

NI 5431 Composite Video Generator Help

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This help file describes the NI 5431 Composite Video Generator LabVIEW VIs, which include data generation examples, high-level driver, low-level driver, and IMAQ Vision VIs. After installing the NI 5431 Composite Video Generator software, the LabVIEW Functions palette includes the Video Generation palette.

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NI 5431 Composite Video Generator

Low-Level Driver VIs

The low-level driver VIs are located in the NI-VideoDataGen.llb file in LabVIEW. You can also access these VIs from the LabVIEW palette by selecting **Functions»Video Generation»Low Level Driver**. Click the topics below to learn more about these examples and VIs.

Video Data Formatting VIs

[VDG_SetVideoFormat](#)

[VDG_SetImage](#)

[VDG_Attribute](#)

[VDG_SetFilter](#)

Get 16-Bit Output Data VI

[VDG_Get_I16_LineBlock](#)

Set Insertion Test Lines (ITS) VI

[VDG_MergeDigitalSync](#)

Save/Load ITS VIs

[Download Insertion Test Signal](#)

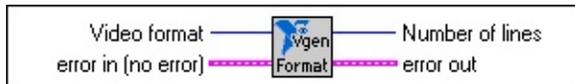
[Save RGB Insertion Test Signal](#)

[Save YUV Insertion Test Signal](#)

NI 5431 Composite Video Generator

VDG_SetVideoFormat

This VI selects the video format used for the calculation of the video data.



Video format selects the video format to be generated.



error in is a cluster that describes the error status before this VI executes. If error in indicates that an error occurred before this VI was called, this VI may choose not to execute its function, but just pass the error through to its error out cluster. If no error has occurred, then this VI executes normally and sets its own corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.



Number of lines returns the number of lines per frame for the selected video format.

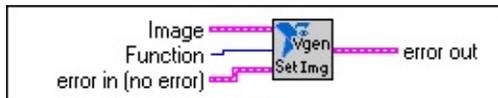


error out is a cluster that describes the error status after this VI executes. If an error occurred before this VI was called, error out is the same as error in. Otherwise, error out shows the error, if any, that occurred in this VI. Use the error handler VIs to look up the error code and to display the corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.

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VDG_SetImage

This VI maps the basic image to be used for the calculation of the video data or unmaps the image after the calculation is performed. Select **Map/Upmap** using the **Function** control.

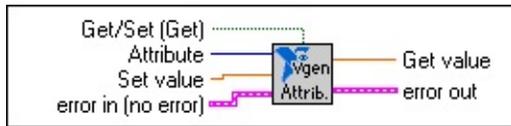


-  **Image** specifies the image reference for the image to be processed.
-  **Function** maps or unmaps the image to be processed.
-  **error in** is a cluster that describes the error status before this VI executes. If error in indicates that an error occurred before this VI was called, this VI may choose not to execute its function, but just pass the error through to its error out cluster. If no error has occurred, then this VI executes normally and sets its own corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.
-  **error out** is a cluster that describes the error status after this VI executes. If an error occurred before this VI was called, error out is the same as error in. Otherwise, error out shows the error, if any, that occurred in this VI. Use the error handler VIs to look up the error code and to display the corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.

NI 5431 Composite Video Generator

VDG_Attribute

This VI gets or sets any attribute for the selected video format.



TF **Get/Set (Get)** selects whether you want to Get or Set an attribute. If you enter the number listed to the left of the choices below in the box to the right of the **Get/Set (Get)** control and click **Enter**, the choice will appear in the control. You can also use the up and down arrows to the left of the control to select your choice.

- 0 Sync amplitude (IRE)
- 1 Zero level (IRE)
- 2 Setup level (IRE)
- 3 White level (IRE)
- 4 Sampling frequency (Hz)
- 5 Samples per line
- 6 Reference line
- 7 Sync duration (us)
- 8 Sync start (us)
- 9 Sync rise time (us)
- 10 Burst duration (us)
- 11 Burst start (us)
- 12 Burst rise time (us)
- 13 Burst amplitude (IRE)
- 14 Subcarrier periods per line
- 15 Subcarrier start phase (deg)
- 16 Subcarrier 2nd harmonic (%)
- 17 Subcarrier 3rd harmonic (%)
- 18 Brightness (IRE)
- 19 Contrast
- 20 Saturation

- 21 Tint (deg)
- 22 Gamma
- 23 Image interlaced
- 24 Image top (lines)
- 25 Image height (lines)
- 26 Image X start (us)
- 27 Image duration (us)
- 28 Image width (pixels)
- 29 Input gain
- 30 Input offset
- 31 Output gain
- 32 Output offset
- 33 Noise level (IRE rms)
- 34 Digital delay (pixels)
- 35 Field polarity
- 36 Y filter
- 37 UV filter
- 38 I filter
- 39 Q filter
- 40 C filter
- 41 Composite filter
- 42 SECAM Bottle shape signal
- 43 U or Q Gain
- 44 V or I Gain



Attribute selects which attribute to Get or Set.



Set value is the attribute value to be set.



error in is a cluster that describes the error status before this VI executes. If error in indicates that an error occurred before this VI was called, this VI may choose not to execute its function, but just pass the error through to its error out cluster. If no error has occurred, then this VI executes normally and sets its own corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.



Get value returns the actual attribute value.

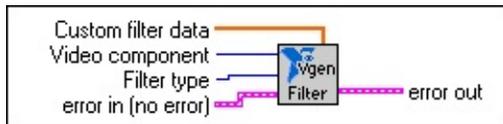


error out is a cluster that describes the error status after this VI executes. If an error occurred before this VI was called, error out is the same as error in. Otherwise, error out shows the error, if any, that occurred in this VI. Use the error handler VIs to look up the error code and to display the corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.

NI 5431 Composite Video Generator

VDG_SetFilter

This VI selects and applies a specific filter to a specified video component. If the specified filter is of custom type, the custom filter coefficients need to be entered using the control **Custom filter data**.



[SGL] **Custom filter data** inputs the filter coefficients for a custom defined filter to be applied on a specified component. The filter coefficients are input as an array of values as shown in the following list that represents a 7 taps FIR lowpass filter:

- 0 0.062462**
- 1 0.142423**
- 2 0.191198**
- 3 0.207834**
- 4 0.191198**
- 5 0.142423**
- 6 0.062462**



Note The size of the filter must be an odd number such as 3 or 5.



Video component selects the video component to be filtered. Use the up and down arrows on the **Video component** control to select the video component. The video components are listed below:

Y
U and V
I
Q
C
Composite



Filter type selects the type of filter to be used on the specified component. If you enter the number listed to the left of the choices below in the box to the right of the **Filter type** control and click **Enter**, the filter type will appear in the control. You can also use the up and down arrows to the left of the control to select your filter type. The filter types are listed below:

- 0 None**
- 1 Butterworth 0.4 MHz**
- 2 Butterworth 1.3 MHz**
- 3 Butterworth 4.2 MHz**

4 Butterworth 5.0 MHz

5 Butterworth 5.5 MHz

6 Butterworth 6.0 MHz

7 1.3 MHz

8 4.2 MHz

9 5.0 MHz

10 5.5 MHz

11 6.0 MHz

12 Custom filter

13 Custom butterworth



error in is a cluster that describes the error status before this VI executes. If error in indicates that an error occurred before this VI was called, this VI may choose not to execute its function, but just pass the error through to its error out cluster. If no error has occurred, then this VI executes normally and sets its own corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.



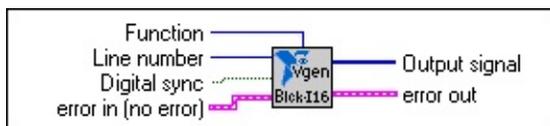
error out is a cluster that describes the error status after this VI executes. If an error occurred before this VI was called, error out is the same as error in. Otherwise, error out shows the error, if any, that occurred in this VI. Use the error handler VIs to look up the error code and to display the corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.

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VDG_Get_I16_LineBlock

This VI controls the generation of the composite video data in block mode. Block mode is significantly faster than the simple line-by-line mode, but requires a different procedure. The procedure is as follows:

1. Before starting the lines calculation, call the VI with the **Function** control in **Prepare** mode.
2. Calculate the needed data by calling the VI with the **Function** in **Get line** mode for all the needed lines (typically lines 1 to 2500 for Standard PAL, lines 1 to 1050 for M-NTSC and lines 1 to 3750 for SECAM).
3. Call the VI with the **Function** control in **Release** mode to clear the internal buffers and release memory.



 **Function** selects the function to perform. Use the up and down arrows to select a mode listed below:

Release
Prepare
Get line

 **Line number** specifies the number of video lines to be calculated.

 **Digital Sync** enables or disables the insertion of the four digital synchronization signals into the four lowest significant bits of the 16-bit video data.

 **error in** is a cluster that describes the error status before this VI executes. If error in indicates that an error occurred before this VI was called, this VI may choose not to execute its function, but just pass the error through to its error out cluster. If no error has occurred, then this VI executes normally and sets its own corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.

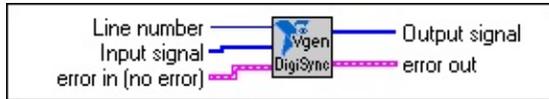
 **Output signal** returns the calculated composite I16 data for the specified line.

 **error out** is a cluster that describes the error status after this VI executes. If an error occurred before this VI was called, error out is the same as error in. Otherwise, error out shows the error, if any, that occurred in this VI. Use the error handler VIs to look up the error code and to display the corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.

NI 5431 Composite Video Generator

VDG_MergeDigitalSync

This VI merges the four synchronization bits (Hsync, Vsync, Csync, and FieldID) into the four least significant bits of a 16-bit input array. In order to merge the signal correctly, you need to pass the precalculated 16-bit data and the line number to the VI.



Line number specifies the video line where the synchronization signals are to be merged.



Input signal is the 16-bit (I16) data array containing the line data where the synchronization signals are to be merged.



error in is a cluster that describes the error status before this VI executes. If error in indicates that an error occurred before this VI was called, this VI may choose not to execute its function, but just pass the error through to its error out cluster. If no error has occurred, then this VI executes normally and sets its own corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.



Output signal is the 16-bit (I16) data array containing the four synchronization bits.



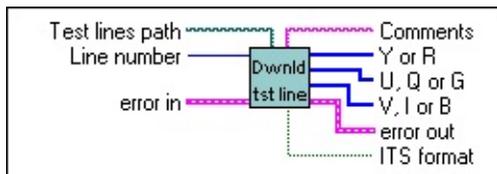
error out is a cluster that describes the error status after this VI executes. If an error occurred before this VI was called, error out is the same as error in. Otherwise, error out shows the error, if any, that occurred in this VI. Use the error handler VIs to look up the error code and to display the corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.

NI 5431 Composite Video Generator

Download Insertion Test Signal

This VI downloads insertion test signal (ITS) data from a file. To work properly, the data must have been saved using either [Save RGB Insertion Test Signal](#) or the [Save YUV Insertion Test Signal](#).

This VI automatically detects if the data were saved as RGB or YUV data and then returns any comments that might have been linked to the signal when saved.



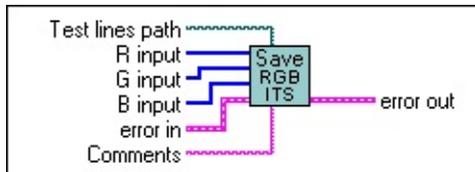
- Test lines path** is the file path for the ITS data file to be loaded.
- Line number** specifies the video line where the ITS signal is to be inserted.
- error in** is a cluster that describes the error status before this VI executes. If error in indicates that an error occurred before this VI was called, this VI may choose not to execute its function, but just pass the error through to its error out cluster. If no error has occurred, then this VI executes normally and sets its own corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.
- Comments** returns comments about the saved ITS signal. If no comments have been saved, this indicator will be empty.
- Y or R** is an array indicator that contains the data for the first ITS component. If the ITS component is YUV, the data represents the Y (luma) signal. If the ITS format is RGB, the data represents the R (red) signal.
- U, Q or G** is an array indicator that contains the data for the second ITS component. If the ITS format is YUV, the data represents the U (PAL), Db (SECAM), or Q (NTSC) signal. If the ITS format is RGB, the data represents the G (green) signal.
- V, I or B** is an array indicator that contains the data for the third ITS component. If the ITS format is YUV, the data represents the V (PAL, Dr (SECAM), or I (NTSC) signal. If the ITS format is RGB, the data represents the B (blue) signal.
- error out** is a cluster that describes the error status after this VI executes. If an error occurred before this VI was called, error out is the same as error in. Otherwise, error out shows the error, if any, that occurred in this VI. Use the error handler VIs to look up the error code and to display the corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.
- ITS format** returns the ITS format (either YUV or RGB) for the loaded test line.

NI 5431 Composite Video Generator

Save RGB Insertion Test Signal

This VI saves the three arrays (U16[]) that correspond to an RGB insertion test signal. Optional comments can be linked to the file.

The ITS signal can be reloaded and inserted to a video signal using [Download Insertion Test Signal](#).



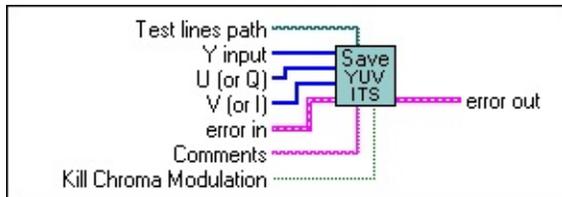
- Test lines path** is the file path for the ITS signal to be saved.
- [U16]** **R input** inputs the 16-bit (U16) data for the red channel of the ITS signal to be saved.
- [U16]** **G input** inputs the 16-bit (U16) data for the green channel of the ITS signal to be saved.
- [U16]** **B input** inputs the 16-bit (U16) data for the blue channel of the ITS signal to be saved.
- [Err]** **error in** is a cluster that describes the error status before this VI executes. If error in indicates that an error occurred before this VI was called, this VI may choose not to execute its function, but just pass the error through to its error out cluster. If no error has occurred, then this VI executes normally and sets its own corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.
- [abc]** **Comments** saves a maximum of 256 characters of text that will be saved in the same file as the ITS data. This text can be retrieved using a VI such as Download insertion test signal.
- [Err]** **error out** is a cluster that describes the error status after this VI executes. If an error occurred before this VI was called, error out is the same as error in. Otherwise, error out shows the error, if any, that occurred in this VI. Use the error handler VIs to look up the error code and to display the corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.

NI 5431 Composite Video Generator

Save YUV Insertion Test Signal

This VI saves the three arrays (U16[], I16[], and I16[]) that correspond to an YUV or YQI insertion test signal. Optional comments can be linked to the file.

The ITS signal can be reloaded and inserted to a video signal using [Download Insertion Test Signal](#).



- Test lines path** is the file path for the ITS signal to be saved.
- [U16]** **Y input** is an array that inputs the 16-bit (U16) data for the luma channel of the ITS signal to be saved.
- [U16]** **U (or Q)** inputs the 16-bit (I16) data for the V (PAL), I (NTSC), or Dr (SECAM) component of the ITS signal to be saved.
- [U16]** **V (or I)** inputs the 16-bit (I16) data for the V (PAL), I (NTSC), or Dr (SECAM) component of the ITS signal to be saved.
- [E-1]** **error in** is a cluster that describes the error status before this VI executes. If error in indicates that an error occurred before this VI was called, this VI may choose not to execute its function, but just pass the error through to its error out cluster. If no error has occurred, then this VI executes normally and sets its own corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.
- [abc]** **Comments** saves a maximum of 256 characters of text that will be saved in the same file as the ITS data. The text will be saved in the same file as the ITS data and can be retrieved using a VI such as Download Insertion Test Signal.
- [TF]** **Kill Chroma Modulation** can be used if the ITS data are to be used in a SECAM video data file. This control optionally disables (kills) the frequency modulation subcarrier that otherwise would always be present, even though the input array for Db and Dr are set to null.
- [E-1]** **error out** is a cluster that describes the error status after this VI executes. If an error occurred before this VI was called, error out is the same as error in. Otherwise, error out shows the error, if any, that occurred in this VI. Use the error handler VIs to look up the error code and to display the corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.

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Advanced Low-Level Driver VIs

You can access the advanced low level driver VIs by selecting **Functions»Video Generation»Low-Level Driver»Advanced**. Click the topics below for the VI descriptions.

Get 16-Bit Output VIs

[VDG_Get_I16_Line](#)

[VDG_Get_YC_I16_Line](#)

[VDG_Get_RGB_I16_Line](#)

Get SGL-Precision Output VIs

[VDG_GetSignalLine](#)

[VDG_Get_YC_Line](#)

Set Insertion Test Lines (ITS) VIs

[VDG_SetLineData](#)

[VDG_SetRGB48LineData](#)

[VDG_SetYUV48LineData](#)

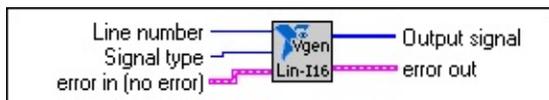
NI 5431 Composite Video Generator

VDG_Get_I16_Line

This advanced VI calculates the data of the selected video component for the specified video line. The output data are signed 16-bit (I16) values and the scaling follows the function:

$$\text{Output signal} = \text{Gain} \times \text{DataIRE} + \text{Offset}$$

DataIRE = value of the data in IRE Gain = value of the attribute **Output Gain** (Default = 250) Offset = value of the attribute **Output Offset** (Default = -4000)



- Line number** specifies the number for the video line to be calculated.
-  **Signal type** specifies the video component to be calculated. Use the up and down arrows on the **Signal type** control to select the video component. The signal types are listed below: **Composite**—the complete composite signal **Sync**—the Sync information only **Y**—the luma signal excluding the Sync information **Sync + Y**—the combined Sync and Luma information, which is the composite Luma signal **U or Q**—the U (PAL) or Q (NTSC) chroma component before modulation **V or I**—the V (PAL) or I (NTSC) chroma component before modulation **Modulation sine**—the modulation carrier for the U (PAL) or Q (NTSC) component **Modulation cosine**—the modulation carrier for the V (PAL) or I (NTSC) component.
-  **error in** is a cluster that describes the error status before this VI executes. If error in indicates that an error occurred before this VI was called, this VI may choose not to execute its function, but just pass the error through to its error out cluster. If no error has occurred, then this VI executes normally and sets its own corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.
-  **Output signal** returns the calculated component I16 data for the specified line.
-  **error out** is a cluster that describes the error status after this VI executes. If an error occurred before this VI was called, error out is the same as error in. Otherwise, error out shows the error, if any, that occurred in this VI. Use the error handler VIs to look up the error code and to display the corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.

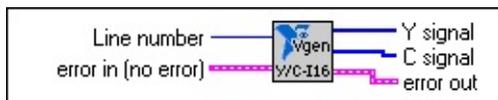
NI 5431 Composite Video Generator

VDG_Get_YC_I16_Line

This advanced VI calculates the data for the Y (Luma) and C (Chroma) components for the specified video line. The output data are signed 16-bit (I16) values, and the scaling follows the function:

$$\text{Output signal} = \text{Gain} \times \text{DataIRE} + \text{Offset}$$

DataIRE = value of the data in IRE Gain = value of the attribute **Output Gain** (Default = 250) Offset = value of the attribute **Output Offset** (Default = -4000)



- Line number** specifies the number for the video line to be calculated.
-  **error in** is a cluster that describes the error status before this VI executes. If error in indicates that an error occurred before this VI was called, this VI may choose not to execute its function, but just pass the error through to its error out cluster. If no error has occurred, then this VI executes normally and sets its own corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.
-  **Y signal** returns the calculated I16 composite luma (including the composite synchronization signal) data for the specified line.
-  **C signal** returns the calculated I16 chroma (including color burst) data for the specified line.
-  **error out** is a cluster that describes the error status after this VI executes. If an error occurred before this VI was called, error out is the same as error in. Otherwise, error out shows the error, if any, that occurred in this VI. Use the error handler VIs to look up the error code and to display the corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.

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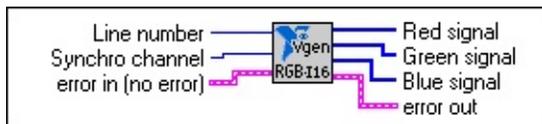
VDG_Get_RGB_I16_Line

This advanced VI calculates the data for the R, G, and B components of the specified video line. The composite synchronization signal can be applied to one of the R, G, or B channels.

The output data are signed 16 bit (I16) values and the scaling follows the function:

$$\text{Output signal} = \text{Gain} \times \text{DataIRE} + \text{Offset}$$

DataIRE = value of the data in IRE Gain = value of the attribute **Output Gain** (Default = 250) Offset = value of the attribute **Output Offset** (Default = -4000)



- Line number** specifies the number for the video line to be calculated.
-  **Synchro channel** specifies which channel will include the composite synchronization signal.
-  **error in** is a cluster that describes the error status before this VI executes. If error in indicates that an error occurred before this VI was called, this VI may choose not to execute its function, but just pass the error through to its error out cluster. If no error has occurred, then this VI executes normally and sets its own corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.
-  **Red signal** returns the calculated red I16 data for the specified line.
-  **Green signal** returns the calculated green I16 data for the specified line.
-  **Blue signal** returns the calculated blue I16 data for the specified line.
-  **error out** is a cluster that describes the error status after this VI executes. If an error occurred before this VI was called, error out is the same as error in. Otherwise, error out shows the error, if any, that occurred in this VI. Use the error handler VIs to look up the error code and to display the corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.

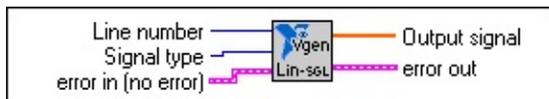
NI 5431 Composite Video Generator

VDG_GetSignalLine

This advanced VI calculates the data of the selected video component for the specified video line. The output data are single-precision (SGL) values and the scaling is in IRE format.



Note This VI can not be used directly with the NI 5431. Use this VI only if the 16-bit resolution offered by [VDG_Get_I16_Line](#) is not sufficient.



Line number specifies the number for the video line to be calculated.



Signal type specifies the video component to be calculated. Use the up and down arrows on the **Signal type** control to select one of the video components listed below:

Composite	the complete composite signal
Sync	the Sync information only
Y	the luma signal excluding the Sync information
Sync + Y	the combined Sync and Luma information, which is the composite Luma signal
U or Q	the U (PAL) or Q (NTSC) chroma component before modulation
V or I	the V(PAL) or I (NTSC) chroma component before modulation
Modulation sine	the modulation carrier for the U (PAL) or Q (NTSC) component
Modulation cosine	the modulation carrier for the V (PAL) or I (NTSC) component



error in is a cluster that describes the error status before this VI executes. If error in indicates that an error occurred before this VI was called, this VI may choose not to execute its function, but just pass the error through to its error out cluster. If no error has occurred, then this VI executes normally and sets its own corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.



Output signal returns the calculated component single precision data for the specified line.



error out is a cluster that describes the error status after this VI executes. If an error occurred before this VI was called, error out is the same as error in. Otherwise, error out shows the error, if any, that occurred in this VI. Use the error handler VIs to look up the error code and to display the corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify

execution order by wiring the error output from one subVI to the error input of the next.

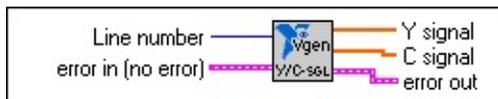
NI 5431 Composite Video Generator

VDG_Get_YC_Line

This advanced VI calculates the data for the Y (Luma) and C (Chroma) components for the specified video line. The output data are single precision (SGL) values and the scaling is in IRE.



Note This VI cannot be used directly with the NI 5431. Use this VI only if the 16-bit resolution offered by [VDG_Get_YC_I16_Line](#) is not sufficient.



Line number specifies the number for the video line to be calculated.



error in is a cluster that describes the error status before this VI executes. If error in indicates that an error occurred before this VI was called, this VI may choose not to execute its function, but just pass the error through to its error out cluster. If no error has occurred, then this VI executes normally and sets its own corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.



Y signal returns the calculated single-precision (SGL) composite luma (Sync + Luma) data for the specified line.



C signal returns the calculated single-precision (SGL) chroma data for the specified line.



error out is a cluster that describes the error status after this VI executes. If an error occurred before this VI was called, error out is the same as error in. Otherwise, error out shows the error, if any, that occurred in this VI. Use the error handler VIs to look up the error code and to display the corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.

NI 5431 Composite Video Generator

VDG_SetLineData

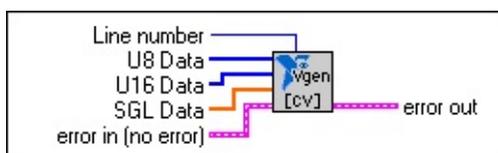
This advanced VI inserts an input array with luma data into the active part of a specific video line. The input data can be either 8-bit unsigned (U8), 16-bit unsigned (U16) or single-precision (SGL) values. The scaling of the input data depends on the data type.

- For U8 input format, 0 corresponds to the setup level (black), while 255 corresponds to 100 IRE (white).
- The scaling for 16-bit input data is controlled by the 2 attributes **Input gain** (Default = 100 IRE/65536) and **Input offset** (Default = 0). By default, input value 0 corresponds to the setup level (black level), while 65535 corresponds to 100 IRE (white level).
- For SGL input format, the data will be represented directly in IRE.

The data correspond to the test signal sampled at the rate returned by the attribute **Sampling frequency (MHz)**. The length of each array should correspond to the active part of the video line (value returned by the attribute **Image duration (us)**), so the number of elements in each array should be:

$$\text{Size} = \text{Round} [\text{Sampling frequency (MHz)} \times \text{Image duration (us)}]$$

Default sizes: M-NTSC = 1044
B-PAL = 1040
M-PAL = 1042



- Line number** specifies the video line where the insertion test signal data is to be inserted.
- U8 Data** inputs the insertion test signal data to the video line defined by the **Line number** control.
- U16 Data** inputs the insertion test signal data to the video line defined by the **Line number** control.
- SGL Data** inputs the insertion test signal data to the video line defined by the **Line number** control.
- error in** is a cluster that describes the error status before this VI executes. If error in indicates that an error occurred before this VI was called, this VI may choose not to execute its function, but just pass the error through to its error out cluster. If no error has occurred, then this VI executes normally and sets its own corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.
- error out** is a cluster that describes the error status after this VI executes. If an error occurred before this VI was called, error out is the same as error in. Otherwise, error out shows the error, if any, that occurred

in this VI. Use the error handler VIs to look up the error code and to display the corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.

NI 5431 Composite Video Generator

VDG_SetRGB48LineData

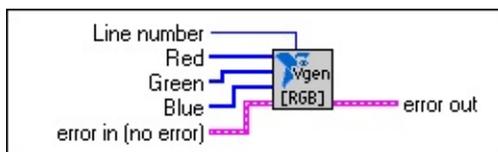
This advanced VI is used to insert an RGB test signal into the active part of a specified video line. The data correspond to the test signal sampled at the rate returned by the attribute **Sampling frequency (MHz)**. The length of each array should correspond to the active part of the video line (value returned by the attribute **Image duration (us)**), so the number of elements in each array should be as follows:

$$\text{Size} = \text{Round} [\text{Sampling frequency (MHz)} \times \text{Image duration (us)}]$$

Default sizes: M-NTSC = 1044
B-PAL = 1040
M-PAL = 1042



Note The scaling of the input RGB data is controlled by the 2 attributes **Input gain** (default = 100 IRE/65536) and **Input offset** (default = 0). By default, input value 0 corresponds to the setup level (black level), while 65535 corresponds to 100 IRE (white level).



I32

Line number specifies the video line where the insertion test signal data is to be inserted.

U16

Red inputs the insertion test signal data for the red channel to the video line defined by the **Line number** control.

U16

Green inputs the insertion test signal data for the green channel to the video line defined by the **Line number** control.

U16

Blue inputs the insertion test signal data for the blue channel to the video line defined by the **Line number** control.

E7H

error in is a cluster that describes the error status before this VI executes. If error in indicates that an error occurred before this VI was called, this VI may choose not to execute its function, but just pass the error through to its error out cluster. If no error has occurred, then this VI executes normally and sets its own corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.

E7H

error out is a cluster that describes the error status after this VI executes. If an error occurred before this VI was called, error out is the same as error in. Otherwise, error out shows the error, if any, that occurred in this VI. Use the error handler VIs to look up the error code and to display the corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.

NI 5431 Composite Video Generator

VDG_SetYUV48LineData

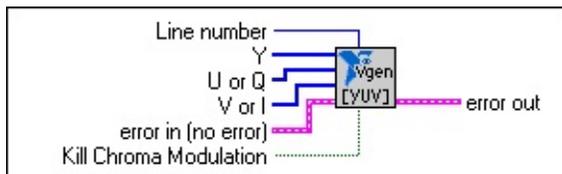
This advanced VI inserts a YUV or YQI (depending on the selected video format) test signal into the active part of a specified video line. The data correspond to the test signal sampled at the rate returned by the attribute **Sampling frequency (MHz)**. The length of each array should correspond to the active part of the video line (value returned by the attribute **Image duration (us)**), so the number of elements in each array should be:

$$\text{Size} = \text{Round} [\text{Sampling frequency (MHz)} \times \text{Image duration (us)}]$$

Default sizes: M-NTSC = 1044
B-PAL = 1040
M-PAL = 1042



Note The scaling of the input YUV/YQI data is controlled by the two attributes **Input gain** (default = 100 IRE/65536) and **Input offset** (default = 0). Using the default values, the Y signal (format U16) will cover the range between the setup level (black) and 100 IRE (white level), while the two chroma components U&V or Q&I (format I16) will cover the range [-50, +50 IRE].



- Line number** specifies the video line where the insertion test signal data is to be inserted.
- [U16]** **Y** inputs the insertion test signal data for the luma component (Y) to the video line defined by the **Line number** control.
- U or Q** inputs the insertion test signal data for the first chroma component (U for PAL, Q for NTSC, or Db for SECAM) to the video line defined by the **Line number** control.
- V or I** inputs the insertion test signal data for the second chroma component (V for PAL, I for NTSC, or Dr for SECAM) to the video line defined by the **Line number** control.
- [E3H]** **error in** is a cluster that describes the error status before this VI executes. If error in indicates that an error occurred before this VI was called, this VI may choose not to execute its function, but just pass the error through to its error out cluster. If no error has occurred, then this VI executes normally and sets its own corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.
- Kill Chroma Modulation** disables (kills) the frequency modulation subcarrier in SECAM mode that otherwise would be present on a test line, even though the U (Db) and V (Dr) components are null.
- [E3H]** **error out** is a cluster that describes the error status after this VI executes. If an error occurred before this VI was called, error out is the same as error in. Otherwise, error out shows the error, if any, that occurred in this VI. Use the error handler VIs to look up the error code and to display the corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.

NI 5431 Composite Video Generator

High-Level Driver VIs

The high-level driver VIs use many of the low-level driver VIs in their block diagram. These VIs calculate, download, save, initialize, configure, and setup attributes for the video data.

You can access the high-level driver VIs by selecting **Functions»Video Generation»High-Level Driver**. Click topics below to learn more about these examples and VIs.

[HL Initialize](#)

[HL Setup Attribute](#)

[HL Download Video Data from File](#)

[HL Configure Sequencer](#)

[HL Calculate and Download Video Data](#)

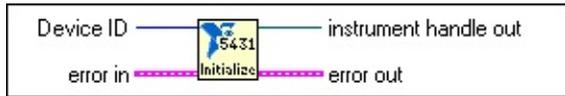
[HL Calculate and Save Video Data](#)

[HL Calculate and Save S-Video Data](#)

NI 5431 Composite Video Generator

HL Initialize

This high-level VI initializes the NI 5431 module. The example [Basic Create Composite Signal from BMP Image](#) shows how to correctly use this VI.



Device ID is where you input the device number assigned in MAX for your NI 5431.



error in is a cluster that describes the error status before this VI executes. If error in indicates that an error occurred before this VI was called, this VI may choose not to execute its function, but just pass the error through to its error out cluster. If no error has occurred, then this VI executes normally and sets its own corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.



instrument handle out is the VISession handle that you get from the NI-FGEN Initiate or Initiate With Options VIs. The handle identifies a particular instrument session.

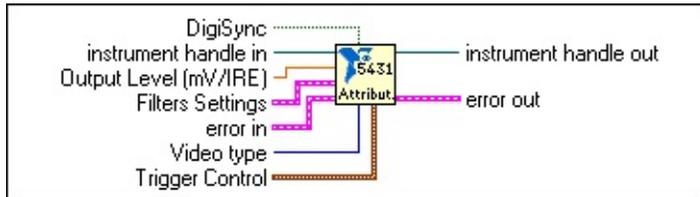


error out is a cluster that describes the error status after this VI executes. If an error occurred before this VI was called, error out is the same as error in. Otherwise, error out shows the error, if any, that occurred in this VI. Use the error handler VIs to look up the error code and to display the corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.

NI 5431 Composite Video Generator

HL Setup Attribute

This high-level VI sets the attributes that control the main generation parameters such as video type, output level, and trigger conditions.



TF **DigiSync** enables the digital data output of the NI 5431 module. Note that digital synchronization bits only will be generated if you also have enabled for the calculation. Refer to [HL Calculate and Download Video Data](#) or [HL Calculate and Save Video Data](#).

D **instrument handle in** is the VIsession handle that you get from the NI-FGEN Initiate or Initiate With Options VIs. The handle identifies a particular instrument session.

DBL **Output level (mV/IRE)** specifies the output level of the generated video signal. (Default = 7.000 mV/IRE).

FFH **Filter Settings** enables both the analog and the digital (interpolation) filters of the NI 5431 module. For generation of video data, it is recommended to always enable these filters.

analog filter enable = ON (default)

digital filter enable = ON (default)

FFH **error in** is a cluster that describes the error status before this VI executes. If error in indicates that an error occurred before this VI was called, this VI may choose not to execute its function, but just pass the error through to its error out cluster. If no error has occurred, then this VI executes normally and sets its own corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.

DD **Video type** selects the video format to be generated. Use the up and down arrows to select the video format. The formats are listed below:

M-NTSC Standard NTSC format as used in countries such as the US or Japan

Standard PAL including B/G/H and I type as used in most of Europe

M-PAL as used in Brazil

N-PAL as used in Argentina

Combination N-PAL as used in parts of South America

SECAM as used in countries such as France

M-NTSC (2) a different version of M-NTSC with no color burst in the vertical blanking interval



Trigger Control

trigger source (Default = Immediate)

- Immediate
- External
- Software
- GPIB Get
- TTL0
- TTL1
- TTL2
- TTL3
- TTL4
- TTL5
- TTL6
- TTL7
- ECL0
- ECL1
- PXI Star
- RTSI 0-6

trigger mode (Default = Continuous)

- Continuous
- Stepped
- Burst
- Single



instrument handle out is the VISession handle that you get from the NI-FGEN Initiate or Initiate With Options VIs. The handle identifies a particular instrument session.

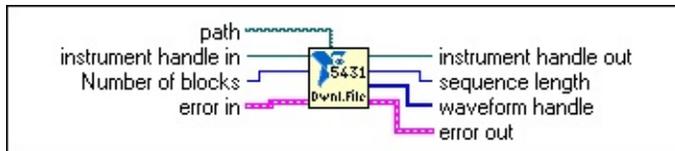


error out is a cluster that describes the error status after this VI executes. If an error occurred before this VI was called, error out is the same as error in. Otherwise, error out shows the error, if any, that occurred in this VI. Use the error handler VIs to look up the error code and to display the corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.

NI 5431 Composite Video Generator

HL Download Video Data from File

This high-level VI loads binary composite video data saved in the file defined by the path control and downloads these data to the NI 5431. It also exports the sequence information needed by [HL Configure Sequencer](#). The example [Download Video File to NI 5431](#) shows how to correctly use this VI.



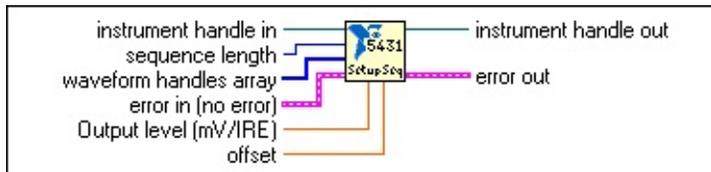
- path** specifies the file path for the data to be downloaded.
-  **instrument handle in** is the VISession handle that you get from the NI-FGEN Initiate or Initiate With Options VIs. The handle identifies a particular instrument session.
-  **Number of blocks**—due to the large size of a typical video file, the downloading process can be split in a number of consecutive blocks. The recommended number of blocks depends on the video format and is suggested to be:

M-NTSC	10
Standard PAL	20
M-PAL	15
N-PAL	20
Combination N-PAL	20
SECAM	30
M-NTSC (2)	10
-  **error in** is a cluster that describes the error status before this VI executes. If error in indicates that an error occurred before this VI was called, this VI may choose not to execute its function, but just pass the error through to its error out cluster. If no error has occurred, then this VI executes normally and sets its own corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.
-  **instrument handle out** is the VISession handle that you get from the NI-FGEN Initiate or Initiate With Options VIs. The handle identifies a particular instrument session.
-  **sequence length** is an output that should be connected to the corresponding input of [HL Configure Sequencer](#).
-  **waveform handles array** is an output that should be connected to the corresponding input of the HL Configure Sequencer VI.
-  **error out** is a cluster that describes the error status after this VI executes. If an error occurred before this VI was called, error out is the same as error in. Otherwise, error out shows the error, if any, that occurred in this VI. Use the error handler VIs to look up the error code and to display the corresponding error

message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.

NI 5431 Composite Video Generator HL Configure Sequencer

This high-level VI configures the NI 5431 sequencer, which is the play-list that will create the correct video signal generation. The example [Basic Create Composite Signal from BMP Image](#) shows how to correctly use this VI.



instrument handle in is the VISession handle that you get from the NI-FGEN Initiate or Initiate With Options VIs. The handle identifies a particular instrument session.



sequence length is used for single frame generation. Connect this input to the corresponding output of a VI such as [HL Calculate and Download Video Data](#).



waveform handles array is used for single frame generation. Connect this input to the corresponding output of a VI such as [HL Calculate and Download Video Data](#).



error in is a cluster that describes the error status before this VI executes. If error in indicates that an error occurred before this VI was called, this VI may choose not to execute its function, but just pass the error through to its error out cluster. If no error has occurred, then this VI executes normally and sets its own corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.



Output level (mV/IRE) specifies the output level of the generated video signal. (Default = 7.000 mV/IRE).



Offset specifies the offset of the generated video signal. (Default = 0.112 V results in 0 V output at the blanking level of the video signal).



instrument handle out is the VISession handle that you get from the NI-FGEN Initiate or Initiate With Options VIs. The handle identifies a particular instrument session.

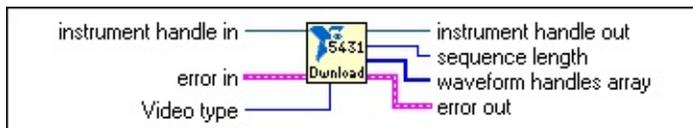


error out is a cluster that describes the error status after this VI executes. If an error occurred before this VI was called, error out is the same as error in. Otherwise, error out shows the error, if any, that occurred in this VI. Use the error handler VIs to look up the error code and to display the corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.

NI 5431 Composite Video Generator

HL Calculate and Download Video Data

This high-level VI calculates all the video lines corresponding to a specified video format in block mode and downloads the data to the NI 5431. It also exports the sequence information needed by [HL Configure Sequencer](#). The example [Basic Create Composite Signal from BMP Image](#) shows how to correctly use this VI.



instrument handle in is the ViSession handle that you get from the NI-FGEN Initiate or Initiate With Options VIs. The handle identifies a particular instrument session.



error in is a cluster that describes the error status before this VI executes. If error in indicates that an error occurred before this VI was called, this VI may choose not to execute its function, but just pass the error through to its error out cluster. If no error has occurred, then this VI executes normally and sets its own corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.



Video type selects the video format to be used. Use the up and down arrows to select the video format. The formats are listed below:

M-NTSC	Standard NTSC format as used in countries such as the US or Japan
Standard PAL	including B/G/H and I type as used in most of Europe
M-PAL	as used in Brazil
N-PAL	as used in Argentina
Combination N-PAL	as used in parts of South America
SECAM	as used in countries such as France
M-NTSC (2)	a different version of M-NTSC with no color burst in the vertical blanking interval



Digital sync enables the insertion of the four synchronization bits in the four lsb's of the I16 binary data of the composite signal.



Instrument handle out is the ViSession handle that you get from the NI-FGEN Initiate or Initiate With Options VIs. The handle identifies a particular instrument session.



sequence length is the output that should be connected to the corresponding input of [HL Configure Sequencer](#).

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Waveform handles array is the output that should be connected to the corresponding input of the HL Configure Sequencer VI.

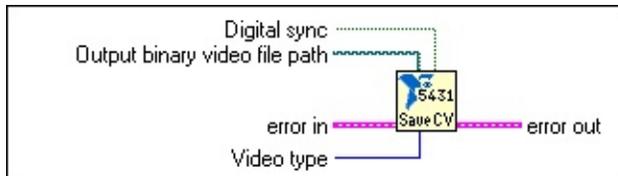
[E+]

error out is a cluster that describes the error status after this VI executes. If an error occurred before this VI was called, error out is the same as error in. Otherwise, error out shows the error, if any, that occurred in this VI. Use the error handler VIs to look up the error code and to display the corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.

NI 5431 Composite Video Generator

HL Calculate and Save Video Data

This high-level VI calculates all the video lines corresponding to a specified video format in block mode and saves the composite video data in a binary file (I16) defined by the file path control. The example [Basic Create Video File from BMP Image and Save](#) shows how to correctly use this VI.



TF **Digital sync** enables the insertion of the four synchronization bits in the four lsb's of the I16 binary data file of the composite signal.

Output binary video file path is the file path for the output binary video data file to be saved.

ET **error in** is a cluster that describes the error status before this VI executes. If error in indicates that an error occurred before this VI was called, this VI may choose not to execute its function, but just pass the error through to its error out cluster. If no error has occurred, then this VI executes normally and sets its own corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.

LD **Video type** selects the video format to be used. Use the up and down arrows to select video format. The formats are listed below:

M-NTSC Standard NTSC format as used in countries such as the US or Japan

Standard PAL including B/G/H and I type as used in most of Europe

M-PAL as used in Brazil

N-PAL as used in Argentina

Combination N-PAL as used in parts of South America

SECAM as used in countries such as France

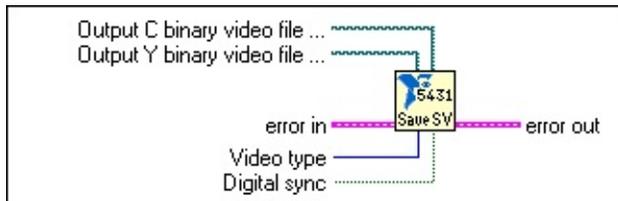
M-NTSC (2) a different version of M-NTSC with no color burst in the vertical blanking interval

ET **error out** is a cluster that describes the error status after this VI executes. If an error occurred before this VI was called, error out is the same as error in. Otherwise, error out shows the error, if any, that occurred in this VI. Use the error handler VIs to look up the error code and to display the corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.

NI 5431 Composite Video Generator

HL Calculate and Save S-Video Data

This high-level VI calculates all the video lines corresponding to a specified S-Video format and saves the data in 2 binary files (I16) defined by the Y and C file paths.



- Output C binary video file** is the file path for the Output C binary video file to be saved.
- Output Y binary video file** is the file path for the Output Y binary video file to be saved.
-  **error in** is a cluster that describes the error status before this VI executes. If error in indicates that an error occurred before this VI was called, this VI may choose not to execute its function, but just pass the error through to its error out cluster. If no error has occurred, then this VI executes normally and sets its own corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.
-  **Video type** selects the video format to be used. Use the up and down arrows to select the video format. The formats are listed below:

M-NTSC	Standard NTSC format as used in countries such as the US or Japan
Standard PAL	including B/G/H and I type as used in most of Europe
M-PAL	as used in Brazil
N-PAL	as used in Argentina
Combination N-PAL	as used in parts of South America
SECAM	as used in countries such as France
M-NTSC (2)	a different version of M-NTSC with no color burst in the vertical blanking interval
-  **Digital sync** enables the insertion of the 4 synchronization bits in the 4 lsb of the I16 binary data file of the Y signal.
-  **error out** is a cluster that describes the error status after this VI executes. If an error occurred before this VI was called, error out is the same as error in. Otherwise, error out shows the error, if any, that occurred in this VI. Use the error handler VIs to look up the error code and to display the corresponding error message. Using error in and error out clusters is a convenient way to check errors and to specify

execution order by wiring the error output from one subVI to the error input of the next.

NI 5431 Composite Video Generator IMAQ Vision VIs

These IMAQ Vision VIs are used with the video generator VIs to start the generation of video signals. Click the topics below for the VI descriptions.

[IMAQ Create](#)

[IMAQ Dispose](#)

[IMAQ GetPalette](#)

[IMAQ ArrayToImage](#)

[IMAQ ImageToArray](#)

[IMAQ ReadFile](#)

[IMAQ WriteFile](#)

[IMAQ WindDraw](#)

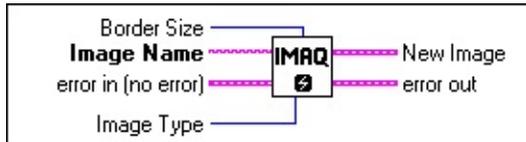
[IMAQ VI Error Clusters](#)

NI 5431 Composite Video Generator

IMAQ Create

Creates an image.

8 16 F C R_{Q_B} R_{S_L}

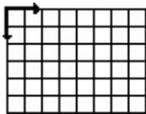


Note Use IMAQ Create in conjunction with [IMAQ Dispose](#) to create/dispose of IMAQ Vision images in LabVIEW.

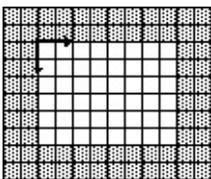
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Border Size determines the width, in pixels, of the border to create around an image. These pixels are used only for specific VIs. Create a border at the beginning of your application if an image is to be processed later using functions that require a border (for example, labeling and morphology). The default border value is 3. With a border of three pixels, you can use kernels up to 7×7 with no change. If you plan to use kernels larger than 7×7 in your process, specify a larger border when creating your image.

The following graphic illustrates an 8×6 image with a border equal to 0.



In the following 8×6 image, the border equals 2, allowing the use of kernels up to 5×5 .



Note The border of an image is taken into account only when the image is processed. It is never displayed or stored to a file.

abc

Image Name is the name associated with the created image. Each image created must have a unique name.

err

error in (no error) is a cluster that describes the error status before this VI executes. Refer to [IMAQ VI Error Clusters](#) for more information about this indicator.

img

Image Type specifies the image type. This input can accept the following values:

8

8 bits 8 bits per pixel (unsigned, standard monochrome)

16

16 bits 16 bits per pixel (signed)

F

float 32 bits (floating point) per pixel

C

complex 2×32 bits (floating point) per pixel (native format after an FFT)



RGB 32 bits per pixel (RGB, color)



HSL 32 bits per pixel (HSL, color)



New Image is the **Image** structure that is supplied as input to all subsequent (downstream) functions used by IMAQ Vision. Multiple images can be created in a LabVIEW application.



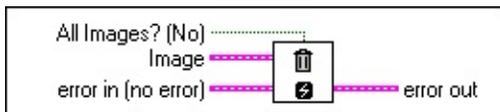
error out is a cluster that describes the error status after this VI executes. Refer to [IMAQ VI Error Clusters](#) for more information about this indicator.

NI 5431 Composite Video Generator

IMAQ Dispose

Destroys an image and frees the space it occupied in memory. This VI is required for each image created in an application to free the memory allocated to [IMAQ Create](#). Execute IMAQ Dispose only when the image is no longer needed in your application. You can use IMAQ Dispose for each call to IMAQ Create or just once for all images created with IMAQ Create.

8 16 F C $H_{0_{8}}$ $H_{8_{1}}$



TF **All Images? (No)** specifies whether to destroy a single image or all previously created images. Giving a TRUE value on input destroys all images previously created. The default is FALSE. Be sure to use this function at the end of an application to free the memory occupied by the images.

FI **Image** specifies the image to destroy.

FI **error in (no error)** is a cluster that describes the error status before this VI executes. Refer to [IMAQ VI Error Clusters](#) for more information about this indicator.

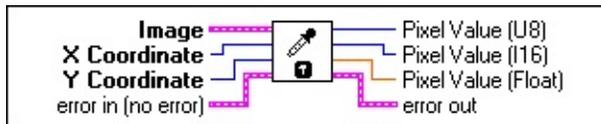
FI **error out** is a cluster that describes the error status after this VI executes. Refer to [IMAQ VI Error Clusters](#) for more information about this indicator.

 **Note** When a LabVIEW application is aborted, the image space remains occupied.

NI 5431 Composite Video Generator

IMAQ GetPalette

Selects a display palette. Five predefined palettes are available. To activate a color palette choose a code for **Palette Number** and connect the **Color Palette** output to the input **Color Palette** of IMAQ WindDraw.



 **Palette Number (gray)** gives you a choice of five predefined palettes. You can choose from the following values:

Gray Grayscale is the default palette. The color tables are all identical.

Binary Binary palette is designed especially for binary images.

Gradient Gradient palette

Rainbow Rainbow palette

Temperature Temperature palette

 **error in (no error)** is a cluster that describes the error status before this VI executes. Refer to [IMAQ VI Error Clusters](#) for more information about this indicator.

 **Color Palette** indicates an array of clusters composed of 256 elements for each of the three color planes. A specific color is the result of applying a value between 0 and 255 for each of the three color planes (red, green, and blue). If the three planes have the identical value, a gray level is obtained (0 specifies black and 255 specifies white). This output is to be directly connected to the input **Color Palette** of IMAQ WindDraw.

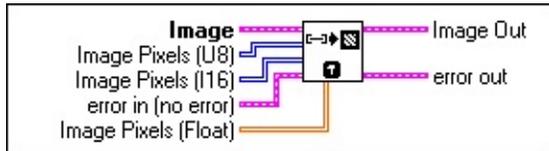
 **error out** is a cluster that describes the error status after this VI executes. Refer to [IMAQ VI Error Clusters](#) for more information about this indicator.

NI 5431 Composite Video Generator

IMAQ ArrayToImage

Creates an image from a 2D array.

8 16 F



Note Each **Image Pixels** input is specific for a particular type of data.



Image is the reference to the source (input) image.



Image Pixels (U8) is a 2D array containing all the pixel values that form the image. The first index corresponds to the vertical axis and the second to the horizontal index. The final size of the image is equal to the size of the array. The image passed in the input image is forced to the same size as the array encoded by **Image Pixels**. Use this input only to create an 8-bit image.



Image Pixels (I16) is a 2D array of 16-bit integers. This input is required if the image connected is a 16-bit image. Use this input only to create a 16-bit signed image.



error in (no error) is a cluster that describes the error status before this VI executes. Refer to [IMAQ VI Error Clusters](#) for more information about this indicator.



Image Pixels (Float) is a 2D array of floating-point values. This input is required if the image connected is a floating-point image. Use this input only to create floating-point images.



Image Out is the reference to the destination (output) image.



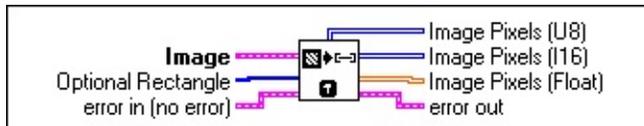
error out is a cluster that describes the error status after this VI executes. Refer to [IMAQ VI Error Clusters](#) for more information about this indicator.

NI 5431 Composite Video Generator

IMAQ ImageToArray

Extracts (copies) the pixels from an image, or part of an image, into a LabVIEW 2D array. This array is encoded in 8 bits, 16 bits, or floating point, as determined by the type of input image.

8 16 F



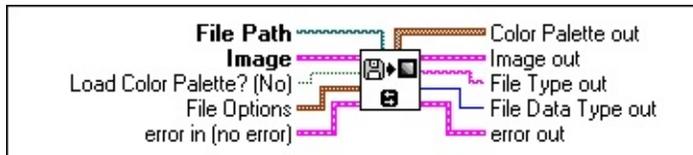
- Image** is the reference to the source (input) image.
- Optional Rectangle** defines a four-element array that contains the coordinates (Left/Top/Right/Bottom) of the region to extract. The operation applies to the entire image if the input is empty or not connected.
- error in (no error)** is a cluster that describes the error status before this VI executes. Refer to [IMAQ VI Error Clusters](#) for more information about this indicator.
- Image Pixels (U8)** returns the extracted pixel values into a 2D array. This output is used only for an 8-bit image.
- Image Pixels (I16)** returns the extracted pixel values into a 2D array. This output is used only for a 16-bit image.
- Image Pixels (Float)** returns the extracted pixel values into a 2D array. This output is used only for a 32-bit floating-point image.
- error out** is a cluster that describes the error status after this VI executes. Refer to [IMAQ VI Error Clusters](#) for more information about this indicator.

NI 5431 Composite Video Generator

IMAQ ReadFile

Reads an image file. The file format can be a standard format (BMP, TIFF, JPEG, PNG, and AIPD) or a nonstandard format known to the user. In all cases, the read pixels are converted automatically into the image type passed by **Image**.

8 16 F C $H_{0..3}$ $H_{5..7}$



File Path is the complete path name, including drive, directory, and filename, for the file to be loaded.



Image is the reference to the image structure to which the data from the image file is applied.



Load Color Palette? (No) determines whether to load the color table present in the file (if it exists). If loaded, this table is read and made available to the output **Color Palette**. The default is FALSE.



File Options is a cluster of user-optional values that you can use to read nonstandard file formats. The file structure must be known to the user. This cluster consists of the following elements:



Read Raw File indicates whether the file to be read has a nonstandard file format. If so, the remaining options in this cluster describe how to read the data.



File Data Type indicates how the image file is encoded.



Offset to Data specifies the size, in bytes, of the file header. This part of the file is not taken into account when read. The pixel values are read from the byte immediately after the offset size. The default is 0.



Use Min Max determines if the user is using a predetermined minimum and maximum. The technique to determine this minimum and maximum depends on the following input values:

- 0 Don't use min max** Minimum and maximum are dependent on the type of image. For an 8-bit image, min = 0 and max = 255.
- 1 Use file values** Pixel values from the file are scanned one time to determine the minimum and maximum, and a linear interpolation is performed before loading the image.
- 2 Use optional** Uses the two optional values described below.

values

 **Optional Min Value** is the minimum value of the pixels if **Use Min Max** is selected in mode 2 (**Use optional values**). In this case, pixels with a smaller value are altered to match the chosen minimum. The default is 0.

 **Optional Max Value** is the maximum value of the pixels if **Use Min Max** was selected in mode 2 (**Use optional values**). In this case, pixels with a greater value are truncated to match the chosen maximum. The default is 255.

 **Byte Order** determines if the byte weight is to be swapped (Intel or Motorola). The default is FALSE, which specifies big endian (Motorola). TRUE specifies little endian (Intel). This input is useful only if the pixels are encoded with more than 8 bits.

 **error in (no error)** is a cluster that describes the error status before this VI executes. Refer to [IMAQ VI Error Clusters](#) for more information about this indicator.

 **Color Palette out** contains the RGB color table (if the file has one) read from the file when you pass the value TRUE for the input **Load Color Palette? (No)**.

 **Image out** is the reference to the image structure containing the data read from the image file.

 **File Type out** indicates the file type that is read. This string returns an identifier of the file format, which can be BMP, TIFF, JPEG, PNG, or AIPD (internal file format). **File Type** returns xxx if the file format is unknown.

 **File Data Type out** indicates the pixel size defined in the header for standard image file types. **File Options** are not necessary for reading standard image files. For other types of image files, the returned values are passed from **File Options/File Data Type**.

 **error out** is a cluster that describes the error status after this VI executes. Refer to [IMAQ VI Error Clusters](#) for more information about this indicator.

NI 5431 Composite Video Generator

IMAQ WriteFile

Writes an image to a file.

8 16 F C R_{G_B} R_{S_L}



Color Palette is used to apply colors to a monochrome image. **Color Palette** is an array of clusters constructed by the user or supplied by [IMAQ GetPalette](#). This palette is composed of 256 elements for each of the three color planes. A specific color is the result of applying a value between 0 and 255 for each of the three color planes (red, green, and blue). If the three planes have the identical value, a gray level is obtained (0 specifies black and 255 specifies white). If the image type requires a color palette and it is not supplied, a grayscale color palette is generated and written.



Image is the reference to the image structure to be written to an image file.



File Type describes the file type to be written. The default file type is **BMP**. Other file types supported are **AIPD**, **TIFF**, **JPEG**, and **PNG**.



error in (no error) is a cluster that describes the error status before this VI executes. Refer to [IMAQ VI Error Clusters](#) for more information about this indicator.



File Path is the complete path name, including drive, directory, and filename, of the file to be written. This path can be supplied by either the user or the VI **File Dialog** from LabVIEW.



error out is a cluster that describes the error status after this VI executes. Refer to [IMAQ VI Error Clusters](#) for more information about this indicator.

The following table indicates the image types that each image file format supports.

File Type Image Types Supported

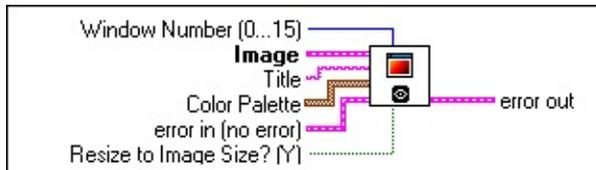
BMP	8 R_{G_B}
JPEG	8 R_{G_B}
PNG	8 16 R_{G_B}
TIFF	8 16 R_{G_B}
AIPD	8 16 F C R_{G_B} R_{S_L}

NI 5431 Composite Video Generator

IMAQ WindDraw

Displays an image in an image window. The image window appears automatically when the VI is executed. Note that the default image window does not have scrollbars. You can add scrollbars by using the IMAQ WindSize VI.

8 16 F C $H_{0..15}$ $H_{s..l}$



I32 **Window Number (0...15)** specifies the image window in which the image is displayed. As many as 16 windows can be displayed simultaneously. Each window is specified with an indicator ranging from 0 to 15. Only the specified image window is affected, and all other image windows remain the same. The default value is 0.

F11 **Image** specifies the image reference for the displayed image.



Note Floating-point and 16-bit images are displayed by scaling the data to 8 bits, calculated as a function of the dynamic range from the image source. The minimum value (min) and the maximum value (max) are calculated automatically. Then the following formula is applied to each pixel: $Display(x, y) = (Src(x, y) - min) \times 255 / (max - min)$

Title is an image window name. When a string is attached to this input, the image window automatically takes that name.

E01 **Color Palette** is used to apply a color palette to an image window. **Color Palette** is an array of clusters constructed by the user or supplied by IMAQ GetPalette. This palette is composed of 256 elements for each of the three color planes. A specific color is the result of applying a value between 0 and 255 for each of the three color planes (red, green, and blue). If the three planes have the identical value, a gray level is obtained (0 specifies black and 255 specifies white). The color palette can be used only for 8-bit images.



Note For best results, set your video adapter to high color or true color.

F11 **error in (no error)** is a cluster that describes the error status before this VI executes. Refer to [IMAQ VI Error Clusters](#) for more information about this indicator.

TF **Resize to Image Size? (Y)** specifies whether the user wants to resize the image window automatically to fit the image size. The default is TRUE (yes), in which case the user does not have to know the size of a source image before displaying it.

F11 **error out** is a cluster that describes the error status after this VI executes. Refer to [IMAQ VI Error Clusters](#) for more information about this indicator.

NI 5431 Composite Video Generator

IMAQ VI Error Clusters

IMAQ Vision VIs use a standard control and indicator (**error in** and **error out**) to notify you that an error has occurred.

 **error in (no error)** is a cluster that describes the error status before the VI executes. If **error in** indicates that an error occurred before the VI was called, the VI might choose not to execute its function but just pass the error through to its **error out** cluster. If no error has occurred, the VI executes normally and sets its own error status in **error out**. Use the Error Handler VIs to look up the error code and to display the corresponding error message. Using **error in** and **error out** clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.

 **status** is TRUE if an error occurred before the VI was called or FALSE if not. If **status** is TRUE, **code** is a nonzero error code. If **status** is FALSE, **code** can be 0 or a warning code.

 **code** is the number identifying an error or warning. If **status** is TRUE, **code** is a nonzero error code. If **status** is FALSE, **code** can be 0 or a warning code. Use the Error Handler VIs to look up the meaning of this code and to display the corresponding error message.

source is a string that indicates the origin of the error, if any. Usually, **source** is the name of the VI in which the error occurred.

 **error out** is a cluster that describes the error status after the VI executes. If an error occurred before the VI was called, **error out** is the same as **error in**. Otherwise, **error out** shows the error, if any, that occurred in the VI. Use the Error Handler VIs to look up the error code and to display the corresponding error message. Using **error in** and **error out** clusters is a convenient way to check errors and to specify execution order by wiring the error output from one subVI to the error input of the next.

 **status** is TRUE if an error occurred or FALSE if not. If **status** is TRUE, **code** is a nonzero error code. If **status** is FALSE, **code** can be 0 or a warning code.

 **code** is the number identifying an error or warning. If **status** is TRUE, **code** is a nonzero error code. If **status** is FALSE, **code** can be 0 or a warning code. Use the Error Handler VIs to look up the meaning of this code and to display the corresponding error message.

source is a string that indicates the origin of the error, if any. Usually, **source** is the name of the VI in which the error occurred.

NI 5431 Composite Video Generator Attribute List

The following table lists and describes the LabVIEW attributes and their default values based on the standard video type.

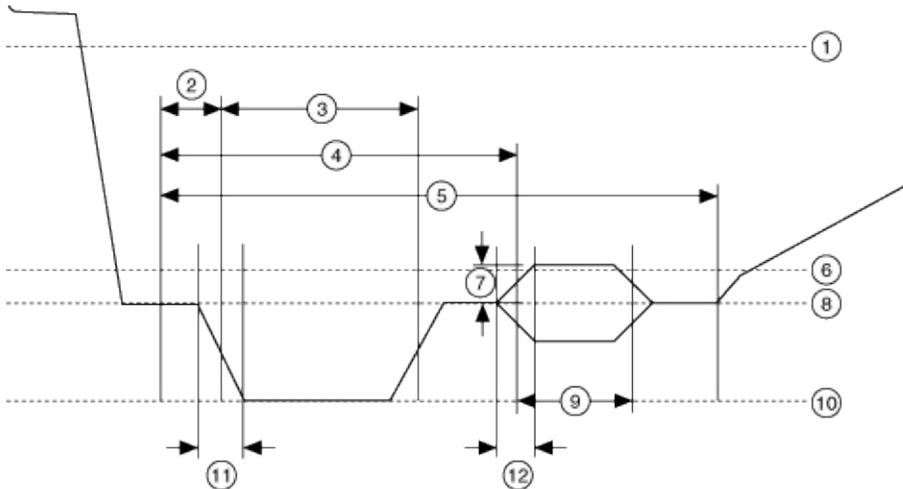
Attribute List

Attribute Name	Value	Description	Unit	Default Value
SYNC_AMPLITUDE (IRE)	double*	Level of the synchronization pulses. The sync level is negative. A positive value is inverted by the software.	IRE	NTSC: -40 SECAM: -40 Std PAL: -43 M-PAL: -40 N-PAL: -40 Comb N-PAL: -43
ZERO_LEVEL (IRE)	double*	Level of zero or blanking.	IRE	0
SETUP_LEVEL (IRE)	double*	Level of black. The value indicates the setup level, that is the difference between blanking and black.	IRE	NTSC: 7.5 Std PAL: 0.0 SECAM: 0.0 M-PAL: 7.5 N-PAL: 7.5 Comb N-PAL: 0
WHITE_LEVEL (IRE)	double*	Level of white.	IRE	100.00
SAMPLING_FREQUENCY (Hz)	double*	Sampling frequency of the generator.	Hz	NTSC: 20.013986 M-PAL: 20.013986 others:20.000000
SAMPLES_PER_LINE	int	Number of samples in a video line.	sample	NTSC: 1272 M-PAL: 1272 others:1280
REFERENCE_LINE	int	Number of the line that starts at the vertical sync edge.	line	NTSC: 4 M-PAL: 4 others: 1
SYNC_DURATION (US)	double*	Duration of the HSync pulse.	µs	4.74.
SYNC_START (US)	double*	Where the falling edge of sync signal reach 50% of the sync level.	µs	0.00
SYNC_RISETIME (US)	double*	Time between 10–90% of the sync level.	µs	0.2
BURST_DURATION (US)	double*	Duration of the color burst.	µs	Std PAL: 2.25 SECAM: 2.25 N-PAL: 2.25 others: 2.5
BURST_START (US)	double*	Where the amplitude of the color burst signal reach 50% of BURST_AMPLITUDE.	µs	NTSC : 5.3 N-PAL: 5.8 others: 5.6
BURST_RISETIME (US)	double*	10–90% rise time of the color burst signal.	µs	0.2
BURST_AMPLITUDE (IRE)	double*	Amplitude of the color burst.	IRE	NTSC: 20.0 others: 21.4
SUBCARRIER_PERIODS_PER_LINE	double*	Number of periods of the chroma subcarrier in a video line.	periods	NTSC: 227.5000 Std PAL: 283.7516 M-PAL:

				227.2500 CombN-PAL: 229.2516 (not applicable for SECAM)
SUBCARRIER_START_PHASE (DEG)	double*	Color modulation start phase.	degrees	0.00
SUBCARRIER_SECOND_HARMONIC (%)	double*	Color modulation second harmonic distortion.	%	0.00 (not applicable for SECAM)
SUBCARRIER_THIRD_HARMONIC (%)	double*	Color modulation third harmonic distortion.	%	0.00
BRIGHTNESS (IRE)	double*	Brightness value added the Y signal.	IRE	0.00
CONTRAST	double*	Contrast factor.	none	1.00
SATURATION	double*	Saturation factor.	none	1.00
TINT(DEG)	double*	Hue offset angle (NSTC only).	degree	0.00
GAMMA	double*	Gamma correction factor.	none	1.00
IMAGE_INTERLACED	int	Is the image interlaced.	no/yes	1 (yes)
IMAGE_TOP (LINES)	int	Line number where the image starts in the video frame.	line	NTSC: 22 M-PAL: 22 others: 21
IMAGE_HEIGHT (LINES)	int	Number of line of the image to be used.	line	NTSC: 480 M-PAL: 480 others: 576
IMAGE_X_START (US)	double*	Specify the time from the beginning of each line where the active image starts.	µs	Std PAL: 10.5 SECAM: 10.5 CombN-PAL: 10.5 others: 9.5
IMAGE_DURATION (US)	double*	Specify the duration of the active image on each line.	µs	NTSC: 52.2 M-PAL: 52.2 N-PAL: 53.0 others: 52.0
IMAGE_WIDTH (PIXELS)	int	Number of line pixels of the image to be used.	pixel	NTSC: 640 M-PAL: 640 others: 768
INPUT_GAIN	double*	Used only with 16-bit pixels as input data.	none	100 IRE/65535 lsb = 1.5259 ⁻³
INPUT_OFFSET	double*	Used only with 16-bit pixels as input data.	none	0
OUTPUT_GAIN	double*	Used only with 16-bit pixels as output data.	none	25000 lsb/100 IRE = 250
OUTPUT_OFFSET	double*	Used only with 16-bit pixels as output data.	none	-4000 lsb
NOISE_LEVEL (IRE RMS)	double*	Level of white noise to be added to the generated signal.	IRE rms	0.00
DIGITAL_DELAY (PIXELS)	int	Delay between the analog sync and the	samples	28

		digital sync signals.		
FIELD_POLARITY	int	Field digital signal polarity.	Logical	0 (negative)
Y_FILTER	int	Lowpass filter used for the Y component.	filter1	none
UV_FILTER	int	Lowpass filter used for the U and V components.	filter1	1.3 MHz IIR
I_FILTER	int	Lowpass filter used for the I component.	filter1	1.3 MHz IIR
Q_FILTER	int	Lowpass filter used for the Q component.	filter1	0.4 MHz IIR
C_FILTER	int	Lowpass filter used for the C component.	filter1	none
COMPOSITE_FILTER	int	Lowpass filter used for the composite signal.	filter1	none
SECAM_BOTTLE_SHAPE_SIGNAL	int	Enables the bottle shape signals (SECAM only)	Disable/Enabled	1 (enabled)
U or Q Gain	Double*	Gain applied to the U or the Q signal	none	1.00
V or I Gain	Double*	Gain applied to the V or the I signal	none	1.00
<p>1. Refer to How the NI 5431 Generates Video Signals</p>				

The following figure shows the relationship between the sync and burst timings and the attribute name. For example, the number 3 is specified by the attribute Sync Duration (us).



1	White Level (IRE)	2	Sync Start (us)
3	Sync Duration (us)	4	Burst Start 9 (us)
5	Image X Start (us)	6	Setup Level (IRE)
7	Burst Amplitude (IRE)	8	Zero Level (IRE)
9	Burst Duration (us)	10	Sync Amplitude (IRE)
11	Sync Rise Time (us)	12	Burst Rise Time (us)

NI 5431 Composite Video Generator Examples

You can access the examples in this help file by selecting **Functions»Video Generation»Generator Examples** from the LabVIEW palette.

You can also access the Composite Video Generator Examples.llb in the <LabVIEW>\Examples\NI-Video directory, or the NI 5431 High Level Driver.llb and the NI-VideoDataGen.llb in the <LabVIEW>\Vi.lib\ni-video\generator directory.

Using these examples, you can generate composite video signals using an NI PXI/PCI-5431 arbitrary video generator. If you want to see the effect of the composite video signal generation, connect the output signal to a video monitor or a television with video input. You can also use most examples as subVIs directly in your own application.



Note When using the following LabVIEW examples, NTSC, PAL, and SECAM users should select the bitmap image files depending upon the video format they want to generate.

The main file path for all bitmap files is <x:>\Program Files\National Instruments\NI-video\Generator\BMPs\. The appropriate directories for the three different user types are as follows:

- NTSC users—Select any bitmap image file found in the \640x480 or \1044x480 directories. The recommended file is the NTSC_test_pattern_01_1044x480.bmp, located in the \1044x480 directory.
- PAL users—Select any bitmap image file found in the \768x576 or \1040x480 directories. The recommended file is the B-PAL_test_pattern_01_1040X576.bmp, located in the \768x576 or \1040x576 directories.
- SECAM users—Select any bitmap image file found in the \768x576 or \1040x576 directories. The recommended file is the SECAM_test_pattern_01_1040x576.bmp, located in the \1040x576 directory.

NI 5431 Composite Video Generator

Basic Examples

After installing the NI Video Software Toolkit, you can access the example LabVIEW VIs by selecting **Functions»Video Generation»Generator Examples**.

You can also access the Composite Video Generator Examples.llb in <x>:\Program Files\National Instruments\LabVIEW\Examples\Ni-Video directory. You can access the NI 5431 High Level Driver.llb and the NI-VideoDataGen.llb in <x>:\Program Files\National Instruments\LabVIEW\Vi.lib\ni-video\generator directory.

NI 5431 Composite Video Generator

Basic Create Composite Signal from BMP Image

This basic VI example generates an NTSC, PAL, or SECAM data array, depending on the selected video format, downloads the data to the NI 5431, and automatically starts the generation of the video signal.

You can access this VI example in the LabVIEW palette by selecting **Functions»Video Generation»Generator Examples»Basic create composite signal from BMP image**.

To generate a standard video signal, follow these steps:

1. After selecting the example VI icon in the LabVIEW palette, click the LabVIEW diagram to place the icon there. Double-click the VI example icon to open it in LabVIEW.



Note You can also access this VI from the installation drive by double-clicking the Composite Video Generator Examples.llb library. The **File Dialog** box appears. Click the **Basic create composite signal from BMP image.vi**, then click **OK**. The VI opens in LabVIEW.

2. Make sure the **Device ID** control value matches device number assigned in MAX during device configuration. Refer to the *NI Signal Sources Getting Started Guide* for more information about device configuration.
3. On the front panel of the VI, using the LabVIEW palette operating tool and the up and down arrows on the **Video type** control, select the appropriate video format.
4. Run the VI. An **Input BMP File?** dialog box appears, prompting you to select the bitmap image file to convert to video.
5. Double-click the BMPs shortcut to browse in the appropriate subdirectory for the appropriate bitmap image file based on the video format you chose in step 3. Refer to [Basic Examples](#) for more information.
6. Double-click the subdirectory, then double-click a .bmp file.



Note To avoid being prompted for the bitmap image file, type the file path in the **Input BMP file path** control before running the VI.

After a few seconds, a video signal should start generating.

NI 5431 Composite Video Generator

Basic Create Video File from BMP Image and Save

This basic VI example only saves the calculated NTSC, PAL, or SECAM data array. It does not download the data array to the hardware.

You can access this VI example in the LabVIEW palette by selecting **Functions»Video Generation»Generator Examples»Basic create video file from BMP image and save**.

To save the calculated data array, follow these steps:

1. After selecting the example VI icon in the LabVIEW palette, click the LabVIEW diagram to place the icon there. Double-click the VI example icon to open it in LabVIEW.



Note You can also access this VI from the installation drive by double-clicking the Composite Video Generator Examples.llb library. The **File Dialog** box appears. Click the **Basic create video file from BMP image and save.vi**, then click **OK**. The VI opens in LabVIEW.

2. On the front panel of the VI, using the LabVIEW palette operator tool and the up and down arrows on the **Video type** control, select the appropriate video format.
3. Run the VI. An **Input BMP File?** dialog box appears, prompting you to select the bitmap image file to convert to a binary video data file.
4. Double-click the BMPs shortcut to browse in the appropriate subdirectory for the appropriate bitmap image file based on the video format you chose in step 2. Refer to [Basic Examples](#) for more information.
5. Double-click the subdirectory, then double-click a .bmp file. An **Output BIN file?** dialog box appears.
6. Double-click the Video data files shortcut to access the appropriate subdirectories. Select the subdirectory based on the video format you selected in the **Video type** control. The new binary video data file is saved in this subdirectory.
7. Enter a .bin file name for the new binary video file being saved.



Note To avoid being prompted for the file paths, enter the file

paths in the **Input BMP file path** control and the **Output video binary file path** control before running the VI.

8. Click Save. A new binary video data file is created and saved in the Video data files\... subdirectory you selected in step 6.

NI 5431 Composite Video Generator

Download Video File to NI 5431

This basic VI example downloads a binary video data file such as the file you saved using [Basic Create Video File from BMP Image and Save](#). It then downloads the data to the NI 5431 and automatically starts the generation of a video signal. The VI automatically detects the **Video type** from the size of the file and adjusts the pixel frequency to the video type.

You can access this VI example in the LabVIEW palette by selecting **Functions»Video Generation»Generator Examples»Download video file to NI-5431**.

To generate a saved video signal, follow these steps:

1. After selecting the example VI icon in the LabVIEW palette, click the LabVIEW diagram to place the icon there. Double-click the VI example icon to open it in LabVIEW.



Note You can also access this VI from the installation drive by double-clicking the Composite Video Generator Examples.llb library. The **File Dialog** box appears. Click the **Download video file to NI 5431.vi**, then click **OK**. The VI opens in LabVIEW.

2. Make sure the **Device ID** control value matches device number assigned in MAX during device configuration. Refer to the *NI Signal Sources Getting Started Guide* for more information about device configuration.

The **Output Level** control should be set to the default analog output level corresponding to the generated video format. The default analog output level is set to 7.000 mV/IRE, which is the normal value for all formats except NTSC, M-PAL, and N-PAL. For these three video formats, the default value should be 7.143 mV/IRE.



Caution You should be careful modifying the **Output Level** control. For example, the NI 5431 can output up to 5 V in a 75 load, resulting in the potential destruction of your unit under test.

3. Run the VI. A **Video bin file** dialog box appears, prompting you to select a subdirectory that is storing the binary video data file to be downloaded.
4. Double-click the Video data files shortcut to access the appropriate

subdirectories. Select the next subdirectory based on the video format of the binary video data file you want to download.

5. Double-click the .bin file you want to download.

A saved video signal is downloaded to your NI 5431 and the video signal starts generating.

The **DigiSync** enables or disables the digital output data lines on the module.



Note Select **enabled** on the **DigiSync** control only if your application needs the four TTL video synchronization symbols.



Note The Basic create video file from BMP image and save VI does not include the synchronization signals in your saved file.

When you select **enabled** on the **Digital sync** control, the VI inserts four digital synchronization signals in order—composite sync (Csync), horizontal sync (Hsync), vertical sync (Vsync), and field identification (Field ID)—into the four least significant bits of your video data. The video data is created and/or saved as 16-bit data, but only 12 of these bits are used to generate the analog video signal. When you create the four digital synchronization signals, it does not affect your analog signal quality.



Note Refer to the NI 5431 device topics for information on the location of these TTL signals on the NI 5431 digital output connector.

When the VI runs, the video format of the binary video data file is detected and displayed in the **Detected video format** control.

NI 5431 Composite Video Generator

Generating a Standard Video Signal

[Basic Create Composite Signal from BMP Image](#) generates an NTSC, PAL, or SECAM data array, depending on the selected video format, downloads the data to the NI PXI/PCI-5431, and automatically starts generating the video signal.

You can access this example VI by selecting **Functions»Video Generation»Generator Examples»Basic create composite signal from BMP image**.

To generate a standard video signal, complete the following steps:

1. Launch the example VI.
2. Make sure the module ID value matches the value assigned by MAX during configuration of the module.
3. On the front panel, use the operating tool and the up and down arrows on the Video type control to select the appropriate video format.
4. Run the VI. The Input BMP File? dialog box appears, prompting you to select the bitmap image file to convert to video.
5. Double-click the BMPs shortcut to browse in a subdirectory for a bitmap image file based on the video format you chose in step 3. Refer to [Basic Examples](#) for more information.
6. Double-click the subdirectory, then double-click a .bmp file.



Note To avoid being prompted for the bitmap image file, enter the file path in Input BMP file path before running the VI.

After a few seconds, a video signal generates on the output connector.

NI 5431 Composite Video Generator

Saving a Video Signal to Disk

The Basic Create Video File from BMP Image and Save VI only saves the calculated NTSC, PAL, or SECAM data array. It does not download the data array to the hardware.

You can access this example VI by selecting **Functions»Video Generation»Generator Examples»Basic create video file from BMP image and save**.

To save the calculated data array, complete the following steps:

1. Launch the example VI icon.
2. On the front panel, use the operator tool and the up and down arrows on the Video type control to select the appropriate video format.
3. Run the VI. The Input BMP File dialog box appears, prompting you to select the bitmap image file that you want to convert to a binary video data file.
4. Double-click **BMPs** to browse in the subdirectories for the appropriate bitmap image file based on the video format you chose in step 2. Refer to [Basic Examples](#) for more information.
5. Double-click a subdirectory, then double-click a .bmp file. The Output BIN file dialog box appears.
6. Double-click **Video data files** to access the appropriate subdirectories.
7. Select the subdirectory based on the video format that you selected in the Video type control. The new binary video data file is saved in this subdirectory.
8. Enter a .bin file name for the new binary video data file being saved.
 **Note** To avoid being prompted for the file paths, enter the file paths in the Input BMP file path field and the Output video binary file path field before running the VI.
9. Click **Save**. A new binary video data file is created and saved in the Video data files subdirectory you selected in step 7.

NI 5431 Composite Video Generator

Generating a Saved Video Signal

[Download Video File to NI 5431](#) downloads a binary video data file, such as the file you saved using the example VI in [Saving a Video Signal to Disk](#), to the NI 5431 and automatically starts generating a video signal. The VI automatically detects the **Video type** from the size of the file and adjusts the pixel frequency to the **Video type**.

You can access this example VI by selecting **Functions»Video Generation»Generator Examples»Download video file to NI 5431**.

To generate a saved video signal, complete the following steps:

1. Launch the example VI.
2. Make sure the module ID value matches the value assigned by the MAX during configuration of the module.

The Output Level should be set to the default analog output level corresponding to the generated video format. The default analog output level is set to 7.000 mV/IRE, which is the normal value for all formats except NTSC, M-PAL, and N-PAL. For these three video formats, the default value should be 7.143 mV/IRE.



Caution Be careful if modifying the Output Level. For example, the NI 5431 can output up to 5 V in a 75 Ω load, potentially resulting in the destruction of the DUT.

3. Run the VI. A Video bin file? dialog box appears, prompting you to select a subdirectory that is storing the binary video data file to be downloaded.
4. Double-click the Video data files shortcut to access the appropriate subdirectories.
5. Select the next subdirectory based on the video format of the binary video data file you want to download.
6. Double-click the .bin file you want to download.

A saved video signal downloads to the NI 5431 and the video signal starts generating.

DigiSync enables or disables the digital output data lines on the module.



Note Select **enabled** in DigiSync only if the application needs the four TTL video synchronization signals.

When you select **enabled** in DigiSync, the VI inserts four digital synchronization signals in order—composite sync (Csync), horizontal sync (Hsync), vertical sync (Vsync), and field identification (Field ID)—into the four least significant bits of the video data. The video data is created and/or saved as 16-bit data, but only 12 of these bits are used to generate the analog video signal. When you create the four digital synchronization signals, it does not affect the analog signal quality.



Note Refer to [\(VIDEO\) DIG Out Connectors](#) for more information on the location of these TTL signals on the digital output connector of the NI 5431.



Note The example VI in [Saving a Video File to Disk](#) does not include the synchronization signals in the saved file.

When the VI runs, the video format of the binary video data file is detected and displayed in detected video format.

NI 5431 Composite Video Generator Intermediate Examples

After installing the NI Video Software Toolkit, you can access the LabVIEW example VI by selecting **Functions»Video Generation»Generator Examples**.

You can also access the Composite Video Generator Examples.llb in <x>:\Program Files\National Instruments\LabVIEW\Examples\Ni-Video. You can access the NI 5431 High Level Driver.llb and the NI-VideoDataGen.llb in <x>:\Program Files\National Instruments\LabVIEW\Vi.lib\ni-video\generator.

NI 5431 Composite Video Generator

Intermediate Create Composite Signal from BMP Image

This intermediate VI example is equivalent to [Basic Create Composite Signal from the BMP Image](#), except that you can modify an arbitrary number of video attributes and insert digital synchronization patterns into your video data.

You can access this VI example in the LabVIEW palette by selecting **Functions»Video Generation»Generator Examples»Intermediate create composite signal from BMP image**.

Video attributes, which are parameters of your video signal, can be modified. In this VI, the **Attribute list** control is an array of clusters. Each element in the array corresponds to an attribute that can be modified. The clusters contain two simple controls on the front panel of the VI.

To modify the video attributes, follow these steps:

1. After selecting the example VI icon in the LabVIEW palette, click the LabVIEW diagram to place the icon there. Double-click the VI example icon to open it in LabVIEW.



Note You can also access this VI from the installation drive by double-clicking the Composite Video Generator Examples.llb library. The **File Dialog** box appears. Click the **Intermediate create composite signal from BMP image.vi**, then click **OK**. The VI opens in LabVIEW.

2. Make sure the **Device ID** control value matches the device number assigned in MAX during device configuration. Refer to the *NI Signal Sources Getting Started Guide* for information about device configuration.
3. On the front panel of the VI, using the LabVIEW palette operator tool and the up and down arrows on the **Video type** control, select the appropriate video format.
4. In the **Attribute list** data array control, click any one of the three **Attribute** controls that you want to modify, and choose the attribute by name. If you need to change more than three attributes, scroll down the array using the **Index** control on the left side of the **Attribute list** data

array control.

5. In the **Attribute list** data array control, input the attribute values in the **Value** control. This example VI shows three default cases:
 - Synchronization amplitude (**Sync amplitude (IRE)**) set to the value 40 IRE (the default for PAL/SECAM = 43; the default for NTSC = 40)
 - Synchronization pulses duration (**Sync duration (us)**) set to the value 4.7 μ s (the default value for all video standards)
 - Contrast factor (**Contrast**) set to the value 1.00 (the default value for all video standards)

When you select **enable** on the **Digital sync** control, the VI inserts four digital synchronization signals in order-composite sync (Csync), horizontal sync (Hsync), vertical sync (Vsync), and field identification (Field ID)-into the four least significant bits of your video data. The video data is created and/or saved as 16-bit data, but only 12 of these bits are used to generate the analog video signal. When you create the four digital synchronization signals, it does not affect your analog signal quality.

The four signals can be accessed as standard TTL signals on the digital output connector of your NI 5431.



Note To generate these signals, enable both the computation and the digital output of your NI 5431.

6. Run the VI. An **Input BMP file ?** dialog box appears, prompting you to select a bitmap image file.
7. Double-click the BMPs shortcut to browse for the appropriate bitmap image file according to the video format you chose in step 3.
8. Double-click the appropriate subdirectory, then double-click a .bmp file.



Note To avoid being prompted for the file, type the bitmap image file path in the **Input BMP file path** control before running the VI.

After a few seconds, a video signal with the modified attributes should start generating.

NI 5431 Composite Video Generator

Intermediate Insert ITS in Composite Signal

This intermediate VI example shows you how to include Insertion Test Signals (ITS) in your video signal. An ITS is typically inserted in the vertical blanking period of the video signal, but this is not a restriction. In fact, you can build an entire video signal using ITS. This allows you to keep full control of the accuracy on the data you are generating. Also, some ITS cannot be generated from RGB data such as a signal with a luminance value of zero, but a saturation value different from zero. Refer to [Create RGB Color Bars Insertion Test Signal](#) and [Create YUV Color Sweep Insertion Test Signal](#) for more information on how to create an ITS.

You can access this VI example in the LabVIEW palette by selecting **Functions»Video Generation»Generator Examples»Intermediate insert ITS in composite signal**.

To insert test signals in your video signal, follow these steps:

1. After selecting the example VI icon in the LabVIEW palette, click the LabVIEW diagram to place the icon there. Double-click the VI example icon to open it in LabVIEW.



Note You can also access this VI from the installation drive by double-clicking the Composite Video Generator Examples.llb library. The **File Dialog** box appears. Click **Intermediate insert ITS in composite signal.vi**, then click **OK**. The VI opens in LabVIEW.

2. Make sure the **Device ID** control value matches device number assigned in MAX during device configuration. Refer to the *NI Signal Sources Getting Started Guide* for more information about device configuration.
3. On the front panel of the VI, using the LabVIEW palette operator tool and the up and down arrows on the **Video type** control, select the appropriate video format.
4. Run the VI. An **Input BMP File ?** dialog box appears, prompting you for the bitmap image file to convert to a binary video data file.
5. Double-click the BMPs shortcut, then double-click the appropriate subdirectory based on the video format you chose in step 3. An **Input ITS file ?** dialog box appears.

6. Double-click the Insertion test signals shortcut to browse for the appropriate insertion test signals file based on the video format you chose in step 3.
7. Double-click a subdirectory, then double-click an .its file.
8. The VI will by default insert an ITS on line 19.

If your video monitor does not have options that allow you to see the vertical blanking lines (cross-pulse mode), modify the **Line number** control from 19 to a higher value such as 50. The ITS line in the upper part of your video image appears.

NI 5431 Composite Video Generator

Generating a Customized Video Signal Using the Video Attributes

[Intermediate Create Composite Signal from BMP Image](#) is equivalent to [Basic Create Composite Signal from BMP Image](#) in [Generating a Standard Video Signal](#), except that you can modify an arbitrary number of video attributes and insert digital synchronization patterns into the video data.

You can access this example VI by selecting **Functions»Video Generation»Generator Examples»Intermediate create composite signal from BMP image**.

You can modify video attributes, which are the parameters of the video signal. In the Intermediate create composite signal from BMP image VI, the Attribute List control is an array of clusters. Each element in the array corresponds to an attribute that you can modify. The clusters contain two simple controls on the front panel.

To modify the video attributes, complete the following steps:

1. Launch the VI.
2. Make sure the module ID control value matches the value assigned by MAX during configuration of the module.
3. On the front panel, use the operator tool and the up and down arrows on the Video type control to select the appropriate video format.
4. In the Attribute List control, click any one of the three **Attribute** controls that you want to modify, and choose the attribute by name. If you need to change more than three attributes, scroll down the array using the Index control on the left side of the Attribute List data array control.
5. In the Attribute List control, input the attribute values in the **Value** control. This example VI shows three default cases:
 - Synchronization amplitude Sync amplitude (IRE) set to the value 40 IRE (the default for PAL/SECAM = 43; the default for NTSC = 40)
 - Synchronization pulses duration Sync duration (μ s) set to the value 4.7 μ s (the default value for all video standards)

- Contrast factor Contrast set to the value 1.00 (the default value for all video standards)

When you select **enable** on the Digital sync control, the VI inserts four digital synchronization signals in order—composite sync (Csync), horizontal sync (Hsync), vertical sync (Vsync), and field identification (Field ID)—into the four least significant bits of the video data. The video data is created and/or saved as 16-bit data, but only 12 of these bits are used to generate the analog video signal. When you create the four digital synchronization signals, it does not affect analog signal quality.

The four signals can be accessed as standard TTL signals on the digital output connector of the NI 5431.



Note To generate these signals, enable both the computation and the digital output of the NI 5431.

6. Run the VI. The Input BMP file? dialog box appears, prompting you to select a bitmap image file.
7. Double-click the BMPs shortcut to browse for the appropriate bitmap image file according to the video format you chose in step 3. Refer to [Basic Examples](#) for more information.
8. Double-click the appropriate subdirectory, then double-click a .bmp file.



Note To avoid being prompted for the file, enter the bitmap image file path in Input BMP file path before running the VI.

After a few seconds, a video signal with the modified attributes generates on the output connector.

NI 5431 Composite Video Generator

Inserting Test Signals in the Video Signal

[Intermediate Insert ITS in Composite Signal](#) shows you how to include insertion test signals in the video signal. An ITS is typically inserted in the vertical blanking period of the video signal, but this is not a restriction. In fact, you can build an entire video signal using ITS. This allows you to keep full control of and accuracy on the data you are generating. Also, some ITS cannot be generated from RGB data such as a signal with a luminance value of zero, but a saturation value other than zero.

You can access this example VI by selecting **Functions»Video Generation»Generator Examples» Intermediate insert ITS in composite signal**.

To insert test signals in the video signal, complete the following steps:

1. Launch the example VI.
2. Make sure the module ID value matches the value assigned by MAX during configuration of the module.
3. On the front panel, use the operator tool and the up and down arrows on the Video type control to select the appropriate video format.
4. Run the VI. The Input BMP File? dialog box appears, prompting you for the bitmap image file to convert to a binary video data file.
5. Double-click the **BMPs** shortcut, then double-click the appropriate subdirectory based on the video format you chose in step 3. The Input ITS file? dialog box appears.
6. Double-click the **Insertion test signals** shortcut to browse for the appropriate insertion test signals file based on the video format you chose in step 3.
7. Double-click a subdirectory, then double-click an .its file. By default, the VI inserts an ITS on line 19.

If the video monitor does not have options that allow you to see the vertical blanking lines (cross-pulse mode), modify the **Line number** from 19 to a higher value such as 50. The ITS line in the upper part of the video image appears.

NI 5431 Composite Video Generator

Creating Insertion Test Signals Using RGB Mode

[Create RGB Color Bars Insertion Test Signal](#) shows you how to create an ITS data file based on RGB data. The example creates an RGB color bar test pattern and saves the data as a file called test create RGB ITS.its. The file can then be recalled using the Intermediate insert ITS in composite signal VI.

You can access this example VI by selecting **Functions»Video Generation»Generator Examples»Create RGB color bars Insertion Test Signal**.

To generate an RGB Insertion Test Signal, complete the following steps:

1. Launch the example VI



Note This VI has predefined parameters for demonstration purposes. If you have not installed the software in the C: drive root directory, correct the file path of the ITS signal to be saved on the VI front panel so that it matches the installation.

2. Make sure the module ID control value matches the value assigned by MAX during configuration of the module.
3. Run the VI. The RGB ITS appears in the front panel, and the ITS data is saved on the disk. Refer to [Attribute List](#) for more information.

An RGB ITS is defined as three data arrays (R, G, and B) of unsigned 16-bit data (U16). The size of the arrays depends on the selected video format and the specified active video duration, which you can modify using the **Image duration (μ s)** attribute. The default value for an NTSC signal is 52.2 μ s, corresponding to approximately 1,044 samples at the nominal sampling frequency of 20.013 MHz. For B-PAL and SECAM, the default active video duration is 52.0 μ s, corresponding to 1,040 samples at the nominal sampling frequency of 20.000 MHz. Refer to [Attribute List](#) for more information.

The default size of the array is 1,044 for M-NTSC and 1,040 for 50 Hz-type PAL or SECAM. The data are scaled so that zero corresponds to black or 0 IRE (if no setup is applied), and 65,535 (the maximum value for unsigned 16-bit data) corresponds to white or 100 IRE.

NI 5431 Composite Video Generator

Creating Insertion Test Signals Using YUV Mode

[Create YUV Color Sweep Insertion Test Signal](#) shows you how to create an ITS data file based on YQI/YUV data. Some test patterns are easier to create using the two chroma components (Q and I for NTSC, or U and V for PAL) than using an RGB approach. In other cases, you simply cannot create the test signal using RGB signals.

This example VI creates a color sweep test pattern and saves the data as a file called `test create YUV ITS.its`. The file can then be recalled using [Intermediate Insert ITS in Composite Signal](#).

You can access this example VI by selecting **Functions»Video Generation»Generator Examples»Create YUV Color sweep Insertion Test Signal**.

To generate and save a color sweep test pattern, complete the following steps:

1. Launch the example VI.
2. On the front panel, use the operator tool and the up and down arrows on the Video type control to select the appropriate video format.
3. Verify that the module ID control value matches the value assigned by MAX during configuration of the module.



Note This VI has predefined parameters for demonstration purposes. If you have not installed the software in the C:drive root directory, correct the file path of the ITS signal to be saved on the front panel so that it matches the installation.

4. Run the VI. The YUV Insertion Test Signal appears in the front panel and the ITS data are saved on the disk.

A YQI/YUV ITS is defined as three data arrays (Y, Q, and I for NTSC; Y, U, and V for PAL; or Y, Db, and Dr for SECAM) of 16-bit data. The luma Y signal is represented by a 16-bit unsigned array (U16) while the chroma components (Q and I or U and V) are represented by 16-bit signed arrays (I16). The size of the arrays depends on the selected video format and the specified active video duration, which you can modify using the Image duration (μs) attribute. The default value for an NTSC signal is 52.2 μs , corresponding to approximately 1,044 samples at the nominal sampling frequency of 20.013 MHz. For B-PAL or

SECAM, the default active video duration is 52.0 μ s, corresponding to 1,040 samples at the nominal sampling frequency of 20.000 MHz. Refer to [Attribute List](#) for more information.

The default size of the array is 1,044 for M-NTSC and 1,040 for 50 Hz-type PAL or SECAM. For the luma signal Y, the data is scaled so that zero corresponds to black or 0 IRE (if no setup is applied), and 65,535 (the maximum value for unsigned 16-bit data) corresponds to white or 100 IRE. For the chroma component signals, the data is scaled so that ± 50 IRE corresponds to $\pm 32,767$ (the maximum and minimum values for signed 16-bit data).



Note For SECAM users, the terminology used in this example VI is based on the PAL chroma components *U* and *V*. However, these components are internally scaled so that they correspond to the usual *Db* and *Dr* components when a SECAM image generates.

The scaling factors used internally are in order as follows:

$$Db = 1.505 * (Eb - Ey) = +3.0527 * U$$

$$Dr = -1.902 * (Er - Ey) = -2.1688 * V$$

Also, because a modulation is always present in SECAM, even if the *U* and *V* components are set to zeros, an option for generation of the Y component only (without the FM subcarrier) is available on the front panel. Enable **Kill Chroma Modulation** if you do not want the FM subcarrier signal to generate on the test signal.

NI 5431 Composite Video Generator

Advanced Color Bars from ITS with Custom Filters

This VI shows you how to repeat a specific ITS-defined line to create a whole image or portion of an image. It also shows how to define and apply user-specific filters. This VI can create, download, and generate M-NTSC, Standard-PAL, or SECAM signals.

You can access this VI example in the LabVIEW palette by selecting **Functions»Video Generation»Generator Examples»Advanced Color bars from ITS with custom filters**.

To repeat a specific ITS-defined line to create an image, follow these steps:

1. After selecting the example VI icon in the LabVIEW palette, click the LabVIEW diagram to place the icon there. Double-click the VI example icon to open it in LabVIEW.



Note You can also access this VI from the installation drive by double-clicking the Composite Video Generator Examples.llb library. The **File Dialog** box appears. Click **Advanced Color bars from ITS with custom filters.vi**, then click **OK**. The VI opens in LabVIEW.

2. Make sure the **Device ID** control value matches device number assigned in MAX during device configuration. Refer to the *NI Signal Sources Getting Started Guide* for more information about device configuration.
3. On the front panel of the VI, using the LabVIEW palette operating tool and the up and down arrows on the **Video type** control, select the appropriate video format.
4. Run the VI.

The result shows an image that contains 200 color bar lines. The color bars are defined as in the [Create RGB Color Bars Insertion Test Signal](#) example.

Furthermore, this example shows how to define and apply custom filters. The luma and chroma components are filtered using FIR filters without overshoot in the step response. The filter coefficients, represented by the impulse response of an FIR filter, are calculated using the example [Calculate Zero-Overshoot Lowpass Filter](#). When you apply a step signal to the different filters, you get a smooth and symmetrical edge without any overshoot. See the front panel of the subVI for more details on the filter step response and frequency characteristics.

NI 5431 Composite Video Generator

Data Generation Examples

You can access the data generation example VIs by selecting **Functions»Video Generation»Low Level Driver»Data Generation Examples**. Click the topics below for the VI descriptions.

[Show Line](#)

[Show Line From Image](#)

[Show RGB From Image](#)

[Show Digital Sync](#)

[Benchmark](#)

NI 5431 Composite Video Generator

Show Line

This example VI demonstrates the flexibility and functionality of the video data calculation software toolkit. It does not support the generation of a video signal using a dedicated hardware device.

This VI displays any video component of any video line with SGL precision. The data scaling is in IRE. The input image is a constant color that you can select using the **Image color** color box. The displayed component is selected using the **Signal type** control and the selected line using the **Line index** control.

This VI runs continuously. You can get or set any **Attribute value** using the **Get**, **Set**, and **Attribute** controls before the VI runs.

NI 5431 Composite Video Generator

Show Line from Image

This example VI demonstrates the flexibility and functionality of the video data calculation software toolkit. It does not support the generation of a video signal using a dedicated hardware device.

This VI displays any video component of any video line with SGL precision. The data scaling is in IRE. You can use the **Load Image** control to load a color BMP image. The composite synchronization channel can be selected using the **Synchro channel** control and the selected line using the **Line index** control.

This VI runs continuously. You can get or set any **Attribute value** using the **Get**, **Set**, and **Attribute** controls before the VI runs.

NI 5431 Composite Video Generator

Show RGB from Image

This example VI demonstrates the flexibility and functionality of the video data calculation software toolkit. It does not support the generation of a video signal using a dedicated hardware device.

This VI displays the Red, Green, and Blue components of any video line with I16 precision. The **Output Gain** and **Output Offset** attributes define the data scaling. You can use the **Line Image** control to load a color BMP image. The composite synchronization channel is selected using the **Synchro channel** control and the selected line using the **Line index** control.

This VI runs continuously. You can get or set any **Attribute value** using the **Get**, **Set**, and **Attribute** controls before the VI runs.

NI 5431 Composite Video Generator

Show Digital Sync

This example VI demonstrates the flexibility and functionality of the video data calculation software toolkit. It does not support the generation of a video signal using a dedicated hardware device.

This VI displays the four bits that contain the optional synchronization signals. To use this VI, follow these steps:

1. Select the video format using the **Video Type** control.
2. Run the VI.

This VI runs continuously. You can get or set any **Attribute value** using the **Get**, **Set**, and **Attribute** controls before the VI runs.

NI 5431 Composite Video Generator Benchmark

This example VI is designed to demonstrate the flexibility and functionality of the video data calculation software toolkit. It does not support the generation of a video signal using a dedicated hardware device.

You can use this VI as a benchmark to measure the time needed by the PC used to calculate the data corresponding to a specific video waveform. To use this VI, follow these steps:

1. Select your **Video format**, then run the VI.
2. Load a color bitmap image using the **Load Image** control.
3. Click the **Generate** Boolean control.

The VI will then compute all the data corresponding to the selected **Video format** and then return the computation time in the **Time (ms)** indicator.

Optionally, you can keep the calculated data and/or display the calculated data on the graph by activating the **Display** and **Keep Data** boolean controls.

NI 5431 Composite Video Generator

Create RGB Color Bars Insertion Test Signal

This VI shows you how to create an ITS data file based on RGB data. The example creates an RGB color bar test pattern and saves the data as a file called test create RGB ITS.its. The file can then be recalled using the Intermediate insert ITS in composite signal VI.

You can access this VI example in the LabVIEW palette by selecting **Functions»Video Generation»Generator Examples»Create RGB color bars Insertion Test Signal**.

To generate an RGB Insertion Test Signal, follow these steps:

1. After selecting the example VI in the LabVIEW palette, click the LabVIEW diagram to place the icon there. Double-click the VI example icon to open it in LabVIEW.
 -  **Note** You can also access this VI from the installation drive by double-clicking the Composite Video Generator Examples.llb library. The **File Dialog** box appears. Click **Create RGB color bars Insertion Test Signal.vi**, then click **OK**. The VI opens in LabVIEW.
 -  **Note** This VI has predefined parameters for demonstration purposes. If you have not installed your software in your C: drive root directory, correct the file path of the ITS signal to be saved on the VI front panel so it matches your installation.
2. Make sure the **Device ID** control value matches device number assigned in MAX during device configuration. Refer to the *NI Signal Sources Getting Started Guide* for more information about device configuration.
3. On the front panel of the VI, using the LabVIEW palette operator tool and the up and down arrows on the **Video format** control, select the appropriate video format.
4. Run the VI. The RGB ITS appears in the VI front panel and the ITS data are saved on your disk. Refer to the NI-Video Attribute List topic for more information.

An RGB ITS is defined as three data arrays (R, G, and B) of unsigned 16-bit data (U16). The size of the arrays depends on the selected video format and the

specified active video duration, which can be modified using the **Image duration (μ s)** attribute. The default value for an NTSC signal is 52.2 μ s, corresponding to approximately 1,044 samples at the nominal sampling frequency of 20.013 MHz. For B-PAL and SECAM, the default active video duration is 52.0 μ s, corresponding to 1,040 samples at the nominal sampling frequency of 20.000 MHz. Refer to the NI-Video Attribute List topic for more information.

Therefore, the default size of the array is 1,044 for M-NTSC and 1,040 for 50 Hz-type PAL or SECAM. The data are scaled so that 0 corresponds to black or 0 IRE (if no setup is applied), and 65,535 (the maximum value for unsigned 16-bit data) corresponds to white or 100 IRE.

NI 5431 Composite Video Generator

Create YUV Color Sweep Insertion Test Signal

This subVI example shows you how to create an ITS data file based on YQI/YUV data. Some test patterns are easier to create using the two chroma components (Q and I for NTSC, or U and V for PAL) than using an RGB approach. In other cases, the test signal simply cannot be created using RGB signals.

This VI example creates a color sweep test pattern and saves the data as a file called test create YUV ITS.its. The file can then be recalled using the [Insert Test Signals in Your Video Signal](#) example.

You can access this VI example in the LabVIEW palette by selecting **Functions»Video Generation»Generator Examples»Create YUV color sweep Insertion Test Signal**.

To generate and save a color sweep test pattern, follow these steps:

1. After selecting the example VI in the LabVIEW palette, click the LabVIEW diagram to place the icon there. Double-click the VI example icon to open it in LabVIEW.



Note You can also access this VI from the installation drive by double-clicking the Composite Video Generator Examples.llb library. The **File Dialog** box appears. Click **Create YUV color sweep Insertion Test Signal.vi**, then click **OK**. The VI opens in LabVIEW.

2. Make sure the **Device ID** control value matches device number assigned in MAX during device configuration. Refer to the *NI Signal Sources Getting Started Guide* for more information about device configuration.



Note This VI has predefined parameters for demonstration purposes. If you have not installed your software in your C: drive root directory, correct the file path of the ITS signal to be saved on the VI front panel so it matches your installation.

3. On the front panel of the VI, using the LabVIEW palette operator tool and the up and down arrows on the **Video format** control, select the appropriate video format.
4. Run the VI. The YUV Insertion Test Signal appears in the VI front panel

and the ITS data are saved on your disk.

A YQI/YUV ITS is defined as three data arrays (Y, Q, and I for NTSC; Y, U, and V for PAL; and Y, Db, and Dr for SECAM) of 16-bit data. The luma Y signal is represented by a 16-bit unsigned array (U16) while the chroma components (Q and I or U and V) are represented by 16-bit signed arrays (I16). The size of the arrays depends on the selected video format and the specified active video duration, which can be modified using the attribute **Image duration (µs)**. The default value for an NTSC signal is 52.2 µs, corresponding to approximately 1,044 samples at the nominal sampling frequency of 20.013 MHz. For B-PAL or SECAM, the default active video duration is 52.0 µs, corresponding to 1,040 samples at the nominal sampling frequency of 20.000 MHz. Refer to the NI-Video Attribute List topic for more information.

Therefore, the default size of the array is 1,044 for M-NTSC and 1,040 for 50 Hz-type PAL or SECAM. For the luma signal Y, the data are scaled so that 0 corresponds to black or 0 IRE (if no setup is applied) and 65,535 (the maximum value for unsigned 16-bit data) corresponds to white or 100 IRE. For the chroma component signals, the data are scaled so ± 50 IRE corresponds to ± 32,767 (the maximum and minimum values for signed 16-bit data).



Note For SECAM users, the terminology used in this LabVIEW example is based on the PAL chroma components U and V. However, these components are internally scaled so they correspond to the usual Db and Dr components when a SECAM image generates.

The scaling factors used internally are as follows:

$$Db = 1.505 * (Eb - Ey) = +3.0527 * U$$

$$Dr = -1.902 * (Er - Ey) = -2.1688 * V$$

Also, because a modulation is always present in SECAM, even if the U and V components are set to zeros, an option for generation of the Y component only (without the FM subcarrier) is available on the front panel of the VI. Enable the **Kill Chroma Modulation** control if you do not want the FM subcarrier signal to be generated on your test signal.

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Create RGB Color Bars ITS with Rise Time Control

This subVI example shows how to create a 3×16 -bit RGB insertion test signal and save it to disk. A utility subVI controls the rise time of the different edges in the image. The signal can be loaded from disk and downloaded to the video generator using the driver VI.

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Calculate Zero-Overshoot Lowpass Filter

This utility VI calculates the filter coefficients for an FIR filter without overshoot on the Step Response. The filter impulse response is defined as a raised cosine (1-Cos) to the power of Power coefficient.

This filter can be used for filtering of the video components if no-overshoot is a requirement. When sampling at 20 MHz, the requirements for the different chroma components can be approximately achieved using the following input values:

NTSC Q Component: Filter size = 25; Power coefficient = 0.50

NTSC I or PAL U and V components: Filter size = 7; Power coefficient = 0.40



Note This VI requires the LabVIEW Advanced Analysis library. If you do not have this library installed, open the diagram and delete the specified frame.