

Keysight U2701A/U2702A USB Modular Oscilloscopes

IVI-COM
Programmer's
Reference for
Keysight VEE

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This chapter introduces the remote programming basics of the U2701A/U2702A USB modular oscilloscopes. The IVI-COM programming commands provide the means to control this instrument remotely via a PC.

Getting Started

The IVI Foundation is an open consortium founded in year 1998 to promote specifications for programming test instruments.

For complete information on the IVI Foundation and for the most up-to-date versions of all IVI specifications and components, you can visit the IVI Foundation website at www.ivifoundation.org.

Installation Guide

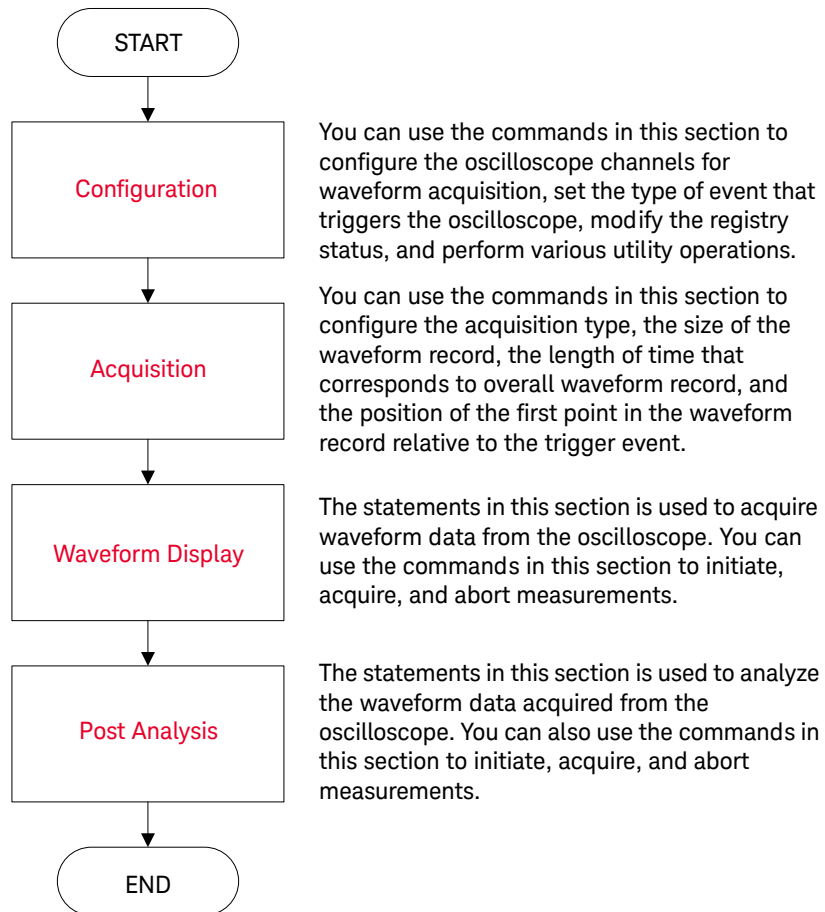
- 1 To download the KeysightU2701A IVI Driver, go to the Keysight Technical Support website at:
<http://www.home.keysight.com/keysight/techSupport.jsp?pid=1369621&cc=US&lc=eng&t=80029.k.0&guid=181735>
- 2 Click **Drivers & Software > IVI-COM and IVI-C for U2701A/U2702A** to download the KeysightU2701A IVI Driver package.
- 3 Save the file to any location on your hard disk.
- 4 Disconnect any instrument that is connected to your PC and close all other applications on your PC.
- 5 Double-click the saved installation file to begin installation.
- 6 The latest version of the IVI Shared Components should be downloaded from www.ivifoundation.org prior to installing the KeysightU2701A IVI Driver package. It is recommended that you periodically check for newer versions of the IVI Shared Components and update as available from the IVI Foundation.
- 7 If the latest version of the IVI Shared Components is detected, installation of the KeysightU2701A IVI Driver will proceed as normal.



- 8 The **KeysightU2701A IVI Driver 1.0.0.0 Setup Wizard** dialog will appear. Click **Next** to begin.
- 9 Read the License Agreement and select **I accept the terms in the License Agreement** to proceed. You may click **Print** to print a hardcopy of the Keysight License Terms for your reference. Click **Next** to proceed.
- 10 Fill in the Customer Information Form accordingly, and click **Next**.
- 11 Select the **Typical** or **Full** option in the Setup Type to install the KeysightU2701A IVI Driver package. Advanced users may select the **Custom** option to customize the program features to be installed and where they will be installed. Click **Next** to proceed.
- 12 Click **Next** to install to the specified folder or click **Change** to install to a different folder.
- 13 Click **Install** to begin the installation of the KeysightU2701A IVI Driver package.
- 14 Click **Finish** when the installation has completed.

General Guidelines for Oscilloscope Programming

The block diagram below illustrates the general flow of steps required to program an oscilloscope. The necessary IVI-COM driver commands are arranged to reflect this block diagram.



Side-by-Side SCPI and IVI-COM Comparison of the U2701A/U2702A Commands

Table 1-1 SCPI, IKeysightU2701A IVI, and IlviScope command comparison

SCPI command	IKeysightU2701A IVI command	IlviScope command
IEEE 488.2 Common commands		
*CLS	IKeysightU2701AStatus.Clear	-
*IDN	IlviDriver.Identity	IlviDriver.Identity
*OPC?	IKeysightU2701ASystem.WaitForOperationComplete()	-
*RST	IlviDriverUtility.Reset()	IlviDriverUtility.Reset()
Root level commands		
AUTO	IKeysightU2701AMeasurements.AutoSetup	IlviScopeMeasurements.AutoSetup
ACQUIRE commands		
AVERages	IKeysightU2701AAcquisition.NumberOfAverages	IlviScopeAcquisition.NumberOfAverages
MODE	IKeysightU2701AAcquisition.SampleMode	IlviScopeAcquisition.SampleMode
SRATE?	IKeysightU2701AAcquisition.SampleRate	IlviScopeAcquisition.SampleRate
TYPE	IKeysightU2701AAcquisition.Type	IlviScopeAcquisition.Type
CHANnel<n> commands		
BWLimit	IKeysightU2701AChannel.BandwidthLimit	-
COUPling	IKeysightU2701AChannel.Coupling	IlviScopeChannel.Coupling
DISPlay	IKeysightU2701AChannel.Enabled	IlviScopeChannel.Enabled
INVert	-	-
OFFSet	IKeysightU2701AChannel.Offset	IlviScopeChannel.Offset
PROBe	IKeysightU2701AChannel.ProbeAttenuation	IlviScopeChannel.ProbeAttenuation
SCALe	IKeysightU2701AChannel.Range	IlviScopeChannel.Range

Table 1-1 SCPI, IKeysightU2701A IVI, and IlviScope command comparison (continued)

SCPI command	IKeysightU2701A IVI command	IlviScope command
KEY commands		
AUTO_SCALE	IKeysightU2701AMeasurements.AutoSetup	IlviScopeMeasurements.AutoSetup
CH1	IKeysightU2701AChannel.Enabled	IlviScopeChannel.Enabled
CH1_POS_DEC	IKeysightU2701AChannel.Offset	IlviScopeChannel.Offset
CH1_POS_INC	IKeysightU2701AChannel.Offset	IlviScopeChannel.Offset
CH1_SCALE_DEC	IKeysightU2701AChannel.Range	IlviScopeChannel.Range
CH1_SCALE_INC	IKeysightU2701AChannel.Range	IlviScopeChannel.Range
CH2	IKeysightU2701AChannel.Enabled	IlviScopeChannel.Enabled
CH2_POS_DEC	IKeysightU2701AChannel.Offset	IlviScopeChannel.Offset
CH2_POS_INC	IKeysightU2701AChannel.Offset	IlviScopeChannel.Offset
CH2_SCALE_DEC	IKeysightU2701AChannel.Range	IlviScopeChannel.Range
CH2_SCALE_INC	IKeysightU2701AChannel.Range	IlviScopeChannel.Range
MAIN_DELAYED	IKeysightU2701AAcquisition.StartTime	IlviScopeAcquisition.StartTime
MATH	IKeysightU2701AMeasurementsMathFunction	-
MEASURE	IKeysightU2701AMeasurement	IlviScope.Measurement
MODE_COUPLING	IKeysightU2701AChannel.Coupling	IlviScopeChannel.Coupling
SINGLE	IKeysightU2701AMeasurements.Initiate	IlviScopeMeasurements.Initiate
TIME_POS_DEC	IKeysightU2701AAcquisition.StartTime	IlviScopeAcquisition.StartTime
TIME_POS_INC	IKeysightU2701AAcquisition.StartTime	IlviScopeAcquisition.StartTime
TIME_SCALE_DEC	IKeysightU2701AAcquisition.TimePerRecord	IlviScopeAcquisition.TimePerRecord
TIME_SCALE_INC	IKeysightU2701AAcquisition.TimePerRecord	IlviScopeAcquisition.TimePerRecord
TRIG_LVL_DEC	IKeysightU2701ATrigger.Level Property	IlviScopeTrigger.Level
TRIG_LVL_INC	IKeysightU2701ATrigger.Level Property	IlviScopeTrigger.Level

Table 1-1 SCPI, IKeysightU2701A IVI, and IIVI-Scope command comparison (continued)

SCPI command	IKeysightU2701A IVI command	IIVI-Scope command
MEASure commands		
FALLtime	KeysightU2701AMeasurementEnum Enumeration	IIVI-ScopeMeasurementEnum Enumeration
FREQuency	KeysightU2701AMeasurementEnum Enumeration	IIVI-ScopeMeasurementEnum Enumeration
NDUTcycle	KeysightU2701AMeasurementEnum Enumeration	IIVI-ScopeMeasurementEnum Enumeration
NWIDth	KeysightU2701AMeasurementEnum Enumeration	IIVI-ScopeMeasurementEnum Enumeration
OVERshoot	KeysightU2701AMeasurementEnum Enumeration	IIVI-ScopeMeasurementEnum Enumeration
PDUTcycle	KeysightU2701AMeasurementEnum Enumeration	IIVI-ScopeMeasurementEnum Enumeration
PERiod	KeysightU2701AMeasurementEnum Enumeration	IIVI-ScopeMeasurementEnum Enumeration
PREShoot	KeysightU2701AMeasurementEnum Enumeration	IIVI-ScopeMeasurementEnum Enumeration
PWIDth	KeysightU2701AMeasurementEnum Enumeration	IIVI-ScopeMeasurementEnum Enumeration
RISetime	KeysightU2701AMeasurementEnum Enumeration	IIVI-ScopeMeasurementEnum Enumeration
VAMPlitude	KeysightU2701AMeasurementEnum Enumeration	IIVI-ScopeMeasurementEnum Enumeration
VAVerage	KeysightU2701AMeasurementEnum Enumeration	IIVI-ScopeMeasurementEnum Enumeration
VBASe	KeysightU2701AMeasurementEnum Enumeration	IIVI-ScopeMeasurementEnum Enumeration
VMAX	KeysightU2701AMeasurementEnum Enumeration	IIVI-ScopeMeasurementEnum Enumeration
VMIN	KeysightU2701AMeasurementEnum Enumeration	IIVI-ScopeMeasurementEnum Enumeration

Table 1-1 SCPI, IKeysightU2701A IVI, and IlviScope command comparison (continued)

SCPI command	IKeysightU2701A IVI command	IlviScope command
MEASure commands		
VPP	KeysightU2701AMeasurementEnum Enumeration	IlviScopeMeasurementEnum Enumeration
VRMS	KeysightU2701AMeasurementEnum Enumeration	IlviScopeMeasurementEnum Enumeration
VTOP	KeysightU2701AMeasurementEnum Enumeration	IlviScopeMeasurementEnum Enumeration
TIMEbase commands		
DElayed	IKeysightU2701AAcquisition.StartTime	IlviScopeAcquisition.StartTime
HOLDoff	IKeysightU2701ATrigger.Holdoff	IlviScopeTrigger.Holdoff
POSition	IKeysightU2701AAcquisition.StartTime	IlviScopeAcquisition.StartTime
SCALE	IKeysightU2701AAcquisition.TimePerRecord	IlviScopeAcquisition.TimePerRecord
TRIGger commands		
[EDGE]:COUPling	IKeysightU2701ATrigger.Coupling Property	IlviScopeChannel.Coupling
[EDGE]:LEVel	IKeysightU2701ATrigger.Level Property	IlviScopeTrigger.Level
[EDGE]:SLOPe	IKeysightU2701ATriggerEdge.Slope Property	IlviScopeTriggerEdge.Slope
[EDGE]:SOURe	IKeysightU2701ATrigger.Source Property	IlviScopeTrigger.Source
[EDGE]:SWEep	IKeysightU2701ATrigger.Modifier Property	IlviScopeTrigger.Modifier
MODE	IKeysightU2701ATrigger.Type Property	IlviScopeTrigger.Type
PULSe:MODE	KeysightU2701ATriggerTypeEnum Enumeration	IlviScopeTriggerTypeEnum Enumeration
PULSEe:WIDTH	KeysightU2701ATriggerTypeEnum Enumeration	IlviScopeTriggerTypeEnum Enumeration
STATus	IKeysightU2701ATrigger.Status	-
WAVEform commands		
DATA?	IKeysightU2701AMeasurement.ReadWaveform	IlviScopeMeasurement.ReadWaveform
XINCrement?	IKeysightU2701AMeasurement.ReadWaveform	IlviScopeMeasurement.ReadWaveform
XORigin?	IKeysightU2701AMeasurement.ReadWaveform	IlviScopeMeasurement.ReadWaveform

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2 Configuration

Count	25
Item	26
Name	41
Close	43
Initialize	44
Initialized	46
Configure	47
Coupling	49
Edge	51
Glitch	55
Holdoff	62
Modifier	63
Level	65
Source	66
Status	67
TV	68
Width	77
Clear	85
ConfigureServiceRequest	86
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2 Configuration

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This chapter describes the configuration commands used to program the U2701A/U2702A USB modular oscilloscopes over the remote interface. You can use the commands in this chapter to configure the oscilloscope channels for waveform acquisition, set the type of event that triggers the oscilloscope, modify the registry status, and perform various utility operations.

Count

Type

Property

Function

Get

Description

This command returns the number of channels available.

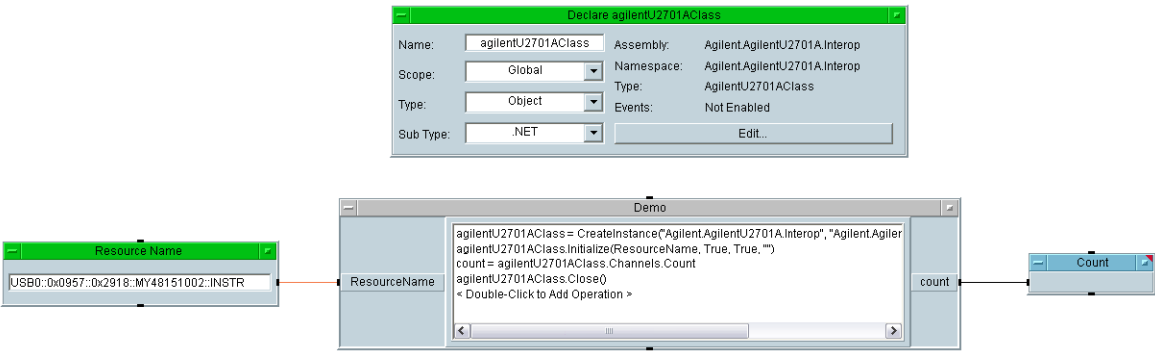
Hierarchy

IKeysightU2701A
└ Channels
 └ Count

Parameters

Long/Int32

Example



Item

This is an interface reference pointer to the IKeysightU2701AChannel interface which is selected by the channel name.

BandwidthLimit

Type

Property

Function

Get and Set

Description

This command returns/sets the bandwidth limit status for the selected channel. If **True**, the bandwidth limit for the selected channel is enabled. If **False**, the bandwidth limit for the selected channel is disabled.

Hierarchy

```
IKeysightU2701A
├── Channels
│   ├── Item(Name)
│   │   └── BandwidthLimit
```

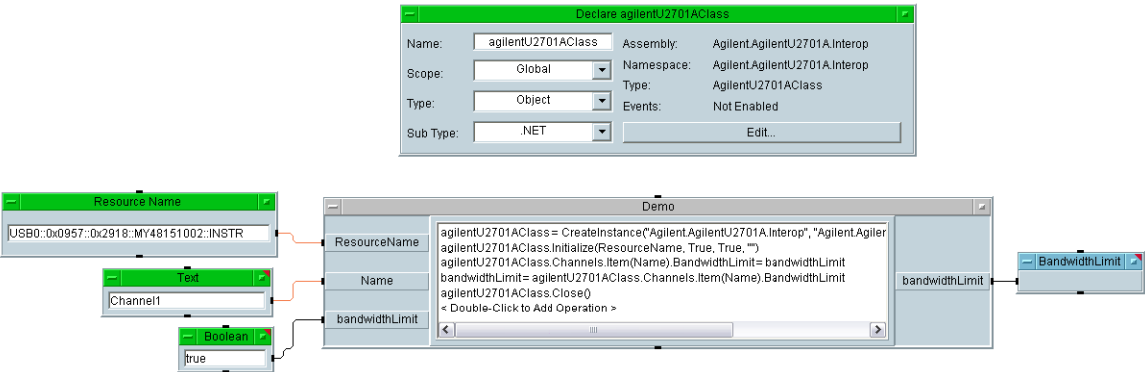
Parameters

Item	Type	Description
Name	String	The name of a measurement. This command is used to select the channel the function is to be run on. (For example: Channel 1, Channel 2, and so on.)

Return Format

Boolean

Example



Configure

Type

Method

Function

Set

Description

This command configures the most commonly used properties of the oscilloscope channel sub-system. Use this command to enable or disable the channel and to set the range, offset, coupling, and probe attenuation values.

Hierarchy

```
IKeysightU2701A
├── Channels
│   └── Item(Name)
│       └── Configure(Range, Offset, Coupling, ProbeAttenuation, Enabled)
```

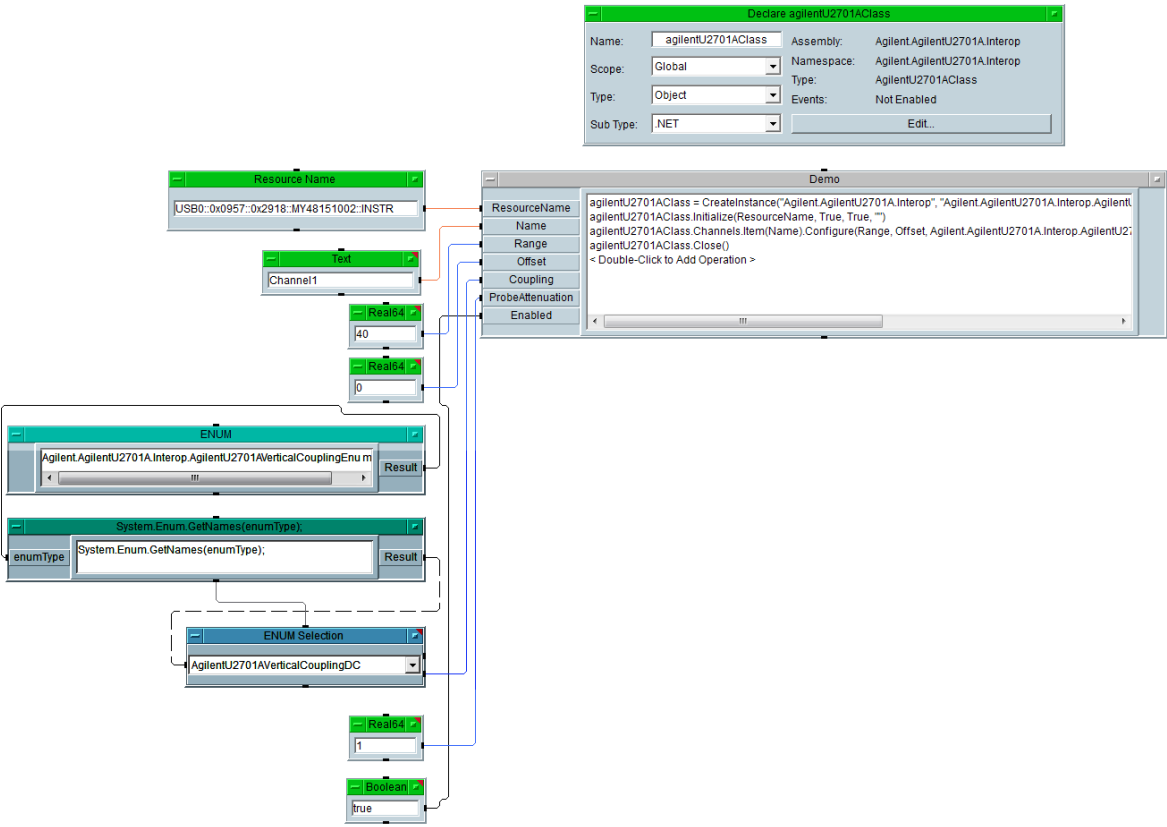
Parameters

Item	Type	Description
Name	String	The name of a measurement. This command is used to select the channel the function is to be run on. (For example: Channel 1, Channel 2, and so on.)
Range	Double	Specifies the vertical range. This value sets the Vertical Range property.
Offset	Double	Specifies the vertical offset. This value sets the Vertical Offset property.
Coupling	KeysightU2701A VerticalCoupling Enum	Specifies how to couple the input signal. This value sets the Vertical Coupling property.
ProbeAttenuation	Double	Specifies the probe attenuation. This value sets the ProbeAttenuation property.
Enabled	Boolean	Specifies if the channel is enabled for acquisition. This value sets the Channels. Enabled property.

Return Format

Boolean

Example



Coupling

Type

Property

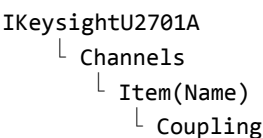
Function

Get and Set

Description

This command returns/sets how the oscilloscope couples the input signal.

Hierarchy



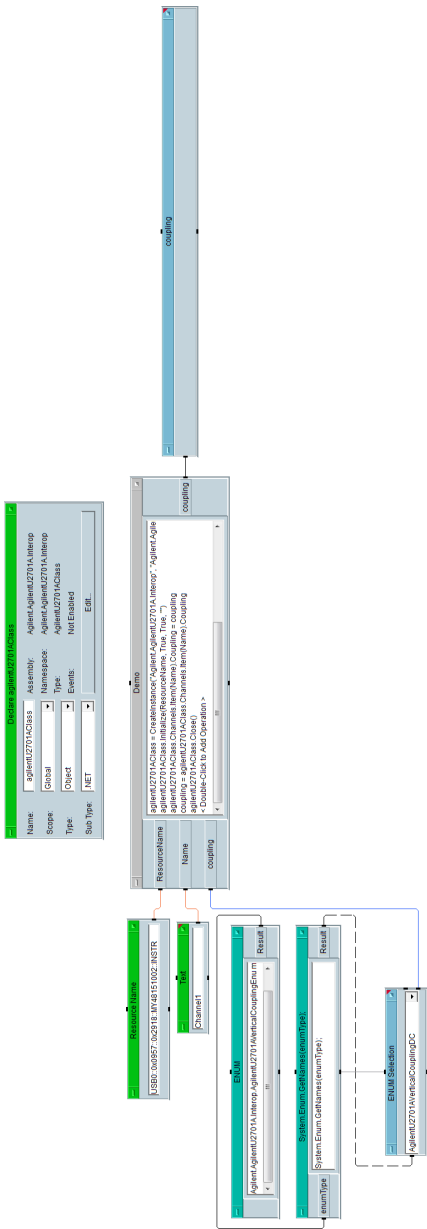
Parameters

Item	Type	Description
Name	String	The name of a measurement. This command is used to select the channel the function is to be run on. (For example: Channel 1, Channel 2, and so on.)

Return Format

Item	Type	Description
KeysightU2701A VerticalCoupling Enum	Enum	See “ KeysightU2701AVerticalCouplingEnum ” on page 112.

Example



Enabled

Type

Property

Function

Get and Set

Description

If this command is set to True, the oscilloscope acquires a waveform for this channel when the IKeysightU2701AMeasurement.Initiate, IKeysightU2701AMeasurement.ReadWaveform, IKeysightU2701AMeasurement.ReadWaveformMeasurement, or IIVI_ScopeMeasurement.ReadWaveformMinMax methods are called.

Hierarchy

```
IKeysightU2701A
├── Channels
│   └── Item(Name)
│       └── Enabled
```

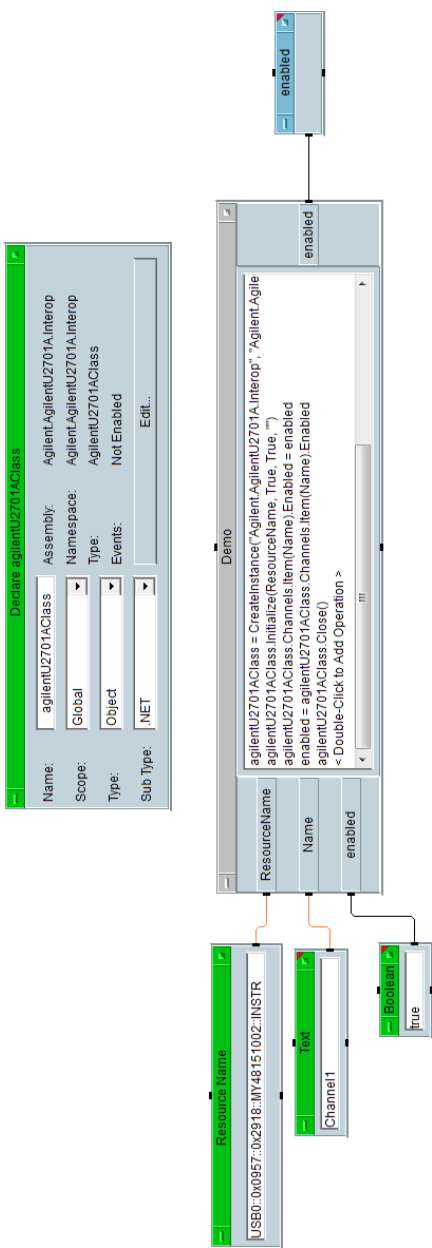
Parameters

Item	Type	Description
Name	String	The name of a measurement. This command is used to select the channel the function is to be run on. (For example: Channel 1, Channel 2, and so on.)

Return Format

Boolean

Example



Offset

Type

Property

Function

Get and Set

Description

This command returns/sets the location of the center of the range that was specified with the **Range** property. The units are expressed in volts, with respect to ground. For example, to acquire a sine wave spanning from 0.0 V to 10.0 V, set Offset to 5.0 V.

Hierarchy

```
IKeysightU2701A
├── Channels
│   └── Item(Name)
│       └── Offset
```

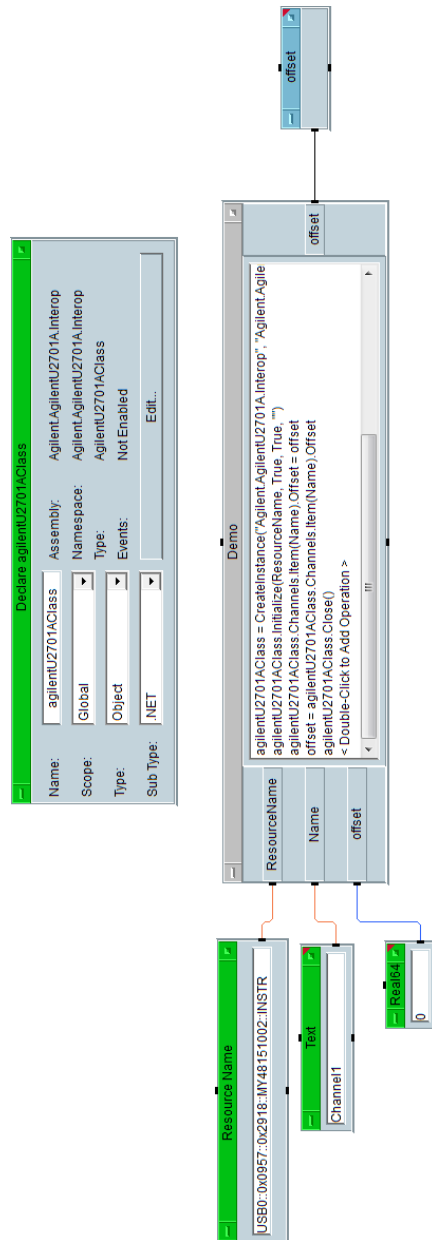
Parameters

Item	Type	Description
Name	String	The name of a measurement. This command is used to select the channel the function is to be run on. (For example: Channel 1, Channel 2, and so on.)

Return Format

Double

Example



ProbeAttenuation

Type

Property

Function

Get and Set

Description

This command returns/sets the scaling factor by which the probe attenuates the input signal. For example, with a 10:1 probe, the value is 10.0.

Hierarchy

```
IKeysightU2701A
├── Channels
│   └── Item(Name)
│       └── ProbeAttenuation
```

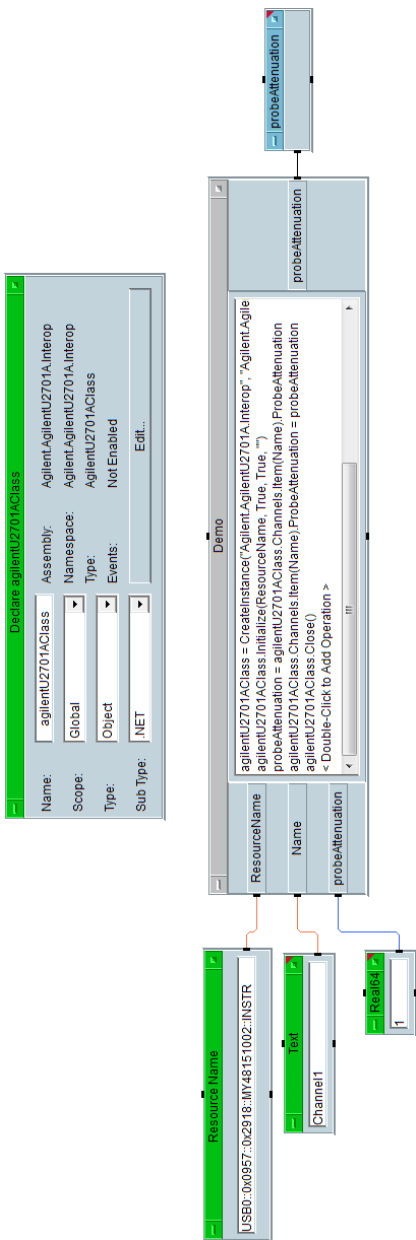
Parameters

Item	Type	Description
Name	String	The name of a measurement. This command is used to select the channel the function is to be run on. (For example: Channel 1, Channel 2, and so on.)

Return Format

Double

Example



Range

Type

Property

Function

Get and Set

Description

This command returns/sets the absolute value of the input range that the oscilloscope can acquire for the channel. The units are expressed in volts. For example, to acquire a sine wave spanning from -5.0 V to 5.0 V, set Range to 10.0 V.

Hierarchy

IKeysightU2701A
└ Channels
└ Item(Name)
└ Range

Parameters

Item	Type	Description
Name	String	The name of a measurement. This command is used to select the channel the function is to be run on. (For example: Channel 1, Channel 2, and so on.)

Remarks

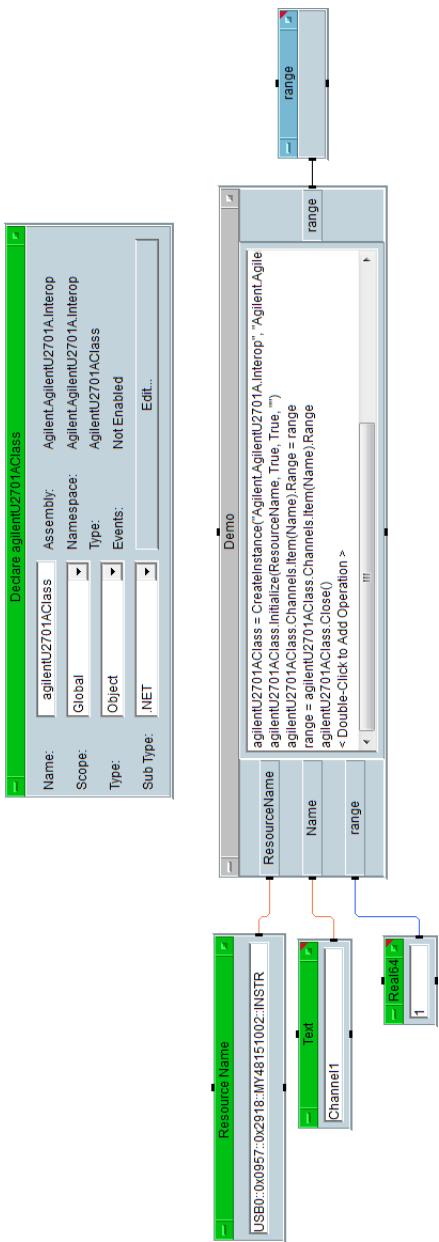
The absolute value of the input range that the oscilloscope can acquire is equivalent to the Volt/Div value multiplied by eight at the scope setting.

Volt/Div (Attenuation = 1x)	Voltage range
2 mV	16 mV
5 mV	40 mV
10 mV	80 mV
20 mV	160 mV
50 mV	400 mV
100 mV	800 mV
200 mV	1.6 V
500 mV	4 V
1 V	8 V
2 V	16 V
5 V	40 V

Return Format

Double

Example



Name

Type

Property

Function

Get

Description

This command returns the channel name for a given index.

Hierarchy

```
IKeysightU2701A
├── Channels
│   └── Name(Index)
```

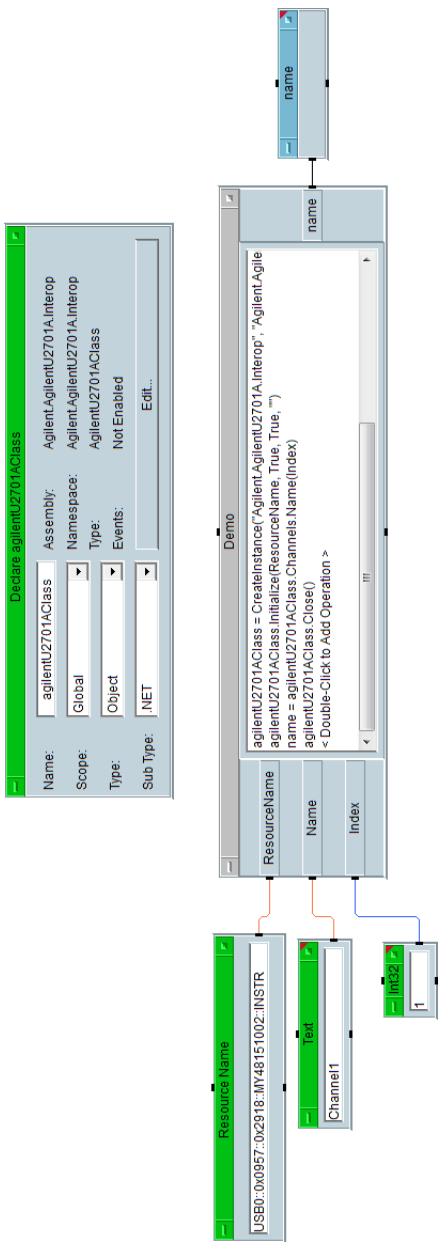
Parameters

Item	Type	Description
Index	Long/Int32	One based index into the collection of channels.

Return Format

String

Example



Close

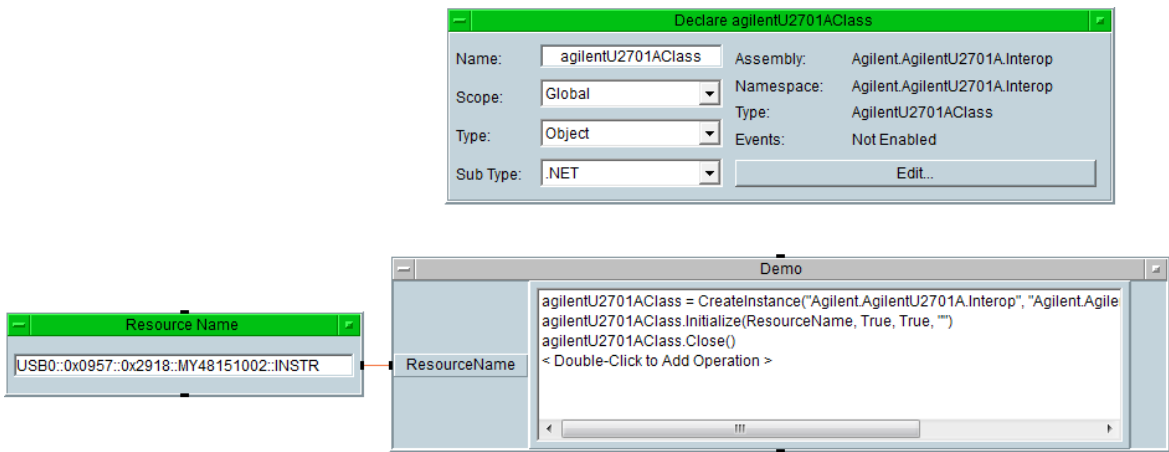
Type
Method

Function
Set

Description
This command closes the I/O session to the instrument. Driver methods and properties that access the instrument are not accessible after Close is called.

Hierarchy
IKeysightU2701A
└─ Close()

Example



Initialize

Type

Method

Function

Set

Description

This command opens the I/O session to the instrument. Driver methods and properties that access the instrument are only accessible after Initialize is called. Initialize optionally performs a Reset and queries the instrument to validate the instrument model.

Hierarchy

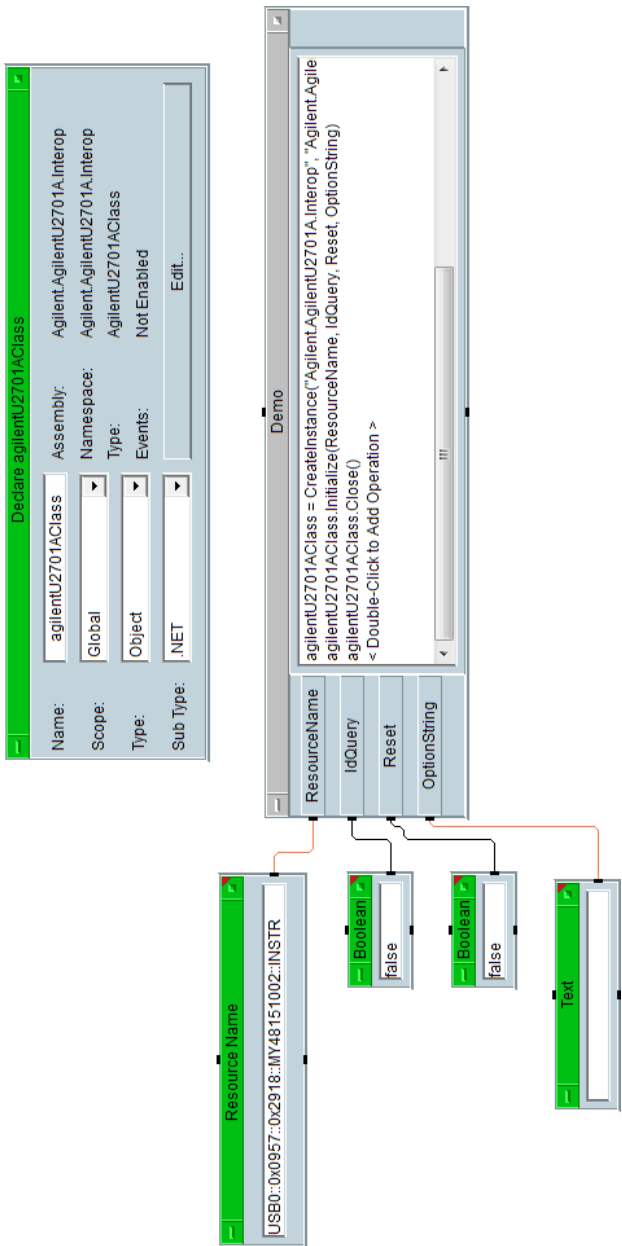
IKeysightU2701A

└ Initialize(ResourceName, IdQuery, Reset, OptionString)

Parameters

Item	Type	Description
ResourceName	String/BSTR	An IVI logical name or an instrument specific string that identifies the address of the instrument, such as a VISA resource descriptor string.
IdQuery	Boolean	Specifies whether to verify the ID of the instrument.
Reset	Boolean	Specifies whether to reset the instrument.
OptionString	String/BSTR	The user can use the <i>OptionString</i> parameter to specify the initial values of certain IVI inherent attributes for the session. The format of an assignment in the <i>OptionString</i> parameter is "Name=Value", where <i>Name</i> is one of: RangeCheck, QueryInstrumentStatus, Cache, Simulate, RecordCoercions, InterchangeCheck, or DriverSetup. Value is either True or False except for DriverSetup. If the <i>OptionString</i> parameter contains an assignment for the Driver Setup attribute, the Initialize function assumes that everything following "DriverSetup=" is part of the assignment.

Example



Initialized

Type

Property

Function

Get

Description

This command returns **True** between a successful call to the **Initialize** method and a successful call to the **Close** method, and **False** at all other times.

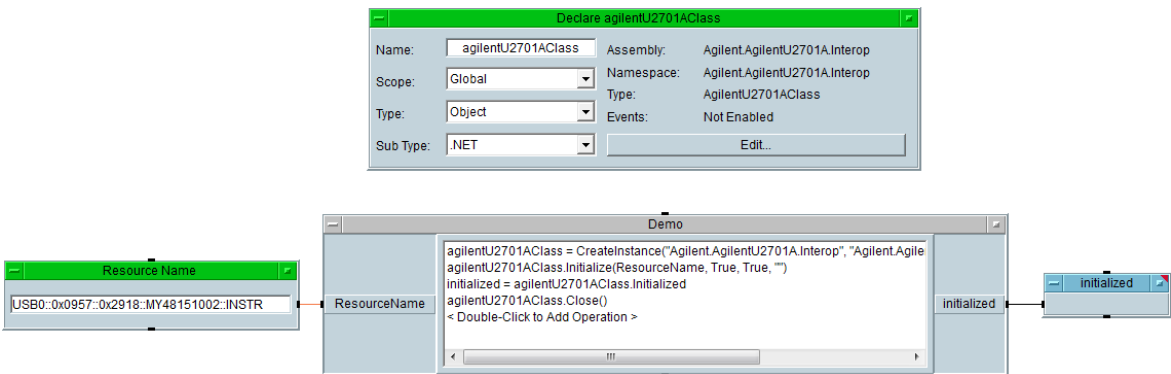
Hierarchy

IKeysightU2701A
└─ Initialized

Return Format

Boolean

Example



Configure

Type

Method

Function

Set

Description

This command configures the trigger *Type* and *Holdoff*. *Holdoff* units are expressed in seconds.

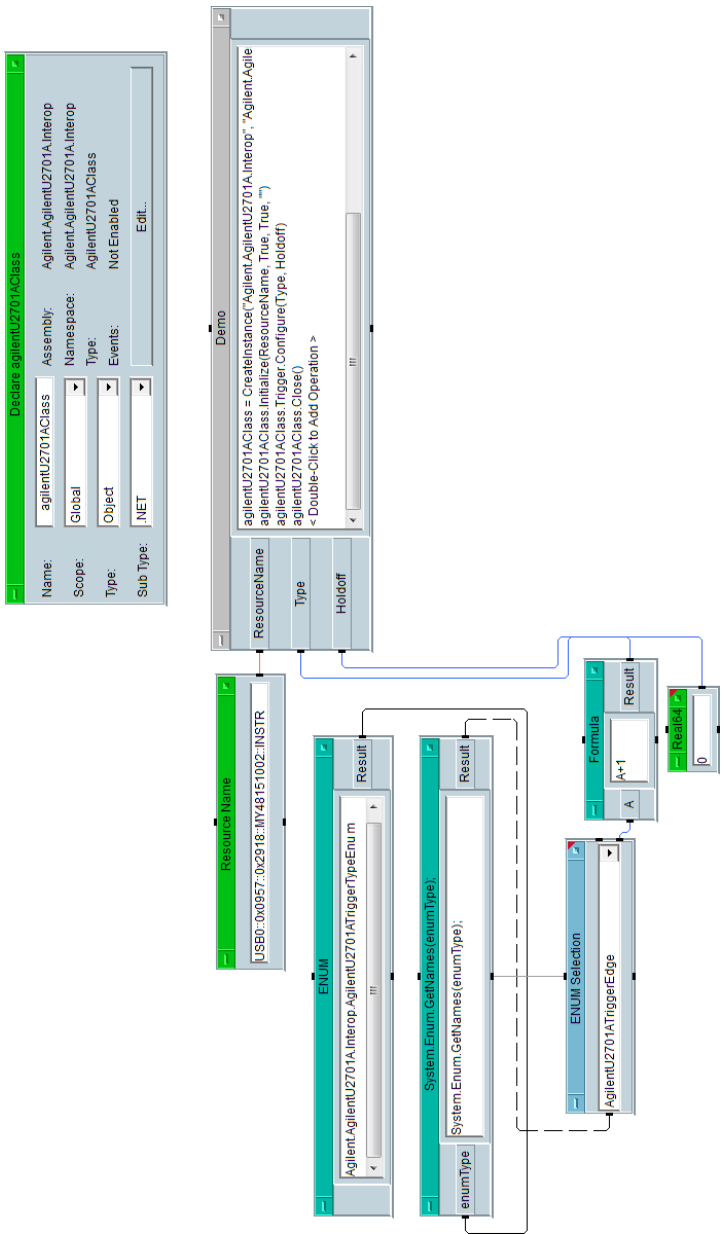
Hierarchy

```
IKeysightU2701A
├─ Trigger
│   └─ Configure(Type, Holdoff)
```

Parameters

Item	Type	Description
Type	KeysightU2701A TriggerTypeEnum	Specifies the trigger type. This value sets the Trigger.Type property. See "KeysightU2701ATriggerTypeEnum" on page 110 for more information.
Holdoff	Double	Specifies the trigger hold-off. This value sets the Trigger.Holdoff property.

Example



Coupling

Type

Property

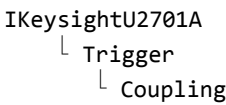
Function

Get and Set

Description

This command returns/sets how the oscilloscope couples the trigger source.

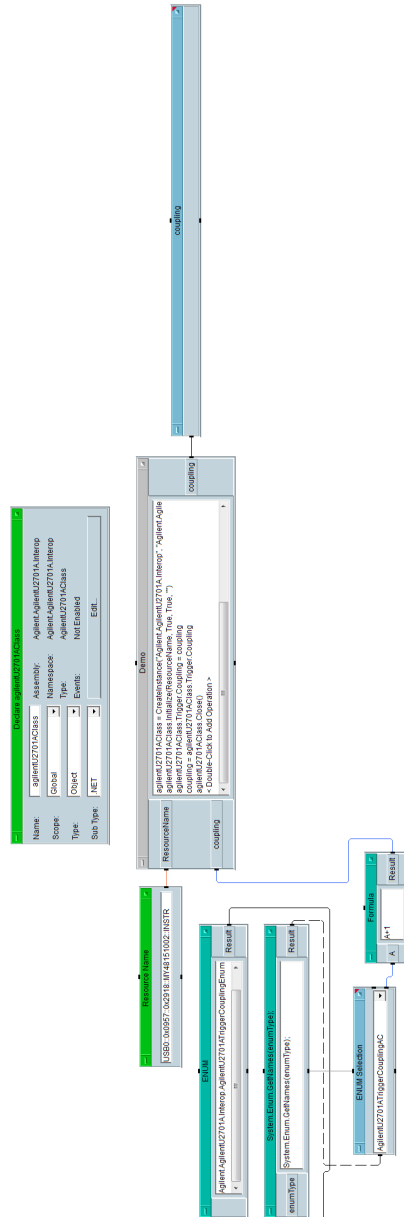
Hierarchy



Return Format

Item	Type	Description
KeysightU2701A TriggerCoupling Enum	Enum	See “ KeysightU2701ATriggerCouplingEnum ” on page 108 for more information.

Example



Edge

This interface configures slope of edge trigger.

Configure

Type

Method

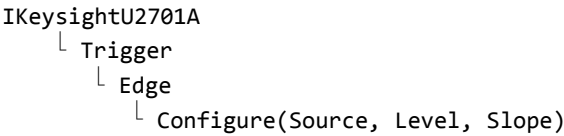
Function

Set

Description

This command configures the conditions for edge trigger. An edge trigger occurs when the trigger source signal passes through the trigger level with the specified slope.

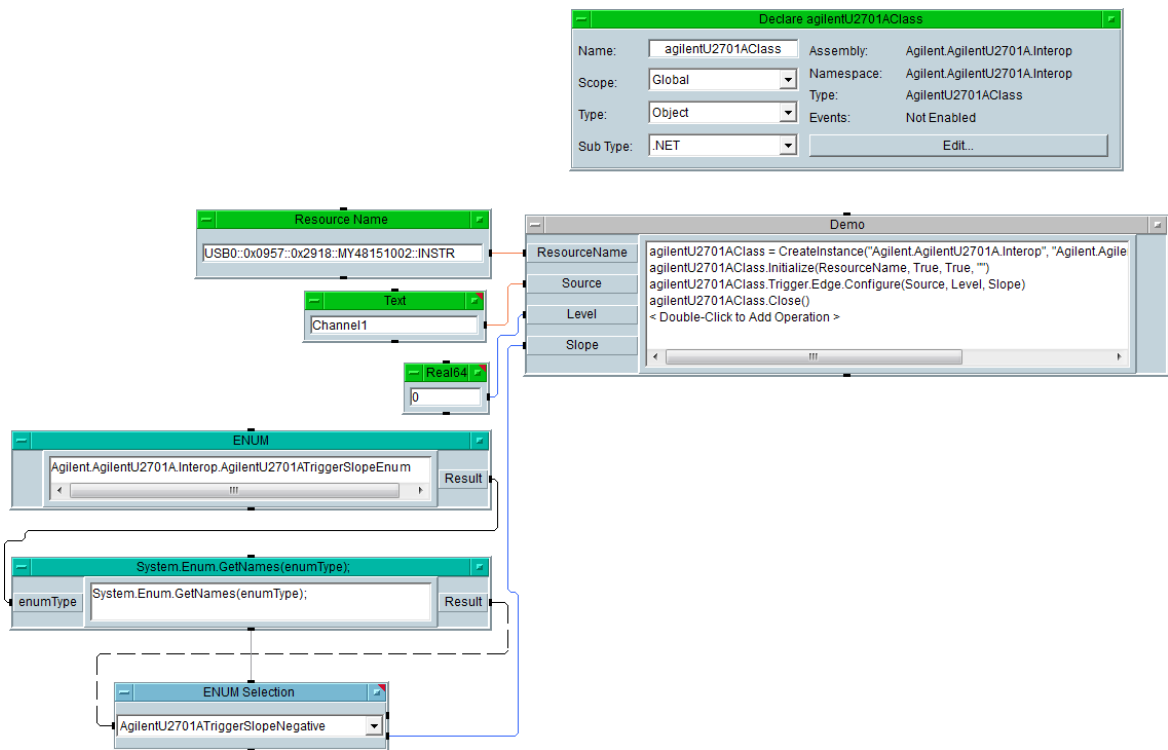
Hierarchy



Parameters

Item	Type	Description
Source	String	Specifies the trigger source. This value sets the Trigger.Source property.
Level	Double	Specifies the trigger level. This value sets the Trigger.Level property.
Slope	KeysightU2701A TriggerSlopeEnum	Specifies the trigger slope. This value sets the Trigger.Slope property. See "KeysightU2701ATriggerSlopeEnum" on page 109 for more information.

Example



Slope

Type

Property

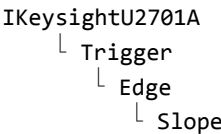
Function

Get and Set

Description

This command returns/sets the slope, a rising or a falling edge, that triggers the oscilloscope.

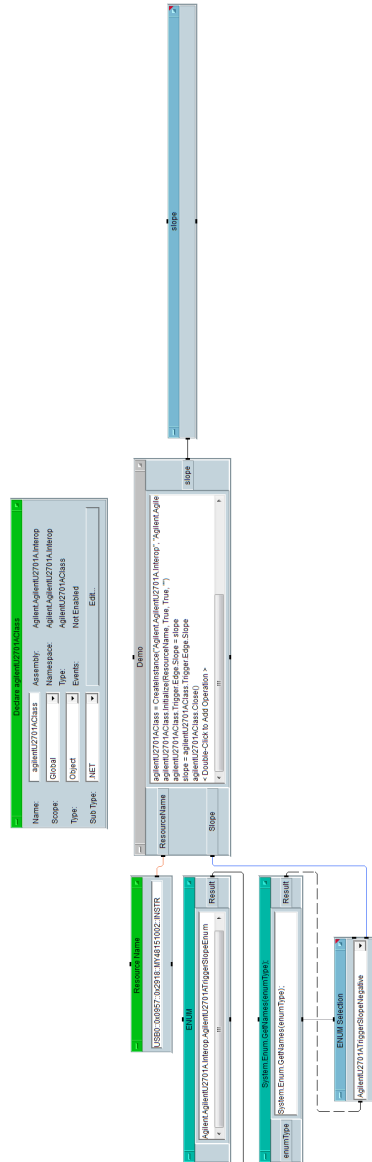
Hierarchy



Parameters

Item	Type	Description
KeysightU2701A TriggerSlopeEnum	Enum	See “ KeysightU2701ATriggerSlopeEnum ” on page 109 for more information.

Example



Glitch

This interface configures the condition, polarity, and width of the glitch trigger.

Condition

Type

Property

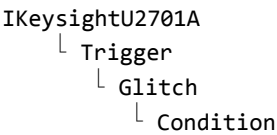
Function

Get and Set

Description

This command returns/sets the glitch condition that determines whether the oscilloscope triggers on a pulse with a width less than or greater than the glitch width value.

Hierarchy



Parameters

Item	Type	Description
KeysightU2701A GlitchCondition Enum	Enum	See “ KeysightU2701AGlitchConditionEnum ” on page 104 for more information.

Configure

Type

Method

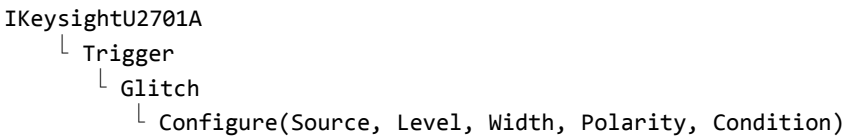
Function

Set

Description

This command configures the glitch trigger *Source*, *Level*, *Width*, *Polarity*, and *Condition*. A glitch trigger occurs when the edge of a pulse that matches the *Width* and *Polarity* crosses the specified *Level* (expressed in volts).

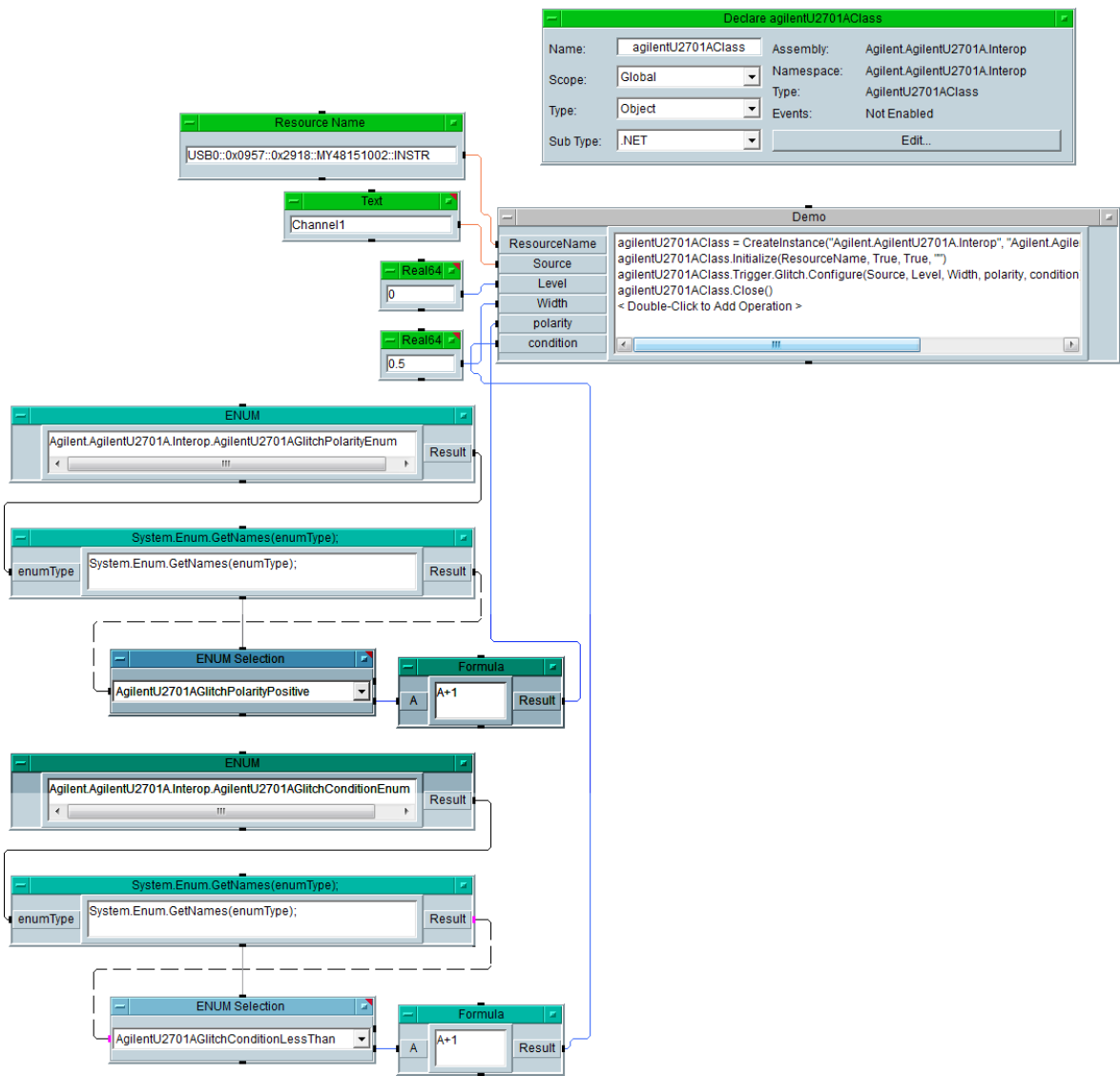
Hierarchy



Parameters

Item	Type	Description
Source	String	Specifies the trigger source. This value sets the Trigger.Source property.
Level	Double	Specifies the trigger level. This value sets the Trigger.Level property.
Width	Double	Specifies the glitch triggering glitch width in seconds. This value sets the Glitch.Width property.
Polarity	KeysightU2701A GlitchPolarity Enum	Specifies the glitch polarity. This value sets the Glitch.Polarity property.
Condition	KeysightU2701A GlitchCondition Enum	Specifies the glitch condition. This value sets the Glitch.Condition property.

Example



Polarity

Type

Property

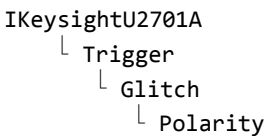
Function

Get and Set

Description

This command returns/sets the polarity of the glitch that triggers the oscilloscope.

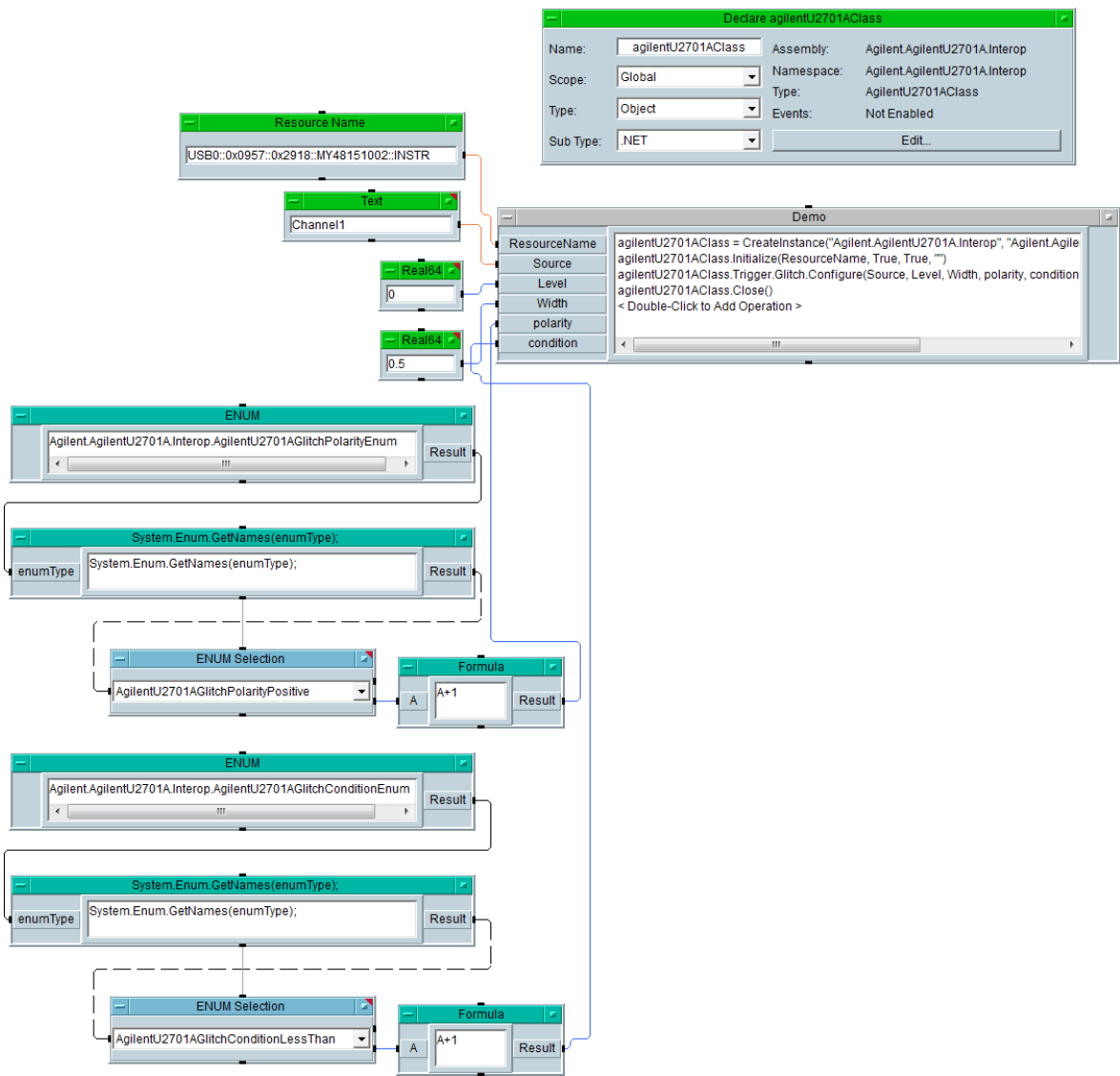
Hierarchy



Return Format

Item	Type	Description
KeysightU2701A GlitchPolarity Enum	Enum	Specifies the glitch polarity. This value sets the Glitch.Polarity property.

Example



Width

Type

Property

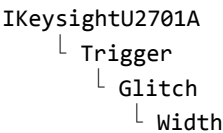
Function

Get and Set

Description

This command returns/sets the glitch width. The units are expressed in seconds.

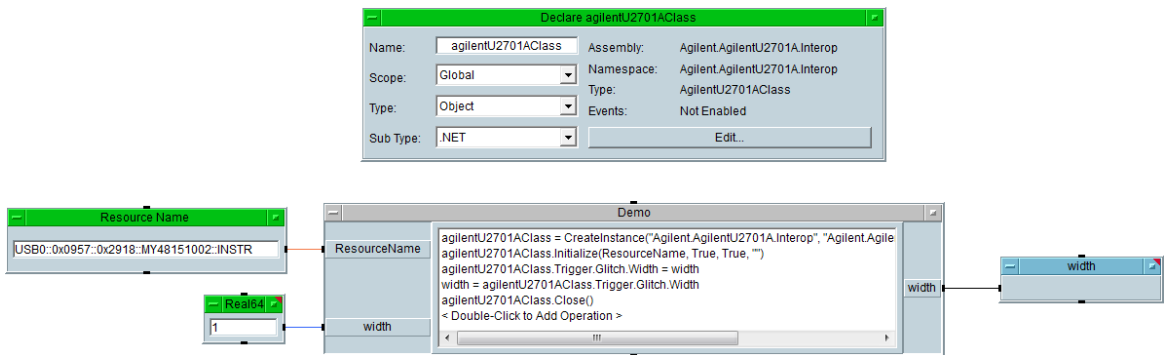
Hierarchy



Return Format

Double

Example



Holdoff

Type

Property

Function

Get and Set

Description

This command returns/sets the length of time the oscilloscope waits after it fills the acquisition buffer until the oscilloscope enables the trigger interface to detect another trigger. The units are expressed in seconds.

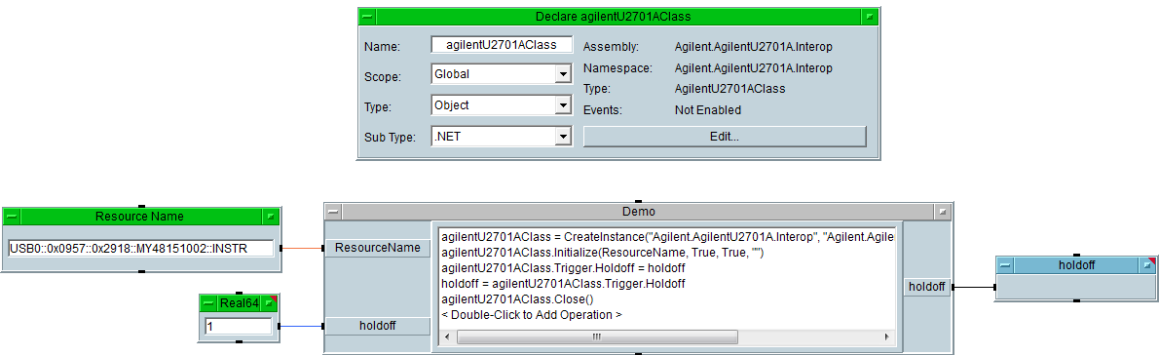
Hierarchy

IKeysightU2701A
└ Trigger
└ Holdoff

Return Format

Double

Example



Modifier

Type

Property

Function

Get and Set

Description

This command determines the oscilloscope behavior in the absence of a trigger.

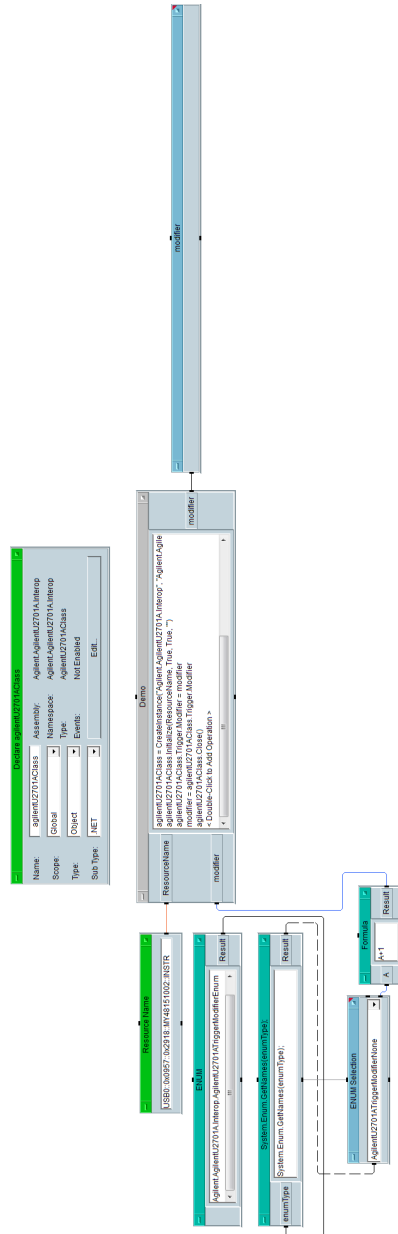
Hierarchy

IKeysightU2701A
└ Trigger
 └ Modifier

Return Format

Item	Type	Description
KeysightU2701A TriggerModifier Enum	Enum	See “ KeysightU2701ATriggerModifierEnum ” on page 108 for more information.

Example



Level

Type

Property

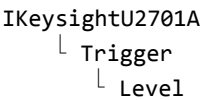
Function

Get and Set

Description

This command returns/sets the voltage threshold for the trigger interface. The units are expressed in volts.

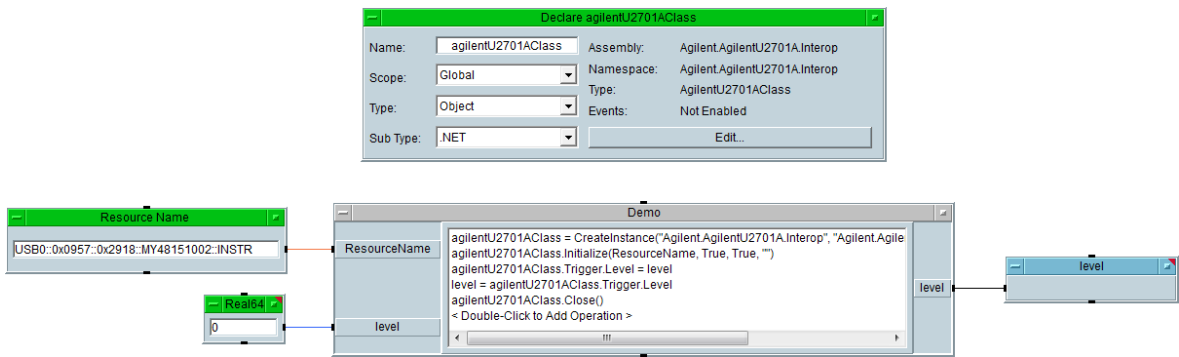
Hierarchy



Return Format

Double

Example



Source

Type

Property

Function

Get and Set

Description

This command returns/sets the signal that the oscilloscope monitors for a trigger. It can be a channel or one of many other values.

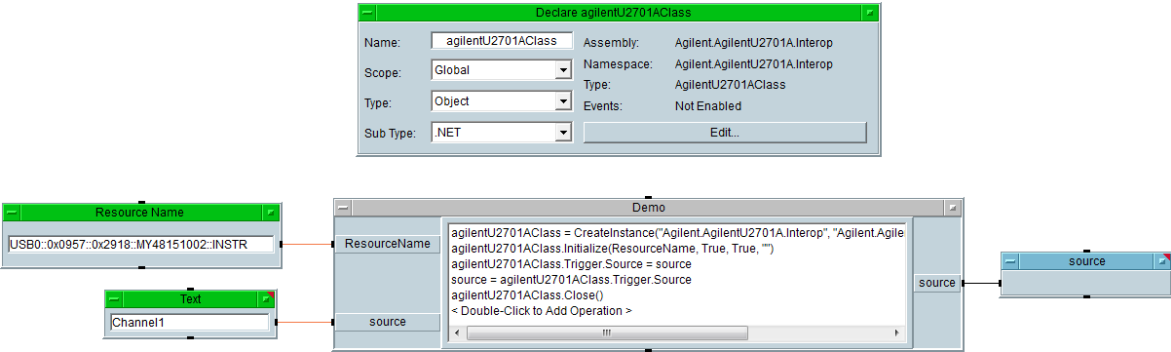
Hierarchy

IKeysightU2701A
└ Trigger
└ Source

Return Format

String/BSTR

Example



Status

Type

Property

Function

Get

Description

If this command is set to **True**, the waveform starts directly after the trigger condition is met. If this command is set to **False**, the instrument has to send a force trigger to get a waveform.

Hierarchy

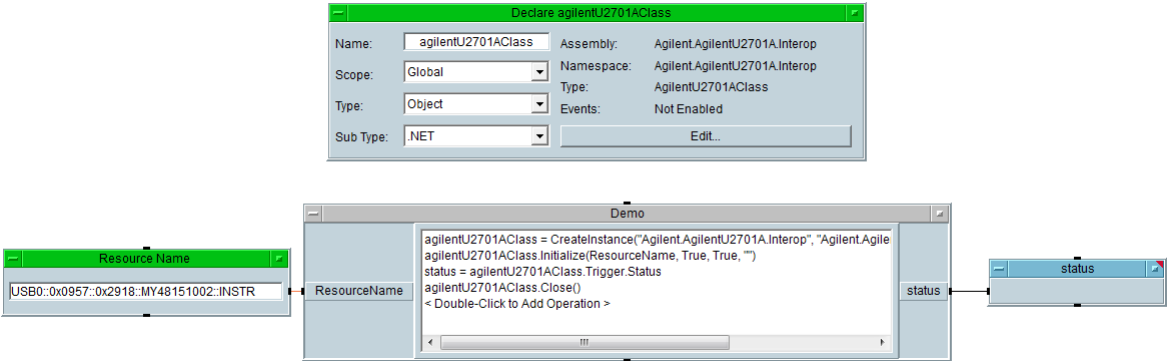
IKeysightU2701A

- Trigger
 - Status

Return Format

Boolean

Example



TV

This interface configures the signal format, number of lines, and events of the TV trigger.

Configure

Type

Method

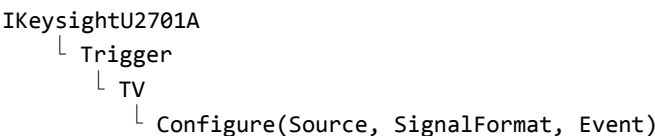
Function

Set

Description

This command configures the TV trigger source, signal format, event, and polarity.

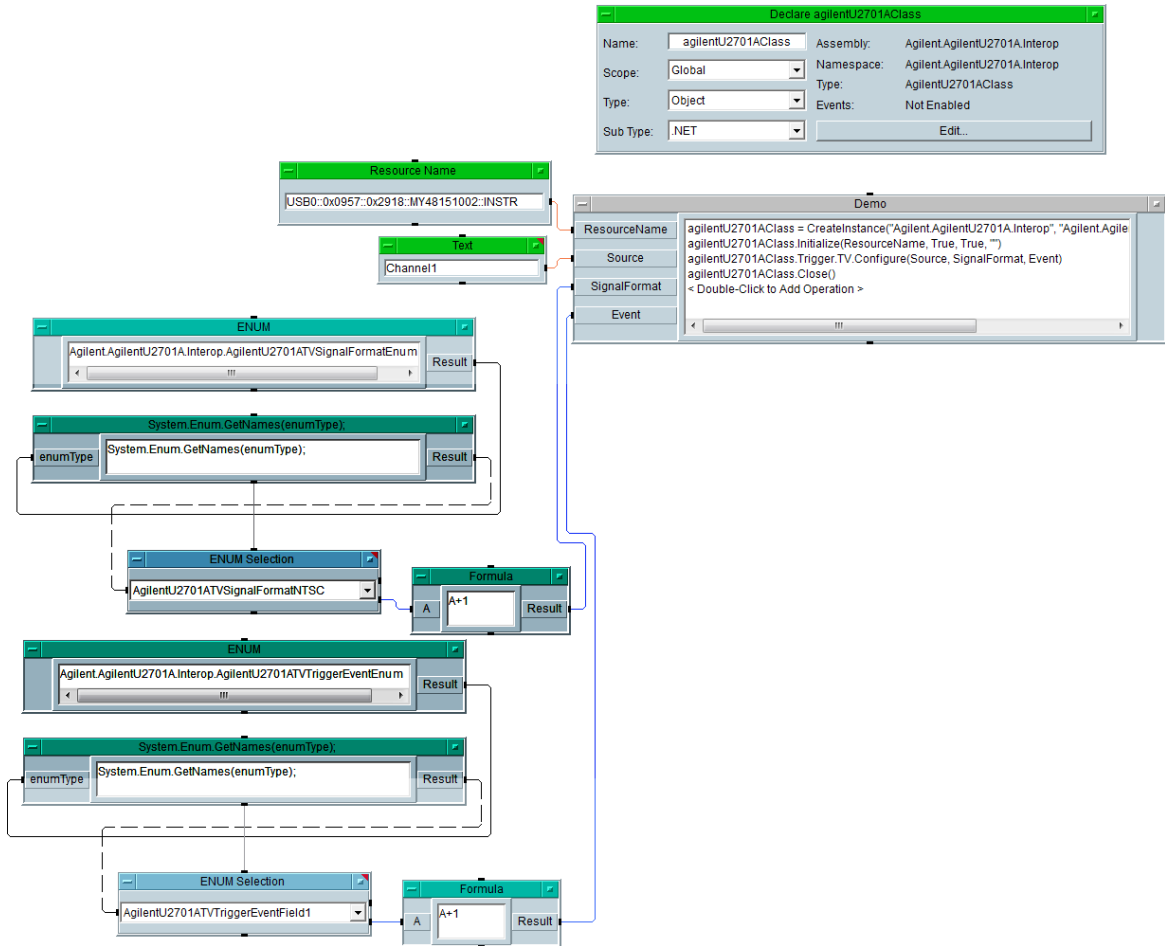
Hierarchy



Parameters

Item	Type	Description
Source	String	Specifies the trigger source. This value sets the Trigger.Source property.
SignalFormat	KeysightU2701ATV SignalFormat Enum	Specifies the TV trigger signal format. This value sets the TV.SignalFormat property. See "KeysightU2701ATVSignalFormatEnum" on page 110 for more information.
Event	KeysightU2701ATV TriggerEventEnum	Specifies the TV trigger event. This value sets the TV.Event property. See "KeysightU2701ATVTriggerEventEnum" on page 111 for more information.

Example



Event

Type

Property

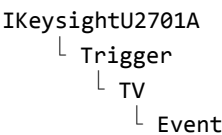
Function

Get and Set

Description

This command returns/sets the event on which the oscilloscope triggers.

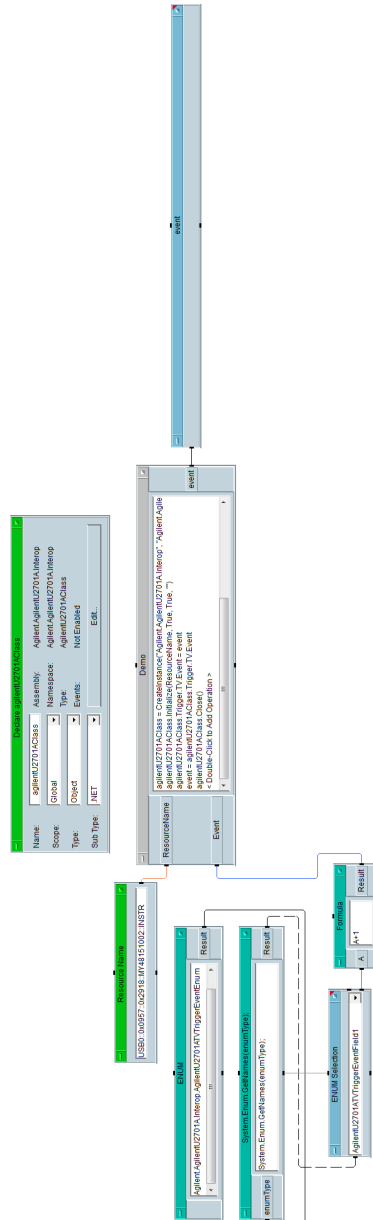
Hierarchy



Return Format

Item	Type	Description
KeysightU2701ATVTriggerEventEnum	Enum	See “ KeysightU2701ATVTriggerEventEnum ” on page 111 for more information.

Example



LineNumber

Type

Property

Function

Get and Set

Description

This command returns/sets the line on which the oscilloscope triggers. The line number is absolute and not relative to the field of the TV signal.

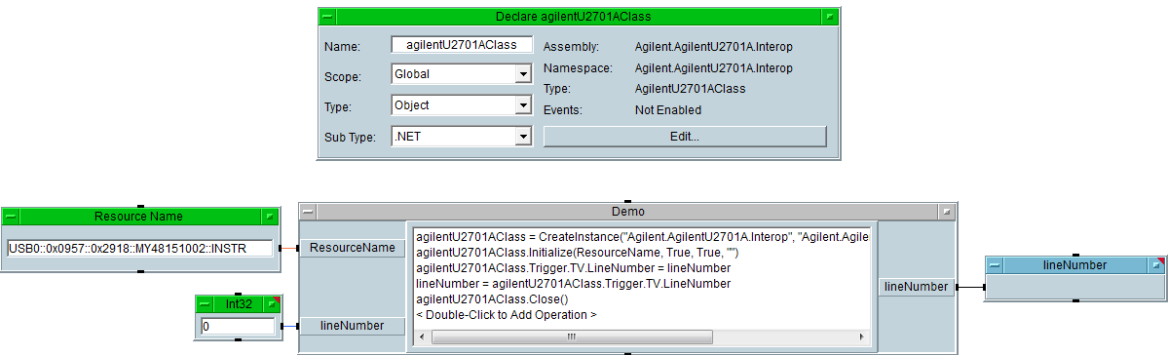
Hierarchy

IKeysightU2701A
└ Trigger
└ TV
└ LineNumber

Return Format

Long/Int32

Example



SignalFormat

Type

Property

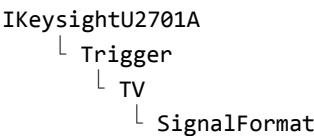
Function

Get and Set

Description

This command returns/sets the format of the TV signal on which the oscilloscope triggers.

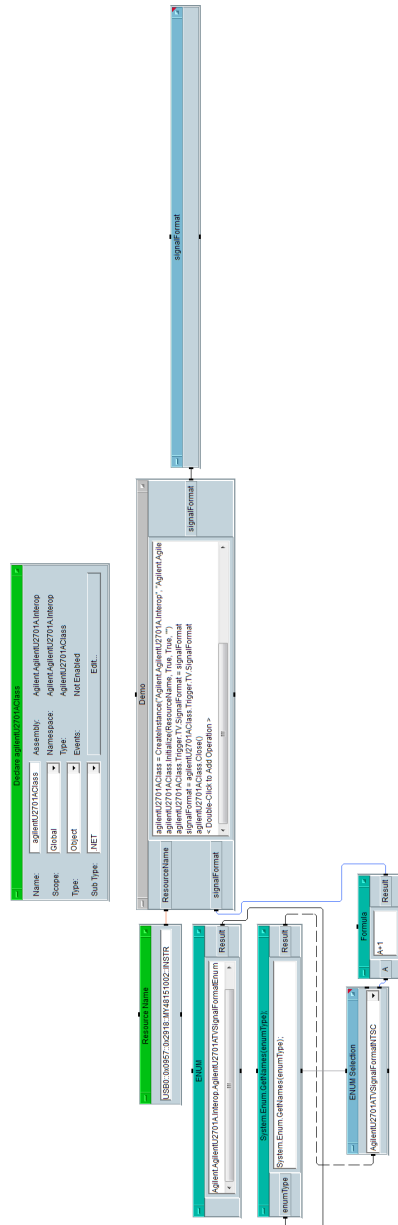
Hierarchy



Return Format

Item	Type	Description
KeysightU2701ATV SignalFormat Enum	Enum	See “ KeysightU2701ATVSignalFormatEnum ” on page 110 for more information.

Example



Type

Type

Property

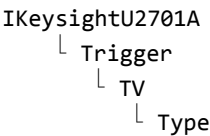
Function

Get and Set

Description

This command returns/sets the kind of event that triggers the oscilloscope.

Hierarchy



Return Format

Item	Type	Description
KeysightU2701A TriggerTypeEnum	Enum	See “ KeysightU2701ATriggerTypeEnum ” on page 110 for more information.

Width

This interface configures condition, polarity, and threshold level of width trigger.

Condition

Type

Property

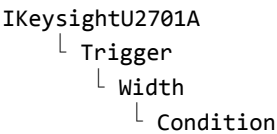
Function

Get and Set

Description

This command returns/sets whether a pulse within or outside the high and low thresholds triggers the oscilloscope.

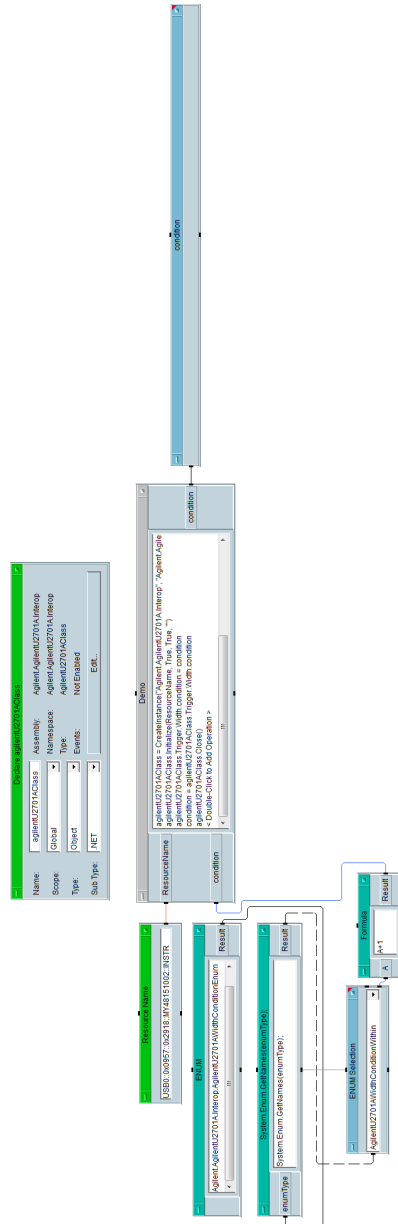
Hierarchy



Return Format

Item	Type	Description
KeysightU2701A WidthCondition Enum	Enum	See “ KeysightU2701AWidthConditionEnum ” on page 112 for more information.

Example



Configure

Type

Method

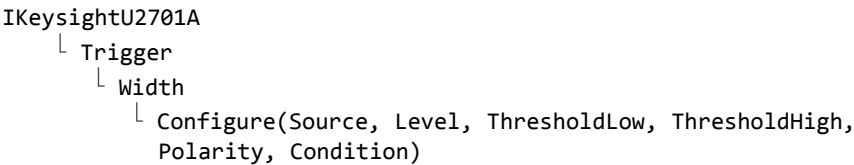
Function

Set

Description

This command configures the width trigger *Source*, *Level*, *ThresholdLow*, *ThresholdHigh*, *Polarity*, and *Condition*. A width trigger occurs when a pulse, which passes through *Level*, with a width between or outside, the width threshold is detected.

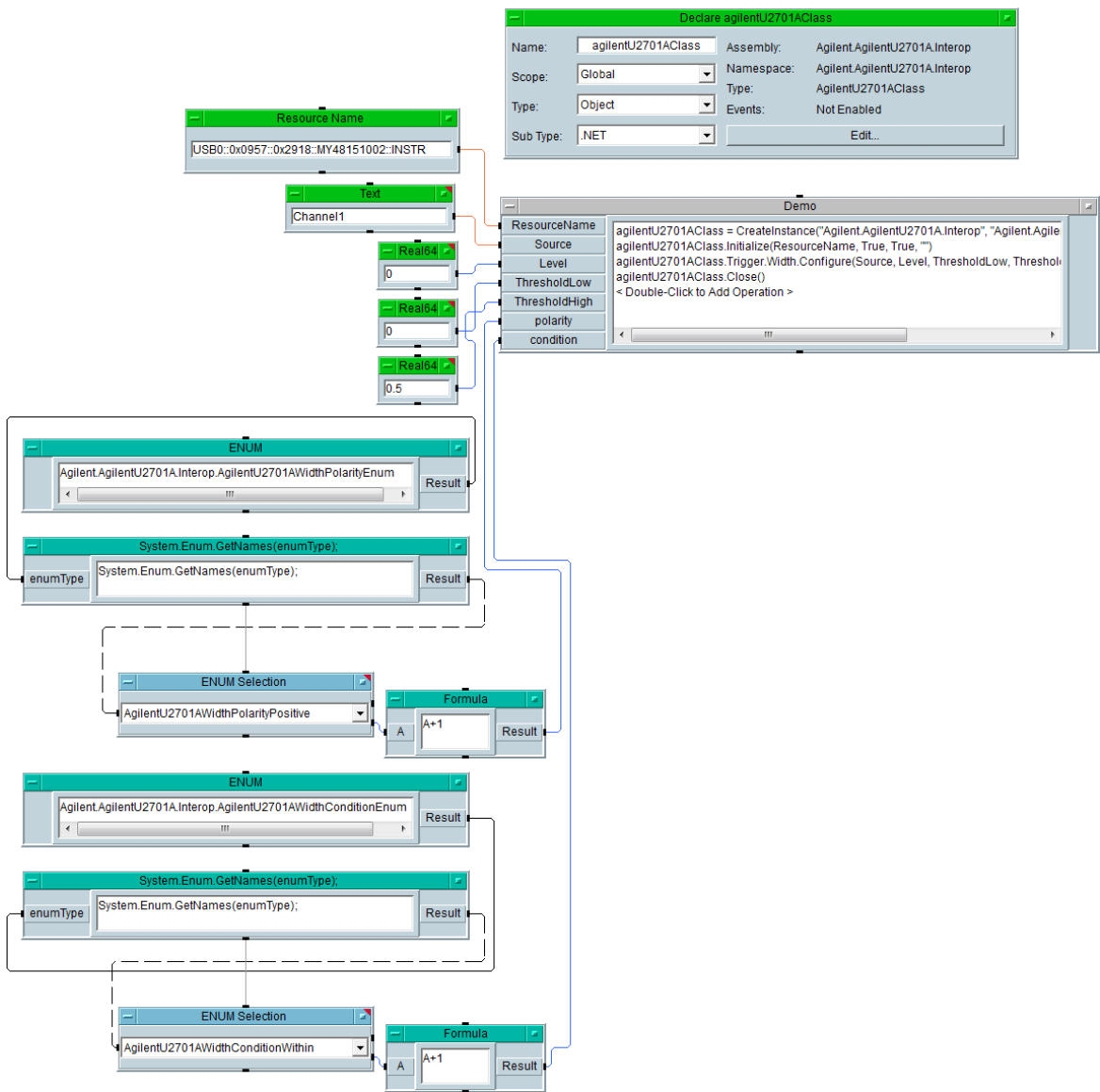
Hierarchy



Parameters

Item	Type	Description
Source	String	Specifies the trigger source. This value sets the Trigger.Source property.
Level	Double	Specifies the trigger level. This value sets the Trigger.Level property.
ThresholdLow	Double	Sets the width triggering low threshold in seconds. This value sets the Width.ThresholdLow property.
ThresholdHigh	Double	Sets the width triggering high threshold in seconds. This value sets the Width.ThresholdHigh property.
Polarity	KeysightU2701A WidthPolarity Enum	Specifies the width polarity. This value sets the Width.Polarity property. See "KeysightU2701AWidthPolarityEnum" on page 113 for more information.
Condition	KeysightU2701A WidthCondition Enum	Specifies the width condition. This value sets the Width.Condition property. See "KeysightU2701AWidthConditionEnum" on page 112 for more information.

Example



Polarity

Type

Property

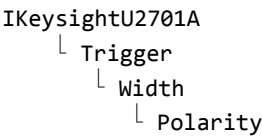
Function

Get and Set

Description

This command returns/sets the polarity of the pulse that triggers the oscilloscope.

Hierarchy



Return Format

Item	Type	Description
KeysightU2701A WidthPolarity Enum	Enum	See “KeysightU2701AWidthPolarityEnum” on page 113 for more information.

ThresholdHigh

Type

Property

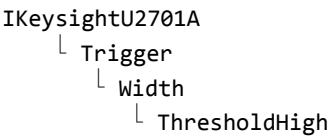
Function

Get and Set

Description

This command returns/sets the high width threshold time, expressed in seconds.

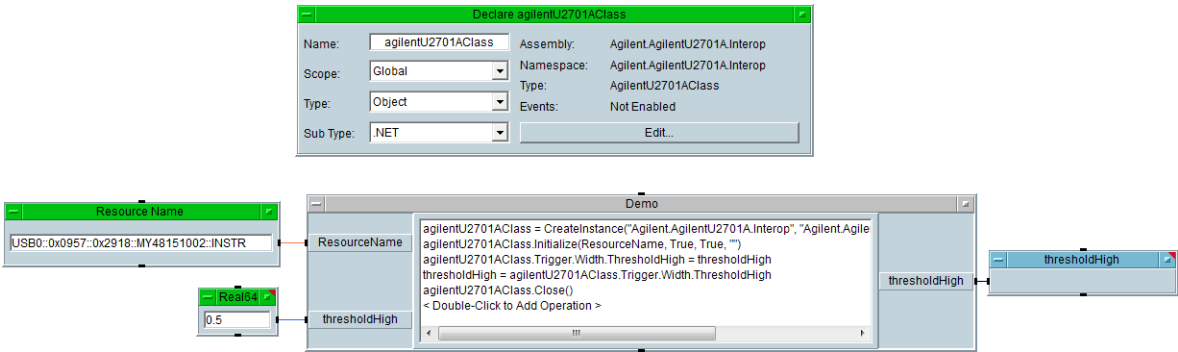
Hierarchy



Return Format

Double

Example



ThresholdLow

Type

Property

Function

Get and Set

Description

This command returns/sets the low width threshold time, expressed in seconds.

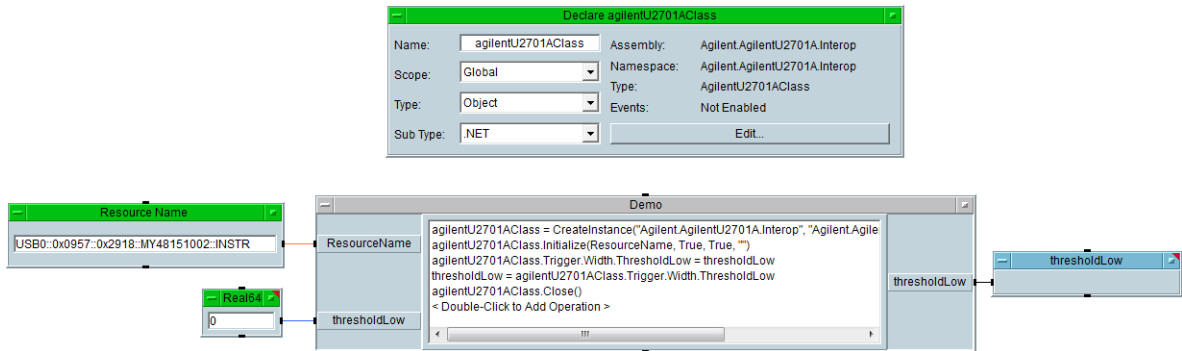
Hierarchy

```
IKeysightU2701A
├── Trigger
│   └── Width
│       └── ThresholdLow
```

Return Format

Double

Example



Clear

Type

Method

Function

Set

Description

This command clears all event registers and error queues. The enable registers are unaffected.

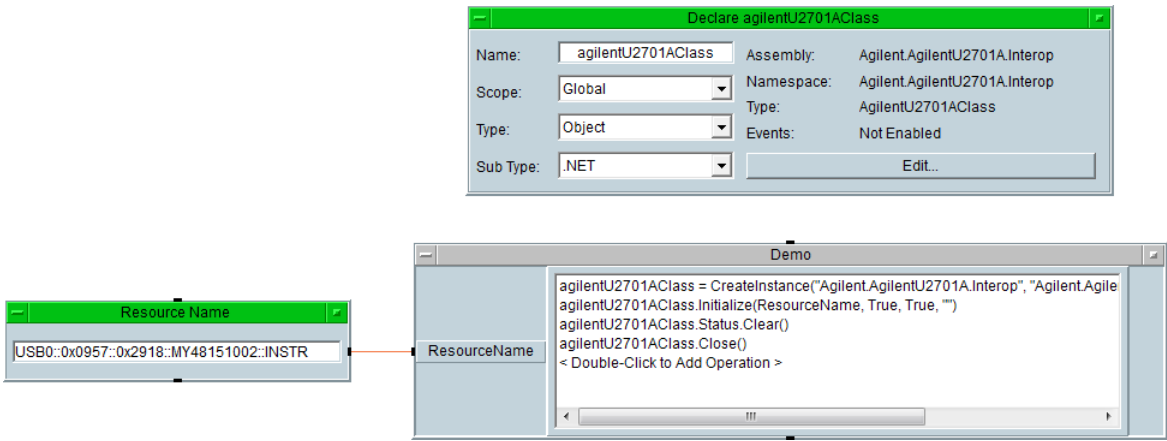
Hierarchy

IKeysightU2701A

Status

Clear()

Example



ConfigureServiceRequest

Type

Method

Function

Set

Description

This command clears all the enable registers. It then sets the appropriate transition filters and enable registers so when the specified event(s) occur(s) the instrument requests service. All other events are disabled from generating a service request. To detect a service request the client application must poll the status byte using the [SerialPoll](#) method or [Register](#) property and test the request service bit.

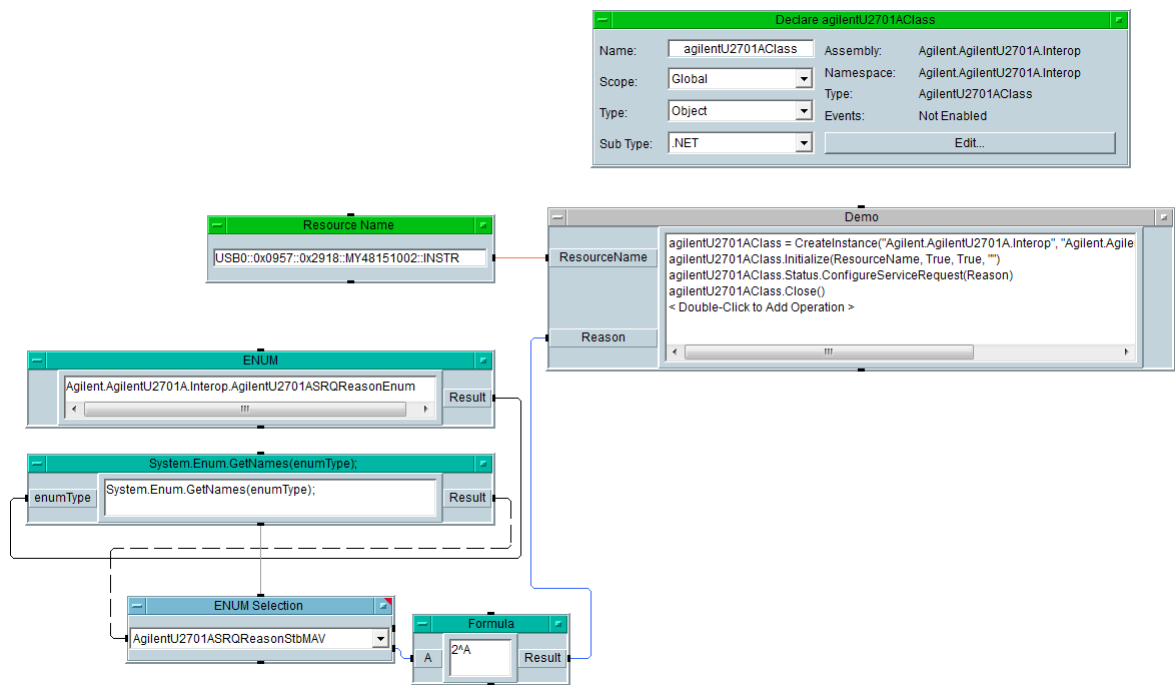
Hierarchy

IKeysightU2701A
└─ Status
 └─ ConfigureServiceRequest(Reason)

Parameters

Item	Type	Description
Reason	KeysightU2701A SRQReasonEnum	The defined values are expressed in the powers of two: 1, 2, 4, and so on. You can OR several reasons together so multiple events can generate a service request. See " KeysightU2701ASRQReasonEnum " on page 105 for more information.

Example



Preset

Type

Method

Function

Set

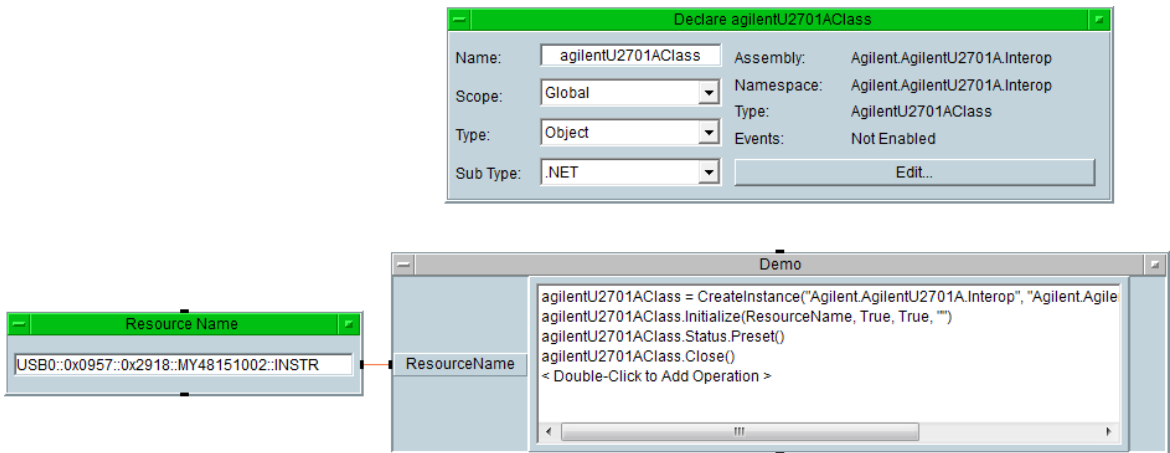
Description

This command sets the SCPI defined enable registers and transition filters.

Hierarchy

IKeySightU2701A
└─ Status
 └─ Preset()

Example



Register

Type

Property

Function

Get and Set

Description

This command returns/sets the instrument status registers.

Hierarchy

```
IKeysightU2701A
├── Status
│   └── Register(Register, SubRegister, val)
```

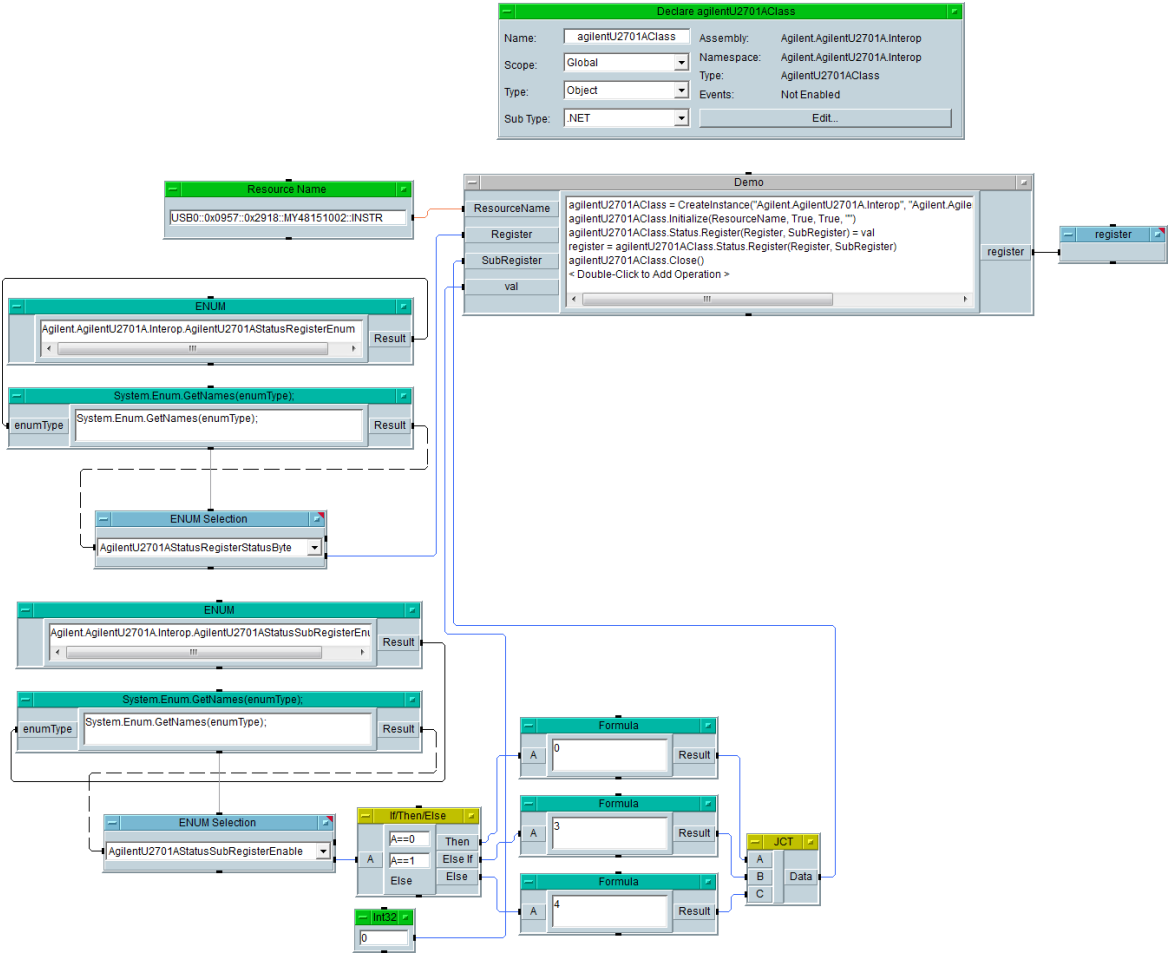
Parameters

Item	Type	Description
Register	KeysightU2701A StatusRegister Enum	The status register to access. See “ KeysightU2701AStatusRegisterEnum ” on page 106 for available registers.
SubRegister	KeysightU2701A StatusSubRegister Enum	The status sub register to access. See “ KeysightU2701AStatusSubRegisterEnum ” on page 107 for available sub registers.
val	Long/Int32	Instrument Status Register value

Return Format

Item	Type	Description
val	Long/Int32	Instrument Status Register value

Example



SerialPoll

Type

Property

Function

Get

Description

This command returns the serial poll of the instrument status byte.

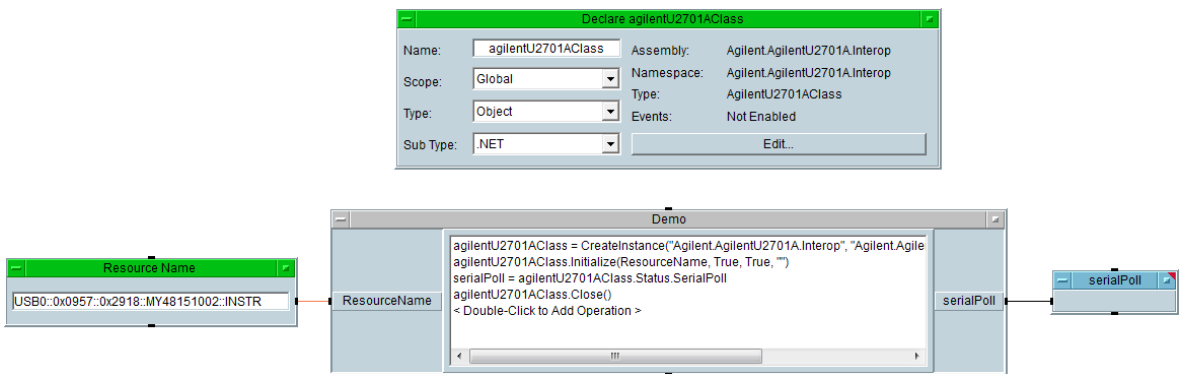
Hierarchy

IKeysightU2701A
└─ Status
 └─ SerialPoll

Return Format

Long/Int32

Example



TimeoutMilliseconds

Type

Property

Function

Set

Description

This command sets the value, in milliseconds, of the default timeout used by I/O operations. This property provides access to the driver Visa Session Timeout. Only in rare, unusual circumstances should you set this property. Driver methods and properties with operations which take a significant time to perform are responsible for adjusting the I/O timeout to an appropriate value. Some methods provide a *MaxTimeMilliseconds* parameter which gives you direct control over the timeout value for that method. Sometimes, however, increasing the timeout value can work around an obscure driver defect.

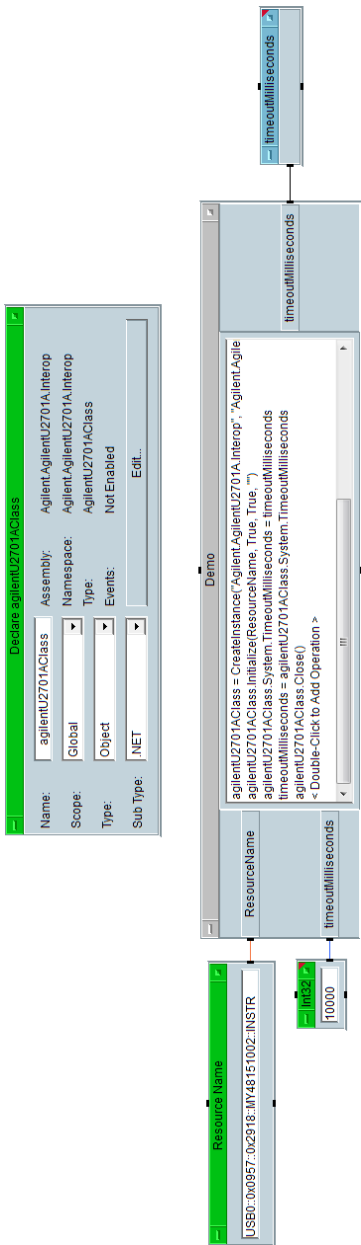
Hierarchy

```
IKeysightU2701A
├── System
│   └── TimeoutMilliseconds
```

Return Format

Long/Int32

Example



WaitForOperationComplete

Type

Method

Function

Set

Description

This command sets the instrument not to return until previously started operations are completed or the *MaxTimeMilliseconds* time have expired.

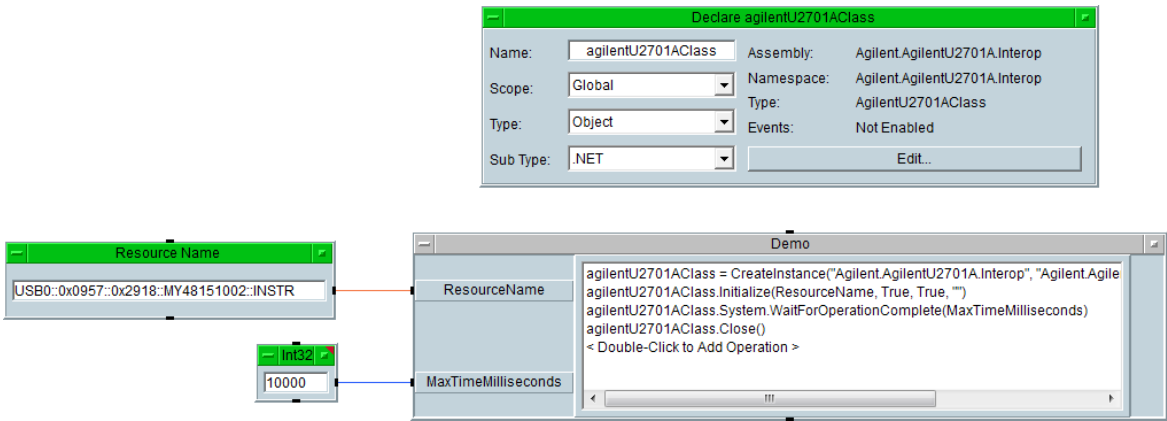
Hierarchy

IKeysightU2701A
└─ System
 └─ WaitForOperationComplete (MaxTimeMilliseconds)

Return Format

String/BTSTR

Example



Disable

Type

Method

Function

Set

Description

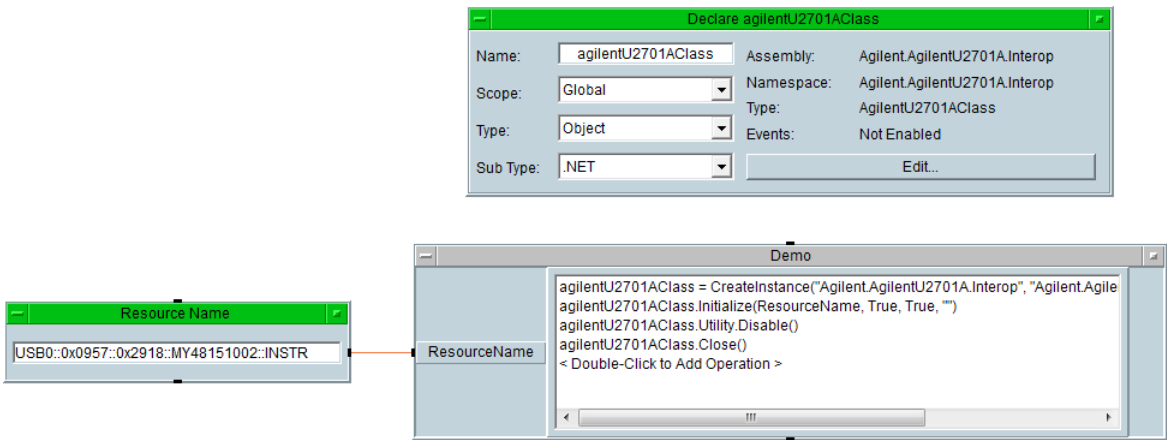
This command quickly places the instrument in a state where it has no, or minimal, effect on the external system to which it is connected. This state is not necessarily a known state.

Hierarchy

IKeysightU2701A

- Utility
 - Disable()

Example



ErrorQuery

Type

Method

Function

Get

Description

This command queries the instrument and returns the instrument specific error information. This function can be used when **QueryInstrumentStatus** is **True** to retrieve error details when the driver detects an instrument error.

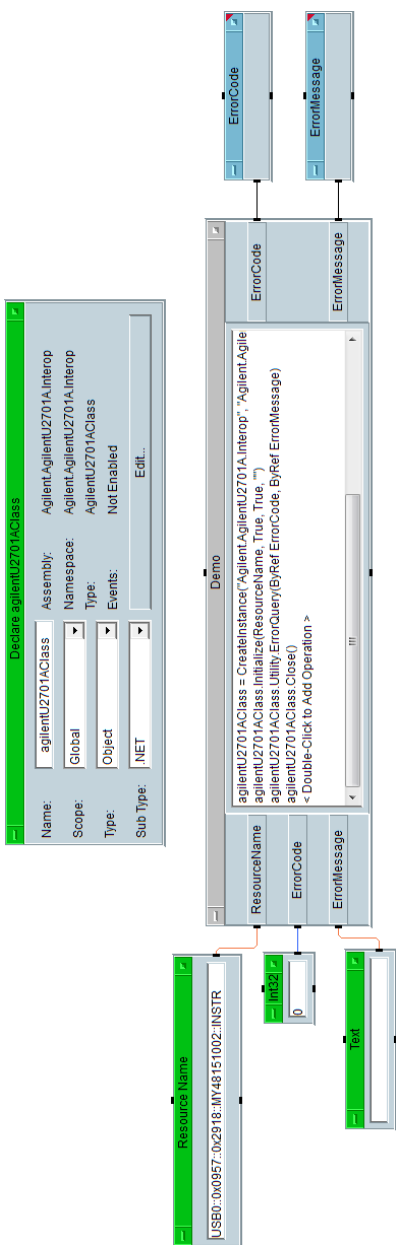
Hierarchy

IKeysightU2701A
└─ Utility
 └─ ErrorQuery(ErrorCode, ErrorMessage)

Return Format

Item	Type	Description
ErrorCode	Long/Int32	Instrument error code.
ErrorMessage	String/BSTR	Instrument error message.

Example



LockObject

Type

Method

Function

Set

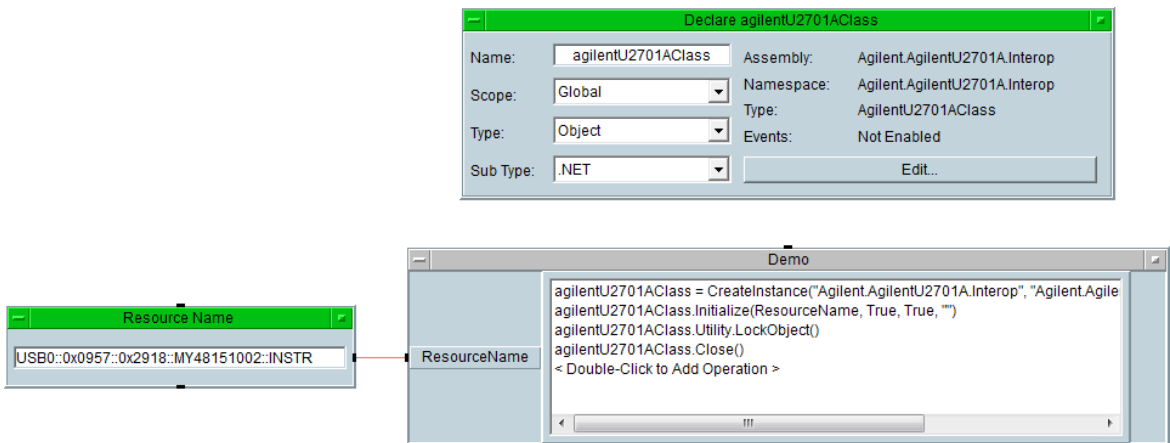
Description

Obtains a multithread lock on the driver after waiting until all other execution threads have released their locks on the instrument session.

Hierarchy

IKeyesightU2701A
└─ Utility
 └─ LockObject()

Example



Reset

Type

Method

Function

Set

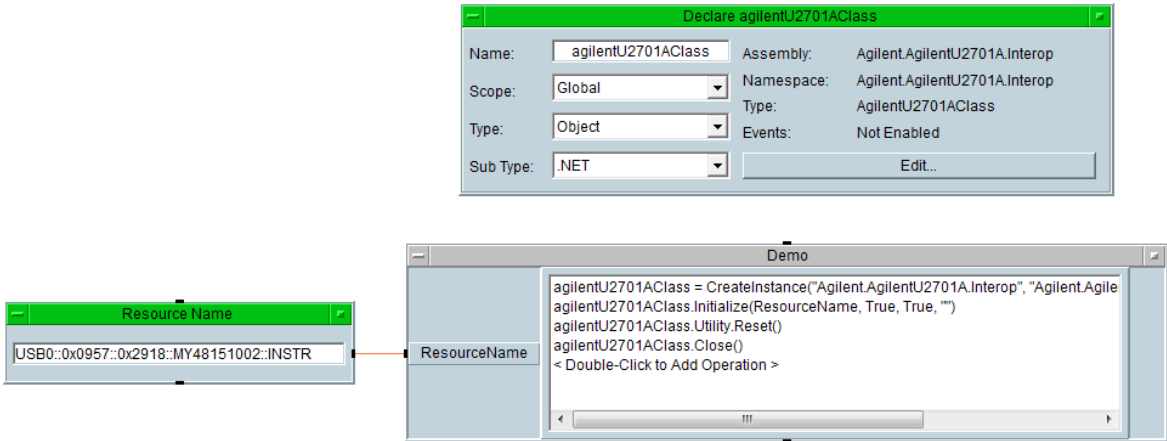
Description

This command places the instrument in a known state and configures instrument options on which the IVI specific driver depends (for example, enabling/disabling headers). For an IEEE-488.2 instrument, Reset sends the command string ***RST** to the instrument.

Hierarchy

KeysightU2701A
└─ Utility
 └─ Reset()

Example



ResetWithDefaults

Type

Method

Function

Set

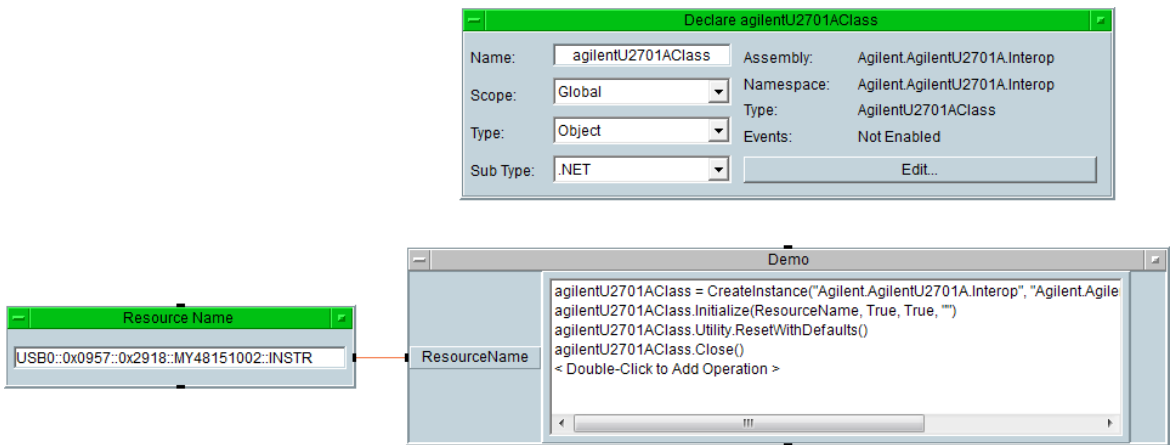
Description

This command does the equivalent of **Reset** and then, disables class extension capability groups, sets attributes to initial values defined by class specs, and configures the driver to option string settings used when **Initialize** was last executed.

Hierarchy

IKeyesightU2701A
└─ Utility
 └─ ResetWithDefaults()

Example



SelfTest

Type

Method

Function

Get

Description

This command performs an instrument self-test, waits for the instrument to complete the test, and queries the instrument for the results. If the instrument passes the test, *TestResult* is “0” and *TestMessage* is “Self test passed”.

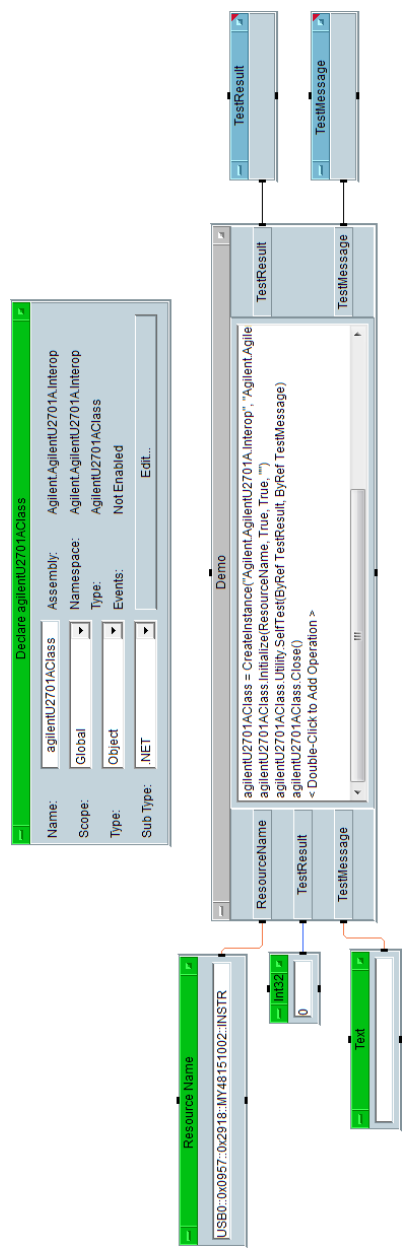
Hierarchy

```
IKeysightU2701A
├── Utility
│   └── SelfTest(TestResult, TestMessage)
```

Return Format

Item	Type	Description
TestResult	Long/Int32	Numeric result from the self-test operation. 0 = no error (test passed).
TestMessage	String/BSTR	Self-test status message.

Example



UnlockObject

Type

Method

Function

Set

Description

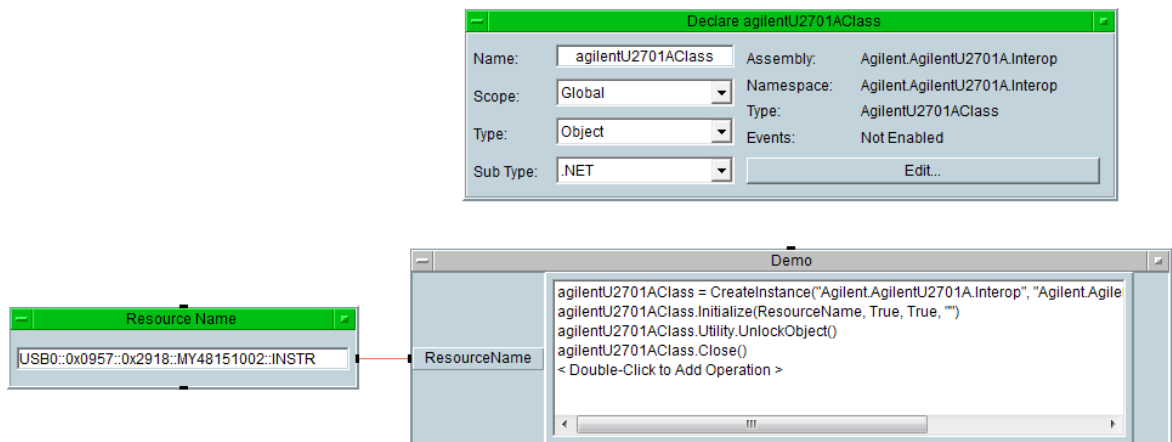
This command releases a previously obtained multithread lock.

Hierarchy

```

IKeysightU2701A
├── Utility
│   └── UnlockObject()
  
```

Example



Enumeration Members

This section describes the members of each enumeration used in this specific IVI-COM driver.

KeysightU2701AGlitchConditionEnum

Description

IVI scope class-compliant values for glitch trigger condition.

Members

Member name	Value	Description
KeysightU2701AGlitchConditionLessThan	1	The oscilloscope triggers when the pulse width is less than the value you specify with the Glitch.Width property.
KeysightU2701AGlitchConditionGreaterThan	2	The oscilloscope triggers when the pulse width is greater than the value you specify with the Glitch.Width property.

KeysightU2701AGlitchPolarityEnum

Description

IVI scope class-compliant values for glitch trigger polarity.

Members

Member name	Value	Description
KeysightU2701AGlitchPolarityPositive	1	The oscilloscope triggers on a positive glitch.
KeysightU2701AGlitchPolarityNegative	2	The oscilloscope triggers on a negative glitch.

KeysightU2701ASRQReasonEnum

Description

Enumeration for the *Reason* parameter of the [ConfigureServiceRequest](#) method.

Members

Member name	Value	Description
KeysightU2701A SRQReasonStbMAV	1	Message Available. Bit 4 in the status byte.
KeysightU2701A SRQReasonStbMsg	2	Error/Event Queue Message Available. Bit 2 in the status byte. The Error/Event queue may be read by the ErrorQuery method.
KeysightU2701A SRQReasonEsrOPC	4	Operation Complete. Bit 0 of the standard event status register.
KeysightU2701A SRQReasonEsr QueryError	8	Query Error. Bit 2 of the standard event status register.
KeysightU2701A SRQReasonEsr DeviceError	16	Device Dependent Error. Bit 3 of the standard event status register.
KeysightU2701A SRQReasonEsr ExecutionError	32	Execution Error. Bit 4 of the standard event status register.
KeysightU2701A SRQReasonEsr CommandError	64	Command Error. Bit 5 of the standard event status register.
KeysightU2701A SRQReasonEsr UserRequest	128	User Request. Bit 6 of the standard event status register.
KeysightU2701A SRQReasonEsr PowerOn	256	Power On. Bit 7 of the standard event status register.
KeysightU2701A SRQReasonStbTrg	512	Trigger Event has occurred. Bit 0 in the status byte register.
KeysightU2701A SRQReasonStbUser	1024	User Event has occurred. Bit 1 in the status byte register.

KeysightU2701AStatusRegisterEnum

Description

Enumeration for the *Register* parameter of the **Register** property.

Members

Member name	Value	Description
KeysightU2701A StatusRegister StatusByte	0	Status Byte register. Conditions defined by IEEE 488.2.
KeysightU2701A StatusRegister StandardEvent	1	Standard Event Status register. Conditions defined by IEEE 488.2.
KeysightU2701A StatusRegister Operation	2	Operation. Conditions which are part of the instrument's normal operation.
KeysightU2701A StatusRegister OverloadEvent	3	The Overload Status Register captures overload events and probe faults that occur on the input channels. This register does not support the Conditions subregister.
KeysightU2701A StatusRegister TriggerEvent	4	The Trigger Event Register captures the trigger event. This register does not support the Conditions or Enable subregisters.
KeysightU2701A StatusRegister ArmEvent	5	The Armed Event Register captures the arm event. An arm event occurs when the oscilloscope has fulfilled all its pre-trigger requirements and is waiting for a trigger event. This register does not support the Conditions or Enable subregisters.

KeysightU2701AStatusSubRegisterEnum

Description

Enumeration for the *SubRegister* parameter of the Register property in the Status interface.

Members

Member name	Value	Description
KeysightU2701A StatusSubRegister Condition	0	Conditions Register. Read only and not available with the Standard Event Status register. Condition bits represent the current instrument state. Reading a condition register does not change the value of the bits.
KeysightU2701A StatusSubRegister Event	3	Event Register. Read only and not available with the Status Byte register. Event bits capture changes in condition bits. Reading an event register clears it.
KeysightU2701A StatusSubRegister Enable	4	Enable Register. Can be read or written and is available for all registers. Enable bits select whether an event bit causes a register summary bit, a kind of condition bit, to become True. Thus, an event can propagated to the status byte and finally to request service. Though the bits in the status byte are not technically event bits, the status byte enable register selects which bits in the status byte cause a service request.

KeysightU2701ATriggerCouplingEnum

Description

IVI Scope class-compliant values for trigger Coupling.

Members

Member name	Value	Description
KeysightU2701A TriggerCouplingAC	1	The oscilloscope AC couples the trigger signal.
KeysightU2701A TriggerCouplingDC	2	The oscilloscope DC couples the trigger signal.
KeysightU2701A TriggerCouplingLF Reject	3	The oscilloscope filters out the low frequencies from the trigger signal.
KeysightU2701A TriggerCouplingHF Reject	4	The oscilloscope filters out the high frequencies from the trigger signal.

KeysightU2701ATriggerModifierEnum

Description

IVI Scope class-compliant values for trigger Modifier.

Members

Member name	Value	Description
KeysightU2701A TriggerModifier None	1	The oscilloscope waits until the trigger the end-user specifies occurs.
KeysightU2701A TriggerModifier Auto	2	The oscilloscope automatically triggers if the configured trigger does not occur within the oscilloscope's timeout period.

KeysightU2701ATriggerSlopeEnum

Description

IVI Scope class-compliant values for edge trigger Slope.

Members

Member name	Value	Description
KeysightU2701A TriggerSlope Negative	0	Triggers will occur on the falling edge.
KeysightU2701A TriggerSlope Positive	1	Triggers will occur on the rising edge.
KeysightU2701A TriggerSlopeEither	2	Triggers will occur on either the rising or falling edge.
KeysightU2701A TriggerSlope Alternate	3	Triggers will occur alternately on the rising and falling edges.

KeysightU2701ATriggerTypeEnum

Description

IVI Scope class-compliant values for trigger Type.

Members

Member name	Value	Description
KeysightU2701A TriggerEdge	1	Configures the oscilloscope for edge triggering. An edge trigger occurs when the trigger signal specified with the Trigger.Source property passes the voltage threshold specified with the Trigger.Level property and has the slope specified with the Trigger.Slope property.
KeysightU2701A TriggerGlitch	2	Configures the oscilloscope for glitch triggering. Use the IviScopeGlitchTrigger extension properties and methods to configure the trigger.
KeysightU2701A TriggerTV	3	Configures the oscilloscope for triggering on TV signals. Use the IviScopeTVTrigger extension properties and methods to configure the trigger.
KeysightU2701A TriggerWidth	4	Configures the oscilloscope for width triggering. Use the IviScopeWidthTrigger extension properties and methods to configure the trigger.

KeysightU2701ATVSignalFormatEnum

Description

IVI Scope class-compliant values for TV trigger SignalFormat.

Members

Member name	Value	Description
KeysightU2701ATV SignalFormat NTSC	1	Configures the oscilloscope to trigger on the NTSC signal format.
KeysightU2701ATV SignalFormatPAL	2	Configures the oscilloscope to trigger on the PAL signal format.
KeysightU2701ATV SignalFormat SECAM	3	Configures the oscilloscope to trigger on the SECAM signal format.

KeysightU2701ATVTriggerEventEnum

Description

IVI Scope class-compliant values for TV trigger Event.

Members

Member name	Value	Description
KeysightU2701ATVTriggerEventField1	1	Sets the oscilloscope to trigger on field 1 of the video signal.
KeysightU2701ATVTriggerEventField2	2	Sets the oscilloscope to trigger on field 2 of the video signal.
KeysightU2701ATVTriggerEventAnyField	3	Sets the oscilloscope to trigger on any field.
KeysightU2701ATVTriggerEventAnyLine	4	Sets the oscilloscope to trigger on any line.
KeysightU2701ATVTriggerEventField1LineNumber	5	Sets the oscilloscope to trigger on a specific line number in Field 1 you specify with the TV.LineNumber property.
KeysightU2701ATVTriggerEventField2LineNumber	6	Sets the oscilloscope to trigger on a specific line number in Field 2 you specify with the TV.LineNumber property.

KeysightU2701AVerticalCouplingEnum

Description

IVI Scope class-compliant values for channel Coupling.

Members

Member name	Value	Description
KeysightU2701A VerticalCoupling AC	0	The oscilloscope AC couples the input signal.
KeysightU2701A VerticalCoupling DC	1	The oscilloscope DC couples the input signal.
KeysightU2701A VerticalCoupling LFReject	2	The oscilloscope rejects low frequency.
KeysightU2701A VerticalCoupling HFReject	3	The oscilloscope rejects high frequency.

KeysightU2701AWidthConditionEnum

Description

IKKeysightU2701A instrument-specific values for the polarity of the pulse that triggers the oscilloscope.

Members

Member name	Value	Description
KeysightU2701A WidthPolarity Positive	1	Configures the oscilloscope to trigger on positive pulses that have a width that meets the condition the user specifies with the Width.Condition property.
KeysightU2701A WidthPolarity Negative	2	Configures the oscilloscope to trigger on negative pulses that have a width that meets the condition the user specifies with the Width.Condition property.

KeysightU2701AWidthPolarityEnum

Description

IKeysightU2701A instrument-specific values for the polarity of the pulse that triggers the oscilloscope.

Members

Member name	Value	Description
KeysightU2701A WidthPolarity Positive	1	Configures the oscilloscope to trigger on positive pulses that have a width that meets the condition the user specifies with the Width.Condition property.
KeysightU2701A WidthPolarity Negative	2	Configures the oscilloscope to trigger on negative pulses that have a width that meets the condition the user specifies with the Width.Condition property.

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3 Acquisition

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This chapter describes the acquisition commands used to program the U2701A/U2702A USB modular oscilloscopes over the remote interface. You can use the commands in this chapter to configure the acquisition type, the size of the waveform record, the length of time that corresponds to overall waveform record, and the position of the first point in the waveform record relative to the trigger event.

ConfigureRecord

Type

Method

Function

Set

Description

This command configures the most commonly used properties of the oscilloscope channel sub-system. Use this command to enable or disable the channel and to set the range, offset, coupling, and probe attenuation values.

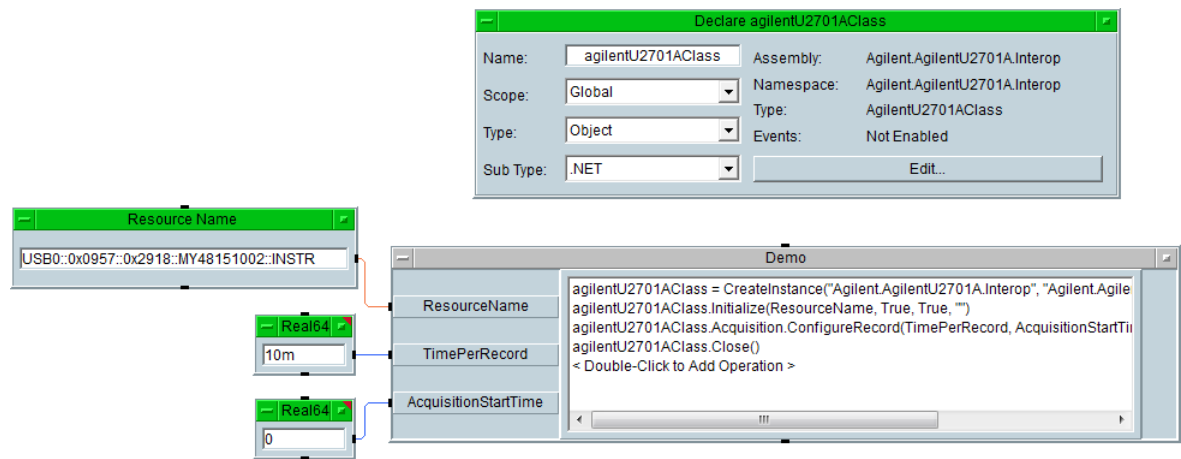
Hierarchy



Parameters

Item	Type	Description
TimePerRecord	Double	Specifies the time per record. This value sets the Horizontal TimePerRecord property.
AcquisitionStart Time	Double	Specifies the position of the first point in the waveform record relative to the trigger event. This value sets the Acquisition. StartTime property.

Example



Interpolation

Type

Property

Function

Get and Set

Description

This command returns/sets the interpolation method the oscilloscope uses when it cannot sample a voltage for every point in the waveform record.

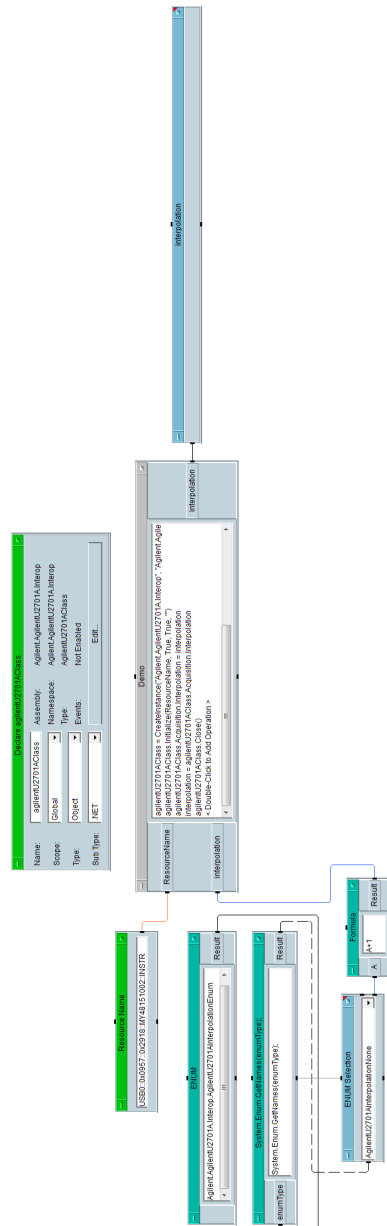
Hierarchy

IKeysightU2701A
└ Acquisition
 └ Interpolation

Return Format

Item	Type	Description
KeysightU2701A InterpolationEnum	Enum	See “ KeysightU2701AInterpolationEnum ” on page 133.

Example



NumberOfAverages

Type

Property

Function

Get and Set

Description

This command returns/sets the number of waveforms the oscilloscope acquires and averages before returning to idle state.

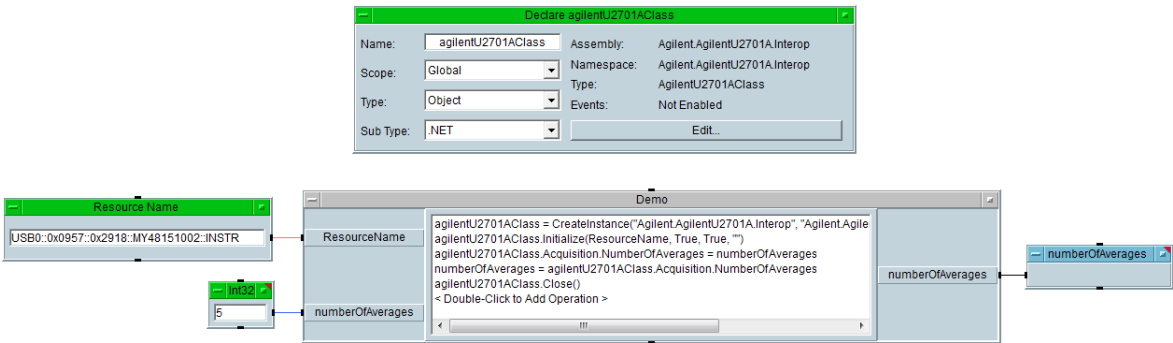
Hierarchy

IKeysightU2701A
└─ Acquisition
 └─ NumberOfAverages

Return Format

Long/Int32

Example



RecordLength

Type

Property

Function

Get

Description

This command returns the actual number of points the oscilloscope acquires for each channel. It is equal to or greater than the minimum number of points specified with the IviScopeAcquisition.NumberOfPointsMin command.

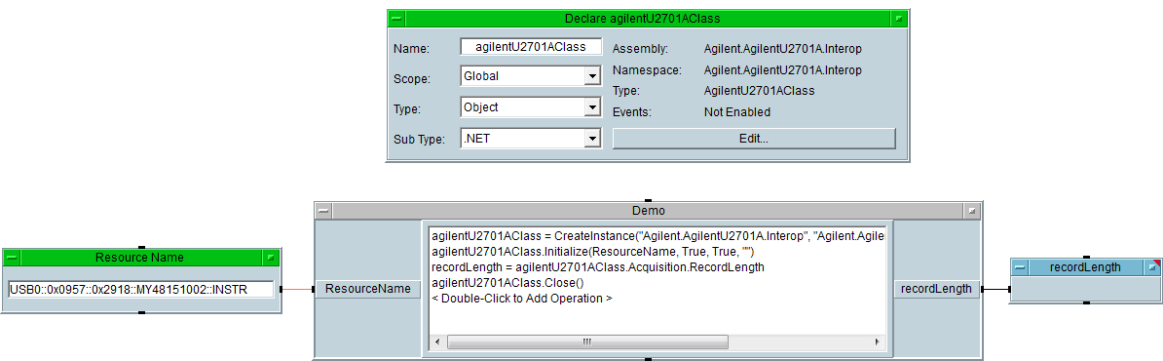
Hierarchy

IKeysightU2701A
└─ Acquisition
 └─ RecordLength

Return Format

Long/Int32

Example



SampleMode

Type

Property

Function

Get

Description

This command returns the sample mode that the oscilloscope is currently using.

Hierarchy

IKeysightU2701A
└─ Acquisition
 └─ SampleMode

Return Format

Item	Type	Description
KeysightU2701A SampleMode Enum	Enum	See "KeysightU2701ASampleModeEnum" on page 134.

SampleRate

Type

Property

Function

Get

Description

This command returns the effective digitizing rate using the current configuration. The units are expressed in samples per second.

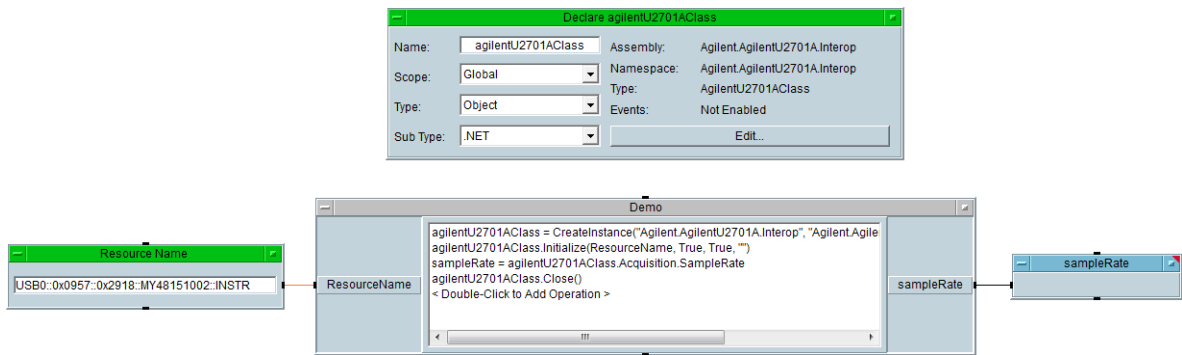
Hierarchy

IKeysightU2701A
└─ Acquisition
 └─ SampleRate

Return Format

Double

Example



StartTime

Type

Property

Function

Get and Set

Description

This command returns/sets the length of time from the trigger event to the first point in the waveform record. The units are expressed in seconds. If positive, the first point in the waveform occurs after the trigger. If negative, the first point in the waveform occurs before the trigger.

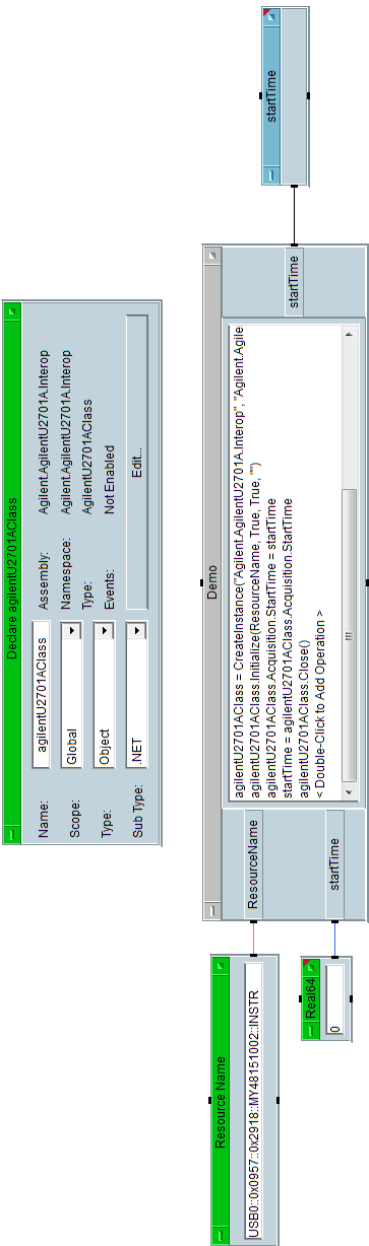
Hierarchy

```
IKeysightU2701A
├─ Acquisition
│   └─ StartTime
```

Return Format

Double

Example



TimePerRecord

Type

Property

Function

Get and Set

Description

This command returns/sets the time in seconds that corresponds to the record length.

Hierarchy

IKeysightU2701A
└ Acquisition
└ TimePerRecord

Return Format

Double

Remarks

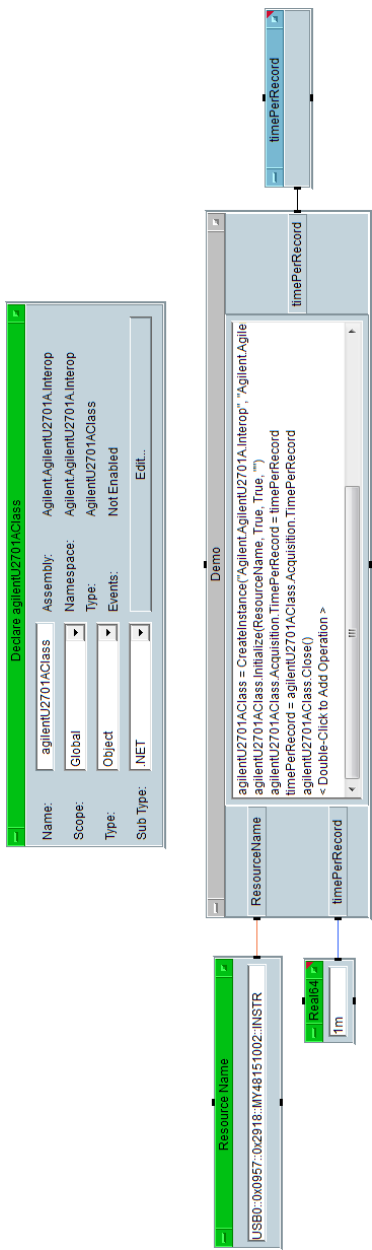
The time per record length is equivalent to the Time/Div multiplied by 10 at the scope setting. The Maximum data point per second you can achieve is 1250, except when in interleave mode (only available with the Keysight Measurement Manager), you can achieve 2000 data points.

Time/Div	TimePer Record	Maximum Data Point
1 ns	10 ns	5
2 ns	20 ns	10
5 ns	50 ns	25
10 ns	100 ns	50
20 ns	200 ns	100
50 ns	500 ns	250

3 Acquisition

Time/Div	TimePer Record	Maximum Data Point
100 ns	1 μ s	500
200 ns	2 μ s	100
500 ns	5 μ s	1250
1 μ s	10 μ s	1250
2 μ s	20 μ s	1250
5 μ s	50 μ s	1250
10 μ s	100 μ s	1250
20 μ s	200 μ s	1250
50 μ s	500 μ s	1250
100 μ s	1 ms	1250
200 μ s	2 ms	1250
500 μ s	5 ms	1250
1 ms	10 ms	1250
2 ms	20 ms	1250
5 ms	50 ms	1250
10 ms	100 ms	1250
20 ms	200 ms	1250
50 ms	500 ms	1250
100 ms	1 s	1250
200 ms	2 s	1250
500 ms	5 s	1250
1 s	10 s	1250
2 s	20 s	1250
5 s	50 s	1250
10 s	100 s	1250
20 s	200 s	1250
50 s	500 s	1250

Example



Type

Type

Property

Function

Get and Set

Description

This commands returns/sets how the oscilloscope acquires data and fills the waveform record. When set to **Envelope** or **Peak Detect**, the oscilloscope acquires minimum and maximum waveforms.

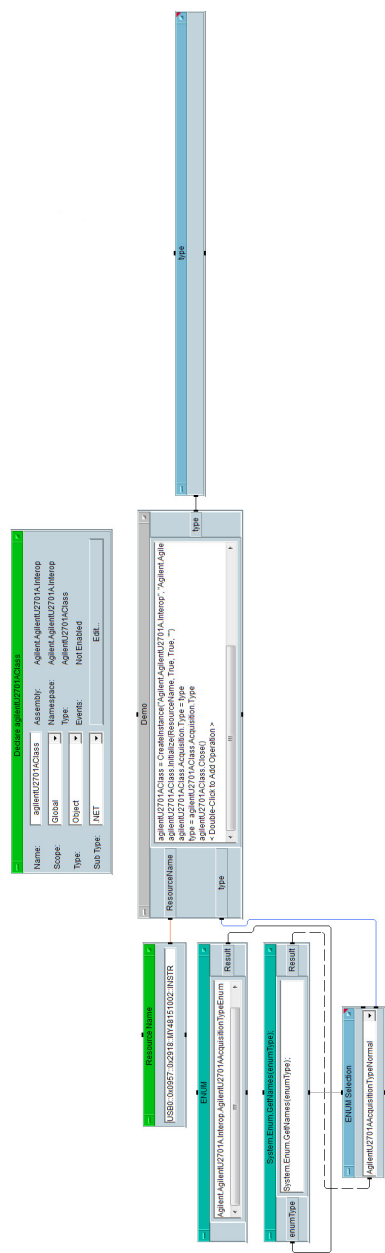
Hierarchy

IKeysightU2701A
└─ Acquisition
 └─ Type

Return Format

Item	Type	Description
KeysightU2701A AcquisitionType Enum	Enum	See "KeysightU2701AAcquisitionTypeEnum" on page 133.

Example



Enumeration Members

This section describes the members of each enumeration used in this specific IVI-COM driver.

KeysightU2701AAcquisitionStatusEnum

Description

IVI scope class-compliant values for the *Status* parameter of the acquisition status method.

Members

Member name	Value	Description
KeysightU2701A AcqInProgress	0	The oscilloscope is still acquiring data.
KeysightU2701A AcqComplete	1	The oscilloscope has completed the acquisition.
KeysightU2701A AcqStatus Unknown	-1	The oscilloscope cannot determine the status of the acquisition.

KeysightU2701AAcquisitionTypeEnum

Description

IVI scope class-compliant values for acquisition type.

Members

Member name	Value	Description
KeysightU2701AAcquisitionTypeNormal	0	Configures the oscilloscope to acquire one sample for each point in the waveform record. The oscilloscope uses real-time or equivalent time sampling.
KeysightU2701AAcquisitionTypePeakDetect	1	Sets the oscilloscope to the peak-detect acquisition mode. The oscilloscope oversamples the input signal and keeps the minimum and maximum values that correspond to each position in the waveform record. The oscilloscope uses only real-time sampling.
KeysightU2701AAcquisitionTypeAverage	2	Configures the oscilloscope to acquire multiple waveforms and calculates the average value for each point in the waveform record. The end-user specifies the number of waveforms to acquire with the NumberOfAverages property. The oscilloscope uses real-time or equivalent time sampling.

KeysightU2701AInterpolationEnum

Description

IVI scope class-compliant values for acquisition interpolation.

Members

Member name	Value	Description
KeysightU2701AInterpolationNone	1	The oscilloscope does not interpolate points in the waveform. Instead, the driver sets every element in the waveform record for which the oscilloscope cannot receive a value to an IEEE-defined NaN (Not-a-Number) value. Use the IsWaveformElementInvalid method to determine if the waveform record element is invalid.
KeysightU2701AInterpolationSineX	2	The oscilloscope uses a sin(x)/x calculation to interpolate a value when it cannot resolve a voltage in the waveform record.

KeysightU2701ASampleModeEnum

Description

IVI Scope class-compliant values for acquisition **SampleMode**.

Members

Member name	Value	Description
KeysightU2701A SampleModeReal Time	0	Indicates that the oscilloscope is using real-time sampling.

4 Waveform Display

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This chapter describes the waveform display commands used to program the U2701A/U2702A USB modular oscilloscopes over the remote interface. The statements in this section is used to acquire waveform data from the oscilloscope. You can use the commands in this section to initiate, acquire, and abort measurements.

Abort

Type

Method

Function

Set

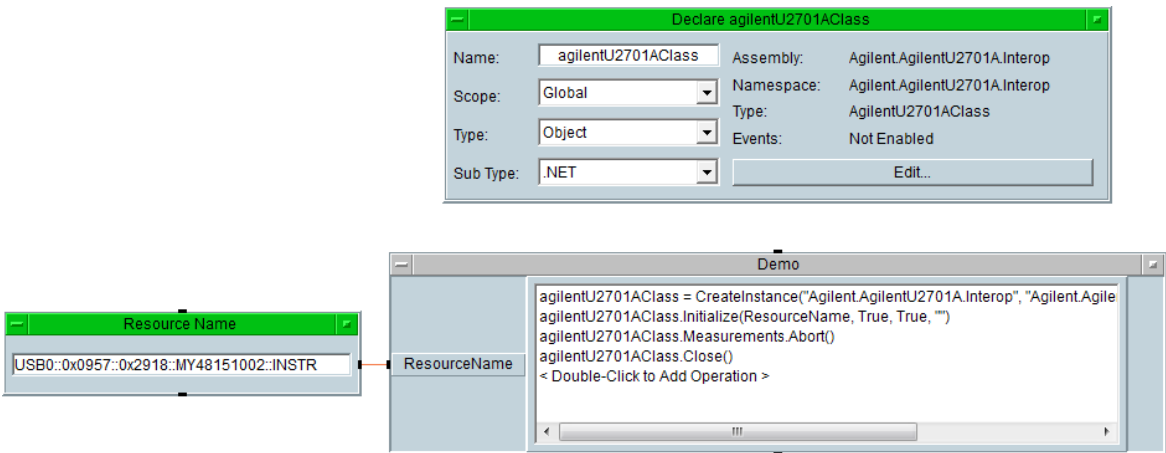
Description

This command aborts an acquisition and returns the oscilloscope to the Idle state.

Hierarchy

IKeysightU2701A
└─ Measurements
 └─ Abort()

Example



AutoSetup

Type

Method

Function

Set

Description

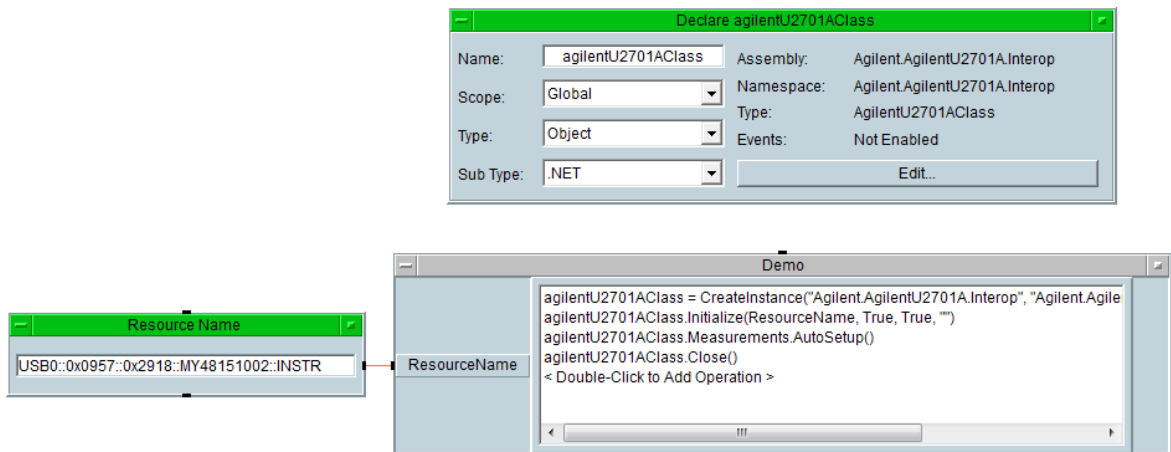
This command automatically configures all the oscilloscopes settings based on the input signals.

Hierarchy

```

IKeysightU2701A
├── Measurements
│   └── AutoSetup()
  
```

Example



Count

Type

Property

Function

Get

Description

This command returns the number of measurements.

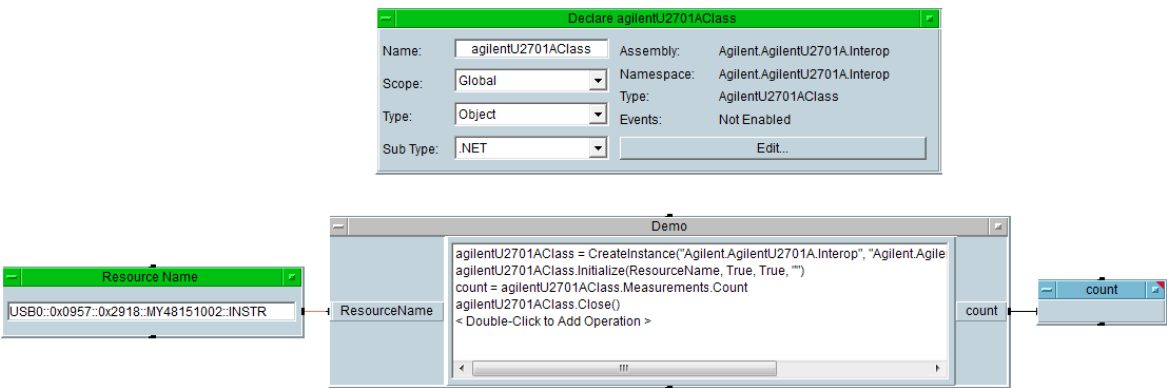
Hierarchy

IKeysightU2701A
└─ Measurements
 └─ Count

Return Format

Long/Int32

Example



Initiate

Type

Method

Function

Set

Description

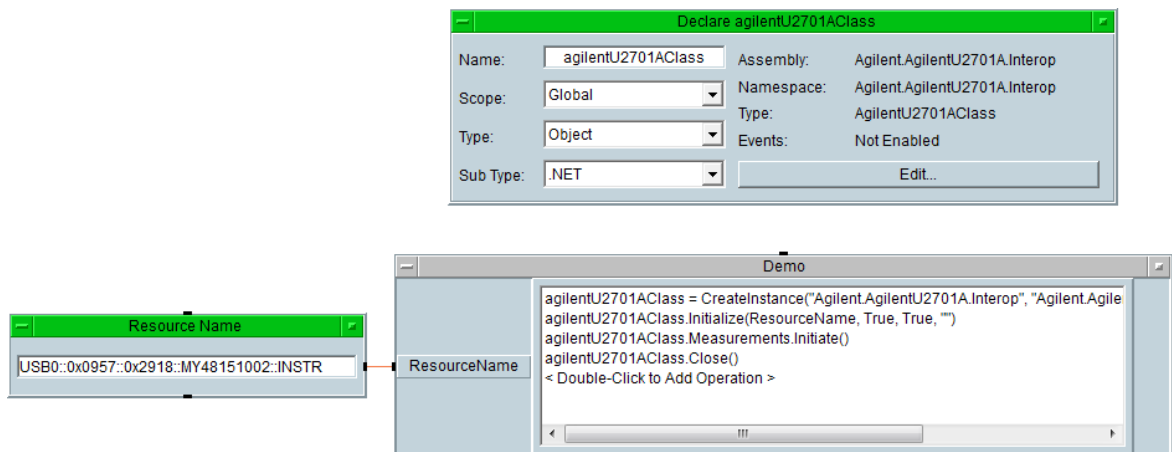
This command initiates a waveform acquisition. The oscilloscope leaves the Idle state and waits for a trigger. The oscilloscope acquires a waveform for each enabled channel.

Hierarchy

```

IKeysightU2701A
├─ Measurements
│   └─ Initiate()
  
```

Example



IsWaveformElementInvalid

Type

Method

Function

Get

Description

This command returns **False** if an element in a waveform array returned by the driver contains a valid voltage. This command returns **True** if an element in a waveform array returned by the driver contains a value indicating that the oscilloscope could not sample a voltage.

Hierarchy

IKeysightU2701A
 └─ Measurements
 └─ IsWaveformElementInvalid(Element)

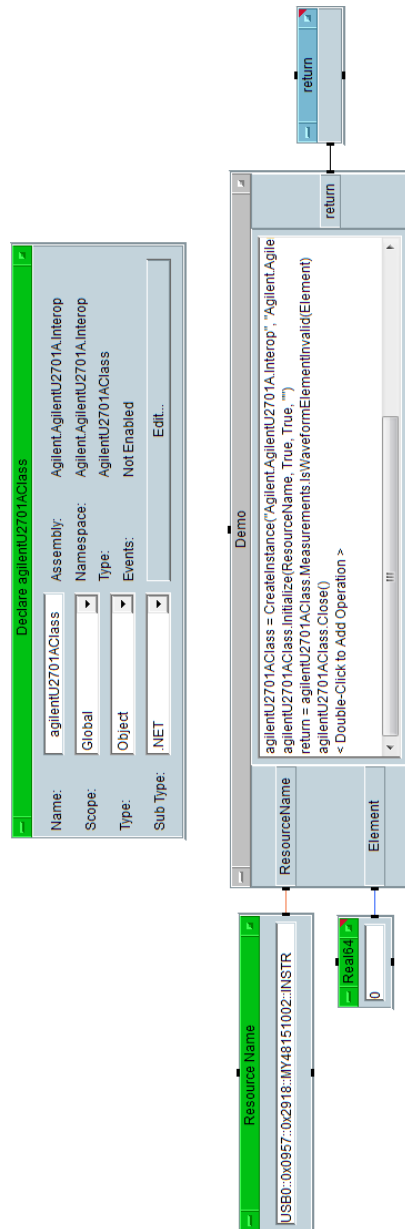
Parameters

Item	Type	Description
Element	Double	Pass one of the values from the waveform array returned by the read and fetch waveform methods.

Return Format

Boolean

Example



Item

This is an interface reference pointer to the IKeysightU2701AMeasurement interface which is selected by the measurement name.

FetchWaveform

Type

Method

Function

Get

Description

This command returns a previously acquired waveform for this channel. The acquisition must be made prior to calling this method. Call this method separately for each channel.

Hierarchy

```
IKeysightU2701A
├── Measurements
│   ├── Item(Name)
│   │   └── FetchWaveform(WaveformArray, InitialX, XIncrement)
```

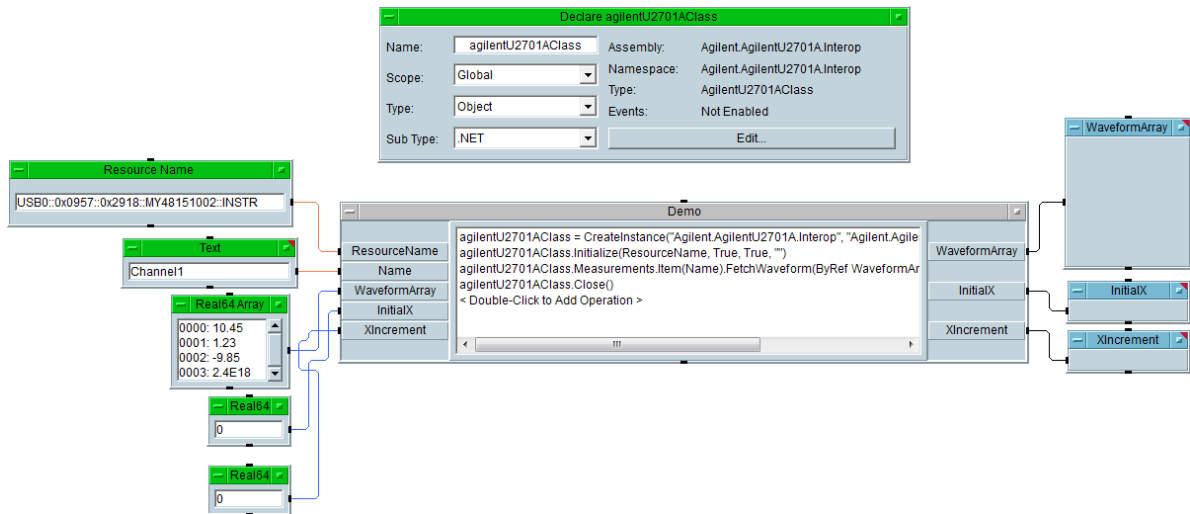
Parameters

Item	Type	Description
Name	String	The name of a measurement. This command is used to select the channel the function is to be run on. (For example: Channel 1, Channel 2, and so on.)

Return Format

Item	Type	Description
WaveformArray	Double	The array contains the acquired waveform. Units for the individual array elements are expressed in volts.
InitialX	Double	The time in relation to the trigger event of the first point in the waveform in seconds. Negative values mean that the first point in the waveform array was acquired before the trigger event.
XIncrement	Double	The effective time between points in the acquired waveform in seconds.

Example



ReadWaveform

Type

Method

Function

Get

Description

This command initiates an acquisition on all enabled channels, waits (up to *MaxTime*) for the acquisition to complete, and returns the waveform for this channel. Call **FetchWaveform** to obtain the waveforms for other channels.

Hierarchy

```
IKeysightU2701A
├── Measurements
│   └── Item(Name)
│       └── ReadWaveform(MaxTimeMilliseconds, WaveformArray, InitialX,
                           XIncrement)
```

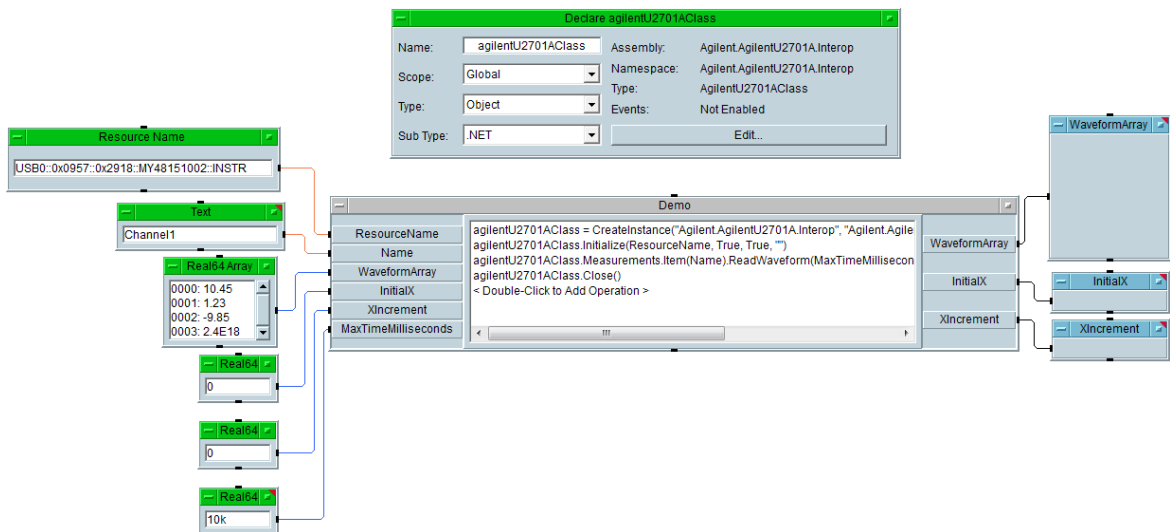
Parameters

Item	Type	Description
Name	String	The name of a measurement. This command is used to select the channel the function is to be run on. (For example: Channel 1, Channel 2, and so on.)

Return Format

Item	Type	Description
MaxTime Milliseconds	Long/Int32	Specifies the maximum time the end-user allows for this method to complete in milliseconds.
WaveformArray	Double	The array contains the acquired waveform. Units for the individual array elements are expressed in volts.
InitialX	Double	The time in relation to the trigger event of the first point in the waveform in seconds. Negative values mean that the first point in the waveform array was acquired before the trigger event.
XIncrement	Double	The effective time between points in the acquired waveform in seconds.

Example



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5 Post Analysis

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This chapter describes the post analysis commands used to program the U2701A/U2702A USB modular oscilloscopes over the remote interface. The statements in this section is used to analyze the waveform data acquired from the oscilloscope. You can also use the commands in this section to initiate, acquire, and abort measurements.

Abort

Type

Method

Function

Set

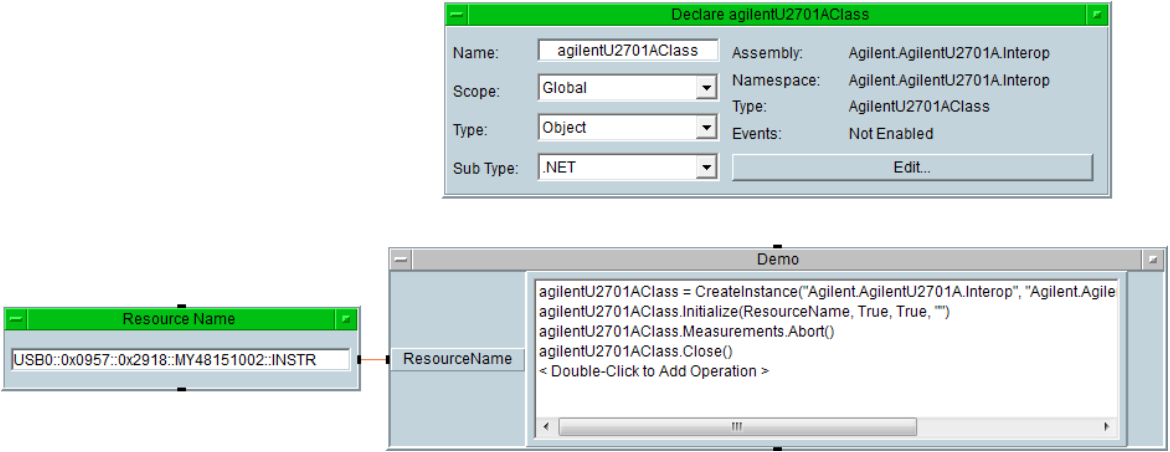
Description

This command aborts an acquisition and returns the oscilloscope to the Idle state.

Hierarchy

IKeysightU2701A
└─ Measurements
 └─ Abort()

Example



AutoSetup

Type

Method

Function

Set

Description

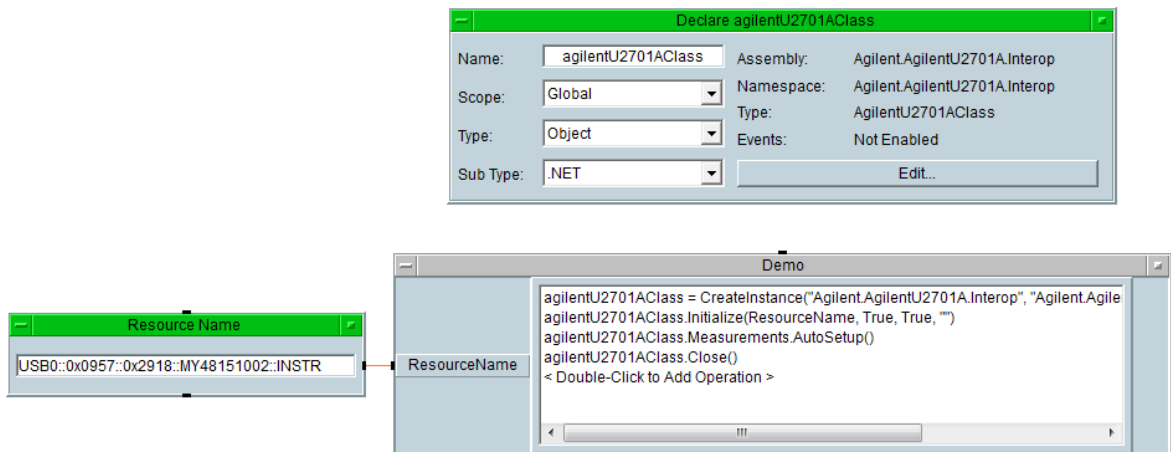
This command automatically configures all the oscilloscopes settings based on the input signals.

Hierarchy

```

IKeysightU2701A
├── Measurements
│   └── AutoSetup()
  
```

Example



Count

Type

Property

Function

Get

Description

This command returns the number of measurements.

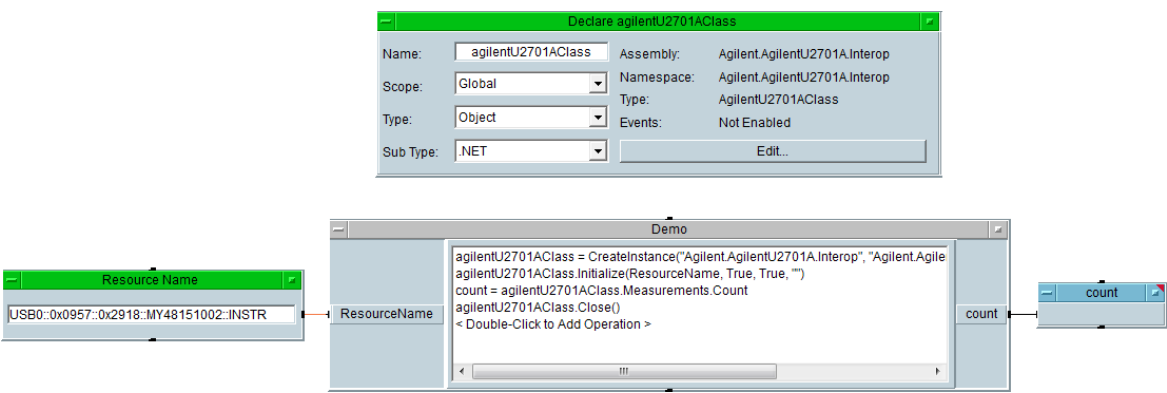
Hierarchy

IKeysightU2701A
└─ Measurements
 └─ Count

Return Format

Long/Int32

Example



Initiate

Type

Method

Function

Set

Description

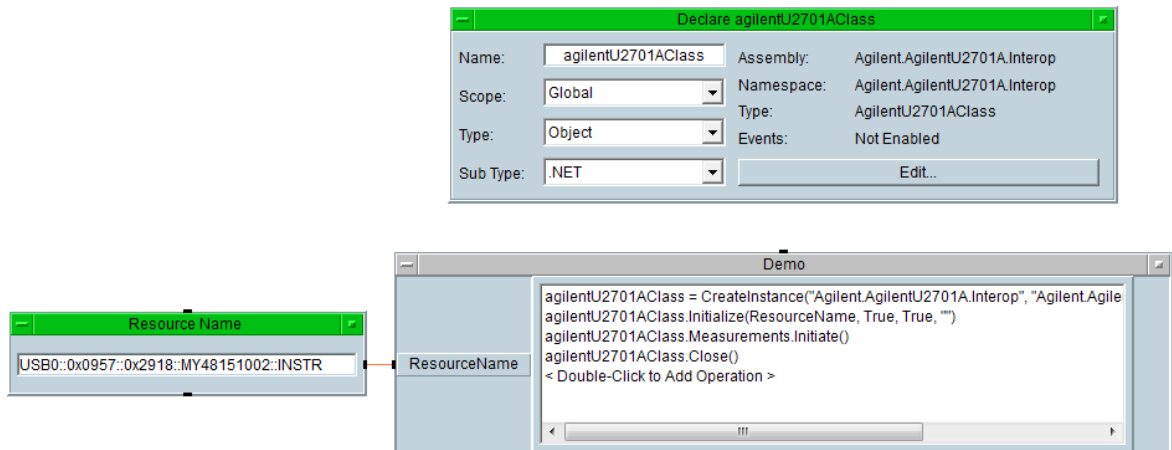
This command initiates a waveform acquisition. The oscilloscope leaves the Idle state and waits for a trigger. The oscilloscope acquires a waveform for each enabled channel.

Hierarchy

```

IKeysightU2701A
├─ Measurements
│   └─ Initiate()
  
```

Example



IsWaveformElementInvalid

Type

Method

Function

Get

Description

This command returns **False** if an element in a waveform array returned by the driver contains a valid voltage. This command returns **True** if an element in a waveform array returned by the driver contains a value indicating that the oscilloscope could not sample a voltage.

Hierarchy

IKeysightU2701A
└─ Measurements
 └─ IsWaveformElementInvalid(Element)

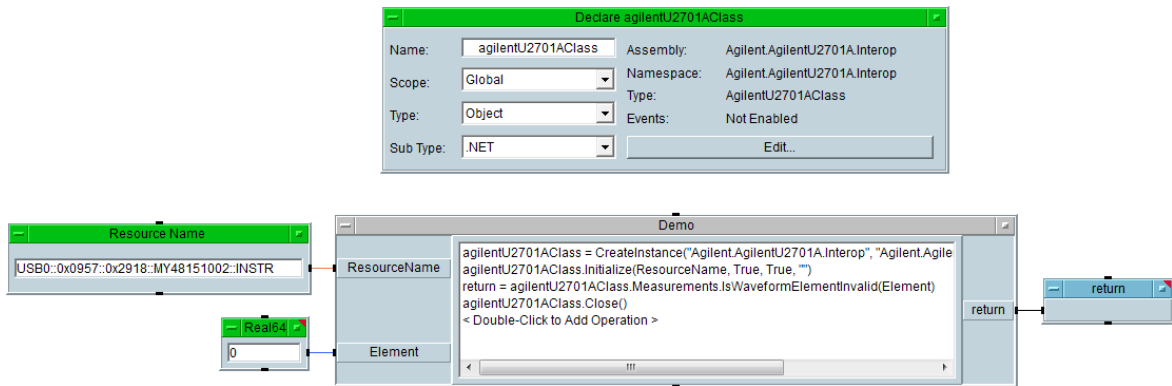
Parameters

Item	Type	Description
Element	Double	Pass one of the values from the waveform array returned by the read and fetch waveform methods.

Return Format

Boolean

Example



Item

This is an interface reference pointer to the IKeysightU2701AMeasurement interface which is selected by the measurement name.

FetchWaveform

Type

Method

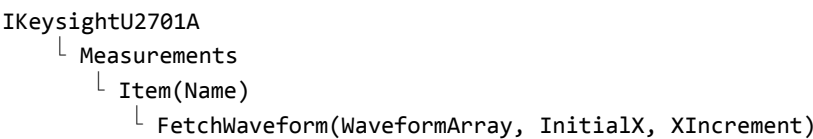
Function

Get

Description

This command returns a previously acquired waveform for this channel. The acquisition must be made prior to calling this method. Call this method separately for each channel.

Hierarchy



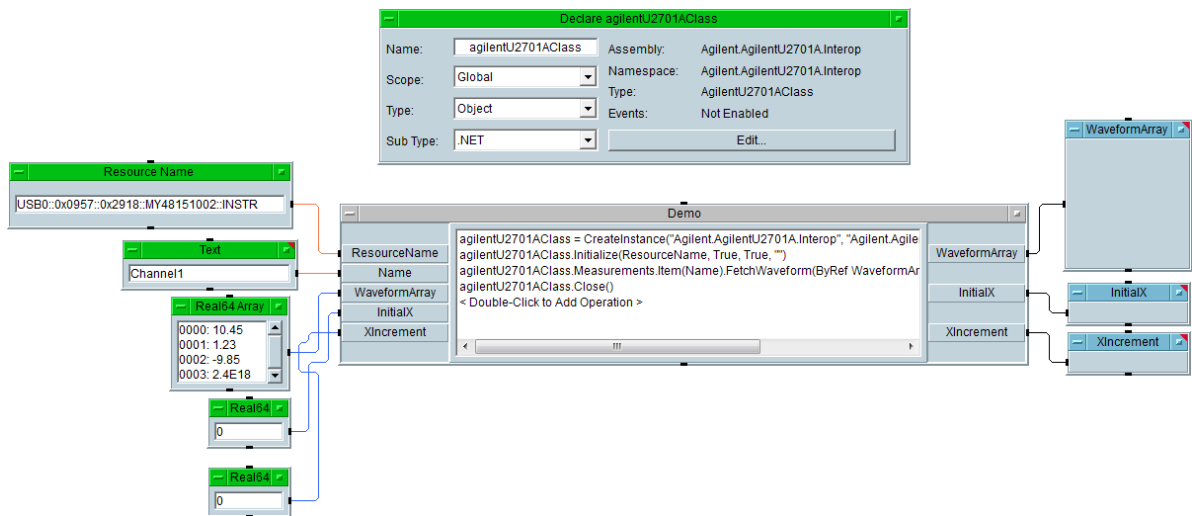
Parameters

Item	Type	Description
Name	String	The name of a measurement. This command is used to select the channel the function is to be run on. (For example: Channel 1, Channel 2, and so on.)

Return Format

Item	Type	Description
WaveformArray	Double	The array contains the acquired waveform. Units for the individual array elements are expressed in volts.
InitialX	Double	The time in relation to the trigger event of the first point in the waveform in seconds. Negative values mean that the first point in the waveform array was acquired before the trigger event.
XIncrement	Double	The effective time between points in the acquired waveform in seconds.

Example



FetchWaveformMeasurement

Type

Method

Function

Get

Description

This command returns a previously acquired waveform measurement for this channel. The acquisition must be made prior to calling this method. Call this method separately for each measurement.

Hierarchy

```
IKeysightU2701A
├── Measurements
│   └── Item(Name)
│       └── FetchWaveformMeasurement (MeasFunction, Measurement)
```

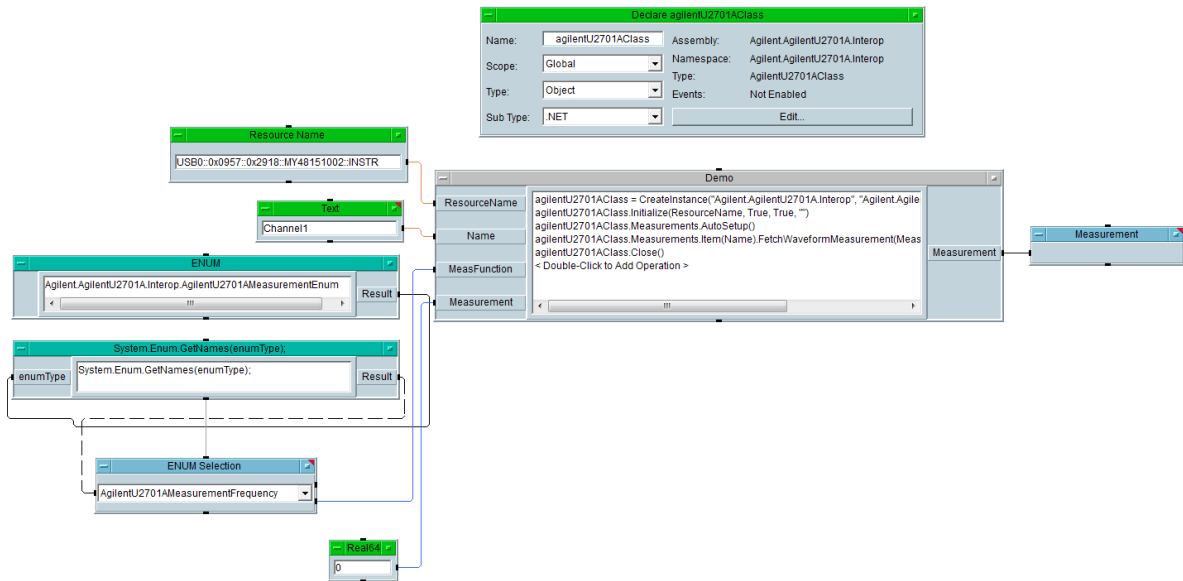
Parameters

Item	Type	Description
Name	String	The name of a measurement. This command is used to select the channel the function is to be run on. (For example: Channel 1, Channel 2, and so on.)

Return Format

Item	Type	Description
MeasFunction	KeysightU2701A Measurement Enum	Characteristic of the acquired waveform to be measured. See "KeysightU2701AMeasurementEnum" on page 170 for more information.
Measurement	Double	The measured value. The units depend on the measurement that the user specifies with the <i>MeasFunction</i> parameter.

Example



ReadFullWaveform

Type

Method

Function

Get

Description

This command pulls the data directly from the device without data manipulation (interleaving or value conversion). It will automatically detect the 16M/32M data size for each channel.

Hierarchy

```
IKeysightU2701A
├── Measurements
│   └── Item(Name)
│       └── ReadFullWaveform(ref Data, ref Length)
```

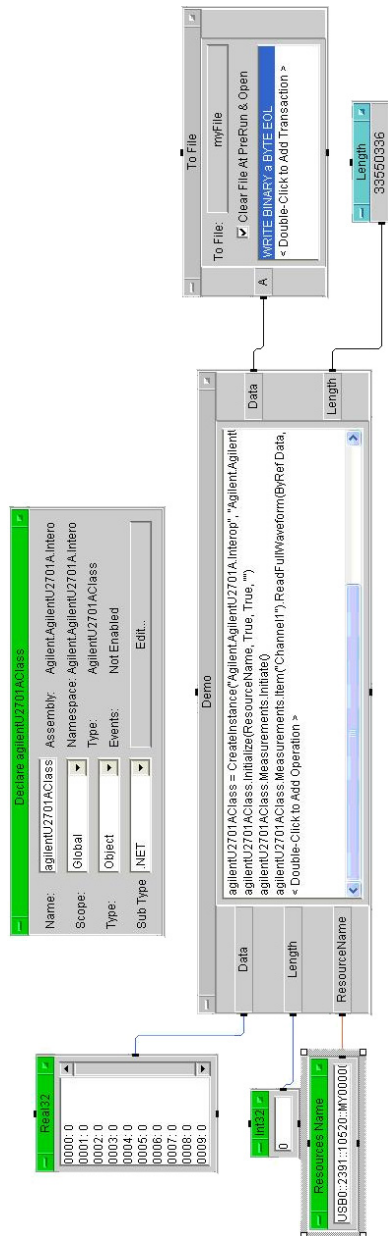
Parameters

Item	Type	Description
Name	String	The name of a measurement. This command is used to select the channel the function is to be run on. (For example: Channel 1, Channel 2, and so on.)

Return Format

Item	Type	Description
Data	Array	The data that contains a raw waveform data in bytes.
Length	Long/Int32	The length of the data size.

Example



ReadWaveform

Type

Method

Function

Get

Description

This command initiates an acquisition on all enabled channels, waits (up to *MaxTime*) for the acquisition to complete, and returns the waveform for this channel. Call **FetchWaveform** to obtain the waveforms for other channels.

Hierarchy

```
IKeysightU2701A
├── Measurements
│   └── Item(Name)
│       └── ReadWaveform(MaxTimeMilliseconds, WaveformArray, InitialX,
                           XIncrement)
```

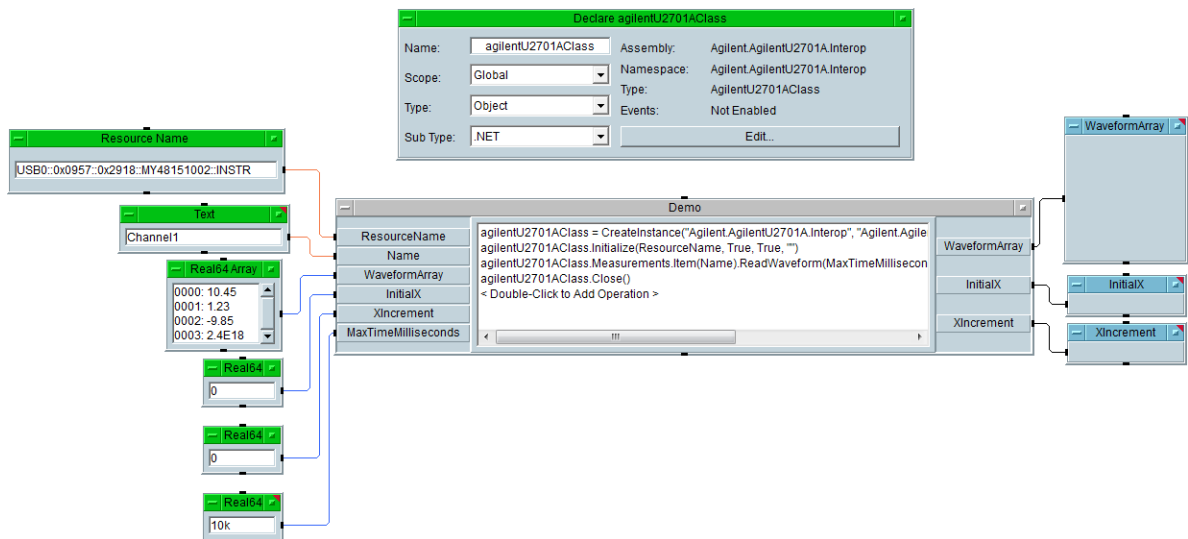
Parameters

Item	Type	Description
Name	String	The name of a measurement. This command is used to select the channel the function is to be run on. (For example: Channel 1, Channel 2, and so on.)

Return Format

Item	Type	Description
MaxTime Milliseconds	Long/Int32	Specifies the maximum time the end-user allows for this method to complete in milliseconds.
WaveformArray	Double	The array contains the acquired waveform. Units for the individual array elements are expressed in volts.
InitialX	Double	The time in relation to the trigger event of the first point in the waveform in seconds. Negative values mean that the first point in the waveform array was acquired before the trigger event.
XIncrement	Double	The effective time between points in the acquired waveform in seconds.

Example



ReadWaveformMeasurement

Type

Method

Function

Get

Description

This command returns a previously acquired waveform for this channel. The acquisition must be made prior to calling this method. Call this method separately for each channel.

Hierarchy

```
IKeysightU2701A
├── Measurements
│   └── Item(Name)
│       └── ReadWaveformMeasurement (MeasFunction, MaxTimeMilliseconds,
                                       Measurement)
```

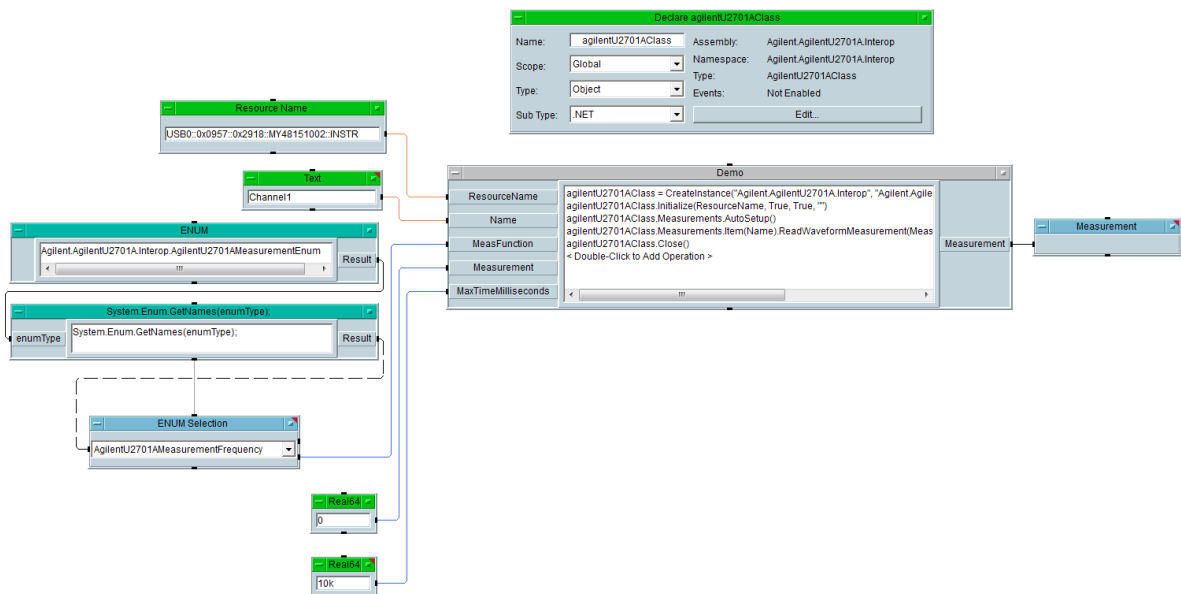
Parameters

Item	Type	Description
Name	String	The name of a measurement. This command is used to select the channel the function is to be run on. (For example: Channel 1, Channel 2, and so on.)

Return Format

Item	Type	Description
MeasFunction	KeysightU2701A Measurement Enum	Characteristic of the acquired waveform to be measured. See “ KeysightU2701AMeasurementEnum ” on page 170 for more information.
MaxTime Milliseconds	Long/Int32	Specifies the maximum time the end-user allows for this method to complete in milliseconds.
Measurement	Double	The measured value. The units depend on the measurement that the user specifies with the <i>MeasFunction</i> parameter.

Example



MathFunction

Type

Method

Function

Set

Description

This command configures a mathematical operation for Channel 1 and 2. The operation and reverse will be set to “**ADD**” and “**False**” by default.

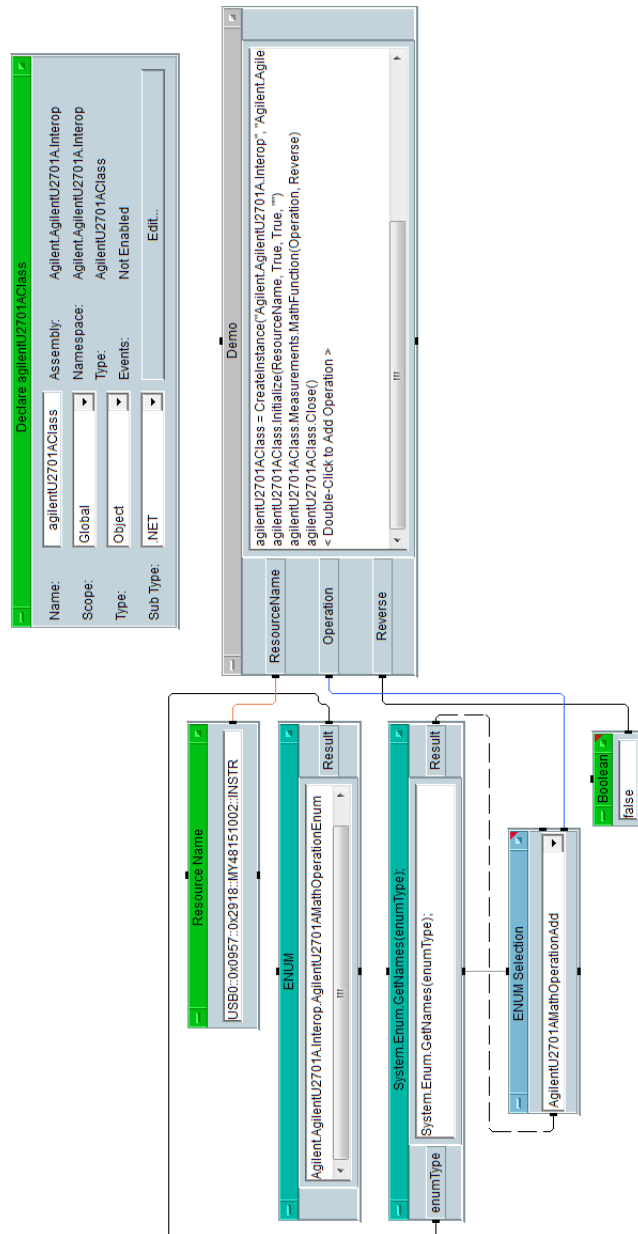
Hierarchy

IKeysightU2701A
└─ Measurements
 └─ MathFunction(Operation, Reverse)

Parameters

Item	Type	Description
Operation	KeysightU2701A Measurement Enum	Channel 1 and Channel 2 math operation.
Reverse	Boolean	The operation order of Channel 1 and Channel 2. If True, Channel 2 <operation> Channel 1. If False, Channel 1 <operation> Channel 2

Example



Name

Type

Property

Function

Get

Description

This command returns the measurement name for a given index.

Hierarchy

IKeysightU2701A
└─ Measurements
 └─ Name(Index)

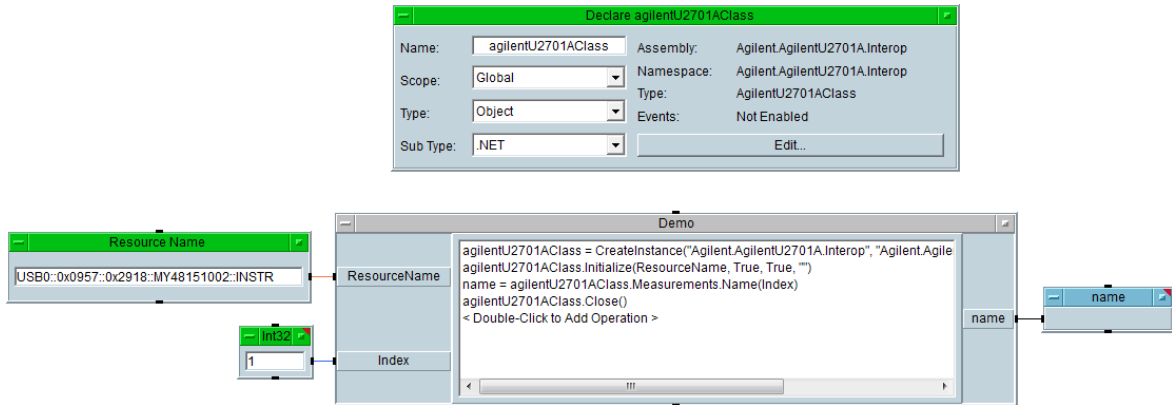
Parameters

Item	Type	Description
Index	Long/Int32	One based index into the collection of measurements.

Return Format

String/BSTR

Example



Status

Type

Method

Function

Get

Description

This command returns whether an acquisition is in progress, complete, or if the status is unknown.

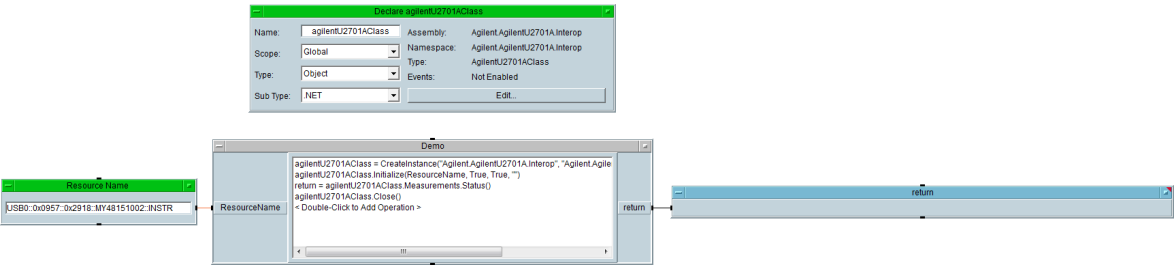
Hierarchy

IKeysightU2701A
└─ Measurements
 └─ Status()

Return Format

Item	Type	Description
KeysightU2701A AcquisitionStatus Enum	Enum	See "KeysightU2701AAcquisitionStatusEnum" on page 132.

Example



Enumeration Members

This section describes the members of each enumeration used in this specific IVI-COM driver.

KeysightU2701AMathOperationEnum

Description

IKeysightU2701A instrument-specific values for channels mathematical operations.

Members

Member name	Value	Description
KeysightU2701A MathOperation Add	0	Add operation between two channels.
KeysightU2701A MathOperation Subtract	1	Subtract operation between two channels.
KeysightU2701A MathOperation Multiply	2	Multiply operation between two channels.
KeysightU2701A MathOperation Divide	3	Divide operation between two channels.

KeysightU2701AMeasurementEnum

Description

IVI scope class-compliant values for the *MeasFunction* parameter read and fetch methods.

Members

Member name	Value	Description
KeysightU2701A MeasurementRise Time	0	The length of time for a rising edge of the signal to rise from the low reference level to the high reference level. The units are expressed in seconds.
KeysightU2701A MeasurementFall Time	1	The length of time for a falling edge of the signal to fall from the high reference level to the low reference level. The units are expressed in seconds.
KeysightU2701A Measurement Frequency	2	The frequency of one complete cycle in the waveform. The units are expressed in hertz.
KeysightU2701A Measurement Period	3	The length of time of one complete cycle in the waveform. The units are expressed in seconds.
KeysightU2701A Measurement VoltageRMS	4	The true Root Mean Square voltage of the entire waveform. The units are expressed in volts.
KeysightU2701A Measurement VoltageRMSAC	5	The true Root Mean Square voltage(AC) of the entire waveform. The units are expressed in volts.
KeysightU2701A Measurement VoltagePeakTo Peak	6	The absolute difference between the Voltage Max and the Voltage Min. The units are expressed in volts.
KeysightU2701A Measurement VoltageMax	7	The maximum amplitude found in the entire waveform. The units are expressed in volts.
KeysightU2701A Measurement VoltageMin	8	The minimum amplitude found in the entire waveform. The units are expressed in volts.

Member name	Value	Description
KeysightU2701A Measurement VoltageHigh	9	The voltage that corresponds to 100% when using the reference levels. The oscilloscope calculates this value using either the min/max or histogram methods. The min/max method uses the maximum value found. The histogram method uses a common value found above the middle of the waveform. The units are expressed in volts.
KeysightU2701A Measurement VoltageLow	10	The voltage that corresponds to 0% when using the reference levels. The oscilloscope calculates this value using either the min/max or histogram methods. The min/max method uses the minimum value found. The histogram method uses a common value found below the middle of the waveform. The units are expressed in volts.
KeysightU2701A Measurement VoltageAverage	11	The arithmetic average in volts measured over the entire waveform. The units are expressed in volts.
KeysightU2701A Measurement WidthNeg	12	The length of time between the mid reference level points of a negative pulse in the waveform. The units are expressed in seconds.
KeysightU2701A Measurement WidthPos	13	The length of time between the mid reference level points of a positive pulse in the waveform. The units are expressed in seconds.
KeysightU2701A Measurement DutyCycleNeg	14	The ratio of the WidthNeg to the Period of an integer number of cycles in the waveform expressed as a percentage.
KeysightU2701A Measurement DutyCyclePos	15	The ratio of the WidthPos width to the Period of an integer number of cycles in the waveform expressed as a percentage.
KeysightU2701A Measurement Amplitude	16	The VoltageHigh less the VoltageLow expressed in volts over the entire waveform.
KeysightU2701A Measurement VoltageCycleRMS	17	The true root mean square voltage over an integer number of cycles in the waveform. The units are expressed in volts.
KeysightU2701A Measurement OverShoot	18	The relative waveform distortion that follows an edge transition.

Member name	Value	Description
KeysightU2701A Measurement Preshoot	19	The relative waveform distortion that precedes an edge transition.
KeysightU2701A Measurement Phase	20	Phase.
KeysightU2701A Measurement Delay	21	Delay.
KeysightU2701A Measurement CrestFactor	22	Crest factor.
KeysightU2701A Measurement StandardDeviation	23	Standard deviation.
KeysightU2701A Measurement TimeAtMax	24	Time at maximum voltage.
KeysightU2701A Measurement TimeAtMin	25	Time at minimum voltage.

6 Others

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This chapter describes the other commands used to program the U2701A/U2702A USB modular oscilloscopes over the remote interface. You can use the commands in this chapter to get and set some of the oscilloscope properties. You can also calibrate the instrument and perform various driver operations.

Calibrate

Type

Method

Function

Set

Description

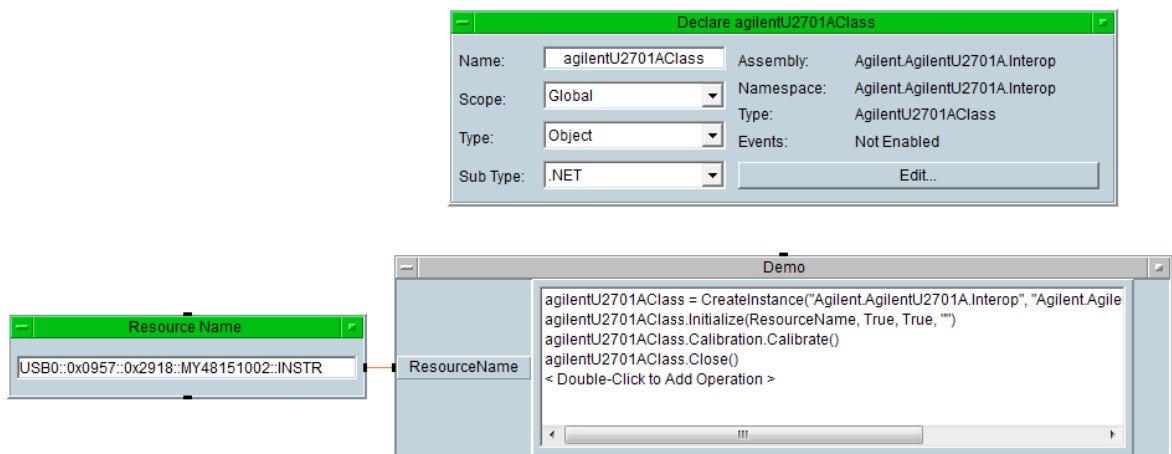
This command calibrates the instrument. This method might take several minutes to complete.

Hierarchy

```

IKeysightU2701A
├── Calibration
│   └── Calibrate()
  
```

Example



Date

Type

Property

Function

Get

Description

This command returns the date the instrument was last calibrated.

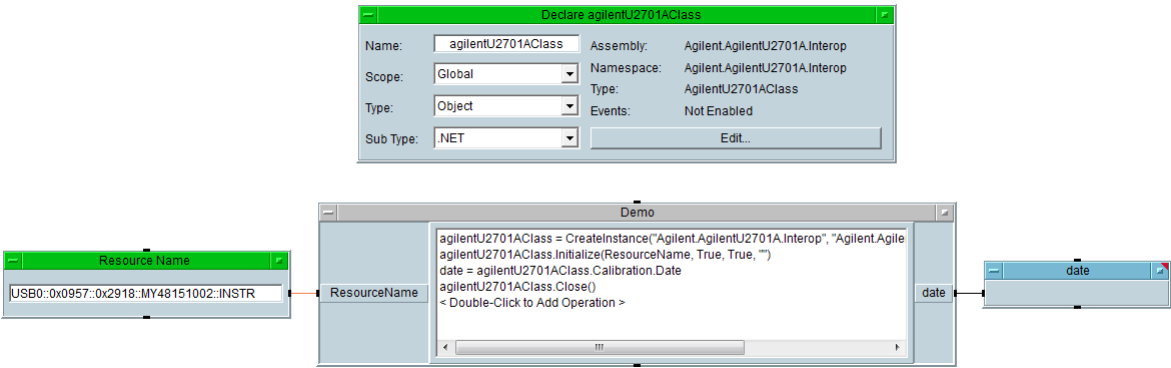
Hierarchy

IKeysightU2701A
└─ Calibration
 └─ Date

Return Format

String/BSTR

Example



Label

Type

Property

Function

Get

Description

This command returns the label set during the last calibration.

Hierarchy

```

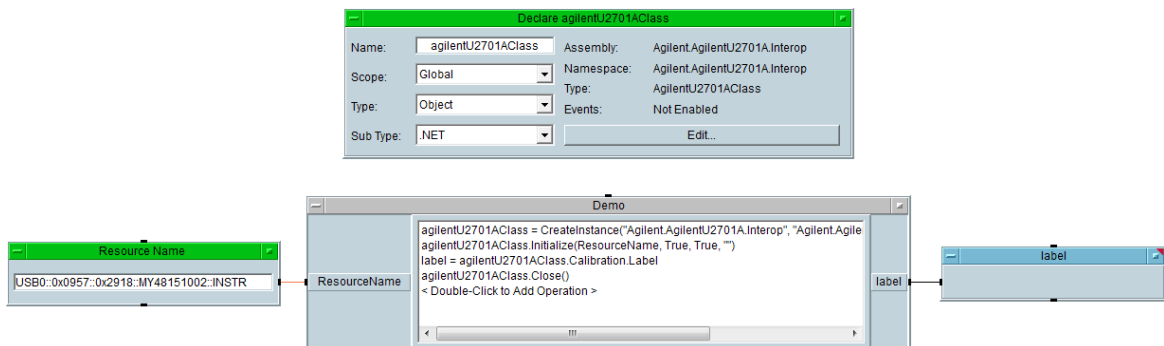
IKeysightU2701A
├── Calibration
│   └── Label

```

Return Format

String/BSTR

Example



Time

Type

Property

Function

Get

Description

This command returns the time the instrument was last calibrated.

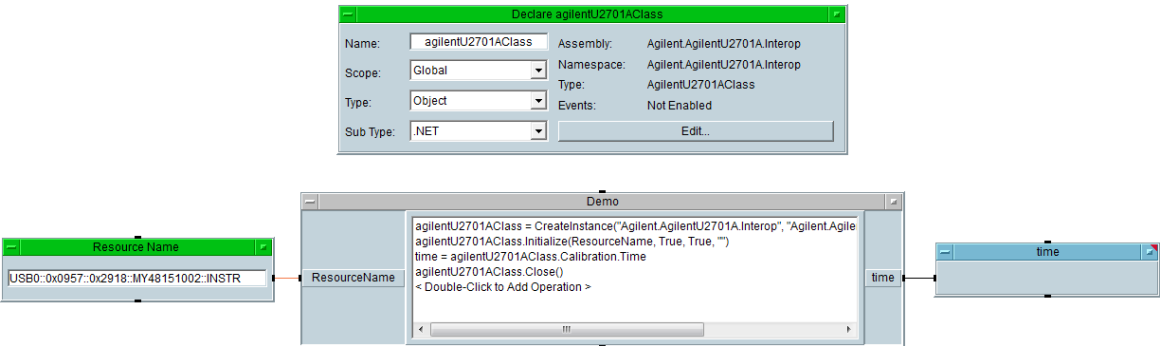
Hierarchy

IKeysightU2701A
└ Calibration
└ Time

Return Format

String/BSTR

Example



Cache

Type

Property

Function

Get and Set

Description

Drivers may choose to always cache some instrument settings, never cache others, or optionally cache others to avoid unnecessary I/O activities to the instrument. If this command is set to **True**, the driver caches optionally cache instrument settings.

Hierarchy

```

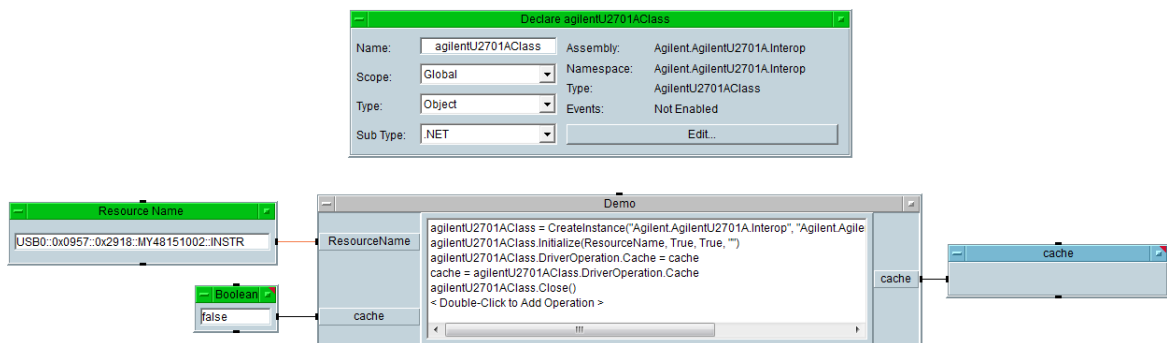
IKeysightU2701A
├── DriverOperation
│   └── Cache

```

Return Format

Boolean

Example



ClearInterchangeWarnings

Type

Method

Function

Set

Description

This command clears the list of interchangeability warnings that the IVI specific driver maintains.

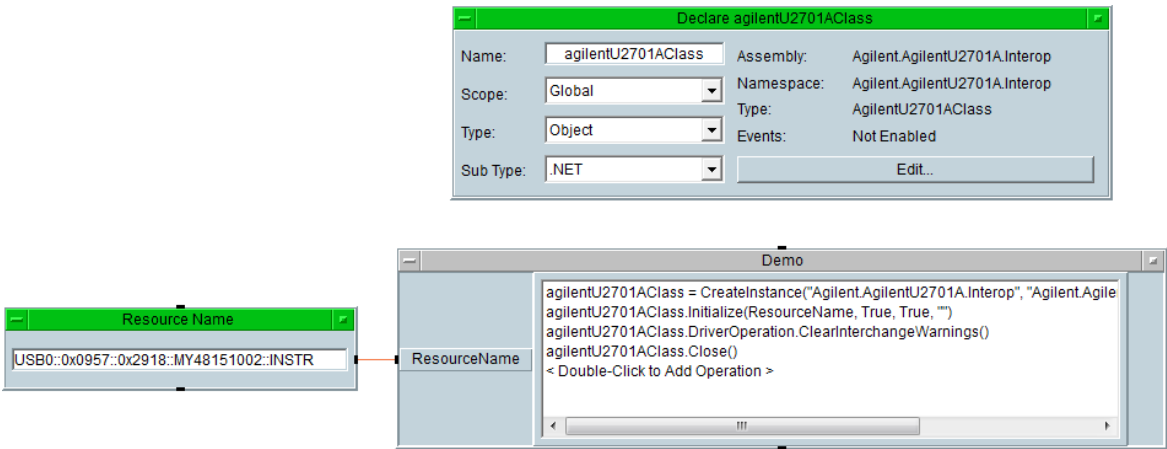
Hierarchy

IKeysightU2701A
└─ DriverOperation
 └─ ClearInterchangeWarnings

Return Format

Boolean

Example



DriverSetup

Type

Property

Function

Get

Description

This command returns the driver setup string. It is either specified in the configuration store or passed in the *OptionString* parameter of the function. Driver setup is empty if the driver is not initialized.

Hierarchy

```

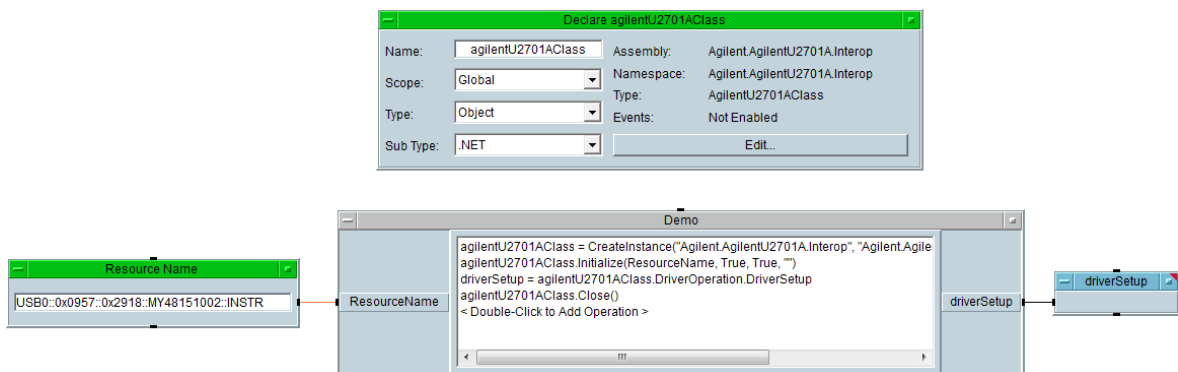
IKeysightU2701A
├── DriverOperation
│   └── DriverSetup

```

Return Format

String/BTSR

Example



GetNextCoercionRecord

Type

Method

Function

Get

Description

This command returns the oldest record from the coercion record list. Records are only added to the list if **RecordCoercions** is set to **True**.

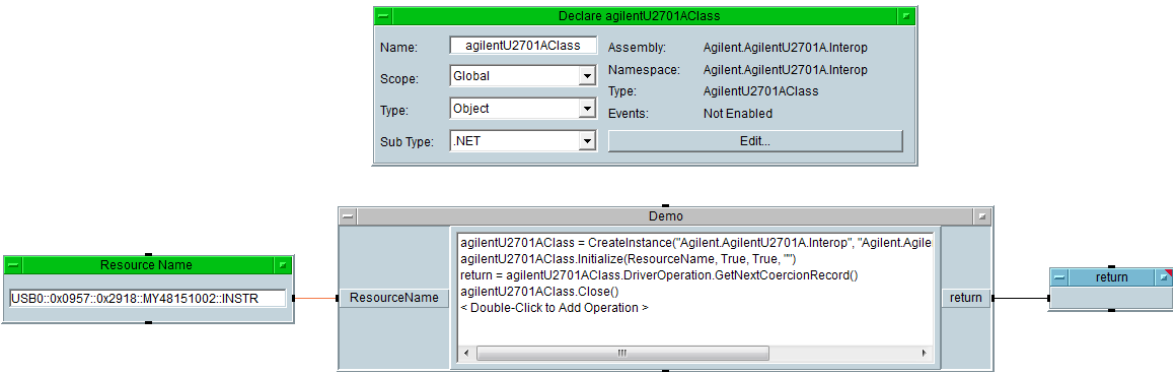
Hierarchy

IKeysightU2701A
└ DriverOperation
└ GetNextCoercionRecord()

Return Format

String/BTSTR

Example



GetNextInterchangeWarning

Type

Method

Function

Get

Description

This command returns the oldest warning from the interchange warning list. Records are only added to the list if **InterchangeCheck** is set to **True**.

Hierarchy

```

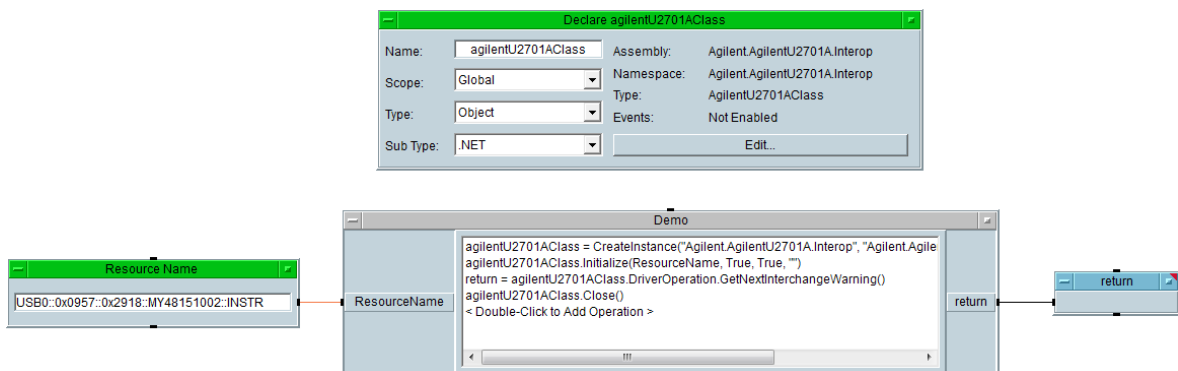
IKeysightU2701A
├── DriverOperation
│   └── GetNextInterchangeWarning()

```

Return Format

String/BTSR

Example



InterchangeCheck

Type

Property

Function

Get and Set

Description

If this command is set to **True**, the driver maintains a record of interchangeability warnings. If the driver does not support interchangeability checking, attempts to set InterchangeCheck to **True** returns an error.

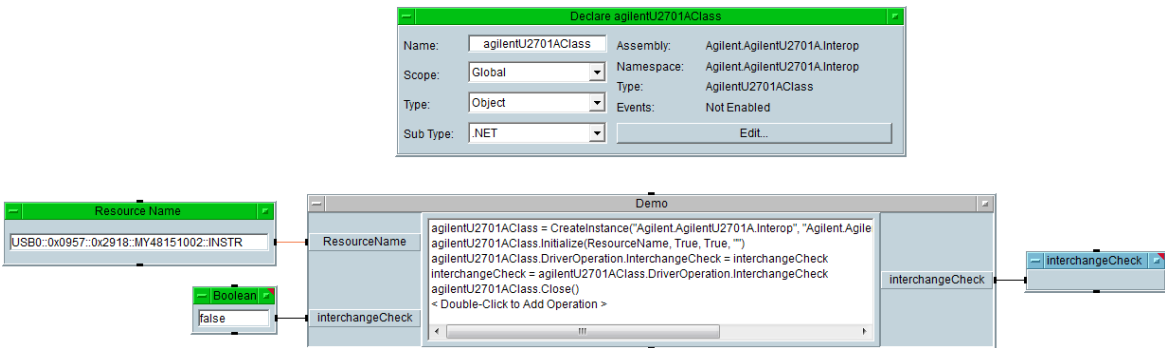
Hierarchy

IKeysightU2701A
└─ DriverOperation
 └─ InterchangeCheck

Return Format

Boolean

Example



InvalidateAllAttributes

Type

Method

Function

Set

Description

This command invalidates all of the driver cached values.

Hierarchy

```

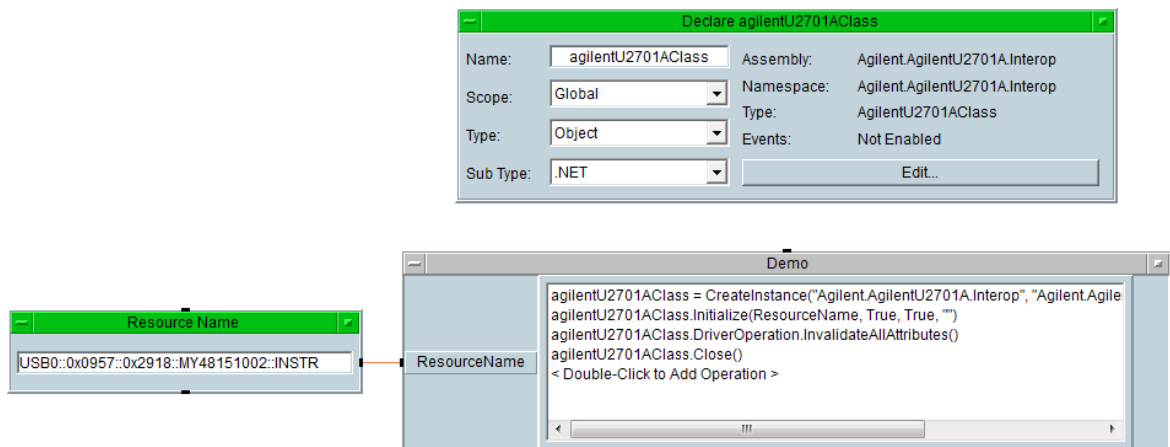
IKeysightU2701A
├── DriverOperation
│   └── InvalidateAllAttributes()

```

Return Format

Boolean

Example



IoResourceDescriptor

Type

Property

Function

Get

Description

This command returns the instrument resource descriptor. The resource descriptor specifies the connection to a physical device. It is either specified in the configuration store or passed in the *ResourceName* parameter of the **Initialize** function. It is empty if the driver is not initialized.

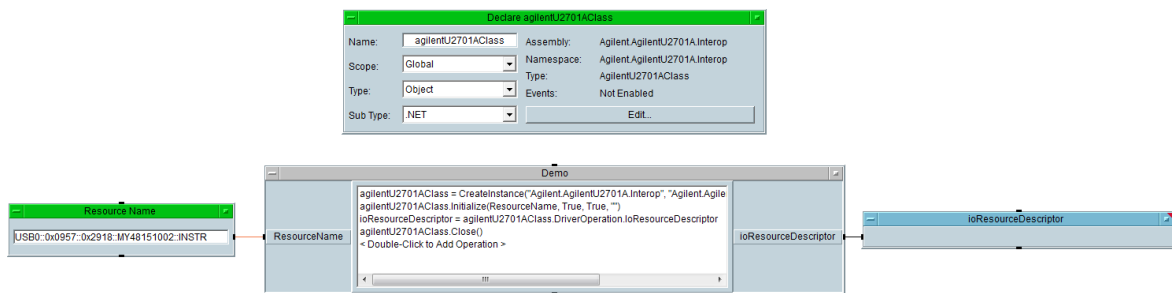
Hierarchy

IKeysightU2701A
 └─ DriverOperation
 └─ IoResourceDescriptor

Return Format

String/BSTR

Example



LogicalName

Type

Property

Function

Get

Description

This command returns the instrument logical name. The logical name identifies a driver session in the configuration store. If logical name is not empty, the driver was initialized from the information in the driver session. If it is empty, the driver was initialized without using the configuration store.

Hierarchy

```

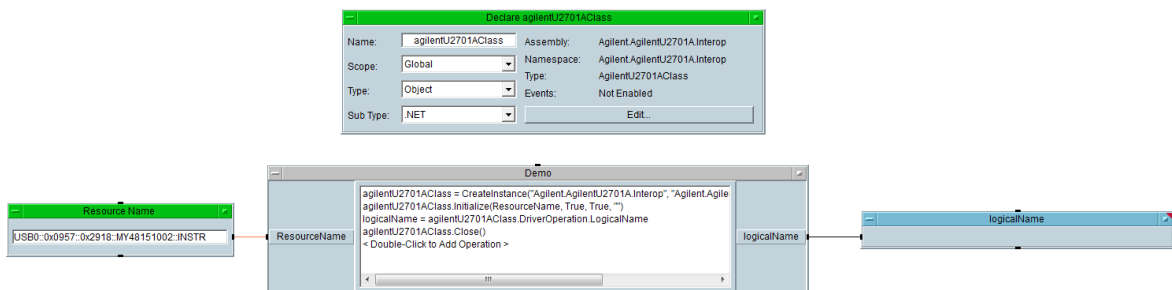
IKeysightU2701A
├── DriverOperation
│   └── LogicalName

```

Return Format

String/BSTR

Example



QueryInstrumentStatus

Type

Property

Function

Get and Set

Description

If this command is set to **True**, the driver queries the instrument status at the end of each method or property that performs I/O to the instrument. If an error is reported, use **ErrorQuery** to retrieve error messages one at a time from the instrument.

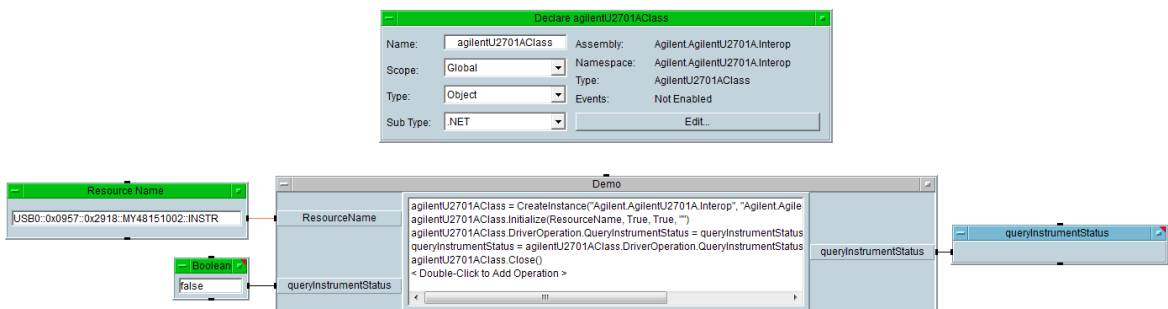
Hierarchy

```
IKeysightU2701A
├── DriverOperation
│   └── QueryInstrumentStatus
```

Return Format

Boolean

Example



RangeCheck

Type

Property

Function

Get and Set

Description

Drivers may choose to always validate some property or parameter values, never validate others, and optionally validate others, to avoid sending invalid commands to the instrument. If this command is set to **True**, the driver performs optional validations.

Hierarchy

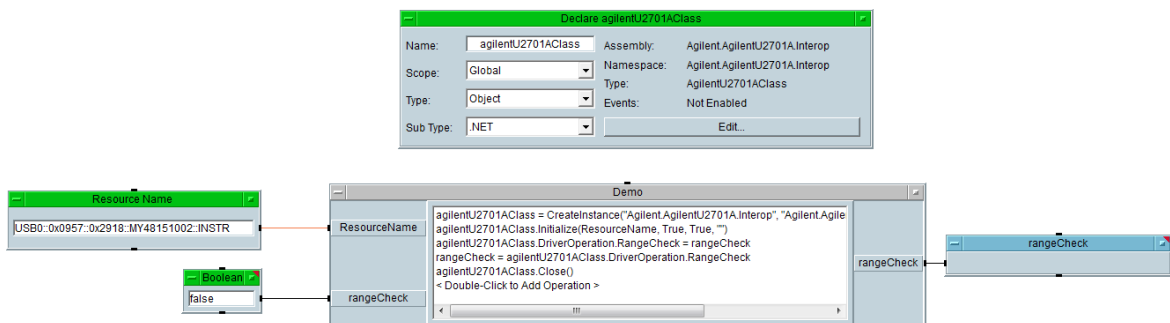
```

IKeysightU2701A
├── DriverOperation
│   └── RangeCheck
  
```

Return Format

Boolean

Example



RecordCoercions

Type

Property

Function

Get and Set

Description

If this command is set to **True**, the driver keeps a list of the value coercions it makes for *ViInt32* and *ViReal64* attributes. If the driver does not support coercion recording, attempts to set RecordCoercions to **True** will return an error.

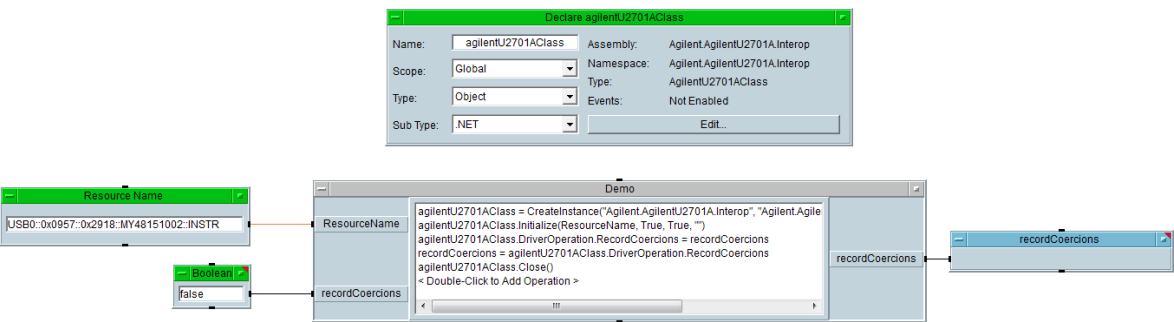
Hierarchy

IKeysightU2701A
└─ DriverOperation
 └─ RecordCoercions

Return Format

Boolean

Example



ResetInterchangeCheck

Type

Method

Function

Set

Description

This command resets the interchangeability checking algorithms of the driver so that methods and properties that were executed prior to calling this function have no affect on whether future calls to the driver will generate interchangeability warnings or not.

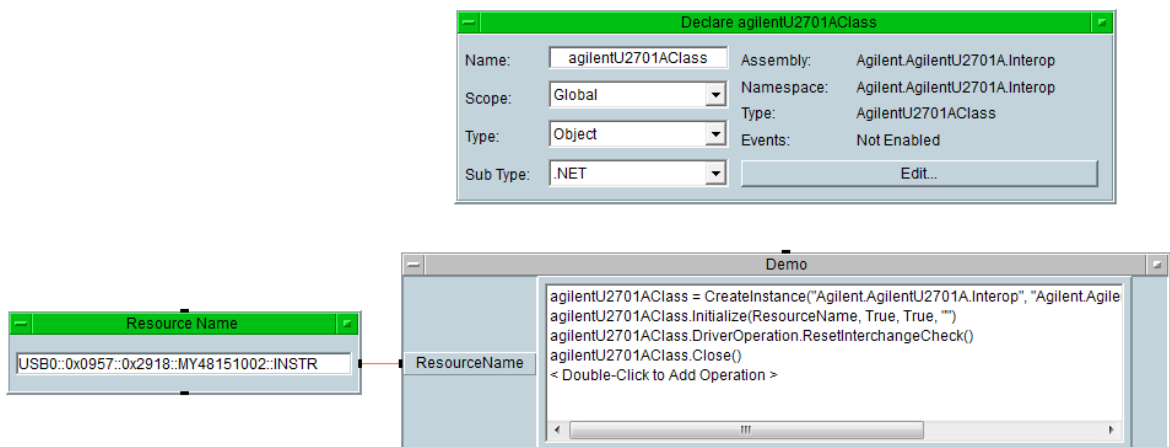
Hierarchy

```

IKeysightU2701A
├── DriverOperation
│   └── ResetInterchangeCheck()

```

Example



Simulate

Type

Property

Function

Get and Set

Description

If this command is set to **True**, the driver does not perform I/O to the instrument, and returns simulated values for output parameters instead.

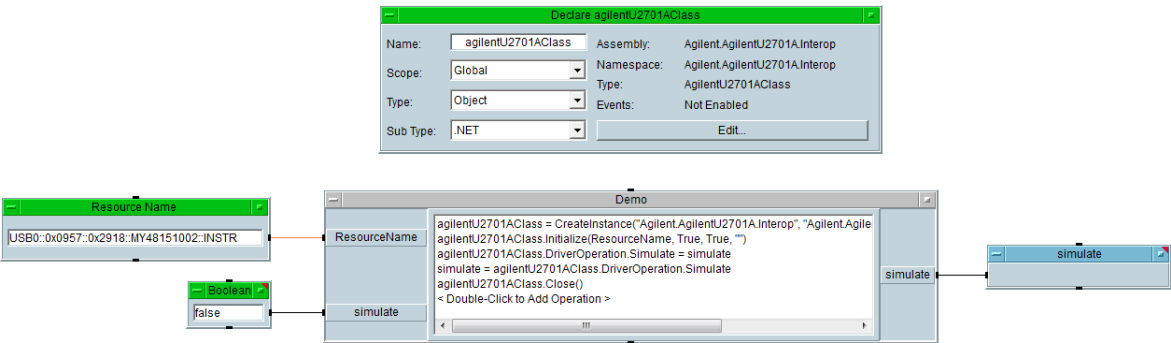
Hierarchy

IKeysightU2701A
└ DriverOperation
 └ Simulate

Return Format

Boolean

Example



Description

Type

Property

Function

Get

Description

This command returns a brief description of the implementing component. Description is limited to 256 bytes.

Hierarchy

```

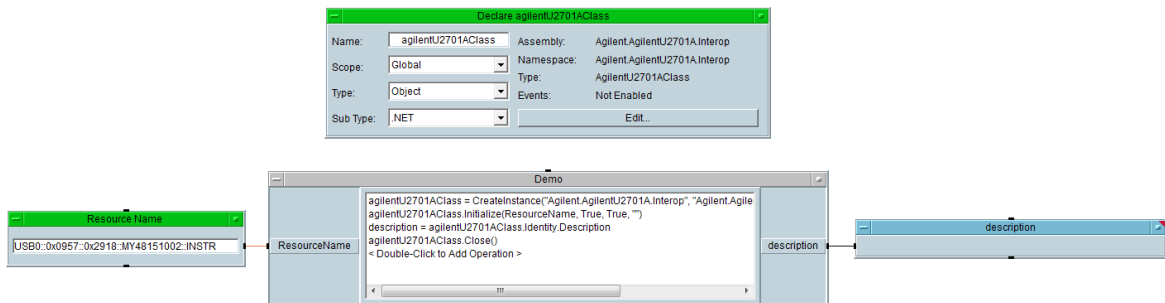
IKeysightU2701A
├── Identity
│   └── Description

```

Return Format

String/BSTR

Example



GroupCapabilities

Type

Property

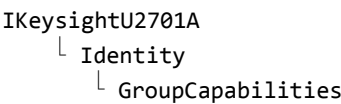
Function

Get

Description

This command returns a comma-separated list of the class capability groups implemented by the driver. Capability group names are documented in the IVI class specifications. If the driver is not class compliant, the driver returns an empty string.

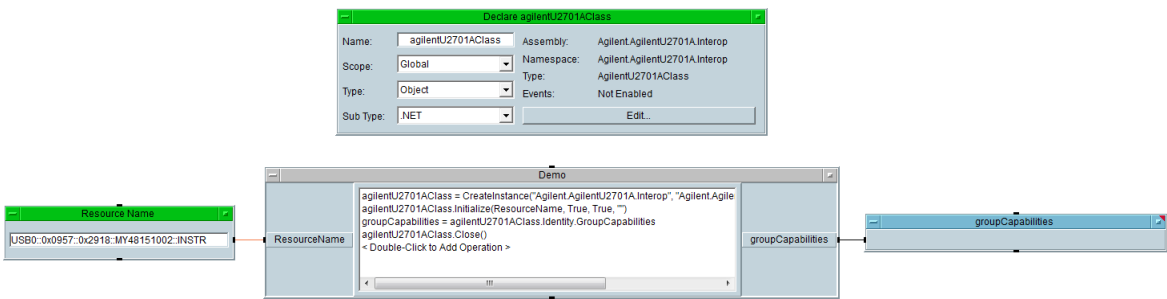
Hierarchy



Return Format

String/BSTR

Example



Identifier

Type

Property

Function

Get

Description

This command returns the case-sensitive unique identifier of the implementing IVI-COM instrument driver.

Hierarchy

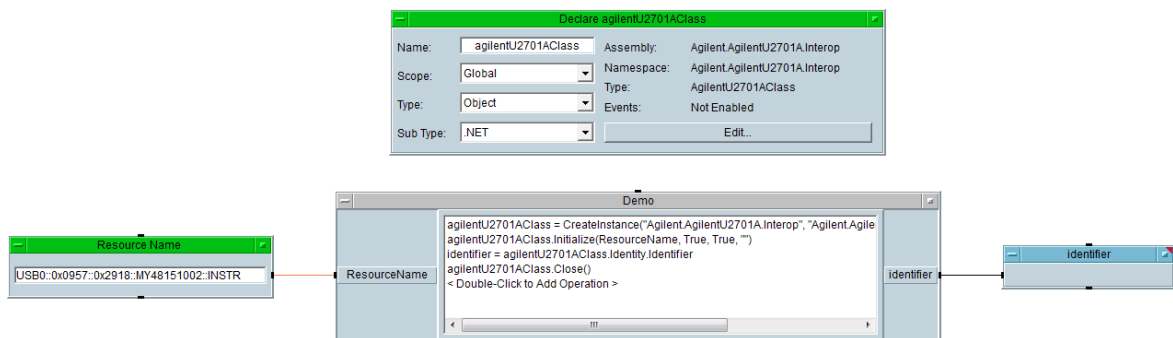
```

KeysightU2701A
├── Identity
│   └── Identifier
    
```

Return Format

String/BSTR

Example



InstrumentFirmwareRevision

Type

Property

Function

Get

Description

This command returns the firmware revision reported by the physical instrument. If **Simulate** is enabled or the instrument is not capable of reporting the firmware revision, a string is returned that explains the condition.

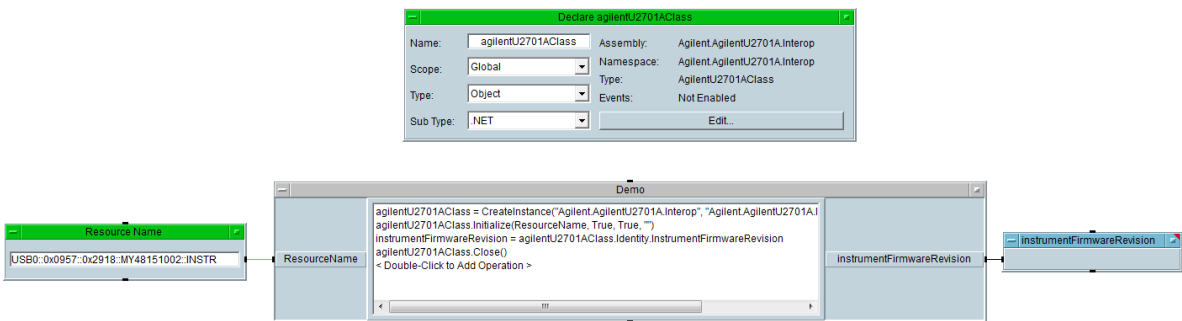
Hierarchy

IKeysightU2701A
└ Identity
└ InstrumentFirmwareRevision

Return Format

String/BSTR

Example



InstrumentManufacturer

Type

Property

Function

Get

Description

This command returns the name of the manufacturer reported by the physical instrument. If **Simulate** is enabled or the instrument is not capable of reporting the name of the manufacturer, a string is returned that explains the condition. InstrumentManufacturer is limited to 256 bytes.

Hierarchy

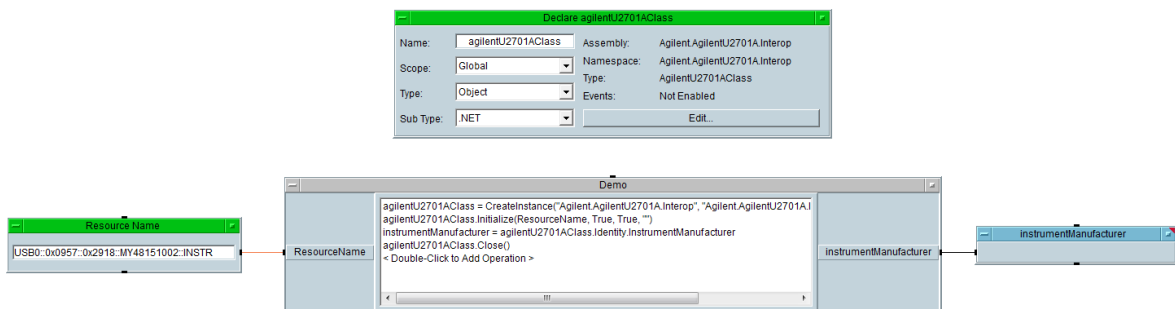
```

IKeysightU2701A
├── Identity
│   └── InstrumentManufacturer
  
```

Return Format

String/BSTR

Example



InstrumentModel

Type

Property

Function

Get

Description

This command returns the model number or name reported by the physical instrument. If **Simulate** is enabled or the instrument is not capable of reporting the model number or name, a string is returned that explains the condition. InstrumentModel is limited to 256 bytes.

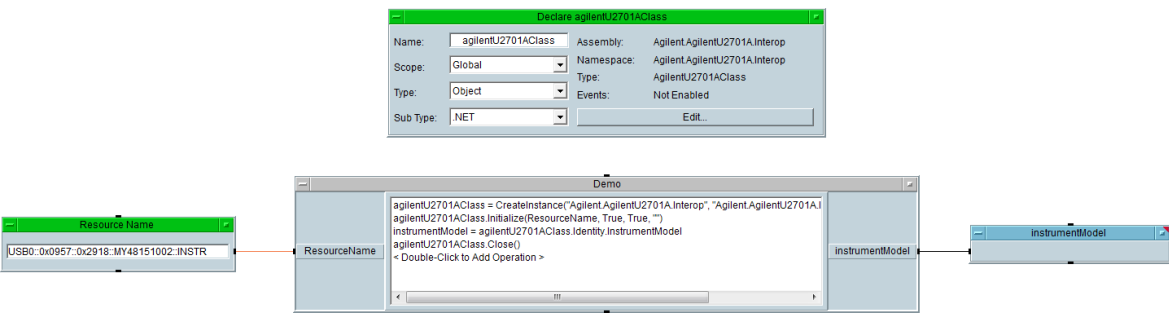
Hierarchy

IKeysightU2701A
└─ Identity
 └─ InstrumentModel

Return Format

String/BSTR

Example



Revision

Type

Property

Function

Get

Description

This command returns the revision of the implementing component. Revision is limited to 256 bytes.

Hierarchy

```

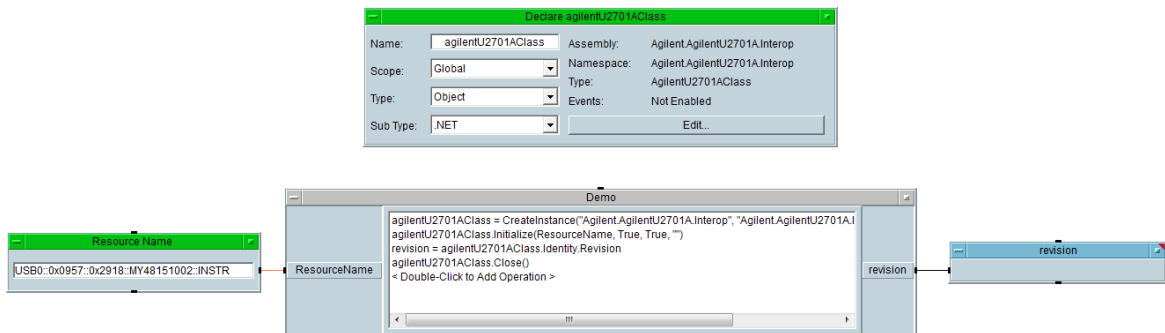
IKeysightU2701A
├── Identity
│   └── Revision

```

Return Format

String/BSTR

Example



SpecificationMajorVersion

Type

Property

Function

Get

Description

For IVI class-compliant drivers, this command returns the major version number of the instrument class specification. If the driver is not class compliant, the driver returns zero.

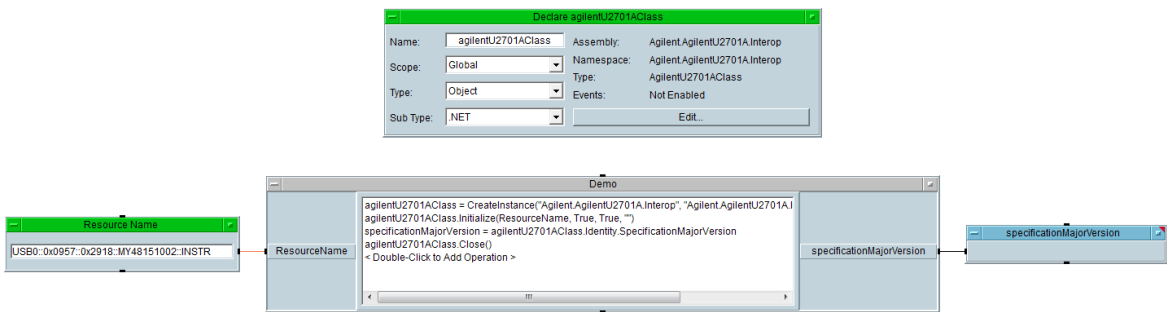
Hierarchy

IKeysightU2701A
└ Identity
└ SpecificationMajorVersion

Return Format

Long/Int32

Example



SpecificationMinorVersion

Type

Property

Function

Get

Description

For IVI class-compliant drivers, this command returns the minor version number of the instrument class specification. If the driver is not class compliant, the driver returns zero.

Hierarchy

```

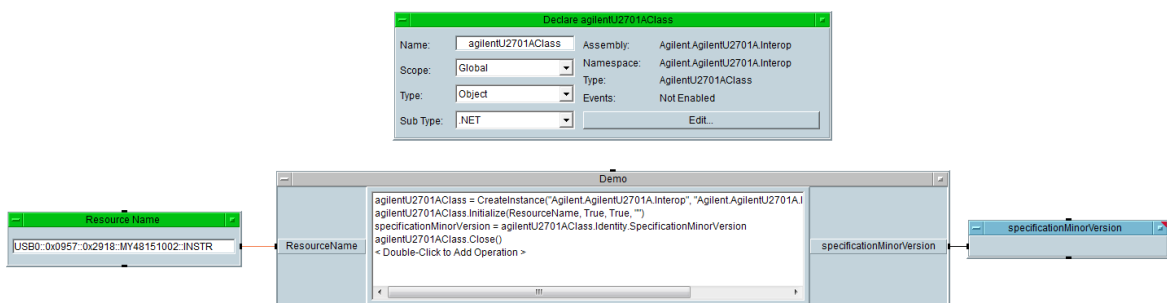
IKeysightU2701A
├── Identity
│   └── SpecificationMinorVersion

```

Return Format

Long/Int32

Example



SupportedInstrumentModels

Type

Property

Function

Get

Description

This command returns a comma-separated list of instrument models that the IVI specific driver can control. The string does not include an abbreviation for the manufacturer if it is the same for all models.

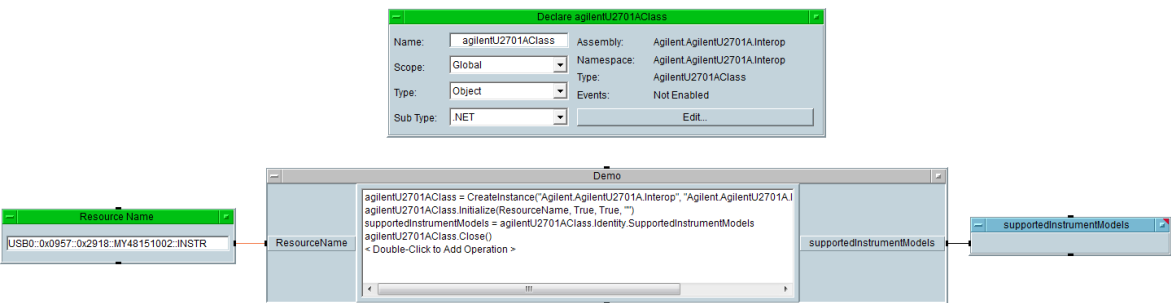
Hierarchy

KeysightU2701A
└ Identity
└ SupportedInstrumentModels

Return Format

String/BSTR

Example



Vendor

Type

Property

Function

Get

Description

This command returns the name of the vendor that supplies the implementing component. Vendor is limited to 256 bytes.

Hierarchy

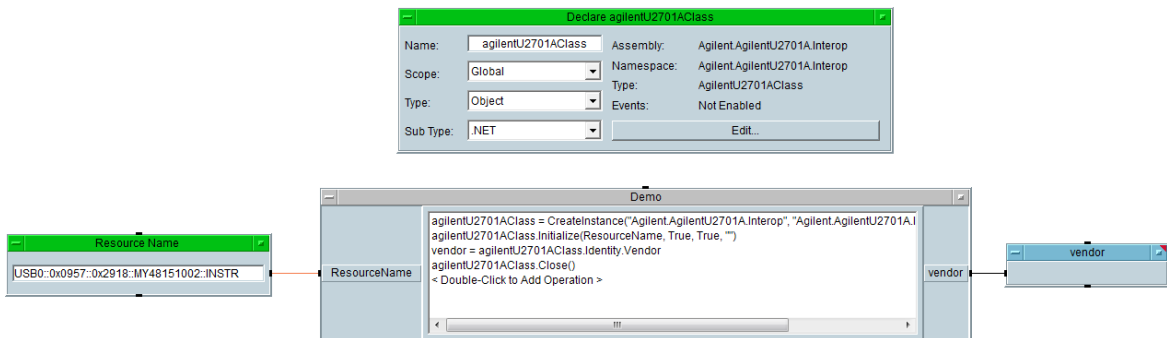
```

IKeysightU2701A
├── Identity
│   └── Vendor
    
```

Return Format

String/BSTR

Example



SerialNumber

Type

Property

Function

Get

Description

This command returns the instrument serial number.

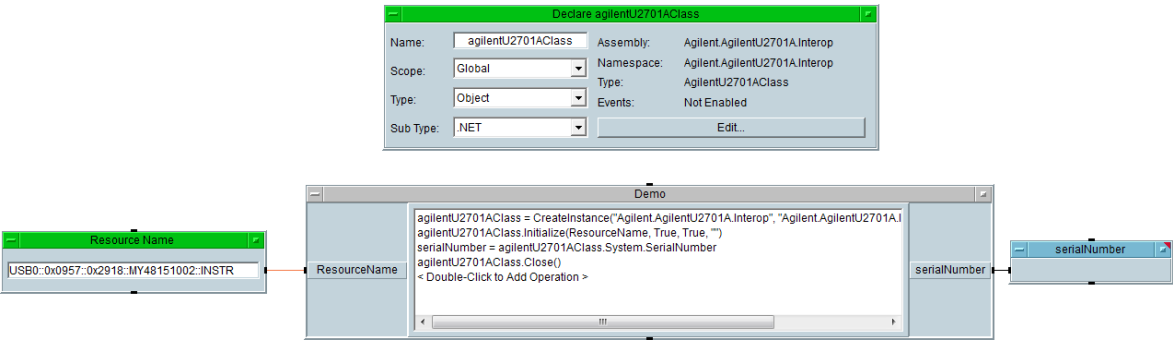
Hierarchy

IKeysightU2701A
└─ System
 └─ SerialNumber

Return Format

String

Example



7 Application Example

Introduction	206
Complete Example	213

This chapter contains an example program for the U2701A/U2702A USB modular oscilloscopes. The following program uses Keysight VEE 9.0. Refer to the instruction manual of Keysight VEE 9.0. for further details about Keysight VEE 9.0.

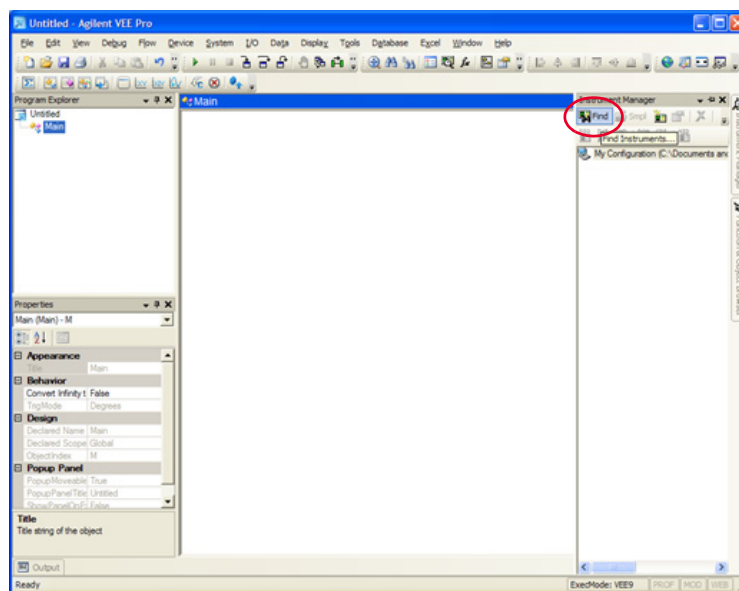
Introduction

This section describes how the KeysightU2701A/U2702A IVI driver is used with the Keysight VEE 9.0.

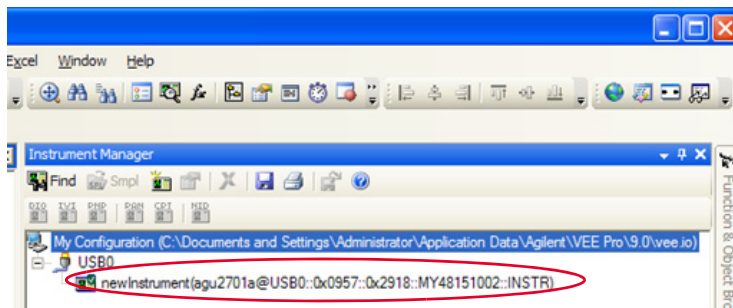
Creating connectivity to the IVI-COM driver

Follow the steps below in order to use the IVI-COM driver in VEE:

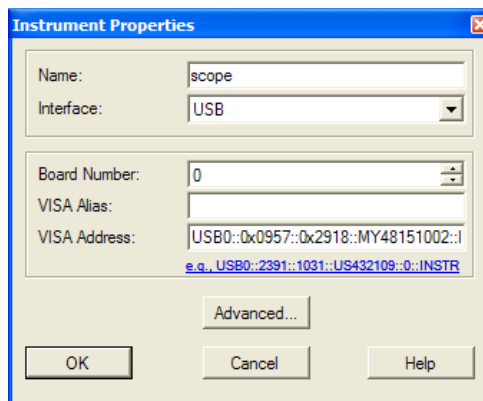
- 1 Launch VEE and open up a new work area.
- 2 Select **I/O > Instrument Manager**.
- 3 Once the U2701A/U2702A is connected and powered on, click the **Find Instruments** button.



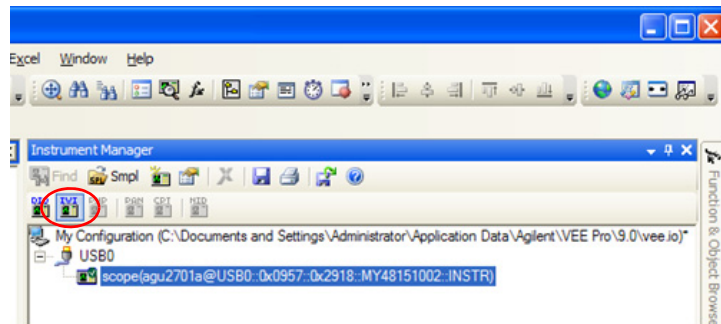
- 4 A confirmation dialog will pop up, asking whether to send an “*IDN?” command to identify the instrument. Click **OK** to accept and the U2701A will be added as shown below:



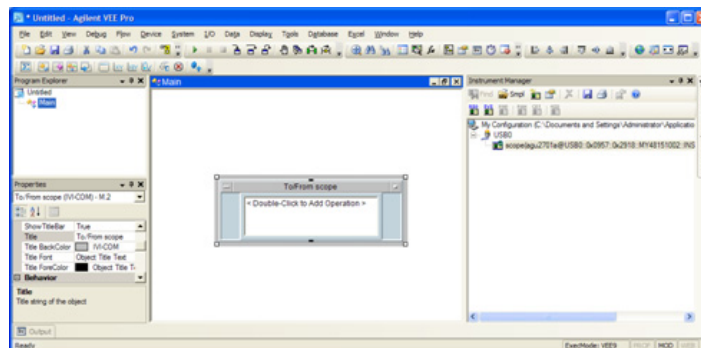
- 5 Right-click on the U2701A/U2702A and select **Instrument Properties**.
- 6 Change the Name of the instrument to another name, e.g scope for easier identification, and click **OK**.



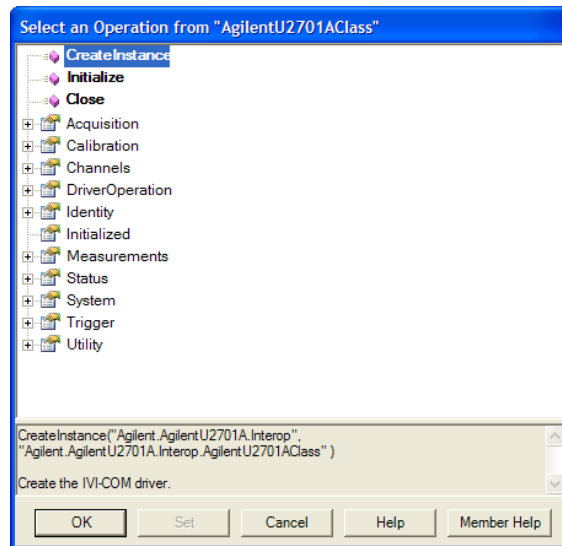
- 7 With the U2701A/U2702A selected, click the **Create IVI-COM Driver Object** button as shown in the following:



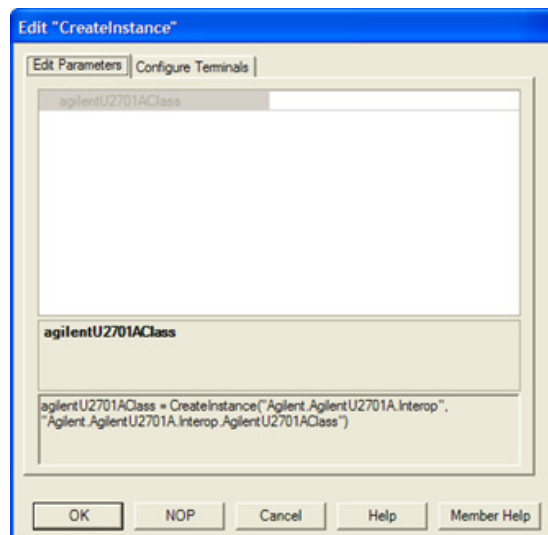
- 8 A “To/From scope” object will be seen. Place the object onto the workspace as shown below:



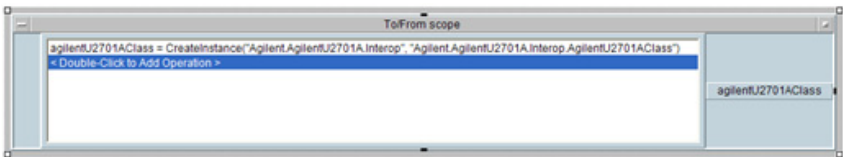
- 9 Double-click the line that says **Double-Click to Add Operation**. This brings up the “Select an Operation...” dialog box. Select **CreateInstance > OK**. **CreateInstance** should be the first operation that you call before you call any other operations for this IVI-COM driver.



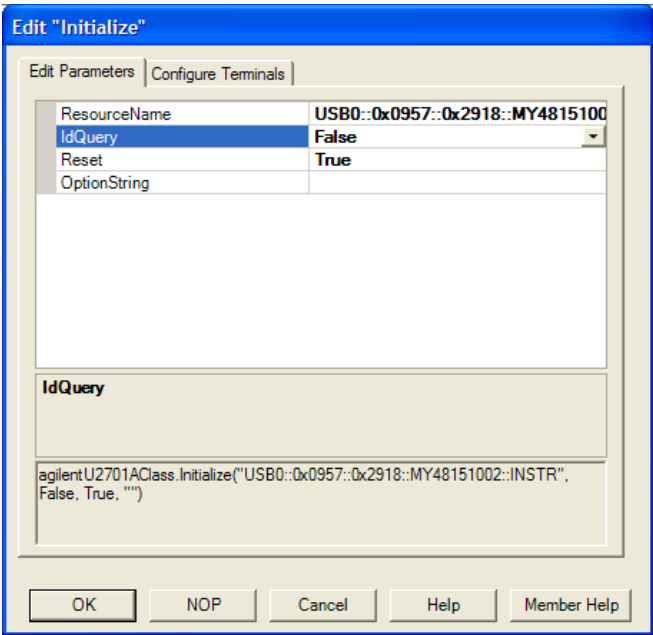
10 Click **OK** again at the "Edit CreateInstance" dialog box.



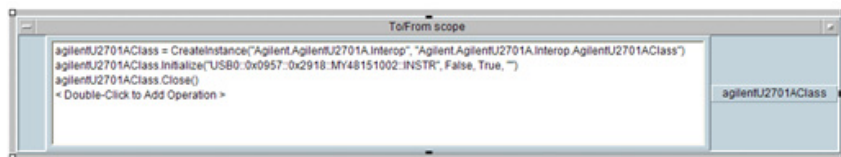
- 11 The “To/From scope” object should now look like below. Double-click the highlighted line again.



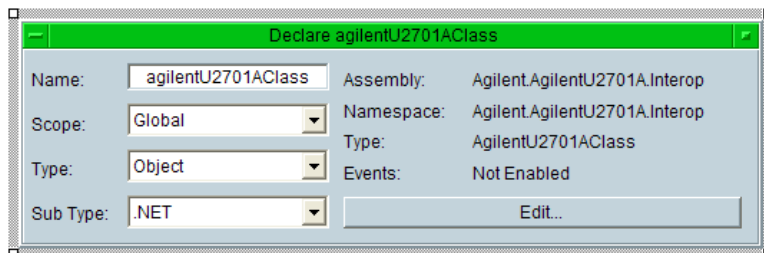
- 12 In the “Select an Operation” dialog box, select **Initialize** and click **OK**. In the “Edit Initialize” dialog box, notice that most of the fields have already been filled by VEE automatically including ResourceName, IdQuery, and Reset. The fields can be changed if needed.



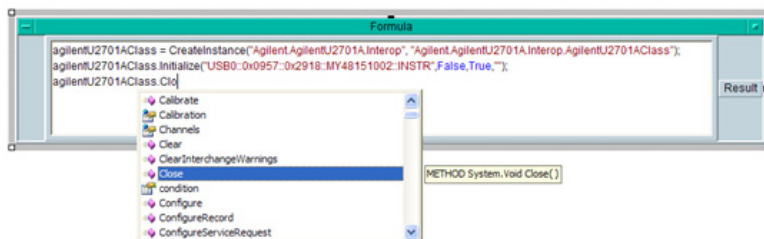
- 13 Other operations can be added using the same method as adding the Initialize operation. After all the operations have been added, the resources need to be released by selecting the **Close** operation. Your “To/From scope” object should look like below:



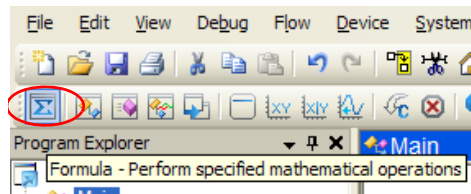
- 14 You can now hit **F5** or click the **Run** button on the toolbar to run this VEE program.
- 15 Alternatively, you can also declare a global variable named “KeysightU2701AClass” by selecting **Data > Variable > Declare Variable** and set its type. To delete the “KeysightU2701AClass” output terminal, right-click the “To/From scope” object and select **Delete Terminal > Output**. By doing this, the IVI-COM object can be shared with other “To/From” objects or you can use it in formula objects.



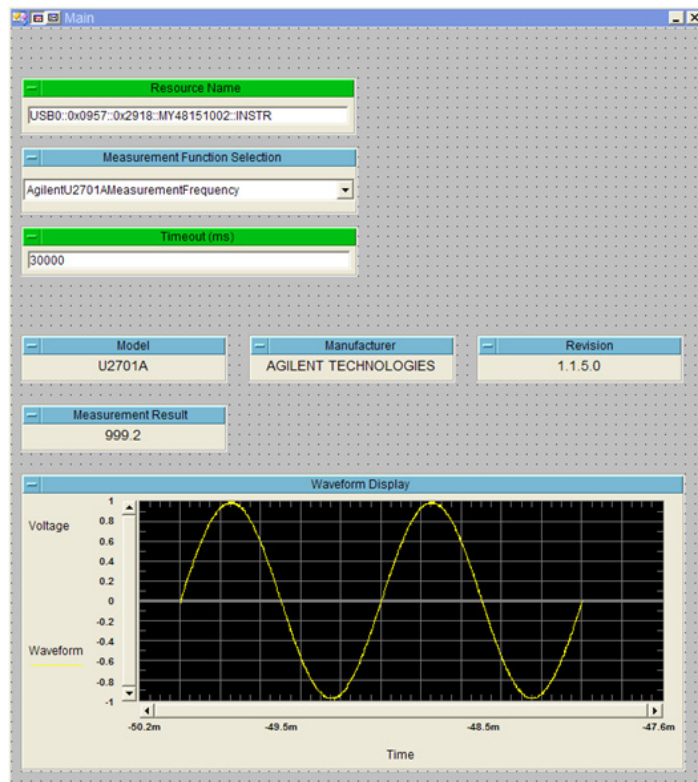
- 16 If you prefer VEE's formula object, you can easily let VEE show you what variables and functions are available and let VEE complete most of the typing for you.



- 17 To use the formula object instead of the “To/From” object, click the **Formula** button on the toolbar.



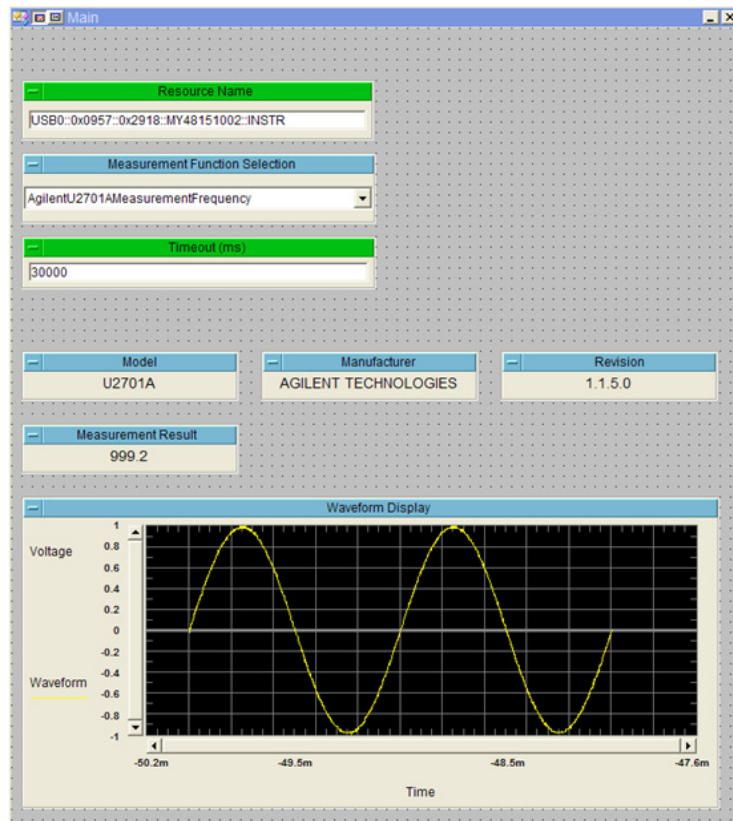
- 18 To create a user interface for your program (e.g might include only the input and display object for a program, where the detailed execution is not needed), select the desired object to be placed and under menu item, select **Edit > Add To Panel**. Arrange the items in the Panel View as required.
- 19 Use the **To Panel** and **To Detail** button to toggle between views.



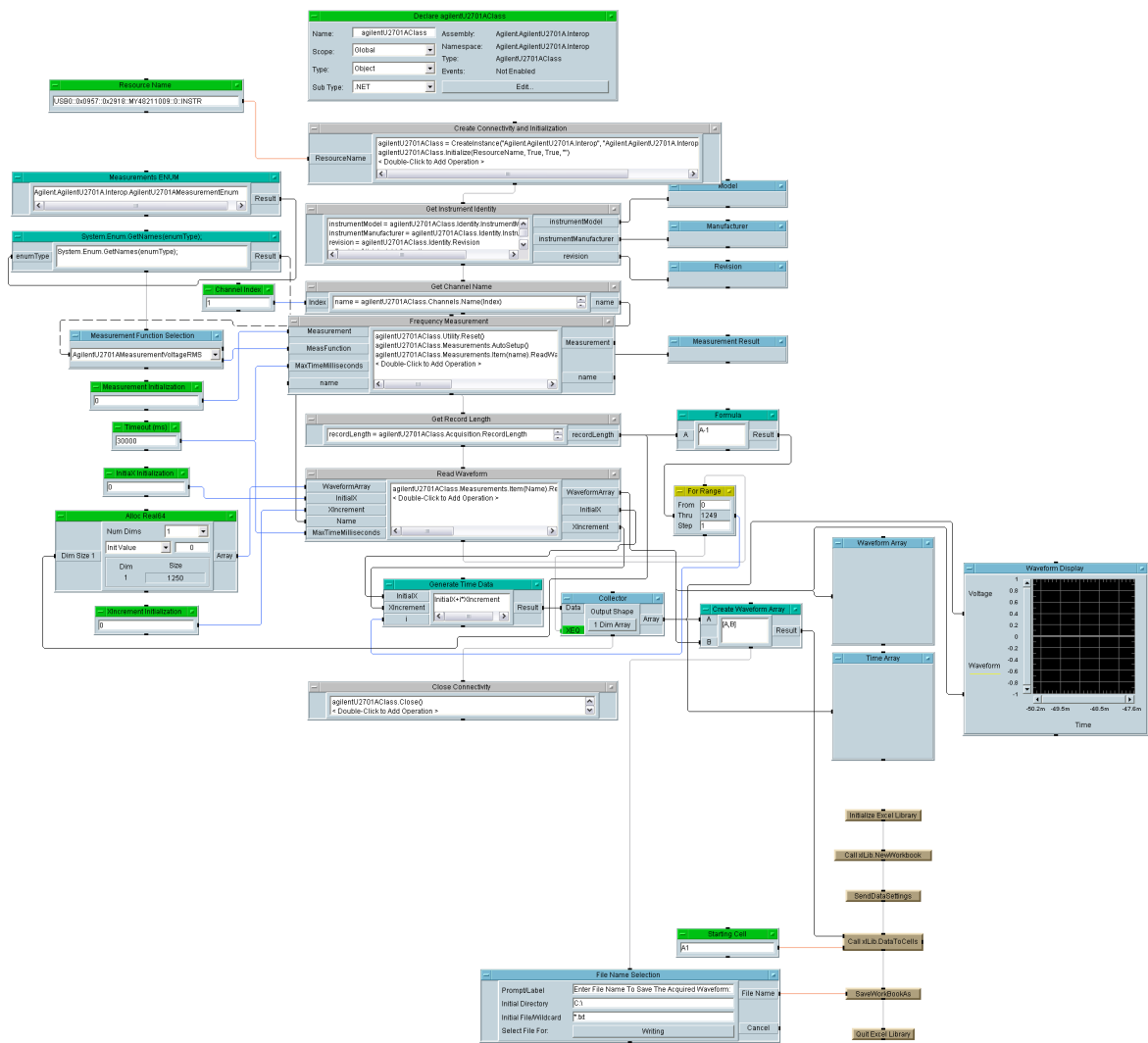
Complete Example

This section illustrates a complete example covering steps needed to get the instrument's identity, reset the instrument, automatically scale the instrument, conducting a simple measurement, and finally acquiring and saving the waveform data using VEE 9.0.

Panel View:



Detail View:



Command Quick Reference

Root keyword	Second-level	Third-level	Fourth-level	Page
IKeysightU2701A	Acquisition	ConfigureRecord		page 116
		Interpolation		page 118
		NumberOfAverages		page 120
		RecordLength		page 121
		SampleMode		page 122
		SampleRate		page 124
		StartTime		page 125
		TimePerRecord		page 127
		Type		page 130
	Calibration	Calibrate		page 175
		Date		page 176
		Label		page 177
		Time		page 178
	Channels	Count		page 25
		Item	BandwidthLimit	page 26
			Configure	page 28
			Coupling	page 30
			Enabled	page 32
			Offset	page 34
			ProbeAttenuation	page 36
			Range	page 38
		Name		page 41
	Close			page 43

Root keyword	Second-level	Third-level	Fourth-level	Page
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		ClearInterchangeWarnings		page 180
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		GetNextInterchangeWarning		page 183
		InterchangeCheck		page 184
		InvalidateAllAttributes		page 185
		IoResourceDescriptor		page 186
		LogicalName		page 187
		QueryInstrumentStatus		page 188
		RangeCheck		page 189
		RecordCoercions		page 190
		ResetInterchangeCheck		page 191
		Simulate		page 192
	Identity	Description		page 193
		GroupCapabilities		page 194
		Identifier		page 195
		InstrumentFirmwareRevision		page 196
		InstrumentManufacturer		page 197
		InstrumentModel		page 198
		Revision		page 199
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Root keyword	Second-level	Third-level	Fourth-level	Page
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		SupportedInstrument Models		page 202
		Vendor		page 203
	Initialize			page 44
	Initialized			page 46
	Measurements	Abort		page 136/148
		AutoSetup		page 137/149
		Count		page 138/150
		Initiate		page 139/151
		IsWaveformElement Invalid		page 140/152
		Item	FetchWaveform	page 142/154
			FetchWaveform Measurement	page 156
			ReadWaveform	page 144/160
			ReadWaveform Measurement	page 162
		MathFunction		page 164
		Name		page 166
		Status		page 168
	Status	Clear		page 85
		ConfigureService Request		page 86
		Preset		page 88
		Register		page 89
		SerialPoll		page 91

Root keyword	Second-level	Third-level	Fourth-level	Page
IKeysightU2701A	System	SerialNumber		page 204
		TimeoutMilliseconds		page 92
		WaitForOperationComplete		page 94
	Trigger	Configure		page 47
		Coupling		page 49
		Edge	Configure	page 51
			Slope	page 53
		Glitch	Condition	page 55
			Configure	page 57
			Polarity	page 59
			Width	page 61
		Holdoff		page 62
		Modifier		page 63
		Level		page 65
		Source		page 66
		Status		page 67
		TV	Configure	page 68
			Event	page 70
			LineNumber	page 72
			SignalFormat	page 73
			Type	page 75
		Width	Condition	page 77
			Configure	page 79
			Polarity	page 81
			ThresholdHigh	page 83

Root keyword	Second-level	Third-level	Fourth-level	Page
IKeysightU2701A	Trigger	Width	ThresholdLow	page 84
	Utility	Disable		page 95
		ErrorQuery		page 96
		LockObject		page 98
		Reset		page 99
		ResetWithDefaults		page 100
		SelfTest		page 101
		UnlockObject		page 103

Enumeration Quick Reference

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KeysightU2701AAcquisitionStatusEnum	page 132
KeysightU2701AAcquisitionTypeEnum	page 133
KeysightU2701AGlitchConditionEnum	page 104
KeysightU2701AGlitchPolarityEnum	page 104
KeysightU2701AInterpolationEnum	page 133
KeysightU2701AMathOperationEnum	page 169
KeysightU2701AMeasurementEnum	page 170
KeysightU2701ASampleModeEnum	page 134
KeysightU2701ASRQReasonEnum	page 105
KeysightU2701AStatusRegisterEnum	page 106
KeysightU2701AStatusSubRegisterEnum	page 107
KeysightU2701ATriggerCouplingEnum	page 108
KeysightU2701ATriggerModifierEnum	page 108
KeysightU2701ATriggerSlopeEnum	page 109
KeysightU2701ATriggerTypeEnum	page 110
KeysightU2701ATVSignalFormatEnum	page 110
KeysightU2701ATVTriggerEventEnum	page 111
KeysightU2701AVerticalCouplingEnum	page 112
KeysightU2701AWidthConditionEnum	page 112
KeysightU2701AWidthPolarityEnum	page 113

Appendix

Property	Possible values		
IKeysightU2701AAcquisition.NumberOfAverages	Values (Int32)		
	1 - 999		
IKeysightU2701AAcquisition.StartTime IKeysightU2701AAcquisition.TimePerRecord	Time/Div	TimePerRecord	StartTime
	1 ns	10 ns	-5 ns - 5 ns
	2 ns	20 ns	-10 ns - 10 ns
	5 ns	50 ns	-25 ns - 25 ns
	10 ns	100 ns	-50 ns - 50 ns
	20 ns	200 ns	-100 ns - 100 ns
	50 ns	500 ns	-250 ns - 250 ns
	100 ns	1 μ s	-500 ns - 500 ns
	200 ns	2 μ s	-1 μ s - 1 μ s
	500 ns	5 μ s	-2.5 μ s - 2.5 μ s
	1 μ s	10 μ s	-5 μ s - 5 μ s
	2 μ s	20 μ s	-10 μ s - 10 μ s
	5 μ s	50 μ s	-25 μ s - 25 μ s
	10 μ s	100 μ s	-50 μ s - 50 μ s
	20 μ s	200 μ s	-100 μ s - 100 μ s
	50 μ s	500 μ s	-250 μ s - 250 μ s
	100 μ s	1 ms	-500 μ s - 500 μ s
	200 μ s	2 ms	-1 ms - 1 ms
	500 μ s	5 ms	-2.5 ms - 2.5 ms

Property		Possible values		
IKeysightU2701AAcquisition.StartTime IKeysightU2701AAcquisition.TimePerRecord	Time/Div	TimePerRecord	StartTime	
	1 ms	10 ms	-5 ms - 5 ms	
	2 ms	20 ms	-10 ms - 10 ms	
	5 ms	50 ms	-25 ms - 25 ms	
	10 ms	100 ms	-50 ms - 50 ms	
	20 ms	200 ms	-100 ms - 100 ms	
	50 ms	500 ms	-250 ms - 250 ms	
	100 ms	1 s	-500 ms - 500 ms	
	200 ms	2 s	-1 s - 1 s	
	500 ms	5 s	-2.5 s - 2.5 s	
	1 s	10 s	-5 s - 5 s	
	2 s	20 s	-10 s - 10 s	
	5 s	50 s	-25 s - 25 s	
	10 s	100 s	-50 s - 50 s	
	20 s	200 s	-100 s - 100 s	
	50 s	500 s	-250 s - 250 s	
IKeysightU2701AChannels.Item	Name (String)			
	Channel1			
	Channel2			
	MathChannel			
IKeysightU2701AChannel.ProbeAttenuation	Value (double)			
	1			
	10			
	100			

Property	Possible values		
IKeysightU2701AChannel.Offset IKeysightU2701AChannel.Range	Volt/Div	Voltage Range (Attenuation = 1x)	Offset
	2 mV	16 mV	–8 mV - 8 mV
	5 mV	40 mV	–20 mV - 20 mV
	10 mV	80 mV	–40 mV - 40 mV
	20 mV	160 mV	–80 mV - 80 mV
	50 mV	400 mV	–200 mV - 200 mV
	100 mV	800 mV	–400 mV - 400 mV
	200 mV	1.6 V	–800 mV - 800 mV
	500 mV	4 V	–2 V - 2 V
	1 V	8 V	–4 V - 4 V
	2 V	16 V	–8 V - 8 V
	5 V	40 V	–20 V - 20 V
IKeysightU2701ATriggerGlitch.Wid th	Condition LessThan (Value)	Condition GreaterThan (Value)	
	> 7 ns	> 15 ns	
IKeysightU2701ATrigger.Holdoff	Value (Double)		
	> 59 ns		
IKeysightU2701ATrigger.Source	Value (String)		
	Channel1		
	Chan1		
	CHANNEL1		
	Channel2		
	Chan2		
	CHANNEL2		
	Ext		
	EXT		

Property	Possible values
IKeysightU2701ATriggerTv.LineNumber	Value (Int) 1 - 263
IKeysightU2701ATriggerWidth.ThresholdHigh	Value (Double) > 15 ns
IKeysightU2701ATriggerWidth.ThresholdLow	Value (Double) > 7 ns

This information is subject to change without notice. Always refer to the Keysight website for the latest revision.

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