to read from and write to shared memory on an RT Series processor board. Use this class library to pass data between LabVIEW Real-Time Module VIs and an application.

- CNiLvRealTimeSharedMemLocByName
  - CNiLvRealTimeSharedMemLocByNameT<>
    - CNiLvRealTimeSharedUInt8ByName
    - CNiLvRealTimeSharedInt16ByName
    - CNiLvRealTimeSharedInt32ByName
    - CNiLvRealTimeSharedReal32ByName
    - CNiLvRealTimeSharedReal64ByName

Note: This class library is only supported in Visual Studio .NET 2003.

Analysis

The Analysis class library includes `CNiMath`, which you can use to perform signal generation, frequency and time domain analysis, windowing, digital filtering, curve fitting, statistics, waveform measurements, and linear algebra. You can use the `CNiPeakDetector` class to detect peaks in waveforms. You can use the `CNiIIRCascadeFilter` class to create cascading infinite impulse response filters. You can use the `CNiIIRDirectFilter` to create a direct form infinite impulse response filter using custom reverse and forward coefficients. You can use the `CNiMathWarning` class to detect any warnings in the Analysis class library.

- CNiIIRCascadeFilter
- CNiIIRDirectFilter
- CNiMath
- CNiMathWarning
- CNiPeakDetector

User Interface

The User Interface class library includes a set of classes that encapsulates the ActiveX user interface controls such as graph, button, slide, and knob. Objects that derive from `CWnd` represent the actual instance of the control on a `CDialog` or `CFormView`. Objects that derive from `COleDispatchDriver` represent interfaces to subparts of the control, such as cursors, fonts, and plots. These class definitions are in the UI and 3D Graph class libraries.

- CWnd
  - CNiControl
    - **CNiButton**
    - **CNiGraph**
    - **CNiGraph3D**
    - **CNiKnob**
    - **CNiNumEdit**
    - **CNiSlide**
- CNiInterface
  - CNiAnnotation
  - CNiAnnotations
  - CNiArrow
  - CNiAxes
  - CNiAxes3D
  - CNiAxis
  - CNiAxis3D
  - CNiBinding
  - CNiBindings
  - CNiCaption
  - CNiContour
  - CNiContours
  - CNiControlMetrics
  - CNiCursor
  - CNiCursor3D
  - CNiCursors
  - CNiCursors3D
  - CNiDispatch
    - CNiFont
    - CNiPicture
  - CNiImage
  - CNiLabels
  - CNiLabels3D
  - CNiLight
  - CNiLights
  - CNiPlot
  - CNiPlot3D
  - CNiPlots
  - CNiPlots3D
  - CNiPointer
  - CNiPointers
  - CNiShape
  - CNiTicks
  - CNiTicks3D
  - CNiValuePair
  - CNiValuePairs

NI-Reports

The NI-Reports class library includes a set of classes that communicate with the National Instruments NI-Reports ActiveX Automation server. The NI-Reports ActiveX Automation server provides report generation, formatting, and printing functionality.

- CNiInterface
  - **CNiReport**
  - CNiReportData
  - CNiReportPicture
  - CNiReportTable
  - CNiReportTableCell
  - CNiReportTableCells
  - CNiReportTableRow

Data Objects

The data objects are complex, vector, string, and matrix data types. These data objects represent a common format for exchanging data between the acquisition, analysis, and user interface portions of an application. These class definitions are in the Common class library.

- CObject
  - CNiDataObject
    - CNiComplex
      - CNiComplexT<> → CNiDataTypeT<>
        - CNiComplexInt8
        - CNiComplexUInt8
        - CNiComplexInt16
        - CNiComplexUInt16
        - CNiComplexInt32
        - CNiComplexUInt32
        - CNiComplexInt
        - CNiComplexUInt
        - CNiComplexReal32
        - **CNiComplexReal64**
    - CNiLockableDataObject
      - CNiVector
        - CNiVectorT<> → CNiDataType<>
          - CNiScalarVector<>
            - CNiInt8Vector
            - CNiUInt8Vector
            - CNiInt16Vector
            - CNiUInt16Vector
            - CNiInt32Vector
            - CNiUInt32Vector
            - CNiIntVector
            - CNiUIntVector
            - CNiReal32Vector
            - **CNiReal64Vector**
          - CNiComplexVector<>
            - CNiComplexInt8Vector
            - CNiComplexUInt8Vector
            - CNiComplexInt16Vector
            - CNiComplexUInt16Vector
            - CNiComplexInt32Vector
            - CNiComplexUInt32Vector
            - CNiComplexIntVector
            - CNiComplexUIntVector
            - CNiComplexReal32Vector
            - **CNiComplexReal64Vector**
        - CNiColorVector → CNiDataType<CNiColor>
      - CNiMatrix
        - CNiMatrixT<> → CNiDataType<>
          - CNiScalarMatrix<>
            - CNiInt8Matrix
            - CNiUInt8Matrix
            - CNiInt16Matrix
            - CNiUInt16Matrix
            - CNiInt32Matrix
            - CNiUInt32Matrix
            - CNiIntMatrix
            - CNiUIntMatrix
            - CNiReal32Matrix
            - **CNiReal64Matrix**
          - CNiComplexMatrix<>
            - CNiComplexInt8Matrix
            - CNiComplexUInt8Matrix
            - CNiComplexInt16Matrix
            - CNiComplexUInt16Matrix
            - CNiComplexInt32Matrix
            - CNiComplexUInt32Matrix
            - CNiComplexIntMatrix
            - CNiComplexUIntMatrix
            - CNiComplexReal32Matrix
            - **CNiComplexReal64Matrix**
    - CNiGenericLockableDataObject
      - CNiGenericVector<>
        - CNiBoolVector
        - CNiStringVector
      - CNiGenericMatrix<>
        - CNiBoolMatrix
  - CString
    - CNiString
  - COleVariant
    - CNiVariant
  - CNiColor

IVI Class Drivers

The Measurement Studio IVI class driver class libraries provide native Measurement Studio interfaces to IVI class-compliant instrument drivers to allow you to seamlessly integrate instrument control into Measurement Studio applications. You can use the Measurement Studio IVI class drivers to control any instrument that has an IVI class-compliant instrument driver.

- CNiIviDriver
  - CNiIviClassDriver
    - **CNiIviDcPwr**
    - **CNiIviDmm**
    - **CNiIviFgen**
    - **CNiIviScope**
    - **CNiIviSwtch**
  - CNiIviDcPwrSubObject
    - CNiIviDcPwrOutput
    - CNiIviDcPwrTrigger
  - CNiIviDmmSubObject
    - CNiIviDmmAc
    - CNiIviDmmAdvanced
    - CNiIviDmmFrequency
    - CNiIviDmmMeasurement
    - CNiIviDmmMultipoint
    - CNiIviDmmRtd
    - CNiIviDmmTemperature
    - CNiIviDmmThermistor
    - CNiIviDmmThermocouple
    - CNiIviDmmTrigger
- CNiIviDriverSubObject
  - CNiIviClassDriverIdentity
  - CNiIviClassDriverOperation
  - CNiIviDriverOperation
  - CNiIviSpecificDriverIdentity
  - CNiIviUtility
- CNiIviFgenSubObject
  - CNiIviFgenAm
  - CNiIviFgenArbitrary
  - CNiIviFgenArbitrarySequence
  - CNiIviFgenArbitraryWaveform
  - CNiIviFgenFm
  - CNiIviFgenOutput
  - CNiIviFgenStandardWaveform
  - CNiIviFgenTrigger
- CNiIviScopeSubObject
  - CNiIviScopeAcquisition
  - CNiIviScopeChannel
  - CNiIviScopeMeasurement
  - CNiIviScopeReferenceLevel
  - CNiIviScopeTrigger
  - CNiIviScopeTriggerAcLine
  - CNiIviScopeTriggerEdge
  - CNiIviScopeTriggerGlitch
  - CNiIviScopeTriggerRunt
  - CNiIviScopeTriggerTv
  - CNiIviScopeTriggerWidth
- CNiIviSwtchSubObject
  - CNiIviSwtchChannel
  - CNiIviSwtchCharacteristics
  - CNiIviSwtchPath
  - CNiIviSwtchScan

NI-DAQmx

The NI-DAQmx class library includes a set of classes that you can use to communicate with and control an NI data acquisition (DAQ) device.

- CNiDAQmxAdvanceTrigger
- CNiDAQmxAnalogEdgeReferenceTrigger
- CNiDAQmxAnalogEdgeStartTrigger
- CNiDAQmxAnalogLevelPauseTrigger
- **CNiDAQmxAnalogMultiChannelReader**
- **CNiDAQmxAnalogMultiChannelWriter**
- **CNiDAQmxAnalogSingleChannelReader**
- **CNiDAQmxAnalogSingleChannelWriter**
- **CNiDAQmxAnalogUnscaledReader**
- **CNiDAQmxAnalogUnscaledWriter**
- CNiDAQmxAnalogWindowPauseTrigger
- CNiDAQmxAnalogWindowReferenceTrigger
- CNiDAQmxAnalogWindowStartTrigger
- CNiDAQmxArmStartTrigger
- CNiDAQmxAsyncOperation
- CNiDAQmxBuffer
- CNiDAQmxChannel
  - CNiDAQmxAIChannel
  - CNiDAQmxAOChannel
  - CNiDAQmxCIChannel
  - CNiDAQmxCOChannel
  - CNiDAQmxDIChannel
  - CNiDAQmxDOChannel
- CNiDAQmxCODataFrequency
- CNiDAQmxCODataTicks<>
  - CNiDAQmxCODataUInt32Ticks
- CNiDAQmxCODataTime
- **CNiDAQmxCounterMultiChannelWriter**
- **CNiDAQmxCounterReader**
- **CNiDAQmxCounterSingleChannelWriter**
- CNiDAQmxDevice
- CNiDAQmxDigitalEdgeAdvanceTrigger
- CNiDAQmxDigitalEdgeArmStartTrigger
- CNiDAQmxDigitalEdgeReferenceTrigger
- CNiDAQmxDigitalEdgeStartTrigger
- CNiDAQmxDigitalEdgeWatchdogExpirationTrigger
- CNiDAQmxDigitalLevelPauseTrigger
- **CNiDAQmxDigitalMultiChannelReader**
- **CNiDAQmxDigitalMultiChannelWriter**
- **CNiDAQmxDigitalPatternPauseTrigger**
- **CNiDAQmxDigitalPatternReferenceTrigger**
- **CNiDAQmxDigitalPatternStartTrigger**
- **CNiDAQmxDigitalSingleChannelReader**
- **CNiDAQmxDigitalSingleChannelWriter**
- CNiDAQmxEvent
  - CNiDAQmxSignalEvent
    - CNiDAQmxCounterOutputEvent
    - CNiDAQmxDigitalChangeDetectionEvent
    - CNiDAQmxSampleClockEvent
    - CNiDAQmxSampleCompleteEvent
  - CNiDAQmxTaskDoneEvent
- CNiDAQmxEventHandlerID
- CNiDAQmxExportSignals
- CNiDAQmxExternalCalibrationSession
- CNiDAQmxHandshakeTrigger
- CNiDAQmxInterlockedHandshakeTrigger
- CNiDAQmxPauseTrigger
- CNiDAQmxPhysicalChannel
- CNiDAQmxReferenceTrigger
- CNiDAQmxSavedChannelInfo
- CNiDAQmxSavedScaleInfo
- CNiDAQmxSavedTaskInfo
- CNiDAQmxScale
  - CNiDAQmxLinearScale
  - CNiDAQmxPolynomialScale
  - CNiDAQmxRangeMapScale
  - CNiDAQmxTableScale
- CNiDAQmxSinglePoint
- CNiDAQmxStartTrigger
- CNiDAQmxStream
- CNiDAQmxSwitch
- CNiDAQmxSwitchChannel
- CNiDAQmxSwitchScan
- **CNiDAQmxSystem**
- **CNiDAQmxTask**
- CNiDAQmxTiming
- CNiDAQmxTriggers
- CNiDAQmxWatchdog
- CNiDAQmxWatchdogExpirationTrigger