NI-SCOPE Instrument Driver Quick Reference Guide

Easy Programming for National Instruments Oscilloscopes

ICON	FUNCTION NAME AND DESCRIPTION[1]	TYPE	PARAMETER	VALUE TO SET, COMMENTS[2]
Initiate and Close Functions				
	**niScope_init** Creates a new session to the instrument.	ViRsrc ViBoolean ViBoolean ViSession *	resourceName IDQuery resetDevice vi	DAQ::#, where # is the device number NISCOPE_VI_TRUE, NISCOPE_VI_FALSE NISCOPE_VI_TRUE, NISCOPE_VI_FALSE Reference to the new session
	**niScope_close** Closes the current session to the instrument.	ViSession	vi	Session handle
Application Functions				
	**APP_EasyAcquire** Illustrates the basics of acquiring data from the hardware. Configures the scope to acquire one record of data specified in terms of time per record. Initiates the acquisition, waits for it to complete, and returns the acquired data.	For parameters and other function-specific information, see `niScope` APP `Easy Acquire.vi` for LabVIEW or `App_EasyAcquire.c` for CVI and Visual C++.		
	**APP_TimeBaseAcquire** Configures the scope to acquire one record of data specified in terms of time per record. Initiates the acquisition, waits for it to complete, and returns the acquired data.	For parameters and other function-specific information, see `niScope` APP `Time Base Acquire.vi` for LabVIEW or `APP_TimeBaseAcquire.c` for CVI and Visual C++.		
	**APP_SampleRateAcquire** Configures the scope to acquire one record of data specified in terms of sample rate. Initiates the acquisition, waits for it to complete, and returns the acquired data.	For parameters and other function-specific information, see `niScope` APP `Sample Rate Acquire.vi` for LabVIEW or `APP_SampleRateAcquire.c` for CVI and Visual C++.		
	**APP_BinaryAcquire** Configures the scope to acquire one record of 8-bit binary data specified in terms of sample rate. Initiates the acquisition, waits for it to complete, and returns the acquired data.	For parameters and other function-specific information, see `niScope` APP `Binary Acquire.vi` for LabVIEW or `APP_BinaryAcquire.c` for CVI and Visual C++.		
	**APP_MultiRecordAcquire** Configures the scope to acquire multiple records of data specified in terms of sample rate. Initiates the acquisition, waits for it to complete, and returns the acquired data.	For parameter information, see `niScope` APP `Multi Record Acquire.vi` for LabVIEW or `APP_MultiRecordAcquire.c` for CVI and Visual C++.		
	**APP_MultiChannelAcquire** Configures the scope to acquire one record of data specified in terms of sample rate for two channels. Initiates the acquisition, waits for it to complete, and returns the acquired data. Trigger occurs only on channel 0, but both channels 0 and 1 acquire simultaneous data.	For parameters and other function-specific information, see `niScope` APP `Multi Channel Acquire.vi` for LabVIEW or `APP_MultiChannelAcquire.c` for CVI and Visual C++.		

[1] Function name for C, C++, LabWindows/CVI, and Visual Basic.

[2] In C, C++, and LabWindows/CVI, constant names such as NISCOPE_VI_TRUE and NISCOPE_VAL_EDGE refer to the use of # defines in your program. In LabVIEW, these constants refer to boolean or ring controls with corresponding entries. For example, NISCOPE_VAL_EDGE corresponds to the LabVIEW ring control entry "Edge." Refer to LabVIEW online help for more details.

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Configuration Functions				
	**niScope_ConfigureAcquisition** Configures the oscilloscope acquisition mode.	ViSession	vi	Session handle
		ViInt32	acquisitionType	NISCOPE_VAL_NORMAL, NISCOPE_VAL_FLEXRES, NISCOPE_VAL_PEAK_DETECT
	**niScope_ConfigureVertical** Configures the common properties of the oscilloscope's vertical subsystem for the specified channel.	ViSession	vi	Session handle
		ViConstString	channel	Channel to configure
		ViReal64	range	Volts Peak to Peak; values vary depending on product
		ViReal64	offset	Location of the center of the range that you specify with range
		ViInt32	coupling	NISCOPE_VAL_AC, NISCOPE_VAL_DC
		ViReal64	probeAttenuation	Any positive real number such as 1, 10, and 100
		Vi Boolean	enabled	NISCOPE_VAL_TRUE, NISCOPE_VAL_FALSE
	**niScope_ConfigureChanCharacteristics** Configures the common properties of the oscilloscope's specified channel.	ViSession	vi	Session handle
		ViConstString	channel	Channel to configure
		ViReal64	inputImpedance	NISCOPE_VAL_50_OHM, NISCOPE_VAL_75_OHM, NISCOPE_VAL_1_MEG_OHM
		ViReal64	bandwidth	0 - Use the Hardware's default value; check your hardware user manual to find a device's other supported bandwidths in hertz
	**niScope_ConfigureHorizontal** Configures the common properties of the horizontal sub-system for a single record acquisition specified in terms of time per record.	ViSession	vi	Session handle
		ViReal64	timePerRecord	Time duration of the record in seconds
		ViInt32	minNumPts	Minimum number of points you need in the record for each channel; call **niScope_ActualRecordLength** after the acquisition has been initiated for the actual record length acquired.
		ViReal64	refPosition	Sets the percentage of the waveform record that is pretriggered
	**niScope_ConfigureHorizontalRate** Configures the common properties of the horizontal sub-system for a single record acquisition specified in terms of minimum sample rate.	ViSession	vi	Session handle
		ViReal64	minSampleRate	Minimum sampling rate for the acquisition in samples per second
		ViInt32	minNumPts	Minimum number of points you require in the record for each channel; call **niScope_ActualRecordLength** after the acquisition is initiated to obtain the actual record length acquired
		ViReal64	refPosition	Sets the percentage of the waveform record that is pretriggered
	**niScope_ConfigureMultiHorizontal** Configures the common properties of the horizontal subsystem for a multi-record acquisition specified in terms of time per record.	ViSession	vi	Session handle
		ViReal64	timePerRecord	Time duration of the record in seconds
		ViInt32	minNumPts	Minimum number of points you need in the record for each channel; call **niScope_ActualRecordLength** after the acquisition is initiated for the actual record length acquired
		ViReal64	refPosition	Sets the percentage of the waveform record that is pretriggered
		ViInt32	numRecords	Number of waveform records to acquire
	**niScope_ConfigureMultiHorizontalRate** Configures the common properties of the horizontal sub-system for a multi-record acquisition specified in terms of minimum sample rate.	ViSession	vi	Session handle
		ViReal64	minSampleRate	Minimum sampling rate for the acquisition in samples per second
		ViInt32	minNumPts	Minimum number of points you need in the record for each channel; call **niScope_ActualRecordLength** after the acquisition is initiated for the actual record length acquired
		ViReal64	refPosition	Sets the percentage of the waveform record that is pretriggered
		ViInt32	numRecords	Number of waveform records to acquire

ICON	FUNCTION NAME AND DESCRIPTION[1]	TYPE	PARAMETER	VALUE TO SET, COMMENTS[2]
Configuration Functions (Continued)				
	**niScope_ConfigureClock** Configures the properties for synchronizing the oscilloscope to an external clock or sending the oscilloscope's clock out as a synchronizing clock for other scopes.	ViSession	vi	Session handle
		ViConstString	inputClockSource	NISCOPE_VAL_NO_SOURCE, NISCOPE_VAL_RTSI_CLOCK, NISCOPE_VAL_PFI_<1..2>, NISCOPE_VAL_PXI_CLOCK
		ViConstString	outputClock-Source	NISCOPE_VAL_NO_SOURCE, NISCOPE_VAL_RTSI_CLOCK, NISCOPE_VAL_PFI_<1..2>
		ViConstString	clockSyncPulse-Source	NISCOPE_VAL_NO_SOURCE, NISCOPE_VAL_RTSI_<0..6>, NISCOPE_VAL_PFI_<1..2>
		ViBoolean	masterEnabled	NISCOPE_VAL_TRUE, NISCOPE_VAL_FALSE
	**niScope_ActualRecordLength** Returns the actual number of points the oscilloscope acquires for each channel. Value is valid only after **niScope_InitiateAcquisition** or **niScope_ReadWaveform** has been called.	ViSession	vi	Session handle
		ViInt32 *	actualRecord-Length	Value is equal to or greater than the minimum number of points you specify with a horizontal configuration function; length of record is available for each channel
	**niScope_ConfigureTriggerSource** Configures the common properties of the trigger subsystem.	ViSession	vi	Session handle
		ViConstString	triggerSource[3]	NISCOPE_VAL_IMMEDIATE, "0", "1", NISCOPE_VAL_EXTERNAL, NISCOPE_VAL_SW_TRIG_FUNC, NISCOPE_VAL_RTSI_<0..6>, NISCOPE_VAL_PFI_<1..2>, NISCOPE_VAL_TTL<0..6>, NISCOPE_VAL_PXI_STAR
		ViInt32	triggerType	NISCOPE_VAL_EDGE, NISCOPE_VAL_HYSTERESIS, NISCOPE_VAL_DIGITAL
		ViReal64	triggerDelay	Time to wait after the trigger before marking the reference position in seconds
		ViReal64	holdoff	Time to wait between one waveform acquisition and arming for a new trigger for another acquisition of a multi-record acquisition in seconds
	**niScope_ConfigureEdgeTrigger** Configures the edge trigger. An edge trigger occurs when the trigger signal passes through the voltage threshold that you specify with the level parameter. Its slope is specified with the slope parameter.	ViSession	vi	Session handle
		ViReal64	level	Voltage threshold the oscilloscope uses for edge triggering
		ViInt32	triggerCoupling	NISCOPE_VAL_AC, NISCOPE_VAL_DC
		ViInt32	slope	NISCOPE_VAL_POSITIVE, NISCOPE_VAL_NEGATIVE
	**niScope_ConfigureHysteresisTrigger** Configures the hysteresis trigger. When the slope parameter is set to positive, a trigger occurs when the trigger signal starts below the voltage specified by the level parameter minus the hysteresis parameter, and then crosses above the voltage specified by the level parameter. When slope is set to negative, a trigger occurs when the trigger signal starts above the voltage specified by the level parameter plus the hysteresis parameter, and then crosses below the voltage specified by level.	ViSession	vi	Session handle
		ViReal64	level	Voltage threshold the oscilloscope uses for edge triggering
		ViReal64	hysteresis	Size of the hysteresis window in volts
		ViInt32	triggerCoupling	NISCOPE_VAL_AC, NISCOPE_VAL_DC
		ViInt32	slope	NISCOPE_VAL_POSITIVE, NISCOPE_VAL_NEGATIVE
	**niScope_ConfigureDigitalTrigger** Configures the digital trigger. A digital trigger occurs when the trigger signal has the slope that you specify with the slope parameter.	ViSession	vi	Session handle
		ViInt32	slope	NISCOPE_VAL_POSITIVE, NISCOPE_VAL_NEGATIVE
	**niScope_ConfigureTriggerOutput** Configures the oscilloscope to generate a signal pulse that other scopes can detect when configured for digital triggering. The trigger event argument specifies what condition causes the oscilloscope to generate the signal pulse. The trigger output source argument specifies the hardware source on which the signal pulse will be generated.	ViSession	vi	Session handle
		ViInt32	triggerEvent	NISCOPE_VAL_NO_EVENT, NISCOPE_VAL_STOP_TRIGGER_EVENT
		ViConstString	triggerOutput	NISCOPE_VAL_NO_SOURCE, NISCOPE_VAL_RTSI_<0..6>, NISCOPE_VAL_PFI_<1..2>, NISCOPE_VAL_TTL<0..6>, NISCOPE_VAL_PXI_STAR

[3] In LabVIEW, triggerSource is implemented as a string control. LabVIEW 5.1 and any subsequent versions implement a ring control for this parameter. However, if you use LabVIEW 5.0, you must enter the specific string constant. Refer to the LabVIEW online help for these constant names.

ICON	FUNCTION NAME AND DESCRIPTION[1]	TYPE	PARAMETER	VALUE TO SET, COMMENTS[2]
Acquisition Functions				
	**niScope_ReadWaveform** Initiates an acquisition on all the channels that you enable with **niScope_ConfigureVertical**, waits for the acquisition to complete, and returns the waveform for the channel you specify. **niScope_FetchWaveform** obtains the waveforms for each of the remaining channels.	ViSession	vi	Session handle
		ViConstString	channel	Channel to acquire from
		ViInt32	waveformSize	Number of elements to insert into the waveform array
		ViInt32	maxTime	Maximum length of time in which to allow the read waveform operation to complete in milliseconds
		ViReal64	waveformArray[ ]	Waveform that the oscilloscope acquired
		ViInt32 *	actualPoints	Actual number of points placed in the waveform array
		ViReal64 *	initialX	Time of the first point in the waveform array in seconds; time is relative to the reference position
		ViReal64 *	xIncrement	Time increment between points in the waveform array in seconds
	**niScope_ReadMinMaxWaveform** Initiates a peak detect acquisition on all the channels that you enable with **niScope_ConfigureVertical**, waits for the acquisition to complete, and returns the minimum and maximum waveforms for the channel you specify. The two waveforms are simultaneously sampled. **niScope_FetchMinMaxWaveform** obtains the waveforms for each of the remaining channels.	ViSession	vi	Session handle
		ViConstString	channel	Channel to acquire from
		ViInt32	waveformSize	Number of points to insert into each of the minWaveform and maxWaveform arrays
		ViInt32	maxTime	Maximum length of time in which to allow the read waveform operation to complete in milliseconds
		ViReal64	minWaveform[ ]	Minimum waveform that the oscilloscope acquired
		ViReal64	maxWaveform[ ]	Maximum waveform that the oscilloscope acquired
		ViInt32 *	actualPoints	Actual number of points placed into each of the minWaveform and maxWaveform arrays
		ViReal64 *	initialX	Time of the first point in the waveform array in seconds; time is relative to the reference position
		ViReal64 *	xIncrement	Time increment between points in the waveform array in seconds
	**niScope_InitiateAcquisition** Initiates a waveform acquisition. After you call this function, the oscilloscope leaves the idle state and waits for a trigger. The oscilloscope acquires a waveform for each channel you have enabled with **niScope_ConfigureVertical**.	ViSession	vi	Session handle
	**niScope_Abort** Aborts an acquisition and returns the oscilloscope to the idle state. Acquisition initiated with the **niScope_ReadWaveform** or **niScope_InitiateAcquisition** functions.	ViSession	vi	Session handle
	**niScope_AcquisitionStatus** Shows if an acquisition is in progress or complete.	ViSession	vi	Session handle
		ViInt32 *	status	NISCOPE_VAL_ACQ_IN_PROGRESS (0) NISCOPE_VAL_ACQ_COMPLETE (1)
	**niScope_SendSWTrigger** Sends a command to trigger the oscilloscope. Call if you pass VAL_SW_TRIG_FUNC for the trigger source parameter of **niScope_ConfigureTriggerSource**.	ViSession	vi	Session handle
	**niScope_FetchWaveform** Returns the waveform the oscilloscope acquires for the channel you specify. The waveform is from a previously initiated acquisition.	ViSession	vi	Session handle
		ViConstString	channel	Channel to acquire from
		ViInt32	waveformSize	Number of elements to insert into the waveform array
		ViReal64	waveformArray[ ]	Waveform that the oscilloscope acquired
		ViInt32 *	actualPoints	Actual number of points placed in the waveform array
		ViReal64 *	initialX	Time of the first point in the waveform array in seconds; time is relative to the reference position
		ViReal64 *	xIncrement	Time increment between points in the waveform array in seconds

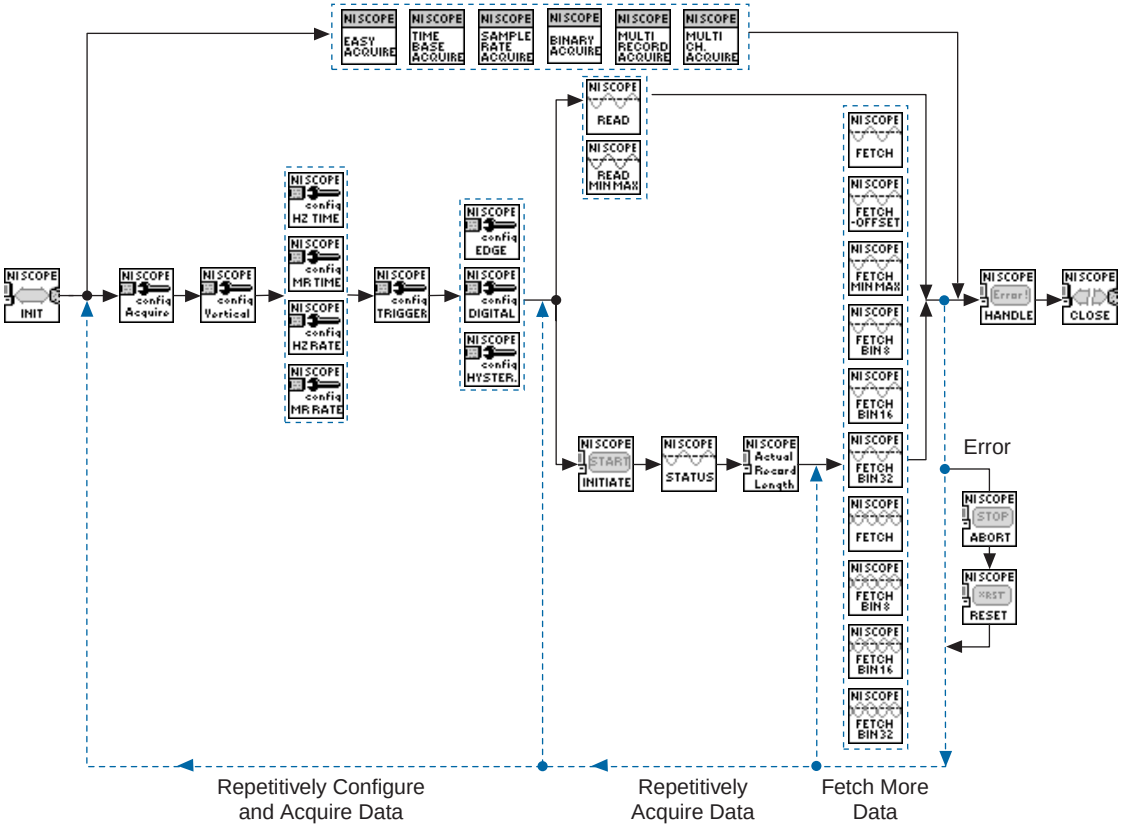
ICON	FUNCTION NAME AND DESCRIPTION[1]	TYPE	PARAMETER	VALUE TO SET, COMMENTS[2]
Acquisition Functions (Continued)				
	**niScope_FetchWaveformFromOffset** Returns the part of the waveform the oscilloscope acquires from the offset you supply for the channel you specify. The waveform is from a previously initiated acquisition.	ViSession	vi	Session handle
		ViConstString	channelName	Channel to acquire from
		ViInt32	retrievalOffset	Offset (in samples) within the record you would like to retrieve from; driver retrieves the waveform starting at this offset
		ViInt32	waveformSize	Number of elements to insert into the waveform array
		ViReal64	waveformArray[ ]	Waveform that the oscilloscope acquired
		ViInt32 *	actualPoints	Actual number of points placed in the waveform array
		ViReal64 *	initialX	Time of the first point in the waveform array in seconds; time is relative to the reference position
		ViReal64 *	xIncrement	Time increment between points in the waveform array in seconds
	**niScope_FetchMinMaxWaveform** Returns the minimum and maximum waveforms from a peak detect acquisition. The acquisition must have been previously initiated in peak detect mode. The two waveforms are simultaneously sampled.	ViSession	vi	Session handle
		ViConstString	channelName	Channel to acquire from
		ViInt32	waveformSize	Number of elements to insert into each of the minWaveform and maxWaveform arrays
		ViReal64	minWaveform[ ]	Minimum waveform that the oscilloscope acquired
		ViReal64	maxWaveform[ ]	Maximum waveform that the oscilloscope acquired
		ViInt32 *	actualPoints	Actual number of points placed into each of the minWaveform and maxWaveform arrays
		ViReal64 *	initialX	Time of the first point in the waveform array in seconds; time is relative to the reference position
		ViReal64 *	xIncrement	Time increment between points in the waveform array in seconds
  	**niScope_FetchBinary8Waveform** Returns the waveform the oscilloscope acquires for the channel you specify in 8-bit binary form. The waveform is from a previously initiated acquisition. For 16-bit binary form, use **niScope_FetchBinary16Waveform**. For 32-bit binary form, use **niScope_FetchBinary32Waveform**.	ViSession	vi	Session handle
		ViConstString	channelName	Channel to acquire from
		ViInt32	retrievalOffset	Offset (in samples) within the record you would like to retrieve from; driver retrieves the waveform starting at this offset
		ViInt32	waveformSize	Number of elements to insert into the waveform array
		ViInt8/16/32	waveformArray[ ]	Waveform that the oscilloscope acquired
		ViInt32 *	actualPoints	Actual number of points placed in the waveform array
		ViReal64 *	initialX	Time of the first point in the waveform array in seconds; time is relative to the reference position
		ViReal64 *	xIncrement	Time increment between points in the waveform array in seconds
		ViReal64 *	gainFactor	Voltage value that is represented by the full-scale level of the binary data; for use in reconstructing voltage data after the acquisition: *Voltage = waveform array element * gain factor + vertical offset*
		ViReal64 *	verticalOffset	Vertical offset (in volts) of the acquisition; for use in reconstructing the voltage data after the acquisition: *Voltage = waveform array element * gain factor + vertical offset*

ICON	FUNCTION NAME AND DESCRIPTION[1]	TYPE	PARAMETER	VALUE TO SET, COMMENTS[2]
Acquisition Functions (Continued)				
	**niScope_FetchMultiWaveform** Returns the waveform the oscilloscope acquires for the record and channel you specify. The waveform is from a previously initiated acquisition.	ViSession	vi	Session handle
		ViConstString	channelName	Channel to acquire from
		ViInt32	recordNumber	Record number you want to retrieve from the channel indicated in channelName
		ViInt32	retrievalOffset	Offset (in samples) in the record you want to retrieve from; driver retrieves the waveform starting at this offset
		ViInt32	waveformSize	Number of elements to insert into the waveform array
		ViReal64	waveformArray[ ]	Waveform that the oscilloscope acquired
		ViInt32 *	actualPoints	Actual number of points placed in the waveform array
		viReal64 *	initialX	Time of the first point in the waveform array in seconds; time is relative to the reference position
		ViReal64 *	xIncrement	Time increment between points in the waveform array in seconds
  	**niScope_FetchMultiBinary8Waveform** Returns the waveform the oscilloscope acquires for the record and channel you specify in 8-bit binary form. The waveform is from a previously initiated acquisition. For 16-bit binary form, use **niScope_FetchMultiBinary16Waveform**. For 32-bit binary form, use **niScope_FetchMultiBinary32Waveform**.	ViSession	vi	Session handle
		ViConstString	channelName	Channel to acquire from
		ViInt32	recordNumber	Record number you want to retrieve from the channel indicated in channelName
		ViInt32	retrievalOffset	Offset (in samples) in the record you want to retrieve from; the driver retrieves the waveform starting at this offset
		ViInt32	waveformSize	Number of elements to insert into waveform array
		ViInt8/16/32	waveformArray[ ]	Waveform that the oscilloscope acquired
		ViInt32 *	actualPoints	Actual number of points placed in waveform array
		ViReal64 *	initialX	Time of the first point in waveform array in seconds; time is relative to the reference position
		ViReal64 *	xIncrement	Time increment between points in the waveform array in seconds
		ViReal64 *	gainFactor	Voltage value that is represented by the full-scale level of the binary data; for use in reconstructing voltage data after the acquisition: *Voltage = waveform array element * gain factor + verticalOffset*
		ViReal64 *	verticalOffset	Vertical offset (in volts) of the acquisition. For use in reconstructing the voltage data after the acquisition: *Voltage = waveform array element * gain factor + verticalOffset*
Error Function				
	**niScope_errorHandler** Translates an error code and its source into a detailed error description.	ViSession	vi	Session handle
		ViInt32	errorCode	Error code to translate
		ViChar	errorSource [MAX_FUNCTION_NAME_ SIZE]	Function returning the error code, can be VI_NULL
		ViChar	errorDescription [MAX_ERROR_DESCRIPTION]	Translated description

ICON	FUNCTION NAME AND DESCRIPTION[1]	TYPE	PARAMETER	VALUE TO SET, COMMENTS[2]
Utility Functions				
	**niScope_reset** Resets the instrument to a known state.	ViSession	vi	Session handle
	**niScope_self_test** Runs the instrument's self-test routine and returns the test result(s).	ViSession ViInt16 * ViChar	vi selfTestResult selfTestMessage [IVI_MAX_ MESSAGE_BUF_ SIZE]	Session handle 0–Self test passed 1–Self test failed Self-test response string from the instrument; see the device user manual for an explanation of the string's contents
	**niScope_revision_query** Returns the revision numbers of the instrument driver and instrument firmware.	ViSession ViChar ViChar	vi instrumentDriver-Revision[IVI_MAX_ MESSAGE_BUF_ SIZE] firmwareRevision [IVI_MAX_ MESSAGE_BUF_ SIZE]	Session handle Instrument driver software revision numbers in the form of a string Instrument firmware revision numbers in the form of a string
	**niScope_ProbeCompensationSignalStart** Starts the square wave output on PFI 1 for probe compensation.	ViSession	vi	Session handle
	**niScope_ProbeCompensationSignalStop** Stops the square wave output on PFI 1 for probe compensation.	ViSession	vi	Session handle

Programming Flow

Application Functions



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