NI-RFSG LabVIEW Reference

September 2007, 371000D-01

This help file contains technical and programming support for using the NI-RFSG LabVIEW API. This help file provides reference material for the NI-RFSG VIs and properties.

Use the NI-RFSG VIs to program NI RF signal generators using the NI-RFSG instrument driver.

Palette Object	Description
<u>niRFSG</u> Initialize	 Initializes the NI-RFSG device and performs the following initialization actions: Creates a new instrument driver session. Opens a session to the device you specify as the resource name parameter. If reset device is set to TRUE, this VI resets the device to a known state. Returns an instrument handle that you use to identify the NI-RFSG device in all subsequent NI-RFSG VIs.
	Supported Devices: NI 5650/5651/5652/5670/5671/5672
<u>niRFSG</u> <u>Configure</u> <u>RF</u>	Configures the frequency and power level of the RF output signal. The NI 5670/5671/5672 device must be in the Configuration state before you call this VI. The NI 5650/5651/5652 device can be in the Configuration state or Generation state when you call this VI.
	Supported Devices: NI 5650/5651/5652/5670/5671/5672
<u>niRFSG</u> <u>Initiate</u>	Initiates signal generation, causing the NI-RFSG device to leave the Configuration state or Committed state and enter the Generation state. If settings have not been committed to the device before you use this VI, they are committed with this VI. The operation returns when the RF output signal settles. To return to the Configuration state, use the <u>niRFSG</u> <u>Abort</u> VI.
	Supported Devices: NI 5650/5651/5652/5670/5671/5672
<u>niRFSG</u>	Checks the status of the generation. Use this VI to check for

<u>Check</u> Generation <u>Status</u>	any errors that may occur during signal generation, or to check whether the device has finished generating.
	Supported Devices: NI 5650/5651/5652/5670/5671/5672
<u>niRFSG</u> <u>Close</u>	Performs the following closing actions: - Aborts any signal generation in progress. - Destroys the instrument driver session and any set properties.
	Supported Devices: NI 5650/5651/5652/5670/5671/5672
<u>niRFSG</u> Abort	Aborts a previously initiated signal generation.
	Supported Devices: NI 5650/5651/5652/5670/5671/5672

Subpalette	Description
<u>Generation</u> <u>Configuration</u> VIs	Use the Configuration VIs to configure the signal generation.
<u>Utility</u> VIs	Use the Utility VIs to access additional features of the NI-RFSG instrument driver.

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Generation Configuration

Owning Palette: NI-RFSG Main Palette

Use the Configuration VIs to configure the signal generation.

Subpalette	Description
<u>Configure</u> Waveform	Use the Waveform Configuration VIs to configure a waveform.
<u>Configure</u> Trigger	Use the Trigger Configuration VIs to configure NI- RFSG triggers.
Configure Clock	Use the Clock Configuration VIs to configure the clocks.

Configure Waveform

Owning Palette: Generation Configuration

Use the Waveform Configuration VIs to configure a waveform.

Palette Object	Description
niRFSG Configure Generation Mode	Configures the NI-RFSG device to generate a continuous sine tone (CW), apply IQ (vector) modulation to the RF output signal, or generate arbitrary waveforms according to scripts. The NI-RFSG device must be in the Configuration state before you call this VI.
	Supported Devices: NI 5650/5651/5652/5670/5671/5672
niRFSG Write Arb Waveform	Writes an arbitrary waveform to the NI-RFSG device. This VI enters the I and Q vectors of a complex baseband signal. If the waveform to be written is already allocated using the <u>niRFSG Allocate Arb Waveform</u> VI, the more data pending? parameter is ignored. This VI has six polymorphic instances that take as data input a complex cluster, a waveform datatype (CWDT), Direct DMA, Complex DBL, I16, and I-Q arrays. The NI 5670/5671 device must be in the Configuration state before you call this VI.
	Supported Devices: NI 5670/5671/5672
<u>niRFSG</u> <u>Write Script</u>	Identifies a string containing a script to control waveform generation in Script mode. Use the <u>niRFSG Configure</u> <u>Generation Mode</u> VI to configure the device for Script mode. The NI-RFSG device must be in the Configuration state before calling this VI. Refer to the topic <u>Scripting</u> <u>Instructions</u> in the <i>NI RF Signal Generators Help</i> for information about using scripts.
	Supported Devices: NI 5670/5671/5672
<u>niRFSG</u> <u>Clear Arb</u> <u>Waveform</u>	Deletes a specified waveform from the pool of currently defined waveforms. The NI-RFSG device must be in the Configuration state before you call this VI.
	Supported Devices: NI 5670/5671/5672
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niRFSG Clear All Arb	Deletes all currently defined waveforms and scripts. The NI- RFSG device must be in the Configuration state before you call this VI.
<u>Waveforms</u>	Supported Devices: NI 5670/5671/5672
niRFSG Configure Digital	Specifies the <u>message signal</u> used for digital modulation when the <u>Modulation Type</u> property is enabled and the <u>Waveform Type</u> property is set to User Defined.
Modulation User Defined Waveform	Supported Devices: NI 5650/5651/5652
<u>niRFSG</u> <u>Select Arb</u> <u>Waveform</u>	Specifies the waveform that is generated upon a call to the <u>niRFSG Initiate</u> VI when the generation mode parameter of the <u>niRFSG Configure Generation Mode</u> VI is set to Arb Waveform. You must specify a waveform name in the name parameter if you have written multiple waveforms. The NI-RFSG device must be in the Configuration state before you call this VI.
	Supported Devices: NI 5670/5671/5672
<u>niRFSG</u> Configure Signal	Configures the signal bandwidth of the arbitrary waveform. The NI-RFSG device must be in the Configuration state before you call this VI.
<u>Bandwidth</u>	Supported Devices: NI 5670/5671/5672
<u>niRFSG</u> <u>Fractional</u> Resampling	Resamples and/or realigns a complex-valued waveform that you specify. This VI has three polymorphic instances, which take as data input a Complex Cluster, a Complex Waveform, or an I-Q Array.
	Supported Devices: NI 5670/5671/5672
<u>niRFSG</u> <u>Allocate</u> <u>Arb</u> Waveform	Allocates onboard memory space for the arbitrary waveform. Use this VI to specify the total size of a waveform before writing the data. You only need to use this VI if you are calling the <u>niRFSG Write Arb Waveform</u> VI multiple times to write a large waveform in smaller blocks. The NI-RFSG device must be in the Configuration state before you call this VI.

Supported Devices: NI 5670/5671/5672

niRFSG Configure Generation Mode

Configures the NI-RFSG device to generate a continuous sine tone (CW), apply IQ (vector) modulation to the RF output signal, or generate arbitrary waveforms according to scripts. The NI-RFSG device must be in the Configuration state before you call this VI.

Supported Devices: NI 5650/5651/5652/5670/5671/5672

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Note After you initialize the RF signal generator or call the <u>niRFSG Reset</u> VI or the <u>niRFSG Reset Device</u> VI, generation mode is set to CW.



- instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- **generation mode** specifies the mode used by NI-RFSG for generating an RF output signal. NI-RFSG sets the <u>Generation</u> <u>Mode</u> property to this value.

CW	Configures the RF signal generator to generate a CW signal.
Arb Waveform	Configures the RF signal generator to generate arbitrary waveforms.
Script	Configures the RF signal generator to generate arbitrary waveforms as directed by scripts.

Default Value: CW

- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

- **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- instrument handle out passes a reference to your instrument session to the next VI. instrument handle out is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Write Arb Waveform

Writes an arbitrary waveform to the NI-RFSG device. This VI enters the I and Q vectors of a complex baseband signal. If the waveform to be written is already allocated using the <u>niRFSG Allocate Arb Waveform</u> VI, the **more data pending?** parameter is ignored. This VI has six polymorphic instances that take as data input a complex cluster, a waveform datatype (CWDT), Direct DMA, Complex DBL, I16, and I-Q arrays. The NI 5670/5671 device must be in the Configuration state before you call this VI.

Supported Devices: NI 5670/5671/5672

Use the pull-down menu to select an instance of this VI.

Select an instance

niRFSG Write Arb Waveform (Complex Input)

Writes an arbitrary waveform to the NI-RFSG device. This VI accepts complex baseband signal data in the form of a complex cluster. When calling this VI, the NI-RFSG device must be in the Configuration state.



- instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- **name** specifies the name used to store the waveform. This string is case-insensitive and alphanumeric, and it does not use reserved words.
- **IQ waveform** specifies the complex baseband signal to write to the AWG module.
 - **t0** specifies the trigger (start) time of the acquired **Y** array.
 - **dt** specifies the time interval between the samples in the acquired **Y** array. **dt** is the reciprocal of the IQ rate.
 - Y specifies an array of complex-valued time domain data. The real and imaginary parts of this complex data array correspond to the in-phase (I) and quadrature-phase (Q) data, respectively.
- **use waveform dt for IQ rate?** indicates TRUE if the VI uses the waveform **dt** to configure the IQ rate and FALSE if it does not configure the IQ rate.
- **more data pending?** specifies whether the data block contains the end of the waveform. **more data pending?** is set to TRUE to allow data to be appended to the waveform later. Splitting the waveform into multiple data blocks can reduce the memory requirements of the write operation. You can append data to a previously written waveform by using the saved waveform name. Set this parameter to FALSE to indicate that this data block contains the end of the waveform.

- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- instrument handle out passes a reference to your instrument session to the next VI. instrument handle out is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Write Arb Waveform (CWDT)

Writes an arbitrary waveform to the NI-RFSG device. This VI accepts the complex baseband signal data in the form of a complex waveform datatype. The NI-RFSG device must be in the Configuration state before you call this VI.



- instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- **name** specifies the name used to store the waveform. This string is case-insensitive and alphanumeric, and it does not use reserved words.
- IQ Waveform specifies the complex waveform for writing to the AWG module.
- **use waveform dt for IQ rate?** indicates TRUE if the VI uses the waveform **dt** to configure the IQ rate and FALSE if it does not configure the IQ rate.
- **more data pending?** specifies whether the data block contains the end of the waveform. **more data pending?** is set to TRUE to allow data to be appended to the waveform later. Splitting the waveform into multiple data blocks can reduce the memory requirements of the write operation. You can append data to a previously written waveform by using the saved waveform name. Set this parameter to FALSE to indicate that this data block contains the end of the waveform.

- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

- **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- instrument handle out passes a reference to your instrument session to the next VI. instrument handle out is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - code identifies the error or warning. The pop-up option Explain Error (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Write Arb Waveform (I-Q)

Writes an arbitrary waveform to the NI-RFSG device. This VI accepts the I and Q vectors of a complex baseband signal. The NI-RFSG device must be in the Configuration state before you call this VI.



- instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- **name** specifies the name used to store the waveform. This string is case-insensitive and alphanumeric, and it does not use reserved words.
- **I Data** specifies the in-phase (I) component of the complex baseband signal.
- **Q** Data specifies the quadrature-phase (Q) component of the complex baseband signal.
- **more data pending?** specifies whether the data block contains the end of the waveform. **more data pending?** is set to TRUE to allow data to be appended to the waveform later. Splitting the waveform into multiple data blocks can reduce the memory requirements of the write operation. You can append data to a previously written waveform by using the saved waveform name. Set this parameter to FALSE to indicate that this data block contains the end of the waveform.

- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option

Explain Error (or Explain Warning) gives more information about the error displayed.

- **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **instrument handle out** passes a reference to your instrument session to the next VI. **instrument handle out** is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Write Arb Waveform (Complex DBL)

Writes an arbitrary waveform to the NI-RFSG device. This VI accepts the complex baseband data in the form of complex doubles. The NI-RFSG device must be in the Configuration state before you call this VI.



- instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- **name** specifies the name used to store the waveform. This string is case-insensitive and alphanumeric, and it does not use reserved words.
- waveform data specifies the array of data to load into the waveform. You must normalize the data points in the array to have polar magnitudes between 0.0 and +1.00.
- **more data pending?** specifies whether the data block contains the end of the waveform. **more data pending?** is set to TRUE to allow data to be appended to the waveform later. Splitting the waveform into multiple data blocks can reduce the memory requirements of the write operation. You can append data to a previously written waveform by using the saved waveform name. Set this parameter to FALSE to indicate that this data block contains the end of the waveform.

- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

- **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- instrument handle out passes a reference to your instrument session to the next VI. instrument handle out is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Write Arb Waveform (I16)

Writes an arbitrary waveform to the NI-RFSG device. This VI accepts the interleaved I-Q data of a complex baseband signal. The NI-RFSG device must be in the Configuration state before you call this VI.

Supported Devices: NI 5672

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Note This polymorphic instance only supports **Peak Power** mode. If a waveform is downloaded using this VI, the power level type cannot be changed to **Average Power** without causing error in the output. Refer to the <u>Power Level Type</u> property for more information about setting power level types.



- instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- **name** specifies the name used to store the waveform. This string is case-insensitive and alphanumeric, and it does not use reserved words.
- **interleaved IQ Data** specifies an array of interleaved I data and Q data to load into the waveform, paired in binary (I16) format.
- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

instrument handle out passes a reference to your instrument session to the next VI. **instrument handle out** is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.

- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Write Arb Waveform (Direct DMA)

Writes an arbitrary waveform from a direct <u>DMA</u>-compatible device to the NI-RFSG device. The NI-RFSG device must be in the Configuration state before you call this VI.



- instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- **name** specifies the name used to store the waveform. This string is case-insensitive and alphanumeric, and it does not use reserved words.
- **direct DMA address** specifies the window address of the Direct DMA-compatible device.
- **samples to write** specifies the number of samples to write from the Direct DMA-compatible data source.
- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **instrument handle out** passes a reference to your instrument session to the next VI. **instrument handle out** is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.

error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

- **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **Source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Write Script

Identifies a string containing a script to control waveform generation in Script mode. Use the <u>niRFSG Configure Generation Mode</u> VI to configure the device for Script mode. The NI-RFSG device must be in the Configuration state before calling this VI. Refer to the topic <u>Scripting</u> <u>Instructions</u> in the *NI RF Signal Generators Help* for information about using scripts.

Supported Devices: NI 5670/5671/5672



- instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- **script** specifies the script that controls waveform generation. NI-RFSG supports multiple scripts that may be selected by name with the <u>Selected Script</u> property.
- **instrument handle out** passes a reference to your instrument session to the next VI. **instrument handle out** is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more

information about the error displayed.

- **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Clear Arb Waveform

Deletes a specified waveform from the pool of currently defined waveforms. The NI-RFSG device must be in the Configuration state before you call this VI.

Supported Devices: NI 5670/5671/5672



- instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- **name** specifies the name used to store the waveform. This string is case-insensitive and alphanumeric, and it does not use reserved words.
- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **instrument handle out** passes a reference to your instrument session to the next VI. **instrument handle out** is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain

Warning) gives more information about the error displayed.

- **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Clear All Arb Waveforms

Deletes all currently defined waveforms and scripts. The NI-RFSG device must be in the Configuration state before you call this VI.

Supported Devices: NI 5670/5671/5672



- instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **instrument handle out** passes a reference to your instrument session to the next VI. **instrument handle out** is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

source describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Configure Digital Modulation User Defined Waveform

Specifies the <u>message signal</u> used for digital modulation when the <u>Modulation Type</u> property is enabled and the <u>Waveform Type</u> property is set to User Defined.

Supported Devices: NI 5650/5651/5652



- instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- **used** for digital modulation.
- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **instrument handle out** passes a reference to your instrument session to the next VI. **instrument handle out** is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

status is either TRUE (X) for an error, or FALSE (?) for no

error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

- **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **Source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Select Arb Waveform

Specifies the waveform that is generated upon a call to the <u>niRFSG</u> <u>Initiate</u> VI when the generation mode parameter of the <u>niRFSG Configure</u> <u>Generation Mode</u> VI is set to Arb Waveform. You must specify a waveform name in the **name** parameter if you have written multiple waveforms. The NI-RFSG device must be in the Configuration state before you call this VI.

Supported Devices: NI 5670/5671/5672



- instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- **name** specifies the name of the stored waveform to generate. This string is case-insensitive and alphanumeric, and it does not use reserved words.
- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **instrument handle out** passes a reference to your instrument session to the next VI. **instrument handle out** is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning)

gives more information about the error displayed.

- **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **Source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Configure Signal Bandwidth

Configures the signal bandwidth of the arbitrary waveform. The NI-RFSG device must be in the Configuration state before you call this VI.

Supported Devices: NI 5670/5671/5672

Details



- instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- **signal bandwidth (Hz)** specifies the signal bandwidth used by NI-RFSG for generating an RF output signal. NI-RFSG sets the <u>Signal</u> <u>Bandwidth (Hz)</u> property to this value.
- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **instrument handle out** passes a reference to your instrument session to the next VI. **instrument handle out** is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

Status is either TRUE (X) for an error, or FALSE (?) for no

error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

- **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **Source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

Details

NI-RFSG defines *signal bandwidth* as twice the maximum baseband signal deviation from 0 Hz. Usually, the baseband signal center frequency is 0 Hz. In such cases, the signal bandwidth is simply the baseband signal's minimum frequency subtracted from its maximum frequency, or fmax – fmin. The driver uses this value to optimally configure the center frequency of the upconverter to help minimize phase noise. The generated signal will not be filtered to achieve the set bandwidth. However, specifying a bandwidth smaller than the actual bandwidth of the signal could potentially result in spectral distortion.



Note Based on your signal bandwidth, NI-RFSG decides whether to configure the upconverter center frequency in increments of 1 or 5 MHz. Failure to configure signal bandwidth may result in the signal being placed out of the upconverter passband.

niRFSG Fractional Resampling

Resamples and/or realigns a complex-valued waveform that you specify. This VI has three polymorphic instances, which take as data input a Complex Cluster, a Complex Waveform, or an I-Q Array.

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Supported Devices: NI 5670/5671/5672

Use the pull-down menu to select an instance of this VI.

Select an instance

Details

niRFSG Fractional Resampling (Complex Input)

Inputs a complex-valued waveform and resamples and/or realigns it based on the input parameters that you specify. To realign the input waveform in time, enter a nonzero value in the **initial sample offset** parameter. Positive or negative offset values push the output complex waveform forward or backward in time, respectively, relative to the input complex waveform.



- **initial sample offset (sec)** specifies the alignment of the input waveform in time. To realign the input waveform in time, enter a nonzero value in this parameter. Positive or negative offset values push the output complex waveform forward or backwards in time, respectively, relative to the waveform data specified in the **input complex waveform** parameter.
- **desired sample rate (Hz)** specifies the desired sample rate of the output complex waveform data, expressed in Hz. This value can be an integer or a non-integer multiple of the input data sample rate. The default value is 100 MHz.
- input complex waveform specifies the complex baseband waveform data.
 - **t0** specifies the trigger (start) time of the acquired **Y** array.
 - **dt** specifies the time interval between the samples in the acquired **Y** array. **dt** is the reciprocal of the IQ rate.
 - Y specifies the complex-valued signal-only baseband modulated waveform. The real and imaginary parts of this complex data array correspond to the in-phase (I) and quadrature-phase (Q) data, respectively.
- **reset? (T)** specifies whether the VI continues resampling using the previous iteration states. **reset? (T)** must be set to TRUE (default) whenever you want to restart fractional resampling.
- error in accepts error information from previously called VIs. The
pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

- **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **output complex waveform** returns the resampled complex baseband waveform data.
 - **t0** specifies the trigger (start) time of the acquired **Y** array.
 - **dt** specifies the time interval between the samples in the acquired **Y** array. **dt** is the reciprocal of the IQ rate.
 - Y specifies the complex-valued signal-only baseband modulated waveform. The real and imaginary parts of this complex data array correspond to the in-phase (I) and quadrature-phase (Q) data, respectively.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Fractional Resampling (CWDT)

Inputs a complex-valued waveform and resamples and/or realigns it based on the input parameters that you specify. To realign the input waveform in time, enter a nonzero value in initial sample offset. Positive or negative offset values push the output complex waveform forward or backwards in time, respectively, relative to input complex waveform.



- **initial sample offset (sec)** specifies the alignment of the input waveform in time. To realign the input waveform in time, enter a nonzero value in this parameter. Positive or negative offset values push the output complex waveform forward or backwards in time, respectively, relative to the waveform data specified in the **input complex waveform** parameter.
- **desired sample rate (Hz)** specifies the desired sample rate of the output complex waveform data, expressed in Hz. This value can be an integer or a non-integer multiple of the input data sample rate. The default value is 100 MHz.
- **input complex waveform** specifies the complex baseband waveform data.
- **reset? (T)** specifies whether the VI continues resampling using the previous iteration states. **reset? (T)** must be set to TRUE (default) whenever you want to restart fractional resampling.
- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

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source describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

- **output complex waveform** returns the resampled complex baseband waveform data.
 - **t0** specifies the trigger (start) time of the acquired **Y** array.
 - **dt** specifies the time interval between the samples in the acquired **Y** array. **dt** is the reciprocal of the IQ rate.
 - Y specifies the complex-valued signal-only baseband modulated waveform. The real and imaginary parts of this complex data array correspond to the in-phase (I) and quadrature-phase (Q) data, respectively.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Fractional Resampling (I-Q)

Inputs a complex-valued waveform and resamples and/or realigns it based on the input parameters that you specify. To realign the input waveform in time, enter a nonzero value in initial sample offset. Positive or negative offset values push the output complex waveform forward or backwards in time, respectively, relative to input complex waveform.



- **initial sample offset (sec)** specifies the alignment of the input waveform in time. To realign the input waveform in time, enter a nonzero value in this parameter. Positive or negative offset values push the output complex waveform forward or backwards in time, respectively, relative to the waveform data specified in the **input complex waveform** parameter.
- desired sample rate (Hz) specifies the desired sample rate of the output complex waveform data, expressed in Hz. This value can be an integer or a non-integer multiple of the input data sample rate. The default value is 100 MHz.
- **I** specifies the in-phase (I) component of the complex baseband signal.
- **Q** specifies the quadrature-phase (Q) component of the complex baseband signal.
- **input sample rate** specifies the sample rate, in hertz, of the input data.
- **reset? (T)** specifies whether the VI continues resampling using the previous iteration states. **reset? (T)** must be set to TRUE (default) whenever you want to restart fractional resampling.
- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain

Warning) gives more information about the error displayed.

- **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **I out** returns the resampled complex baseband I data.
- **Q** out returns the resampled complex baseband Q data.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - code identifies the error or warning. The pop-up option Explain Error (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

Details

To resample a waveform, enter a desired sample rate that differs from the existing sample rate of the **input complex waveform** parameter. To realign a waveform without changing the sample rate, specify a **desired sample rate** parameter value equal to the existing sample rate. To resample a waveform without changing the relative timing offset between the input and output complex waveforms, specify an **initial sample offset** parameter value of 0.



Note The sample rate of your waveform corresponds to the <u>IQ</u> <u>rate</u> property in RFSG.

Resampling and Phase Continuity

Resampling can disturb <u>phase continuity</u>. For example, if a sine wave sampled at 4 samples per cycle in a 4-sample long phase-continuous array, is resampled at a rate of 4.5 samples per cycle, the resulting 5 samples are no longer phase-continuous. Phase continuity is only preserved if an integer number of samples in the original array becomes an integer number of samples in the resampled array. The following figure shows a 4-sample waveform resampled to 4.5 samples. The rate change should produce 4.5 samples, but only an integer number of samples can be returned by the resampler.



Address this issue by repeating the original array. If the original array is copied and concatenated, there are 8 samples in the new phasecontinuous array. The frequency content of the new array is exactly the same as the frequency content of the original array. If resampling is performed from 4 to 4.5 samples per cycle, the 8 samples becomes 9 samples. Because 9 is an integer, phase continuity is preserved. This strategy is shown in the Resample and Write example for NI-RFSG. The following figure shows both sample rates phase-continuous on two



niRFSG Allocate Arb Waveform

Allocates onboard memory space for the arbitrary waveform. Use this VI to specify the total size of a waveform before writing the data. You only need to use this VI if you are calling the <u>niRFSG Write Arb Waveform</u> VI multiple times to write a large waveform in smaller blocks. The NI-RFSG device must be in the Configuration state before you call this VI.

Supported Devices: NI 5670/5671/5672

<u>Details</u>



- instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- **name** specifies the name used to store the waveform. This string is case-insensitive and alphanumeric, and it does not use reserved words.
- **size in samples** specifies the size of the waveform to allocate in samples.
- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- instrument handle out passes a reference to your instrument session to the next VI. instrument handle out is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and

identifies a particular instrument session.

- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

Details

If direct download is enabled, NI-RFSG reserves the appropriate amount of memory on the device for the specified waveform. If direct download is disabled, NI-RFSG allocates space in the host memory to hold the requested number of samples.

The niRFSG Write Arb Waveform VI returns an error if you write more data than the amount of memory allocated for it. If you do not write the entire allocation, the signal generator generates uninitialized data during the unwritten portions of the waveform. If you allocate a waveform prior to writing it, NI-RFSG ignores the **more data pending?** parameter in the niRFSG Write Arb Waveform VI.

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Note Direct download is *always* enabled on the NI 5672.

niRFSG Configure Trigger

Configures the start and script triggers. The NI-RFSG device must be in the Configuration state before you call this VI. This VI has six polymorphic instances.

Supported Devices: NI 5670/5671/5672

Use the pull-down menu to select an instance of this VI.

Select an instance

-

niRFSG Configure Start Trigger Digital Edge

Configures the Start trigger for digital edge triggering.



- instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- **source** specifies the trigger source terminal for the Digital Edge Start Trigger. NI-RFSG sets the <u>Digital Edge Start Trigger Source</u> property to this value. Refer to this property for possible values.
- edge specifies the active edge for the Digital Edge Start trigger. NI-RFSG sets the <u>Digital Edge Start Trigger Edge</u> property to this value.

Defined Values:

Rising Edge	Occurs when the signal transitions from low level to high level.
Falling Edge	Occurs when the signal transitions from high level to low level.

Default Value: Rising Edge

- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

instrument handle out passes a reference to your instrument

session to the next VI. **instrument handle out** is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize</u> With Options VI and identifies a particular instrument session.

- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Configure Start Trigger Software

Configures the Start trigger for software triggering. Refer to the <u>niRFSG</u> <u>Send Software Edge Trigger</u> VI for more information about using a Software trigger.

instrument handle	nandle out
error inerror out	

- instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- instrument handle out passes a reference to your instrument session to the next VI. instrument handle out is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

source describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Disable Start Trigger

Configures the device to not wait for a Start trigger after the <u>niRFSG</u> <u>Initiate</u> VI is called. Calling this VI is only necessary if the Start trigger has been previously configured and now needs to be disabled.



- instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- instrument handle out passes a reference to your instrument session to the next VI. instrument handle out is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

source describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Configure Script Trigger Digital Edge

Configures a specified Script trigger for digital edge triggering.



instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.

trigger id specifies the script trigger to configure. NI-RFSG supports four script triggers: scriptTrigger0,scriptTrigger1,scriptTrigger2,scriptTrigger3.

- **source** specifies the trigger source terminal for the Digital Edge Script trigger. NI-RFSG sets the <u>Digital Edge Script Trigger Source</u> property to this value. Refer to this property for possible values.
- edge specifies the active edge for the Digital Edge Script trigger. NI-RFSG sets the <u>Digital Edge Script Trigger Edge</u> property to this value.

Defined Values:

Rising Edge	Occurs when the signal transitions from low level to high level.
Falling Edge	Occurs when the signal transitions from high level to low level.

Default Value: Rising Edge

- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

- **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- instrument handle out passes a reference to your instrument session to the next VI. instrument handle out is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Configure Script Trigger Software

Configures a specified Script trigger for software triggering. Refer to the <u>niRFSG Disable Start Trigger</u> VI for more information on using the Software Script trigger.



- instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- **trigger id** specifies the script trigger to configure. NI-RFSG supports four script triggers:

scriptTrigger0,scriptTrigger1,scriptTrigger2,scriptTrigger3.

- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **instrument handle out** passes a reference to your instrument session to the next VI. **instrument handle out** is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain

Warning) gives more information about the error displayed.

- **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Disable Script Trigger

Configures the device to not wait for the specified Script trigger after the <u>niRFSG Initiate</u> VI is called. Calling this VI is only necessary if the Script trigger has been previously configured and now needs to be disabled.



- instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- **trigger id** specifies the script trigger to configure. NI-RFSG supports four script triggers:

script Trigger 0, script Trigger 1, script Trigger 2, script Trigger 3.

- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- instrument handle out passes a reference to your instrument session to the next VI. instrument handle out is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain

Warning) gives more information about the error displayed.

- **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Send Software Edge Trigger

Forces a trigger to occur. The specified trigger is generated regardless of whether the trigger has been configured as a Software trigger.

Supported Devices: NI 5670/5671/5672



- instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- **trigger type** specifies the type of trigger to assert. NI-RFSG can assert a Start trigger or a Script trigger.
- **trigger ID** specifies the script trigger to configure. This parameter is only valid when the **trigger type** control is set to Script Trigger. NI-RFSG supports four script triggers:

scriptTrigger0,scriptTrigger1,scriptTrigger2,scriptTrigger3.

- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- instrument handle out passes a reference to your instrument session to the next VI. instrument handle out is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning)

gives more information about the error displayed.

- **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Export Signal

Routes signals (triggers, clocks, and events) to a specified output terminal. The NI-RFSG device must be in the Configuration state before you call this VI.

Supported Devices: NI 5650/5651/5652/5670/5671/5672

<u>Details</u>



- instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- **signal** specifies the type of signal to route. NI-RFSG can export a Start trigger, Script trigger, Marker event, or the onboard reference clock.
 - The onboard reference clock output terminal is not configurable on the NI 5670/5671/5672 device.
 - Triggers and marker events are not available on the NI 5650/5651/5652 device.
- signal identifier specifies the script trigger or marker event to configure. NI-RFSG supports four script triggers (scriptTrigger0, scriptTrigger1, scriptTrigger2, and scriptTrigger3), and four marker events (marker0, marker1, marker2, and marker3). This parameter is useful when the signal parameter is set to Script Trigger or Marker Event. Otherwise, set this parameter to None.
- **output terminal** specifies the terminal where the signal will be exported. You can choose not to export any signal.
- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

- **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **instrument handle out** passes a reference to your instrument session to the next VI. **instrument handle out** is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

Details

If you export a signal with this VI and commit the session with the <u>niRFSG Commit</u> VI, the signal is routed to the **output terminal** you specify. If you then reconfigure the signal to have a different **output terminal**, the previous **output terminal** is tristated when the session is next committed. If you change the **output terminal** to **Do Not Export** and commit the session, the previous **output terminal** is tristated.

Any signals exported within a session persist after the session closes to prevent signal glitches between sessions. If you wish to have the exported output terminal that the signal was exported to tristated when the session closes, first change the value of the **output terminal** for the exported signal to **Do Not Export**, and then commit the session again before closing it.

You can also tristate all PFI lines by setting the **reset device** parameter in the <u>niRFSG Initialize</u> VI.

niRFSG Configure Ref Clock

Configures the NI-RFSG device reference clock. The reference clock ensures that the NI-RFSG devices are operating from a common timebase. The NI-RFSG device must be in the Configuration state before you call this VI.

Supported Devices: NI 5650/5651/5652/5670/5671/5672

instrument handle	Instrument handle out
clock source disclock rate	error out
error in	

instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.

clock source specifies the source of the reference clock signal.

Only certain combinations of **clock source** and **PXI Chassis Clk 10 Source Setting** are valid, as shown in the following table.

clock source Setting	Valid PXI Chassis Clk 10 Source Setting
Onboard Clock	None, Onboard Clock
RefIn (external)	None, RefIn
PXI_CLK10	None (PXI 10 MHz oscillator)
	RefIn (Reference signal connected to the REF_IN connector of the upconverter; backplane locked to REF_IN; upconverter locked to backplane)

NI-RFSG sets the <u>Reference Clock Source</u> property to this value.

Clock rate (Hz) specifies the reference clock rate, expressed in hertz. The default value, 10 MHz, is the only supported value.

error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

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status is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

- **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- instrument handle out passes a reference to your instrument session to the next VI. instrument handle out is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.
- **error out** passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Configure PXI Chassis Clk10

Specifies the signal to drive the 10 MHz reference clock on the PXI backplane. This option can only be configured when the NI PXI-5610 is in Slot 2 of the PXI chassis. The NI-RFSG device must be in the Configuration state before you call this VI.

Supported Devices: NI 5670/5671



instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.

PXI Clk10 source specifies the source of the reference clock signal.

Only certain combinations of **clock source** and **PXI Chassis Clock 10 Source** are valid, as shown in the following table.

clock source Setting	Valid PXI Chassis Clk 10 Source Setting
Onboard Clock	None, Onboard Clock
RefIn (external)	None, RefIn
PXI_CLK10	None (PXI 10 MHz oscillator)
	RefIn (Reference signal connected to the REF_IN connector of the upconverter; backplane locked to REF_IN; upconverter locked to backplane)

NI-RFSG sets the PXI Chassis Clk 10 Source property to this value.

error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

status is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain

Warning) gives more information about the error displayed.

- **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- instrument handle out passes a reference to your instrument session to the next VI. instrument handle out is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

Utility

Owning Palette: NI-RFSG Main Palette

Use the Utility VIs to access additional features of the NI-RFSG instrument driver.

Palette Object	Description
<u>niRFSG</u> <u>Initialize With</u> <u>Options</u>	 Initializes the NI-RFSG device (the upconverter module and the AWG module). This VI has the capability of receiving the AWG resource name through option string. This VI performs the following initialization actions: Creates a new IVI instrument driver session. Opens a session to the device you specify in the resource name parameter. If the reset device parameter is set to TRUE, this VI resets the device to a known state. Returns a value for the instrument handle parameter that you use to identify the instrument in all subsequent NI-RESG VIs.
	Supported Devices: NI 5650/5651/5652/5670/5671/5672
<u>niRFSG</u> <u>Commit</u>	Asserts the configured hardware parameters. Calling this VI moves the NI-RFSG device out of the Configuration state and into the Committed state. After calling this VI, changing any property reverts the NI- RFSG device to the Configuration state.
	Supported Devices : NI 5610 (upconverter only mode), NI 5650/5651/5652/5670/5671/5672
niRFSG Wait Until Settled	Waits until the RF output signal settles. This VI is useful for devices that support on-the-fly (dynamic) configuration changes (changes while in the Generation state). Call this VI after making a dynamic change to wait for the output signal to settle. You can also call this VI after calling the <u>niRFSG Commit</u> VI to wait for changes to settle. This VI is not needed after calling the <u>niRFSG Initiate</u> VI because the niRFSG Initiate VI does

	not return until the output is settled.
	Supported Devices: NI 5610 (upconverter only mode), NI 5650/5651/5652/5670/5671/5672
<u>niRFSG</u> <u>Configure</u> <u>Output</u> <u>Enabled</u>	Enables or disables signal output. You can call this VI in any software state, and it does not change the current state. Setting the output enabled parameter to FALSE while in the Generation state stops signal generation although generation continues internally.
	Supported Devices: NI 5610 (upconverter only mode), NI 5650/5651/5652/5670/5671/5672
<u>niRFSG Reset</u>	Resets all properties to their default values and moves the NI-RFSG device to the Configuration state. This VI aborts the signal generation, clears all routes, and resets session properties to the initial values. During a reset, routes of signals between this and other devices are released, regardless of which device created the route.
	Supported Devices: NI 5610 (upconverter only mode), NI 5650/5651/5652/5670/5671/5672
<u>niRFSG Reset</u> <u>Device</u>	 Performs a hard reset on the device, which consists of the following actions: Signal generation is stopped. All routes are released. External bidirectional terminals are tristated. FPGAs are reset. Hardware is configured to its default state. All session properties are reset to their default states.
	Supported Devices: NI 5610 (upconverter only mode), NI 5650/5651/5652/5670/5671/5672
<u>niRFSG Self</u> <u>Test</u>	Performs a self-test on the NI-RFSG device and returns the test results. This VI performs a simple series of tests to determine whether the NI-RFSG device is powered up and responding. This VI does not affect external I/O connections or connections between devices. Complete functional testing and calibration are not performed by this VI. The NI-RFSG device must be in the

	Configuration state before you call this VI.
	Supported Devices: NI 5610 (upconverter only mode), NI 5650/5651/5652/5670/5671/5672
<u>niRFSG Self</u> <u>Cal</u>	Performs an internal (self-) calibration on the device. If the calibration is successful, new calibration data and constants are stored in the onboard nonvolatile memory of the module.
	Supported Devices: NI 5610 (upconverter only mode), NI 5650/5651/5652/5670/5671/5672
rfsg_Resample and Write	Resamples the complex waveform to the new IQ rate and writes it to the NI-RFSG device. This VI preserves the phase continuity of a phase-continuous complex waveform while resampling.
	Supported Devices: NI 5670/5671/5672
<u>niRFSG Error</u> Message	Converts a error code returned by an NI-RFSG VI into a user-readable string.
	Supported Devices: NI 5650/5651/5652/5670/5671/5672
<u>niRFSG</u> Revision	Returns the revision numbers of the NI-RFSG driver and the instrument firmware.
Query	Supported Devices: NI 5650/5651/5652/5670/5671/5672
niRFSG Query Arb Waveform Capabilities	Queries and returns the arbitrary waveform capabilities of the NI-RFSG device. These capabilities are related to the current device configuration. The NI-RFSG device must be in the Configuration or Generation state before you call this VI.
	Supported Devices: NI 5670/5671/5672
niRFSG Perform Thermal Correction	Corrects for any signal drift due to temperature variation when generating the same signal for extended periods of time without a parameter change. This VI compensates automatically for variations in device temperature when any signal generation parameters are changed. Under normal circumstances of short-term signal generation, NI-RFSG automatic compensation

ensures stable power levels, and you do not need to use this VI. Use this VI when generating the same signal for a long period of time in a temperature-fluctuating environment. The NI-RFSG device must be in the Generation state before you call this VI. **Supported Devices**: NI

5650/5651/5652/5670/5671/5672
niRFSG Initialize With Options

Initializes the NI-RFSG device (the upconverter module and the AWG module). This VI has the capability of receiving the AWG **resource name** through **option string**. This VI performs the following initialization actions:

- Creates a new IVI instrument driver session.

- Opens a session to the device you specify in the **resource name** parameter.

- If the **reset device** parameter is set to TRUE, this VI resets the device to a known state.

- Returns a value for the **instrument handle** parameter that you use to identify the instrument in all subsequent NI-RFSG VIs.

Supported Devices: NI 5650/5651/5652/5670/5671/5672



- **resource name** specifies the resource name of the device to initialize.
- **option string** sets the initial value of certain properties for the session. The following properties are used in this parameter:
 - -- Range Check
 - -- Query Instrument Status
 - -- <u>Cache</u>
 - -- Record Coercions
 - -- Driver Setup
 - -- <u>Simulate</u>

The syntax for **Option String** consists of the following relations:

attributeName=value

where

attributeName is the name of the attribute

value is the value to which the attribute is set.

To set multiple properties, separate their assignments with a comma, as shown in the following option string:

```
"RangeCheck=1, QueryInstrStatus=0, Cache=1,
DriverSetup=AWG:pxi1slot4"
```

To simulate a particular AWG module, use the following option string:

"Simulate=1, DriverSetup=AWGModel:5442"

This option string is valid for simulation purposes only.

- **id query** specifies whether NI-RFSG performs an ID query. Set this parameter to TRUE to perform an ID query. Set this parameter to FALSE to not perform an ID query.
- **reset device** specifies whether you want to reset the NI-RFSG device during the initialization procedure. Set this parameter to TRUE if to reset the device. Set this parameter to FALSE to not reset the device.
- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **instrument handle** passes a reference to your instrument session to the next VI. **instrument handle** is obtained from this VI or the <u>niRFSG Initialize</u> VI and identifies a particular instrument session.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

status is either TRUE (X) for an error, or FALSE (?) for no

error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

- **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **Source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Commit

Asserts the configured hardware parameters. Calling this VI moves the NI-RFSG device out of the Configuration state and into the Committed state. After calling this VI, changing any property reverts the NI-RFSG device to the Configuration state.

Supported Devices: NI 5610 (upconverter only mode), NI 5650/5651/5652/5670/5671/5672



- instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **instrument handle out** passes a reference to your instrument session to the next VI. **instrument handle out** is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

- **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Wait Until Settled

Waits until the RF output signal settles. This VI is useful for devices that support on-the-fly (dynamic) configuration changes (changes while in the Generation state). Call this VI after making a dynamic change to wait for the output signal to settle. You can also call this VI after calling the <u>niRFSG Commit</u> VI to wait for changes to settle. This VI is not needed after calling the <u>niRFSG Initiate</u> VI because the niRFSG Initiate VI does not return until the output is settled.

Supported Devices: NI 5610 (upconverter only mode), NI 5650/5651/5652/5670/5671/5672



- instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- Max. time (ms) specifies the maximum time the VI waits for the output to settle. If the maximum time is exceeded, this VI returns an error. If you set Max. time (ms) to -1, NI-RFSG waits indefinitely until it settles.
- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- instrument handle out passes a reference to your instrument session to the next VI. instrument handle out is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and

identifies a particular instrument session.

- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Configure Output Enabled

Enables or disables signal output. You can call this VI in any software state, and it does not change the current state. Setting the **output enabled** parameter to FALSE while in the Generation state stops signal generation although generation continues internally.

Supported Devices: NI 5610 (upconverter only mode), NI 5650/5651/5652/5670/5671/5672



instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.

- **output enabled** specifies whether the RF output is enabled.
- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- instrument handle out passes a reference to your instrument session to the next VI. instrument handle out is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain

Warning) gives more information about the error displayed.

- **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Reset

Resets all properties to their default values and moves the NI-RFSG device to the Configuration state. This VI aborts the signal generation, clears all routes, and resets session properties to the initial values. During a reset, routes of signals between this and other devices are released, regardless of which device created the route.

Supported Devices: NI 5610 (upconverter only mode), NI 5650/5651/5652/5670/5671/5672



- instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- instrument handle out passes a reference to your instrument session to the next VI. instrument handle out is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain

Warning) gives more information about the error displayed.

- **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Reset Device

Performs a hard reset on the device, which consists of the following actions:

- Signal generation is stopped.
- All routes are released.
- External bidirectional terminals are tristated.
- FPGAs are reset.
- Hardware is configured to its default state.
- All session properties are reset to their default states.

Supported Devices: NI 5610 (upconverter only mode), NI 5650/5651/5652/5670/5671/5672

Details



- instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- instrument handle out passes a reference to your instrument session to the next VI. instrument handle out is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and

identifies a particular instrument session.

- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

Details

During a reset, routes of signals between this and other devices are released, regardless of which device created the route. For example, a trigger signal exported to a PXI trigger line that is used by another device is no longer exported.

 NI 5610, NI 5670/5671/5672 -- After calling this VI, the device requires 25 seconds before returning to full functionality. NI-RFSG enforces this condition by adding a wait, if needed, the next time you try to access the device.

niRFSG Self Test

Performs a self-test on the NI-RFSG device and returns the test results. This VI performs a simple series of tests to determine whether the NI-RFSG device is powered up and responding. This VI does not affect external I/O connections or connections between devices. Complete functional testing and calibration are not performed by this VI. The NI-RFSG device must be in the Configuration state before you call this VI.

Supported Devices: NI 5610 (upconverter only mode), NI 5650/5651/5652/5670/5671/5672



- instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- instrument handle out passes a reference to your instrument session to the next VI. instrument handle out is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.
- **self test result** returns the value returned from the device self-test. A value of 0 indicates that the device is powered-up and responding. A value of 1 indicates that the device failed the self test.

- **self test message** returns the self-test response string from the NI-RFSG device.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - code identifies the error or warning. The pop-up option Explain Error (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Self Cal

Performs an internal (self-) calibration on the device. If the calibration is successful, new calibration data and constants are stored in the onboard nonvolatile memory of the module.

Supported Devices: NI 5610 (upconverter only mode), NI 5650/5651/5652/5670/5671/5672



- instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- instrument handle out passes a reference to your instrument session to the next VI. instrument handle out is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option

Explain Error (or Explain Warning) gives more information about the error displayed.

source describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Error Message

Converts a error code returned by an NI-RFSG VI into a user-readable string.

Supported Devices: NI 5650/5651/5652/5670/5671/5672



- instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- **error code** specifies the error code returned from any NI-RFSG VI. The default value is 0.
- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- instrument handle out passes a reference to your instrument session to the next VI. instrument handle out is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.
- error message returns user-readable message string that corresponds to the error code you specify.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

status is either TRUE (X) for an error, or FALSE (?) for no

error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

- **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **Source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Revision Query

Returns the revision numbers of the NI-RFSG driver and the instrument firmware.

Supported Devices: NI 5650/5651/5652/5670/5671/5672



- instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **instrument handle out** passes a reference to your instrument session to the next VI. **instrument handle out** is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.
- **instrument driver revision** returns the instrument driver software revision numbers in the form of a string. The value of the driver <u>Revision</u> property is returned.
- **firmware revision** returns the instrument firmware revision numbers in the form of a string. The value of the <u>Firmware Revision</u> property is returned.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning)

gives more information about the error displayed.

- **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Query Arb Waveform Capabilities

Queries and returns the arbitrary waveform capabilities of the NI-RFSG device. These capabilities are related to the current device configuration. The NI-RFSG device must be in the Configuration or Generation state before you call this VI.

Supported Devices: NI 5670/5671/5672



- instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **instrument handle out** passes a reference to your instrument session to the next VI. **instrument handle out** is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.
- maximum number of waveforms returns the maximum number of arbitrary waveforms that you can write.
- maximum waveform size (samples) returns the value of the Max. Waveform Size property. The number of samples that you write must be less than or equal to this value.

- minimum waveform size (samples) returns the value of the Min. Waveform Size property. The number of samples that you write must be greater than or equal to this value.
- waveform quantum returns the quantum value the signal generator uses. The value of the <u>Arb Waveform Quantum</u> property is returned.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Perform Thermal Correction

Corrects for any signal drift due to temperature variation when generating the same signal for extended periods of time without a parameter change. This VI compensates automatically for variations in device temperature when any signal generation parameters are changed. Under normal circumstances of short-term signal generation, NI-RFSG automatic compensation ensures stable power levels, and you do not need to use this VI. Use this VI when generating the same signal for a long period of time in a temperature-fluctuating environment. The NI-RFSG device must be in the Generation state before you call this VI.

Supported Devices: NI 5650/5651/5652/5670/5671/5672



- instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- instrument handle out passes a reference to your instrument session to the next VI. instrument handle out is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning)

gives more information about the error displayed.

- **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

rfsg_Resample and Write

Resamples the complex waveform to the new IQ rate and writes it to the NI-RFSG device. This VI preserves the phase continuity of a phase-continuous complex waveform while resampling.

-

Supported Devices: NI 5670/5671/5672

Use the pull-down menu to select an instance of this VI.

Select an instance

rfsg_Resample and Write (Complex Input)

Resamples the complex waveform to the new IQ rate and writes it to the NI-RFSG. Given a phase continuous complex waveform, this VI will preserve the phase continuity while resampling. This VI also optimizes memory usage by doing the resampling and writing in blocks of 100k samples and by deallocating unused memory after the VI is executed.



- instrument handle in identifies your instrument session. instrument handle in is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- waveform name specifies the name used to store the waveform.
- **new IQ rate (S/s)** specifies the new IQ rate to resample to.
- **complex waveform** specifies the complex waveform to resample.
 - **t0** specifies the trigger (start) time of the acquired **Y** array.
 - **dt** specifies the time interval between the samples in the acquired **Y** array. **dt** is the reciprocal of the IQ rate.
 - Y specifies the complex-valued signal-only baseband modulated waveform. The real and imaginary parts of this complex data array correspond to the in-phase (I) and quadrature-phase (Q) data, respectively.
- **repeat waveform until tolerance met** allows the resampled waveform to contain multiple copies of the original waveform. This increases the size of the resampled waveform and reduces the IQ rate error introduced when the resample waveform size is coerced to a multiple of the quantum.
- IQ rate tolerance (ppm) specifies how much to limit the adjusted IQ rate over the original IQ rate.
- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

- **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- instrument handle out passes a reference to your instrument session to the next VI. instrument handle out is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.
- adjusted IQ rate / original IQ rate allows you to find out how much the frequency content or the symbol rate of the original waveform was changed. Before resampling the waveform, the original waveform IQ rate is adjusted so that the resampled waveform size will be a multiple of the quantum. Resampled Waveform IQ Rate = (Adjusted IQ Rate / Original IQ Rate) x Original Symbol Rate.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

rfsg_Resample and Write (CWDT)

Resamples the complex waveform to the new IQ rate and writes it to the NI-RFSG. Given a phase continuous complex waveform, this VI will preserve the phase continuity while resampling. This VI also optimizes memory usage by doing the resampling and writing in blocks of 100k samples and by deallocating unused memory after the VI is executed.



- instrument handle in identifies your instrument session. instrument handle in is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- waveform name specifies the name used to store the waveform.
- **new IQ rate (S/s)** specifies the new IQ rate to resample to.
- complex waveform specifies the complex waveform to split into I and Q components.
- **repeat waveform until tolerance met** allows the resampled waveform to contain multiple copies of the original waveform. This increases the size of the resampled waveform and reduces the IQ rate error introduced when the resample waveform size is coerced to a multiple of the quantum.
- IQ rate tolerance (ppm) specifies how much to limit the adjusted IQ rate over the original IQ rate.
- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

- **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **instrument handle out** passes a reference to your instrument session to the next VI. **instrument handle out** is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.
- adjusted IQ rate / original IQ rate allows you to find out how much the frequency content or the symbol rate of the original waveform was changed. Before resampling the waveform, the original waveform IQ rate is adjusted so that the resampled waveform size will be a multiple of the quantum. Resampled Waveform IQ Rate = (Adjusted IQ Rate / Original IQ Rate) x Original Symbol Rate.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **Source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

rfsg_Resample and Write (I-Q)

Resamples the complex waveform to the new IQ rate and writes it to the NI-RFSG. Given a phase continuous complex waveform, this VI will preserve the phase continuity while resampling. This VI also optimizes memory usage by doing the resampling and writing in blocks of 100k samples and by deallocating unused memory after the VI is executed.



- instrument handle in identifies your instrument session. instrument handle in is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- waveform name specifies the name used to store the waveform.
- **new IQ rate (S/s)** specifies the new IQ rate to resample to.
- **I** specifies the in-phase (I) component of the complex baseband signal.
- **Q** specifies the quadrature-phase (Q) component of the complex baseband signal.
- **input IQ rate** specifies the IQ rate of the input waveform.

repeat waveform until tolerance met allows the resampled waveform to contain multiple copies of the original waveform. This increases the size of the resampled waveform and reduces the IQ rate error introduced when the resample waveform size is coerced to a multiple of the quantum.

- IQ rate tolerance (ppm) specifies how much to limit the adjusted IQ rate over the original IQ rate.
- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

status is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain

Warning) gives more information about the error displayed.

- **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- instrument handle out passes a reference to your instrument session to the next VI. instrument handle out is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.
- adjusted IQ rate / original IQ rate allows you to find out how much the frequency content or the symbol rate of the original waveform was changed. Before resampling the waveform, the original waveform IQ rate is adjusted so that the resampled waveform size will be a multiple of the quantum. Resampled Waveform IQ Rate = (Adjusted IQ Rate / Original IQ Rate) x Original Symbol Rate.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **Source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Initialize

Initializes the NI-RFSG device and performs the following initialization actions:

- Creates a new instrument driver session.

- Opens a session to the device you specify as the **resource name** parameter.

- If **reset device** is set to TRUE, this VI resets the device to a known state.

- Returns an **instrument handle** that you use to identify the NI-RFSG device in all subsequent NI-RFSG VIs.

Supported Devices: NI 5650/5651/5652/5670/5671/5672

Details



- **resource name** specifies the resource name of the device to initialize.
- **id query** specifies whether NI-RFSG performs an ID query. Set this parameter to TRUE to perform an ID query. Set this parameter to FALSE to not perform an ID query.
- **reset device** specifies whether you want to reset the NI-RFSG device during the initialization procedure. Set this parameter to TRUE if to reset the device. Set this parameter to FALSE to not reset the device.
- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

- **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- instrument handle passes a reference to your instrument session to the next VI. instrument handle is obtained from this VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

Details

Before initializing the NI 5670/5671/5672, an NI 5421/5441/5442 AWG module must be associated with the NI 5610 upconverter module in MAX. After association, pass the NI 5610 upconverter module device name to this VI to initialize both modules. To change the AWG association, modify the NI 5610 Properties page in MAX, or use the <u>niRFSG Initialize With Options VI to override the association in MAX.</u> Refer to the <u>NI RF Signal Generators Getting Started Guide</u> for information on MAX association.
niRFSG Configure RF

Configures the frequency and power level of the RF output signal. The NI 5670/5671/5672 device must be in the Configuration state before you call this VI. The NI 5650/5651/5652 device can be in the Configuration state or Generation state when you call this VI.

Supported Devices: NI 5650/5651/5652/5670/5671/5672



- instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- **frequency (Hz)** specifies the frequency of the generated RF signal. For arbitrary waveform generation, this parameter specifies the center frequency of the signal.
- **power level (dBm)** specifies the power level of the generated RF signal. By default, this parameter specifies the average power of the signal. To configure the power level of a waveform with varying power, set the <u>Power Level Type</u> property to **Peak Power**.
- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- instrument handle out passes a reference to your instrument session to the next VI. instrument handle out is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and

identifies a particular instrument session.

- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Initiate

Initiates signal generation, causing the NI-RFSG device to leave the Configuration state or Committed state and enter the Generation state. If settings have not been committed to the device before you use this VI, they are committed with this VI. The operation returns when the RF output signal settles. To return to the Configuration state, use the <u>niRFSG</u> Abort VI.

Supported Devices: NI 5650/5651/5652/5670/5671/5672



- instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- instrument handle out passes a reference to your instrument session to the next VI. instrument handle out is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain

Warning) gives more information about the error displayed.

- **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Check Generation Status

Checks the status of the generation. Use this VI to check for any errors that may occur during signal generation, or to check whether the device has finished generating.

Supported Devices: NI 5650/5651/5652/5670/5671/5672



- instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- instrument handle out passes a reference to your instrument session to the next VI. instrument handle out is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.
- **IIII** done? returns TRUE when signal generation has completed.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

132

code identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

source describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Close

Performs the following closing actions:

- Aborts any signal generation in progress.
- Destroys the instrument driver session and any set properties.

Supported Devices: NI 5650/5651/5652/5670/5671/5672



- instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more

information about the error displayed.

niRFSG Abort

Aborts a previously initiated signal generation.

Supported Devices: NI 5650/5651/5652/5670/5671/5672

error in

- instrument handle identifies your instrument session. instrument handle is obtained from either the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI.
- error in accepts error information from previously called VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **source** describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.
- **instrument handle out** passes a reference to your instrument session to the next VI. **instrument handle out** is obtained from the <u>niRFSG Initialize</u> VI or the <u>niRFSG Initialize With Options</u> VI and identifies a particular instrument session.
- error out passes error or warning information out of a VI to be used by other VIs. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **Status** is either TRUE (X) for an error, or FALSE (?) for no error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.
 - **code** identifies the error or warning. The pop-up option **Explain Error** (or Explain Warning) gives more information about the error displayed.

source describes the origin of the error or warning. The popup option **Explain Error** (or Explain Warning) gives more information about the error displayed.

niRFSG Property Node

Gets (reads) or sets (writes) NI-RFSG properties. When you read a property, NI-RFSG analyzes the current configuration in order to return the coerced value for that property. NI-RFSG verifies many properties upon reading, thereby either transitioning the session to the verified state or alerting you of an invalid configuration. Setting a property transitions the session to an unverified state.

Refer to the <u>NI-RFSG Properties</u> for more information on using NI-RFSG properties.

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NI-RFSG Express VI (Arbitrary Waveform)

Configures and runs National Instruments RF signal generators using NI-RFSG to produce an arbitrary waveform signal.

You must place at least two NI-RFSG Express (Arbitrary Waveform) VIs on the block diagram for successful generation. Select Start generation for the generation mode in the first Express VI to start the continuous generation. Select Stop generation for the generation mode in the final Express VI to stop generation and close the NI-RFSG device handle. The following figure shows an example of how to wire the two instances of the Express VI to generate continuously until a stop button is pressed.



Dialog Box Options Block Diagram Inputs Block Diagram Outputs

Dialog Box Options

Parameter	Description
Configuration	Contains the following options:
	• Device —Specifies the NI RF signal generator used. This ring control lists all NI RF signal generators installed on this computer that can be used by this Express VI. If you relaunch the VI and the selected RF signal generator is dimmed, it is no longer available.
	 Generation—Specifies the generation mode. Choose from the following options:
	 Start generation—Configures the NI RF signal generator to generate the waveform continuously and starts the generation. In this mode, the Express VI returns immediately after starting the generation. To stop the generation, drop another instance of this Express VI on the block diagram, select the same RF signal generator, and configure it to Stop generation. Stop generation—Stops a continuous generation that was started by another instance of this Express VI that was configured to Start generation.
	 Frequency (Hz)—Specifies the center frequency of the generated RF signal.
	 Power level (dBm)—Specifies the average power level of the generated RF signal. Bandwidth (Hz)—Specifies the signal bandwidth used by NI-RFSG for generating the RF output signal. The driver uses this value to optimally configure the center frequency of the upconverter to help minimize phase noise. The generated signal will not be filtered to achieve the set bandwidth. However, specifying a bandwidth smaller than the actual bandwidth of

	 the signal could potentially result in spectral distortion. Note The waveform preview graph tries to represent the ideal signal without any consideration for the Bandwidth control. Data type—Specifies the data type of the input waveform. Extract IQ rate from waveform—Specifies whether to use the waveform dt to determine the IQ rate. IQ rate (S/s)—Specifies the IQ rate of the arbitrary waveform.
Trigger and Timing	 Contains the following options: Trigger type—Specifies the type of trigger to use for starting waveform generation. Trigger source—Specifies the trigger source terminal for the digital edge start trigger. Edge—Specifies the active edge for the digital edge start trigger. Reference clock source—Specifies the source of the reference clock signal. Only certain combinations of Reference clock source and PXI Chassis Clk10 source are valid. PXI Chassis Clk 10 source—Specifies the signal driven to the 10 MHz reference clock on the PXI backplane. Only certain combinations of Reference and PXI Chassis Clk10 source are valid. Arb sample clock source—Specifies the sample clock source of the arbitrary waveform generator. To select Clk In, you must uncheck the Extract IQ rate from waveform option on the Configuration page. Arb onboard sample clock mode—Specifies the clock mode on the arbitrary waveform generator. External clock rate (Hz)—Displays the rate that

	the external clock must be set to. This value is calculated from the IQ rate set on the Configuration page.
Advanced	 Contains the following options: Enable DUC pre-filter gain—Specifies whether to enable DUC pre-filter gain. DUC pre-filter gain (dB)—Specifies the digital upconverter (DUC) pre-filter gain. Reduce this value to prevent overflow in the DUC interpolation filters. Other gains on the NI RF signal generator are automatically adjusted to compensate for non-unity DUC pre-filter gain. Allow resampling—Specifies whether to allow resampling of the input waveform. Resampling only occurs if the selected device does not support the IQ rate of the input waveform. If the input waveform will also be phase continuous.
Graph view	 Specifies the information displayed in the waveform preview. Select from the following options: I vs. Q Power Spectrum

Block Diagram Inputs

Parameter	Description
IQ Waveform	Specifies the arbitrary waveform to generate.
error in	Describes error conditions that occur before this Express VI runs.

Block Diagram Outputs

Parameter	Description
error out	Contains error information. If error in indicates that an error occurred before this Express VI runs, error out contains the same error information. Otherwise, it describes the error status that this Express VI produces.

NI-RFSG Express VI (CW)

Configures and runs National Instruments RF signal generators using NI-RFSG to produce a continuous wave (CW) signal.

You must place at least two NI-RFSG Express (CW) VIs on the block diagram for successful generation. Select Start generation for the generation mode in the first Express VI to start the continuous generation. Select Stop generation for the generation mode in the final Express VI to stop generation and close the NI-RFSG device handle. The following figure shows an example of how to wire the two instances of the Express VI to generate continuously until a stop button is pressed.



Dialog Box Options Block Diagram Inputs Block Diagram Outputs

Dialog Box Options

Parameter	Description
Configuration	Contains the following options:
	• Device —Specifies the NI RF signal generator used. This ring control lists all NI RF signal generators installed on this computer that can be used by this Express VI. If you relaunch the VI and the selected RF signal generator is dimmed, it is no longer available.
	 Generation—Specifies the generation mode. Choose from the following options:
	 Start generation—Configures the NI RF signal generator to generate the waveform continuously and starts the generation. In this mode, the Express VI returns immediately after starting the generation. To stop the generation, drop another instance of the Express VI on the block diagram, select the same NI RF signal generator, and configure it to Stop generation. Stop generation—Stops a continuous generation that was started by another instance of this Express VI that was configured to Start generation.
	 Frequency (Hz)—Specifies the frequency of the generated RF signal.
	 Power level (dBm)—Specifies the power level of the generated RF signal.
	 Modulation type—Specifies the type of modulation.
	 Waveform type—Specifies the type of waveform used as a message signal for analog modulation.
	 Waveform frequency (Hz)—Specifies the frequency of the waveform used as a message signal for analog modulation.
	 FM deviation (Hz)—Specifies the FM deviation

	 used in frequency modulation. Waveform type—Specifies the type of waveform used as a message signal for digital modulation. Symbol rate (Hz)—Specifies the symbol rate of the message signal. PRBS order—Specifies the order of the PRBS signal used as the message signal. FSK deviation (Hz)—Specifies the deviation used in FSK modulation.
Trigger and Timing	 Contains the following options: Trigger type—Specifies the type of trigger to use for starting waveform generation. Trigger source—Specifies the trigger source terminal for the digital edge start trigger. Edge—Specifies the active edge for the digital edge start trigger. Reference clock source—Specifies the source of the reference clock signal. Only certain combinations of Reference clock source are valid. PXI Chassis Clk 10 source—Specifies the signal driven to the 10 MHz reference clock on the PXI backplane. Only certain combinations of Reference clock and PXI chassis Clk10 source are valid.

Block Diagram Inputs

Parameter	Description
error in	Describes error conditions that occur before this Express VI
	1013.

Block Diagram Outputs

Parameter	Description
error out	Contains error information. If error in indicates that an error occurred before this Express VI runs, error out contains the same error information. Otherwise, it describes the error status that this Express VI produces.