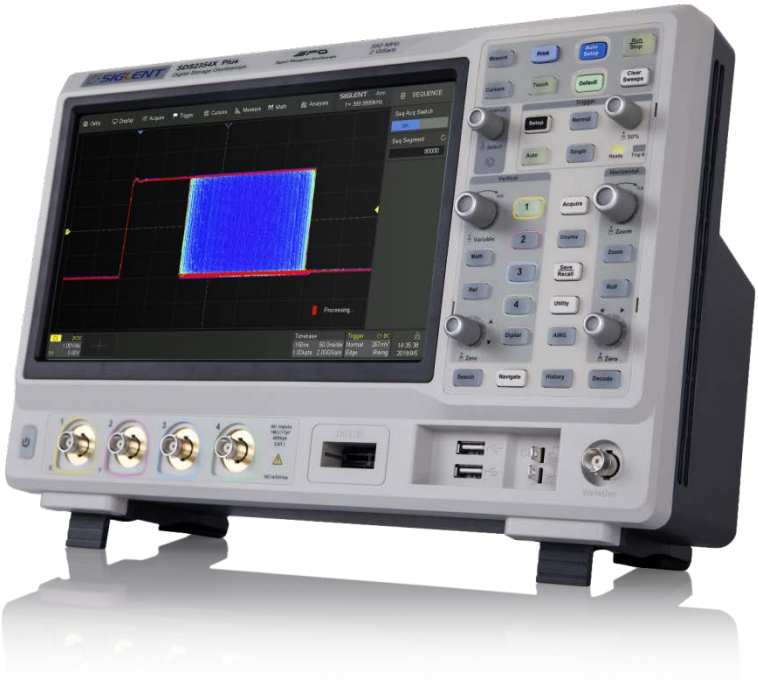
Digital Oscilloscopes

IVI-C Programming Guide

E01A



Revision History

This chapter declares the modifications of IVI driver in the most recent release of the programming guide version.

Version E01A at Introduction

This version, as the first version, will be compared with later versions. When the next version is released, the differences between the two versions will be marked.

Models Supported

The series of SIGLENT digital oscilloscopes supporting this IVI-C driver is shown below.

Series	Release Version Supporting IVI-C Driver
SDS2000X Plus	1.3.5R3

Software Requirement

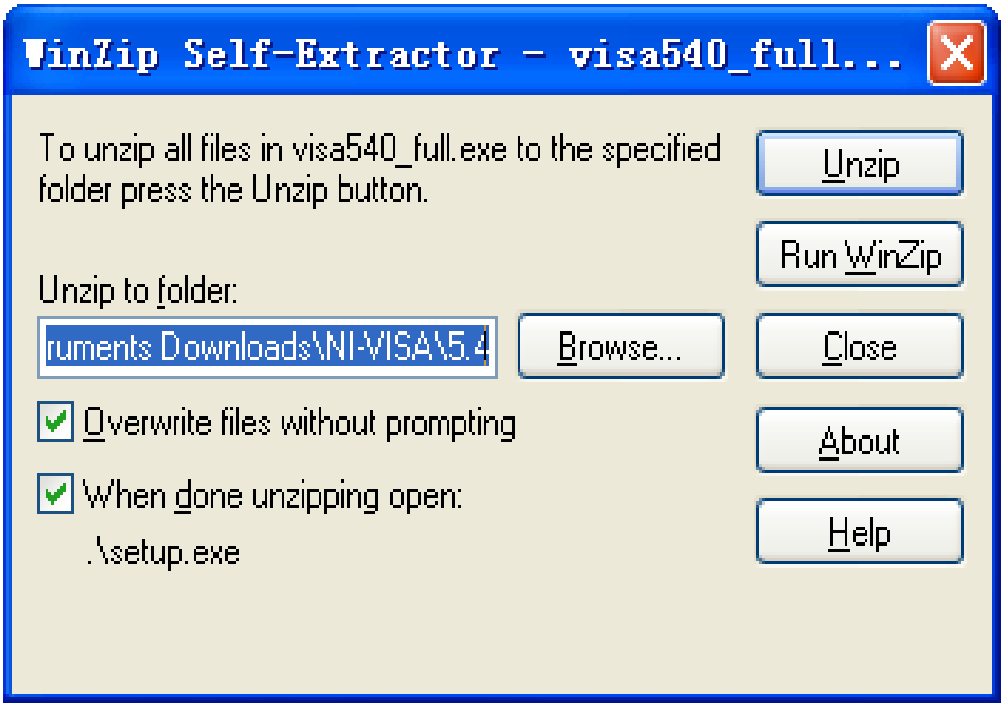
This chapter describes how to configure the IVI driver to control the instrument. If you want to use the IVI Driver, you must install NI-VISA, the IVI Compliance Package, and a C language development system that supports the IVI driver library.

Install NI-MAX

Currently, NI-VISA is packaged in two versions: Full version and Run-Time Engine version. The full version includes the NI device drivers and a tool named NI-MAX which is a user interface to control and test remotely connected devices. You need to install the full version of NI-VISA.

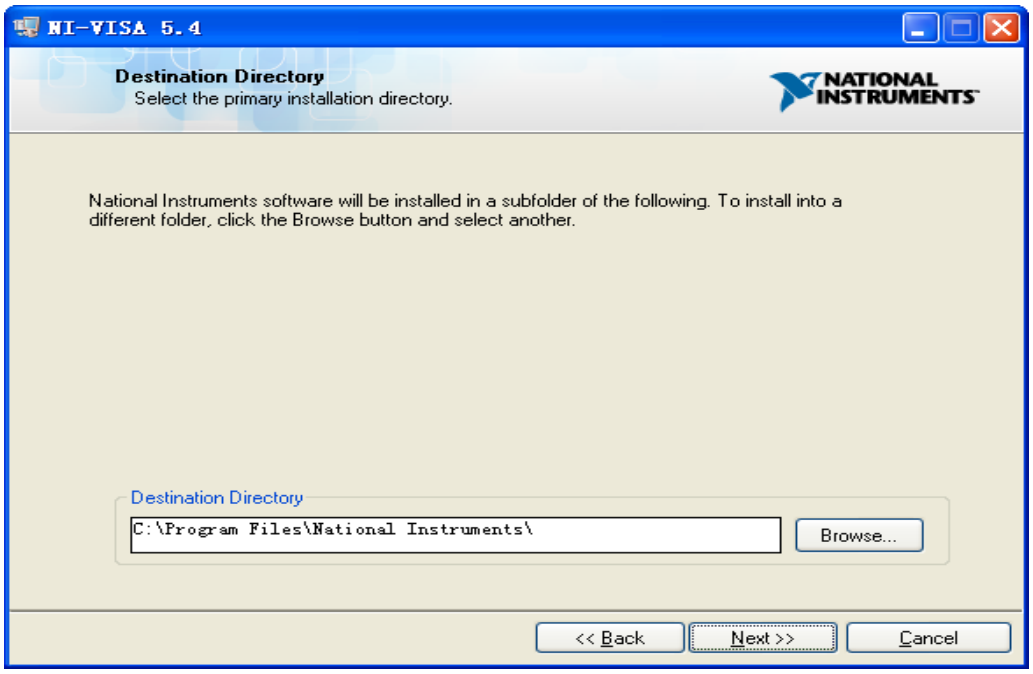
You can get the NI-VISA 5.4 full version from *http://www.ni.com/download/ni-visa-5.4/4230/en/*.

a. Double click the NIVISA 5.4 full.exe, a dialog will be shown as below:

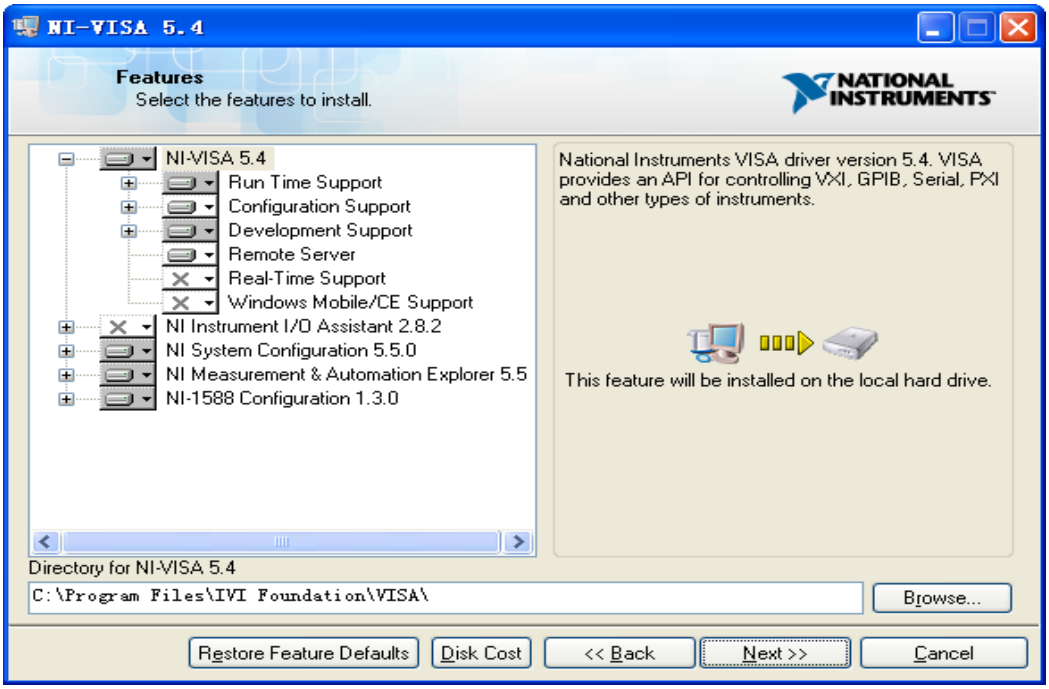


b. Click Unzip, the installation process will automatically launch after unzipping files. If your computer needs to install .NET Framework 4, it may auto start.

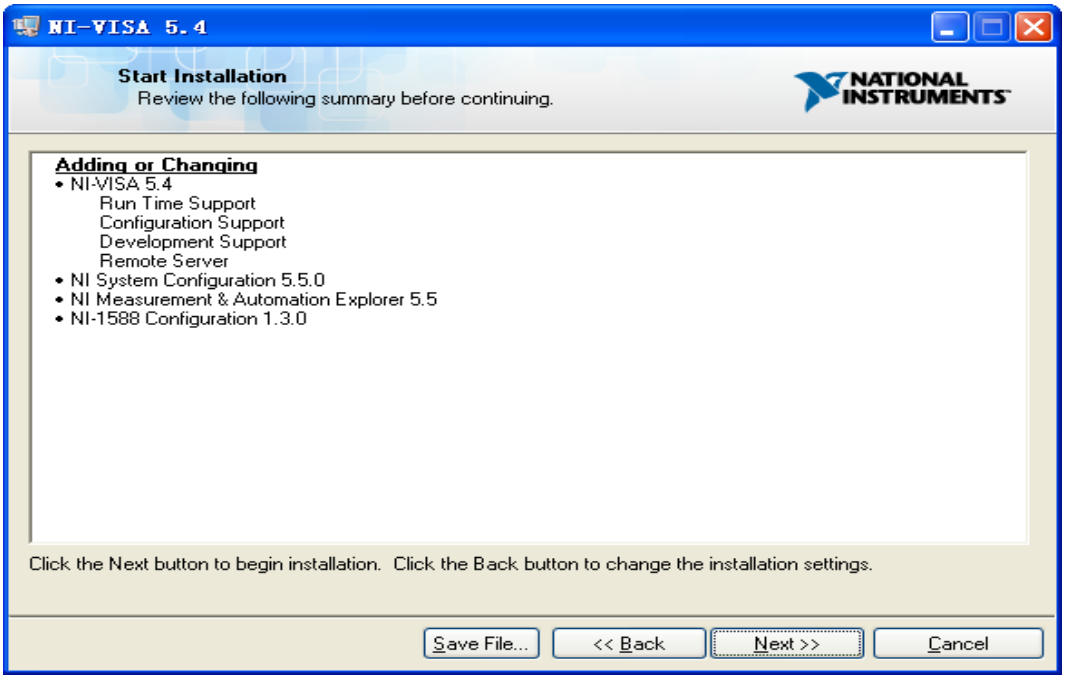
c. The NI-VISA installing dialog is shown above. Click Next to start the installation process.



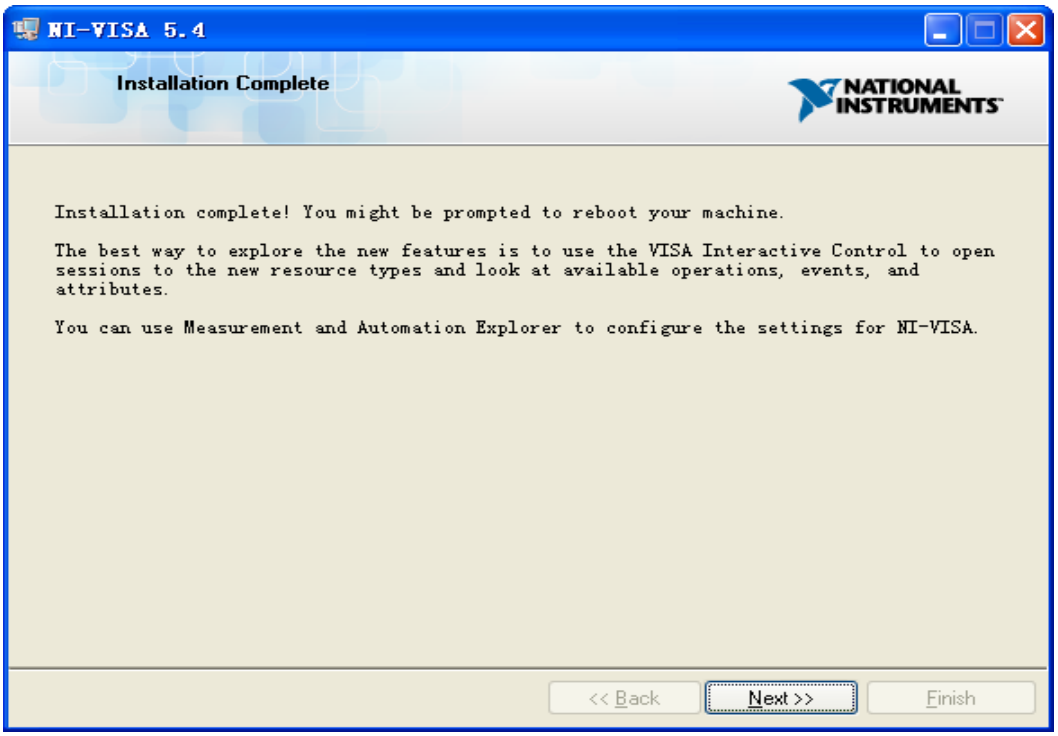
d. Set the install path. The default path is “C:\Program Files\National Instruments\”. You can change it. Click Next.



e. Click Next twice, in the License Agreement dialog, select “I accept the above 2 License Agreement(s).”,and click Next.



f. Click Next to begin the installation.



g. Wait until the installation is completed, and then reboot your PC.

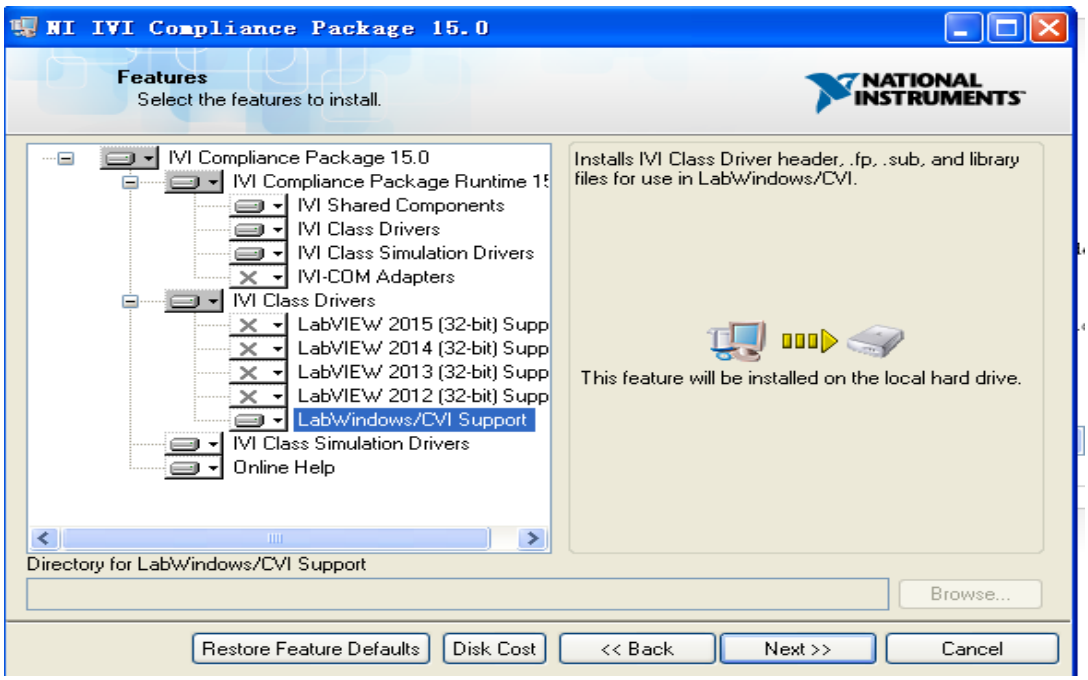
Install the IVI Compliance Package

The IVI Compliance Package contains the IVI class drivers and supported libraries for developing and leveraging IVI-based applications.

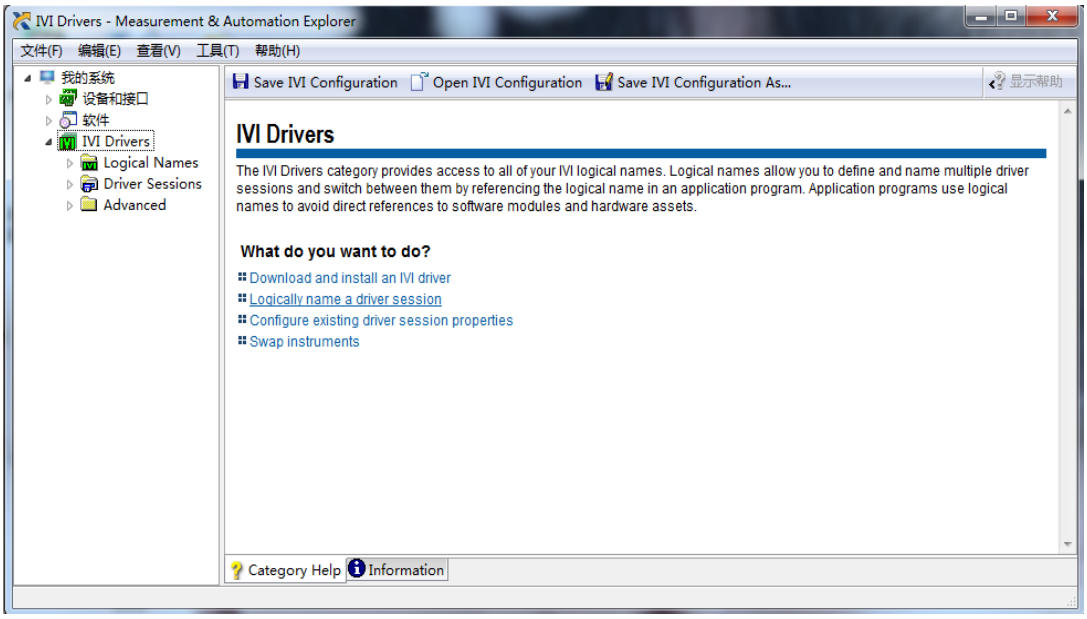
You can get the IVI Compliance Package from *https://www.ni.com/zh-cn/support/downloads/drivers/download.ivi-compliance-package.html#329444*

a. If the IVI Compliance Package is not installed, there is no IVI Drivers option in "My System".

b. Install the IVI Compliance Package (ICP).



c. Restart your computer after the installation. After the reboot, the IVI Drivers option appears.


IVI Drivers - Measurement & Automation Explorer
文件(F) 编辑(E) 查看(V) 工具(T) 帮助(H)
我的系统
设备和接口
软件
IVI Drivers
Logical Names
Driver Sessions
Advanced
Save IVI Configuration
Open IVI Configuration
Save IVI Configuration As...
显示帮助
IVI Drivers
The IVI Drivers category provides access to all of your IVI logical names. Logical names allow you to define and name multiple driver sessions and switch between them by referencing the logical name in an application program. Application programs use logical names to avoid direct references to software modules and hardware assets.
What do you want to do?
Download and install an IVI driver
Logically name a driver session
Configure existing driver session properties
Swap instruments
Category Help
Information

SDS IVI-C Driver Package List

The SDS IVI-C driver package provides three files: sds.dll file, sds.h file and sds.lib file.

File	Description
sds.dll	A dynamic link library file, including variables, functions, and data interfaces for various attributes.
sds.lib	A static data connection library file, including variables, functions, and data interfaces for various attributes.
sds.h	A header file, including declarations of variables, functions, and data interfaces.

Depending on your requirements, you can include the sds.h when programming the Siglent oscilloscope with the IVI driver, and load the sds.dll and sds.lib library files into your own project.

You will find multiple examples that show you how to use these files at the end of this document. You can implicitly call sds.lib, or explicitly call sds.dll as well.

Introduction to IVI

IVI (Interchangeable Virtual Instruments) is a new generation of instrument driver technology specifications introduced by the IVI Foundation. IVI can realize the interchangeability with the instrument, the instrument simulation, and the instrument state tracking and buffer function. All references to IVI drivers in this document refer to IVI-C drivers that are created using NI tools and that rely on the IVI Engine.

IVI Data Type

There are six data types for the attributes of the IVI Engine: ViInt32, ViReal64, ViString, ViBoolean, ViSession and ViAddr.

Table 1 Data Type

Data Type	Description
ViInt32	32-bit signed integer
ViReal64	64-bit floating-point number
ViString	String type
ViBoolean	Boolean value
Visession	A VISA session handle
ViAddr	Logical address type

Access IVI Attribute

User-callable functions are typically implemented by manipulating attributes. You can call sds_SetAttribute or sds_GetAttribute functions.

SetAttribute Function Group

- sds_SetAttributeViInt32 (ViSession vi, ViConstString channelName, ViAttr attributeId, ViInt32 value)

  Example: When you want to set the channel coupling, you can call the SetAttribute function to change the channel coupling.

  ```
  sds_SetAttributeViInt32(session,"CHAN1",SDS_ATTR_VERTICAL_COUPLING,SDS_VAL_AC);
  ```

  where,

  session: The instrument handle.

  "CHAN1": A constant string that represents the analog channel 1 and shows that this **SDS_ATTR_VERTICAL_COUPLING** attribute is corresponding to that specific channel.

  SDS_VAL_AC: This sets the coupling mode to AC.

- sds_SetAttributeViReal64 (ViSession vi, ViConstString channelName, ViAttr attributeId, ViReal64 value)

  Example: When you want to set the probe attenuation, you can call SetAttribute or GetAttribute function to change or obtain the probe attenuation value.

  ```
  sds_SetAttributeViReal64(session,"CHAN1",SDS_ATTR_PROBE_ATTENUATION,100)
  ;
  ```

where,

session: Instrument Handle.

"CHAN1": A constant string that represents the analog channel 1 and shows that this **SDS_ATTR_PROBE_ATTENUATION** attribute is corresponding to this specific channel.

100: Set the probe attenuation to x100.

- sds_SetAttributeViString (ViSession vi, ViConstString channelName, ViAttr attributeId, ViConstString value)

Example: When you want to set the channel label text, you can call SetAttribute or GetAttribute function to change or obtain the channel label text.

```
sds_SetAttributeViString(session,"CHAN1",SDS_ATTR_CHANNEL_LABLE_TEXT,"
Channel1");
```

where,

session: The instrument handle.

"CHAN1": A constant string that represents the analog channel 1 and shows that this **SDS_ATTR_CHANNEL_LABLE_TEXT** attribute is corresponding to this specific channel.

"Channel1": Set the label text of Channel 1 to "Channel1".

- sds_SetAttributeViBoolean (ViSession vi, ViConstString channelName, ViAttr attributeId, ViBoolean value)

Example: When you want to set a channel on or off, you can call SetAttribute or GetAttribute function to change or obtain the state of the channel.

```
sds_SetAttributeViBoolean(session,"CHAN1",SDS_ATTR_CHANNEL_ENABLED,VI_FALSE
);
```

where,

session: The instrument handle.

"CHAN1": A constant string that represents the analog channel 1 and shows that this **SDS_ATTR_CHANNEL_ENABLED** attribute is corresponding to this channel.

VI_FALSE: This means turning channel 1 off.

GetAttribute Function Group

- sds_GetAttributeViReal64 (ViSession vi, ViConstString channelName, ViAttr attributeId, ViReal64 *value)

Example: When you want to set the probe attenuation, you can call SetAttribute or GetAttribute function to change or obtain the probe attenuation value.

```
sds_GetAttributeViReal64(session,"CHAN1",SDS_ATTR_PROBE_ATTENUATION,&val
ue64);
```

where,

session: The instrument handle.

"CHAN1": A constant string that represents the analog channel 1 and shows that this **SDS_ATTR_PROBE_ATTENUATION** attribute is corresponding to this channel.

value64: A ViReal64 type variable which is used to store the returned value of the probe attenuation query.

- sds_GetAttributeViInt32 (ViSession vi, ViConstString channelName, ViAttr attributeId, ViInt32 *value)

  Example: When you want to set the channel coupling, you can call SetAttribute or GetAttribute function to change or obtain the channel coupling.

  ```
  sds_GetAttributeViInt32(session,"CHAN1",SDS_ATTR_VERTICAL_COUPLING,&value32);
  ```

  where,

  session: The instrument handle.

  "CHAN1": A constant string that represents the analog channel 1 and shows that this **SDS_ATTR_VERTICAL_COUPLING** attribute is corresponding to this specific channel.

  value32: A ViInt32 type variable which is used to store the returned value of the coupling query.

- sds_GetAttributeViBoolean (ViSession vi, ViConstString channelName, ViAttr attributeId, ViBoolean *value)

  Example: When you want to set a channel on or off, you can call SetAttribute or GetAttribute function to change or obtain the state of channel.

  ```
  sds_GetAttributeViBoolean(session,"CHAN1",SDS_ATTR_CHANNEL_ENABLED,&boolean);
  ```

  where,

  session: The instrument handle.

“CHAN1”: A constant string that represents the analog channel 1 and shows that this **SDS_ATTR_CHANNEL_ENABLED** attribute is corresponding to this specific channel.

boolean: A ViBoolean type variable which is used to store the returned value.

- sds_GetAttributeViString (ViSession vi, ViConstString channelName, ViAttr attributeId, ViInt32 bufSize, ViChar value[])

Example: When you want to set the channel label text, you can call SetAttribute or GetAttribute function to change or obtain the channel label text.

```
sds_GetAttributeViString(session,"CHAN1",SDS_ATTR_CHANNEL_LABLE_TEXT,buffersize,str);
```

where,

session: The instrument handle.

“CHAN1”: A constant string that represents the analog channel 1 and shows that this **SDS_ATTR_CHANNEL_LABLE_TEXT** attribute is corresponding to this specific channel.

buffersize: A ViInt32 type variable.

str： A ViString type variable which is used to store the returned value.

Attribute

This chapter describes the attributes of the SIGLENT IVI driver. The following table lists the supported IVI base class attributes and SIGLENT custom attributes.

System	Attribute
Channel Subsystem	SDS_ATTR_MAX_INPUT_FREQUENCY
	SDS_ATTR_INPUT_IMPEDANCE
	SDS_ATTR_VERTICAL_COUPLING
	SDS_ATTR_PROBE_ATTENUATION
	SDS_ATTR_VERTICAL_OFFSET
	SDS_ATTR_VERTICAL_RANGE
	SDS_ATTR_CHANNEL_ENABLED
	SDS_ATTR_PROBE_SENSE_VALUE
	SDS_ATTR_CHANNEL_LABLE_TEXT
Acquisition Subsystem	SDS_ATTR_ACQUISITION_TYPE
	SDS_ATTR_HORZ_RECORD_LENGT
	SDS_ATTR_HORZ_SAMPLE_RATE
	SDS_ATTR_HORZ_TIME_PER_RECORD
	SDS_ATTR_ACQUISITION_START_TIME
	SDS_ATTR_INTERPOLATION
	SDS_ATTR_NUM_AVERAGES (Not Supported)
	SDS_ATTR_NUM_ENVELOPES (Not Supported)
	SDS_ATTR_SAMPLE_MODE (Not Supported)
Trigger Subsystem	SDS_ATTR_TRIGGER_TYPE
	SDS_ATTR_TRIGGER_HOLDOFF
	SDS_ATTR_TRIGGER_COUPLING
	SDS_ATTR_TRIGGER_SLOPE
	SDS_ATTR_TRIGGER_SOURCE
	SDS_ATTR_TRIGGER_LEVEL
	SDS_ATTR_TV_TRIGGER_EVENT (Not Supported)
	SDS_ATTR_TV_TRIGGER_LINE_NUMBER
	SDS_ATTR_TV_TRIGGER_SIGNAL_FORMAT
	SDS_ATTR_RUNT_HIGH_THRESHOLD
	SDS_ATTR_RUNT_LOW_THRESHOLD
	SDS_ATTR_RUNT_POLARITY
	SDS_ATTR_GLITCH_CONDITION
	SDS_ATTR_GLITCH_POLARITY
	SDS_ATTR_GLITCH_WIDTH (Not Supported)
	SDS_ATTR_WIDTH_CONDITION
	SDS_ATTR_WIDTH_HIGH_THRESHOLD
	SDS_ATTR_WIDTH_LOW_THRESHOLD
	SDS_ATTR_WIDTH_POLARITY

	SDS_ATTR_TRIGGER_MODIFIER
Measurement Subsystem	SDS_ATTR_MEASURE_ENABLED
	SDS_ATTR_MEASURE_MODE
	SDS_ATTR_MEASURE_GATE
	SDS_ATTR_MEASURE_GATE_GA
	SDS_ATTR_MEASURE_GATE_GB
	SDS_ATTR_MEASURE_ADVANCED_STYLE
	SDS_ATTR_MEASURE_ADVANCED_LINENUMBER
	SDS_ATTR_MEASURE_ADVANCED_STATISTICS
	SDS_ATTR_MEASURE_ADVANCED_STATISTICS_HISTOGRAM
	SDS_ATTR_MEASURE_ADVANCED_STATISTICA_MAXCOUNT
	SDS_ATTR_MEASURE_SIMPLE_SOURCE
	SDS_ATTR_MEASURE_ADVANCED_STATISTICS_RESET

Channel Subsystem

The channel group properties are used to set or read channel-related parameters. The channel group has the following attributes:

- SDS_ATTR_MAX_INPUT_FREQUENCY
- SDS_ATTR_INPUT_IMPEDANCE
- SDS_ATTR_VERTICAL_COUPLING
- SDS_ATTR_PROBE_ATTENUATION
- SDS_ATTR_VERTICAL_OFFSET
- SDS_ATTR_VERTICAL_RANGE
- SDS_ATTR_CHANNEL_ENABLED
- SDS_ATTR_PROBE_SENSE_VALUE
- SDS_ATTR_CHANNEL_LABLE_TEXT

SDS_ATTR_MAX_INPUT_FREQUENCY

Description	This attribute specifies the channel bandwidth limit.
Data type	ViReal64
Access	R/W
Common Control Functions	sds_SetAttributeViReal64 (ViSession vi, ViConstString channelName, ViAttr attributeId, ViReal64 value) sds_GetAttributeViReal64 (ViSession vi, ViConstString channelName, ViAttr attributeId, ViReal64 *value) **Note:** **vi** is the instrument handle. **channelName** is one of the following analog inputs: CHAN1, CHAN2, CHAN3 or CHAN4. **attributeId** is SDS_ATTR_MAX_INPUT_FREQUENCY macro. **value** is used to store or set the value of function represented by **attributeId**.
Value Range	(0,2e+7) means the bandwidth is limited to 20M (2e+7,2e+8) means bandwidth is limited to 200M (2e+8,1e+38) means bandwidth is FULL
Related Attribute	SDS_ATTR_INPUT_IMPEDANCE
High Level Functions	sds_ConfigureChanCharacteristics

SDS_ATTR_INPUT_IMPEDANCE

Description	This attribute specifies the channel impedance.
Data type	ViReal64
Access	R/W
Common Control Functions	sds_SetAttributeViReal64 (ViSession vi, ViConstString channelName, ViAttr attributeId, ViReal64 value) sds_GetAttributeViReal64 (ViSession vi, ViConstString channelName, ViAttr attributeId, ViReal64 *value) **Note**: **vi** is the instrument handle. **channelName** is one of the following analog inputs: CHAN1, CHAN2, CHAN3 or CHAN4. **attributeId** is SDS_ATTR_INPUT_IMPEDANCE macro. **value** is used to store or set the value of function represented by **attributeId**.
Value Range	(49.5,50.5) means the impedance is 50Ω (999999.5,1000000.5) means the impedance is 1MΩ
Related Attribute	SDS_ATTR_MAX_INPUT_FREQUENCY
High Level Functions	sds_ConfigureChanCharacteristics

SDS_ATTR_VERTICAL_COUPLING

Description	This attribute specifies channel coupling.
Data Type	ViReal64
Access	R/W
Common Control Functions	sds_SetAttributeViReal64 (ViSession vi, ViConstString channelName, ViAttr attributeId, ViReal64 value) sds_GetAttributeViReal64 (ViSession vi, ViConstString channelName, ViAttr attributeId, ViReal64 *value) **Note**: **vi** is the instrument handle. **channelName** is one of the following analog inputs: CHAN1, CHAN2, CHAN3 or CHAN4. **attributeId** is SDS_ATTR_VERTICAL_COUPLING macro. **value** is used to store or set the value of function represented by **attributeId**.
Value Range	SDS_VAL_AC SDS_VAL_DC SDS_VAL_GND
Related Attribute	SDS_ATTR_VERTICAL_OFFSET SDS_ATTR_VERTICAL_RANGE SDS_ATTR_CHANNEL_ENABLED SDS_ATTR_PROBE_ATTENUATION
High Level Functions	sds_ConfigureChannel

SDS_ATTR_PROBE_ATTENUATION

Description	This attribute specifies channel probe attenuation.
Data Type	ViReal64
Access	R/W
Common Control Functions	sds_SetAttributeViReal64 (ViSession vi, ViConstString channelName, ViAttr attributeId, ViReal64 value) sds_GetAttributeViReal64 (ViSession vi, ViConstString channelName, ViAttr attributeId, ViReal64 *value) **Note**: **vi** is the instrument handle. **channelName** is one of the following analog inputs: CHAN1, CHAN2, CHAN3 or CHAN4. **attributeId** is SDS_ATTR_PROBE_ATTENUATION macro. **value** is used to store or set the value of function represented by **attributeId**.
Value Range	SDS_VAL_PROBE_SENSE_ON SDS_VAL_PROBE_SENSE_1 SDS_VAL_PROBE_SENSE_10 SDS_VAL_PROBE_SENSE_100
Related Attribute	SDS_ATTR_VERTICAL_OFFSET SDS_ATTR_VERTICAL_RANGE SDS_ATTR_CHANNEL_ENABLED SDS_ATTR_VERTICAL_COUPLING
High Level Functions	sds_ConfigureChannel

SDS_ATTR_VERTICAL_OFFSET

Description	This attribute specifies channel vertical offset.
Data Type	ViReal64
Access	R/W
Common Control Functions	sds_SetAttributeViReal64 (ViSession vi, ViConstString channelName, ViAttr attributeId, ViReal64 value) sds_GetAttributeViReal64 (ViSession vi, ViConstString channelName, ViAttr attributeId, ViReal64 *value) **Note**: **vi** is the instrument handle. **channelName** is one of the following analog inputs: CHAN1, CHAN2, CHAN3 or CHAN4. **attributeId** is SDS_ATTR_VERTICAL_OFFSET macro. **value** is used to store or set the value of function represented by **attributeId**.
Value Range	When the channel scale is between [5e-4*probe, 1e-1*probe], the range of value is [-2*probe, 2*probe]. When the channel scale is between (1e-1*probe, 1*probe], the range of value is [-20*probe, 20*probe]. When the channel scale is between (1*probe, 10*probe], the range of value is [-200*probe, 200*probe]. **Note:** Probe is the value of channel attenuation.
Related Attribute	SDS_ATTR_VERTICAL_OFFSET SDS_ATTR_CHANNEL_ENABLED SDS_ATTR_VERTICAL_COUPLING SDS_ATTR_PROBE_ATTENUATION
High Level Functions	sds_ConfigureChannel

SDS_ATTR_VERTICAL_RANGE

Description	This attribute specifies channel vertical range.
Data Type	ViReal64
Access	R/W
Common Control Functions	sds_SetAttributeViReal64 (ViSession vi, ViConstString channelName, ViAttr attributeId, ViReal64 value) sds_GetAttributeViReal64 (ViSession vi, ViConstString channelName, ViAttr attributeId, ViReal64 *value) **Note**: **vi** is the instrument handle. **channelName** is one of the following analog inputs: CHAN1, CHAN2, CHAN3 or CHAN4. **attributeId** is SDS_ATTR_VERTICAL_RANGE macro. **value** is used to store or set the value of function represented by **attributeId**.
Value Range	When the channel impedance is set to 50Ω, the value range is [5e-4*probe,1e+0*probe] When the channel impedance is set to 1MΩ, the value range is [5e-4*probe,1e+1*probe] **Note:** Probe is the value of channel attenuation.
Related Attribute	SDS_ATTR_CHANNEL_ENABLED SDS_ATTR_VERTICAL_OFFSET SDS_ATTR_VERTICAL_COUPLING SDS_ATTR_PROBE_ATTENUATION
High Level Functions	sds_ConfigureChannel

SDS_ATTR_CHANNEL_ENABLED

Description	This attribute specifies the status of channel.
Data Type	ViBoolean
Access	R/W
Common Control Functions	sds_SetAttributeViBoolean (ViSession vi, ViConstString channelName, ViAttr attributeId, ViBoolean value) sds_GetAttributeViBoolean (ViSession vi, ViConstString channelName, ViAttr attributeId, ViBoolean *value) **Note**: **vi** is the instrument handle. **ChannelName** is one of the following analog inputs: CHAN1, CHAN2, CHAN3 or CHAN4. **attributeId** is SDS_ATTR_CHANNEL_ENABLED macro. **value** is used to store or set the value of function represented by **attributeId**.
Value Range	VI_TRUE means to turn on the channel VI_FALSE means to turn off the channel
Related Attribute	SDS_ATTR_VERTICAL_OFFSET SDS_ATTR_VERTICAL_RANGE SDS_ATTR_VERTICAL_COUPLING SDS_ATTR_PROBE_ATTENUATION
High Level Functions	sds_ConfigureChannel

SDS_ATTR_PROBE_SENSE_VALUE

Description	This attribute specifies channel probe attenuation to 1X.
Data Type	ViReal64
Access	R/O
Common Control Functions	sds_GetAttributeViReal64 (ViSession vi, ViConstString channelName, ViAttr attributeId, ViReal64 *value) **Note**: **vi** is the instrument handle. **channelName** is one of the following analog inputs: CHAN1, CHAN2, CHAN3 or CHAN4. **attributeId** is SDS_ATTR_PROBE_SENSE_VALUE macro. **value** is used to store or set the value of function represented by **attributeId**.
Value Range	None
Related Attribute	None
High Level Functions	None

SDS_ATTR_CHANNEL_LABLE_TEXT

Description	This attribute specifies the label text of the source
Data Type	ViString
Access	R/W
Common Control Functions	sds_SetAttributeViString (ViSession vi, ViConstString channelName, ViAttr attributeId, ViConstString value) sds_GetAttributeViString (ViSession vi, ViConstString channelName, ViAttr attributeId, ViInt32 bufSize,ViChar value[]) **Note**: **vi** is the instrument handle. **channelName** is one of the following analog inputs: CHAN1, CHAN2, CHAN3 or CHAN4. **attributeId** is SDS_ATTR_CHANNEL_LABLE_TEXT macro. **bufSize** is the number of bytes you specified for the Attribute Value parameter in the ViChar array. **value** is used to store or set the value of function represented by **attributeId**.
Value Range	The limit of the label text is 20 bytes
Related Attribute	None
High Level Functions	None

Acquisition Subsystem

The acquisition group properties are used to set or read acquisition related parameters.

The acquisition group has the following attributes:

- SDS_ATTR_ACQUISITION_TYPE
- SDS_ATTR_HORZ_RECORD_LENGT
- SDS_ATTR_HORZ_SAMPLE_RATE
- SDS_ATTR_HORZ_TIME_PER_RECORD
- SDS_ATTR_ACQUISITION_START_TIME
- SDS_ATTR_INTERPOLATION
- SDS_ATTR_NUM_AVERAGES (Not Supported)
- SDS_ATTR_NUM_ENVELOPES (Not Supported)
- SDS_ATTR_SAMPLE_MODE (Not Supported)

SDS_ATTR_ACQUISITION_TYPE

Description	This attribute specifies the acquisition mode.
Data Type	ViInt32
Access	R/W
Common Control Functions	sds_SetAttributeViInt32 (ViSession vi, ViConstString channelName, ViAttr attributeId, ViInt32 value) sds_GetAttributeViInt32 (ViSession vi, ViConstString channelName, ViAttr attributeId, ViInt32 *value) **Note**: **vi** is the instrument handle. **channelName** is NULL. **attributeId** is SDS_ATTR_ACQUISITION_TYPE macro. **value** is used to store or set the value of function represented by **attributeId**.
Value Range	SDS_VAL_NORMAL SDS_VAL_PEAK_DETECT
Related Attribute	None
High Level Functions	sds_ConfigureAcquisitionType

SDS_ATTR_HORZ_RECORD_LENGT

Description	This attribute gets the length of the waveform record.
Data Type	ViInt32
Access	R/O
Common Control Functions	sds_GetAttributeViInt32 (ViSession vi, ViConstString channelName, ViAttr attributeId, ViInt32 *value) **Note**: **vi** is the instrument handle. **channelName** is NULL. **attributeId** is SDS_ATTR_HORZ_RECORD_LENGT macro. **value** is used to store or set the value of function represented by **attributeId**.
Value Range	None
Related Attribute	None
High Level Functions	None

SDS_ATTR_HORZ_SAMPLE_RATE

Description	This attribute gets the sampling rate.
Data Type	ViReal64
Access	R/O
Common Control Functions	sds_GetAttributeViReal64 (ViSession vi, ViConstString channelName, ViAttr attributeId, ViReal64 *value) **Note**: **vi** is the instrument handle. **channelName** is NULL. **attributeId** is SDS_ATTR_HORZ_SAMPLE_RATE macro. **value** is used to store or set the value of function represented by **attributeId**.
Value Range	None
Related Attribute	None
High Level Functions	None

SDS_ATTR_HORZ_TIME_PER_RECORD

Description	This attribute specifies the horizontal scale of the main window.
Data Type	ViReal64
Access	R/W
Common Control Functions	sds_SetAttributeViReal64 (ViSession vi, ViConstString channelName, ViAttr attributeId, ViReal64 value) sds_GetAttributeViReal64 (ViSession vi, ViConstString channelName, ViAttr attributeId, ViReal64 *value) **Note**: **vi** is the instrument handle. **channelName** is NULL. **attributeId** is SDS_ATTR_HORZ_TIME_PER_RECORD macro. **value** is used to store or set the value of function represented by **attributeId**.
Value Range	In the IVI-4.1 specification，values are default coerced up. And the following range make effect on the time base of the main window. So that, (2e-10,5e-10) means 500ps/div (5e-10,1e-9) means 1ns/div (1e-9,2e-9) means 2ns/div (2e-9,5e-9) means 5ns/div (5e-9,1e-8) means 10ns/div (1e-8,2e-8) means 20ns/div (2e-8,5e-8) means 50ns/div (5e-8,1e-7) means 100ns/div (1e-7,2e-7) means 200ns/div (2e-7,5e-7) means 500ns/div (5e-7,1e-6) means 1us/div (1e-6,2e-6) means 2us/div (2e-6,5e-6) means 5us/div (5e-6,1e-5) means 10us/div (1e-5,2e-5) means 20us/div (2e-5,5e-5) means 50us/div (5e-5,1e-4) means 100us/div (1e-4,2e-4) means 200us/div (2e-4,5e-4) means 500us/div

(5e-4,1e-3) means 1ms/div
(1e-3,2e-3) means 2ms/div
(2e-3,5e-3) means 5ms/div
(5e-3,1e-2) means 10ms/div
(1e-2,2e-2) means 20ms/div
(2e-2,5e-2) means 50ms/div
(5e-2,1e-1) means 100ms/div
(1e-1,2e-1) means 200ms/div
(2e-1,5e-1) means 500ms/div
(5e-1,1e+0) means 1s/div
(1e+0,2e+0) means 2s/div
(2e+0,5e+0) means 5s/div
(5e+0,1e+1) means 10s/div
(1e+1,2e+1) means 20s/div
(2e+1,5e+1) means 50s/div
(5e+1,1e+2) means 100s/div
(1e+2,2e+2) means 200s/div
(2e+2,5e+2) means 500s/div
(5e+2,1e+3) means 1ks/div

Related Attribute	SDS_ATTR_ACQUISITION_START_TIME
High Level Functions	sds_ConfigureAcquisitionRecord

SDS_ATTR_ACQUISITION_START_TIME

Description	This attribute specifies the horizontal delay (trigger delay).
Data Type	ViReal64
Access	R/W

Common Control Functions	sds_GetAttributeViReal64(ViSession vi, ViConstString channelName, ViAttr attributeId, ViReal64 *value);
	
	sds_SetAttributeViReal64(ViSession vi, ViConstString channelName, ViAttr attributeId, ViReal64 value);
	
	Note:
	vi is the instrument handle.
	channelName is NULL.
	attributeId is SDS_ATTR_ACQUISITION_START_TIME macro.
	value is used to store or set the value of function represented by **attributeId**.

Value Range	The value range is [-5000div*timebase, 5*timebase].
Related Attribute	SDS_ATTR_HORZ_TIME_PER_RECORD
High Level Functions	sds_ConfigureAcquisitionRecord

SDS_ATTR_INTERPOLATION

Description	This attribute specifies the way of interpolation.
Data Type	ViInt32
Access	R/W
Common Control Functions	sds_SetAttributeViInt32 (ViSession vi, ViConstString channelName, ViAttr attributeId, ViInt32 value) sds_GetAttributeViInt32 (ViSession vi, ViConstString channelName, ViAttr attributeId, ViInt32 *value) **Note**: **vi** is the instrument handle. **channelName** is NULL. **attributeId** is SDS_ATTR_INTERPOLATION macro. **value** is used to store or set the value of function represented by **attributeId**.
Value Range	SDS_VAL_SINE_X SDS_VAL_LINEAR
Related Attribute	None
High Level Functions	sds_ConfigureInterpolation

Trigger Subsystem

The triggering group properties are used to set or read trigger related parameters. The triggering group has the following attributes:

- SDS_ATTR_TRIGGER_TYPE
- SDS_ATTR_TRIGGER_HOLDOFF
- SDS_ATTR_TRIGGER_COUPLING
- SDS_ATTR_TRIGGER_SLOPE
- SDS_ATTR_TRIGGER_SOURCE
- SDS_ATTR_TRIGGER_LEVEL
- SDS_ATTR_TV_TRIGGER_EVENT (Not Supported)
- SDS_ATTR_TV_TRIGGER_LINE_NUMBER
- SDS_ATTR_TV_TRIGGER_SIGNAL_FORMAT
- SDS_ATTR_RUNT_HIGH_THRESHOLD
- SDS_ATTR_RUNT_LOW_THRESHOLD
- SDS_ATTR_RUNT_POLARITY
- SDS_ATTR_GLITCH_CONDITION
- SDS_ATTR_GLITCH_POLARITY
- SDS_ATTR_GLITCH_WIDTH (Not Supported)
- SDS_ATTR_WIDTH_CONDITION
- SDS_ATTR_WIDTH_HIGH_THRESHOLD
- SDS_ATTR_WIDTH_LOW_THRESHOLD
- SDS_ATTR_WIDTH_POLARITY
- SDS_ATTR_TRIGGER_MODIFIER

SDS_ATTR_TRIGGER_TYPE

Description	This attribute specifies the trigger type.
Data Type	ViInt32
Access	R/W
Common Control Functions	sds_SetAttributeViInt32 (ViSession vi, ViConstString channelName, ViAttr attributeId, ViInt32 value) sds_GetAttributeViInt32 (ViSession vi, ViConstString channelName, ViAttr attributeId, ViInt32 *value) **Note**: **vi** is the instrument handle. **channelName** is NULL. **attributeId** is SDS_ATTR_TRIGGER_TYPE macro. **value** is used to store or set the value of function represented by **attributeId**.
Value Range	SDS_VAL_EDGE_TRIGGER SDS_VAL_WIDTH_TRIGGER SDS_VAL_RUNT_TRIGGER SDS_VAL_GLITCH_TRIGGER SDS_VAL_TV_TRIGGER SDS_VAL_PATTERN_TRIGGER SDS_VAL_WINDOW_TRIGGER SDS_VAL_INTERVAL_TRIGGER SDS_VAL_DROPOUT_TRIGGER SDS_VAL_SLOPE_TRIGGER
Related Attribute	SDS_ATTR_TRIGGER_HOLDOFF SDS_ATTR_TRIGGER_LEVEL SDS_ATTR_TRIGGER_SLOPE SDS_ATTR_GLITCH_CONDITION SDS_ATTR_GLITCH_POLARITY SDS_ATTR_GLITCH_WIDTH (Not Supported) SDS_ATTR_WIDTH_CONDITION SDS_ATTR_WIDTH_HIGH_THRESHOLD SDS_ATTR_WIDTH_LOW_THRESHOLD SDS_ATTR_WIDTH_POLARITY
High Level Functions	sds_ConfigureTrigger

sds_ConfigureWidthTriggerSource
sds_ConfigureGlitchTriggerSource
sds_ConfigureEdgeTriggerSource

SDS_ATTR_TRIGGER_HOLDOFF

Description	This attribute specifies the trigger holdoff time.
Data Type	ViReal64
Access	R/W
Common Control Functions	sds_SetAttributeViReal64 (ViSession vi, ViConstString channelName, ViAttr attributeId, ViReal64 value) sds_GetAttributeViReal64 (ViSession vi, ViConstString channelName, ViAttr attributeId, ViReal64 *value) **Note**: **vi** is the instrument handle. **channelName** is NULL. **attributeId** is SDS_ATTR_TRIGGER_HOLDOFF macro. **value** is used to store or set the value of function represented by **attributeId**.
Value Range	[8.00e-09, 3.00e+01] **Note:** Only when the SDS_ATTR_TRIGGER_TYPE is EDGE, SDS_ATTR_TRIGGER_HOLDOFF can be set.
Related Attribute	SDS_ATTR_TRIGGER_TYPE
High Level Functions	sds_ConfigureTrigger

SDS_ATTR_TRIGGER_COUPLING

Description	This attribute specifies the coupling mode of the edge trigger.
Data Type	ViInt32
Access	R/W
Common Control Functions	sds_SetAttributeViInt32 (ViSession vi, ViConstString channelName, ViAttr attributeId, ViInt32 value) sds_GetAttributeViInt32 (ViSession vi, ViConstString channelName, ViAttr attributeId, ViInt32 *value) **Note**: **vi** is the instrument handle. **channelName** is NULL. **attributeId** is SDS_ATTR_TRIGGER_COUPLING macro. **value** is used to store or set the value of function represented by **attributeId**.
Value Range	SDS_VAL_AC_TRIGGER SDS_VAL_DC_TRIGGER SDS_VAL_HF_REJECT SDS_VAL_LF_REJECT **Note:** Only when the SDS_ATTR_TRIGGER_TYPE is EDGE, the SDS_ATTR_TRIGGER_COUPLING can be set.
Related Attribute	None
High Level Functions	sds_ConfigureTriggerCoupling

SDS_ATTR_TRIGGER_SLOPE

Description	This attribute specifies the slope of the edge trigger.
Data Type	ViInt32
Access	R/W
Common Control Functions	sds_SetAttributeViInt32 (ViSession vi, ViConstString channelName, ViAttr attributeId, ViInt32 value) sds_GetAttributeViInt32 (ViSession vi, ViConstString channelName, ViAttr attributeId, ViInt32 *value) **Note**: **vi** is the instrument handle. **channelName** is NULL. **attributeId** is SDS_ATTR_TRIGGER_SLOPE macro. **value** is used to store or set the value of function represented by **attributeId**.
Value Range	SDS_VAL_POSITIVE SDS_VAL_NEGATIVE SDS_VAL_ALTERNATE **Note:** Only when the SDS_ATTR_TRIGGER_TYPE is EDGE, the SDS_ATTR_TRIGGER_SLOPE can be set.
Related Attribute	SDS_ATTR_TRIGGER_SOURCE SDS_ATTR_TRIGGER_LEVEL
High Level Functions	sds_ConfigureEdgeTriggerSource